SACRED HEART COLLEGE, CHALAKUDY

(AFFILIATED TO UNIVERSITY OF CALICUT)

THRISSUR, KERALA - 680307

AQAR 2021-22

CRITERION I

1.1.1 - The Institution ensures effective curriculum delivery through a well planned and documented process



Submitted to

National Assessment and Accreditation Council

Department of Zoology

UNIVERSITY OF CALICUT

B.Sc.ZOOLOGY PROGRAMME

[CBCSS UG 2019]

Lesson Plan

Ms.ANNA KURIAN

SECOND SEMESTER B. Sc. ZOOLOGY PROGRAMME

ZOOLOGY CORE COURSE- II (Theory)

ANIMAL DIVERSITY: NON-CHORDATA PART – II

Code: ZOL2B02T

[DIVERSITY, ADAPTATIONS & FUNCTIONAL ANATOMY OF COELOMATE NON-CHORDATES] [2 Credits]

Course outcomes(COs)

Course outcome statements
Explain the classification of phylum Arthropoda; elucidate the salient features of each class and describe the morphology and structural organization of *Penaeus*(11 hrs)
Describe the characteristic features of phylum Mollusca, illustrate its classification
down to classes and explain the structural organization of *Pila globosa* (8 hrs)
Explain the salient features of phylum Echinodermata and illustrate its classificationdown to classes (4 hrs)
Understand the salient features and affinities of phylum Hemichordata (1 hr)

MODULE 3. Phylum ARTHROPODA (11 hrs)

Classification down to classes (mention the five subphyla and 16 arthropod classes); salient features of the following classes:

1. Class Trilobita [brief account only]
2. Class Merostomata e.g.*Limulu*s
3. Class Arachnida e.g.*Heterometrus (Palamnaeus),Heteropoda*

(Huntsman spider, Order Araneae). Mention ticks and mites (Subclass Acari).

4. Class Chilopoda e.g.*Scolopendra, Scutigera*
5. Class Diplopoda e.g.*Spirostreptus, Julus*
6. Class Crustacea e.g.*Sacculina, Eupagurus*

7. Class Insectae.g.,*Lepisma, Mantis, Tabanus, Troidesminos* (Southern Birdwing butterfly), *Papilio buddha* (Malabar Banded Peacock),Apis.

Type*: Penaeus indicus* [Prawn]

[Morphology, digestive system, respiratory system, blood vascular system, excretory system, nervous system, sense organs (statocyst, compound eye in detail), reproductive system and development] [Details of larval stages not expected].

MODULE 4. Phylum MOLLUSCA (8 hrs)

Classification down to classes; Mention Nudibranchs and Nautilus. Salient features of the following classes:

1. Class Aplacophora e.g., *Chaetoderma*
2. Class Polyplacophora (=Amphineura) e.g., *Chiton*
3. Class Monoplacophora e.g.,*Neopilina*
4. Class Gastropoda e.g.,*Turbinella*
5. Class Bivalvia (=Pelecypoda) e.g.,*Perna*
6. Class Scaphopoda e.g.,*Dentalium*
7. Class Cephalopoda (=Siphonopoda) e.g.,*Sepia*

Type: *Pila globosa* [Apple Snail]

[Morphology, digestive system, respiratory system, blood vascular system, excretory system, nervous system, sense organs (osphradium in detail) and reproductive system].

MODULE 5. Phylum ECHINODERMATA (4 hrs)

Classification down to classes [of extant forms only]; salient features of the following classes and brief account of examples:

1. Class Crinoidea e.g.,*Antedon*
2. Class Asteroidea e.g.,*Astropecten*
3. Class Ophiuroidea e.g.,*Ophiothrix*
4. Class Holothuroidea e.g.,*Holothuria*
5. Class Echinoidea e.g.,*Echinus*

Structural peculiarities of Asterias (star fish); water vascular system in detail.

MODULE 6. Phylum HEMICHORDATA (1 hr)

Balanoglossus: Salient features and affinities

Topics for Assignments/Seminars

1] Larval forms in Crustacea and their significance.

2] Metamorphosis in insects.

3] Social organization in insects.

4] Economic importance of molluscans.

5] Insect vectors of human diseases.

REFERENCES

•Meglitsch, P.A. & Schram, F.R. (1991). Invertebrate Zoology. Oxford University Press, New York

•Russel-Hunter, W. D. (1969). A Biology of Higher Invertebrates. Collier - Macmillan Ltd., London.

•Sandhu, G.S. (2005). Textbook of Invertebrate Zoology, Volume I. University of California & Campus Books International, New Delhi.

• Sebastian, P.A. & Peter, K. V. (2009). Spiders of India. Universities Press, Hyderabad.

•Shubhalaxmi, V. & Kendrick, R. (2018). Field Guide to Indian Moths. Birdwing Publishers, Mumbai.

•Smetacek, P. (2016). A Naturalist's Guide to the Butterflies of India. Prakash Books India Pvt. Ltd., New Delhi.

•Subramanian, K. A. (2005). Dragonflies and Damselflies of Peninsular India- A Field Guide. Indian Academy of Sciences, Bangalore.

•Verma, A. (2005). Invertebrates: Protozoa to Echinodermata. Alpha Science International, Oxford.

THIRD SEMESTER B. Sc. ZOOLOGY PROGRAMME

ZOOLOGY CORE COURSE – III (Theory)

ANIMAL DIVERSITY: CHORDATA PART - I

CODE: ZOL3B03T

[TAXONOMY, DIVERSITY, STRUCTURAL ANATOMY AND ADAPTATIONS OF CHORDATES]

COURSE OUTCOMES [COs]

Elucidate the characteristic features of the class Reptilia and its classification downto orders; describe the morphology and organ systems of Calotes versicolor (15 hrs)

MODULE 7. Class REPTILIA

Type*: Calotes versicolor* (Garden Lizard)

[Morphology, body wall, skeletal system (exclude skull bones), digestive system, respiratory system, circulatory system, excretory system, sense organs and reproductive system].

REFERENCES

•Areste, M. & Cebrian, R. (2003). Snakes of the World. Sterling Publishing Company, New York.

•Barbour, T. (1926). Reptiles and Amphibians-Their Habits and Adaptations. Houghton Mifflin Co., New York.

•Boulenger, G. A. (2016). Fauna of British India, including Ceylon and Burma: Reptilia and Batrachia (illustrated reprint). Wentworth Press (Originally published by Taylor & Francis, New York, 1890).

• Das, I. (2002). A Photographic Guide to Snakes and Other Reptiles of India. Ralph Curtis Books, Florida.

FOURTH SEMESTER B. Sc. ZOOLOGY PROGRAMME

ZOOLOGY CORE COURSE-IV (Theory)

ANIMAL DIVERSITY: CHORDATA PART-II

Code: ZOL4B04T

CLASS: MAMMALIA [25 hrs]

MODULE 3. Classification of Mammalia [11 hrs]

Classification of class Mammalia down to the orders cited with examples specified.

Subclass Prototheria [2 hr]

Infraclass Ornithodelphia [egg-laying mammals]

1. Order Monotremata e.g.,*Ornithorhynchus* [Platypus],

Tachyglossus [= Echidna]

Subclass Theria [2 hr]

Infraclass Metatheria [marsupials]

2. Order Marsupialia e.g.,Didelphis [Opossum], *Macropus* [Kangaroo]

Infraclass Eutheria [true placental mammals] [7 hrs]

3. Order Edentata e.g.,*Bradypus*(Sloth),*Dasypus*(Armadillo), *Myrmecophaga* (Spiny ant-eater)

4. Order Pholidota e.g.,*Manis* (Pangolin/ Scaly ant-eater)

5. Order Lagomorpha [rabbits and hares] e.g.,*Lepus nigricollis*(Indian Hare)

6. Order Rodentia e.g.,*Funambulus, Ratufa*(Giant squirrel)

7. Order Soricimorpha [shrews, moles] e.g.,*Suncusmurinus, Crocidura*

8. Order Erinaceomorpha e.g.,*Paraechinusmicropus* (Indian Hedgehog)

9. Order Chrysochloridea e.g., Golden mole of South Africa

10. Order Dermoptera [colugos] e.g., *Cynocephalusvolans* (flying lemur)

11. Order Chiroptera e.g.,*Pteropus, Pipistrellus, Kerivoulapicta* (Painted bat)

12. Order Primates e.g., *Loris, Macaca, Gorilla, Pongo, Hylobates, Homo*

13. Order Carnivora e.g.,*Phoca* (Seal), *Odobenus* (Walrus), *Panthera* sp.,*Viverriculaindica* (Civet), *Lutrogale* (Otter),*Cuonalpinus* (Wild dog).

14. Order Cetacea e.g.,*Physeter* (Sperm whale), *Delphinus* (Dolphins),*Phocaena* (Porpoise), *Balaenoptera* (Baleen whale]

15. Order Artiodactyla e.g.,*Sus scrofa cristatus* (Wild Boar), *Bos gaurus*(Gaur), *Giraffa* (Giraffe), *Hemitragus* [Tahr], *Rusa* (=Cervus) *unicolor* (Sambar deer), *Axis axis* (Spotted deer), *Moschiola* (Mouse deer), *Antilope cervicapra* (Blackbuck).

16. Order Perissodactyla e.g.,*Equus caballus* (Horse), *Rhinoceros*

17. Order Sirenia e.g.,*Trichechus* (Manatee), *Dugong*

18. Order Proboscidea e.g.,*Elephas maximus indicus* [Indian elephant],*Elephas maximus borneensis* [Borneo pigmy elephant], *Loxodonta africana* [African savanna elephant] and *Loxodonta cyclotis* [African forest elephant].

19. Order Hyracoidea e.g.,*Hyrax* (Coney)

20. Order Tubulidentata e.g.,*Aardvark*

MODULE 4. Type*: Oryctolagus cuniculus* (European Rabbit) [14 hrs]

[External features, integumentary system, skeletal system (dentition in detail – skull excluded), digestive system, respiratory system, circulatory system (exclude arterial and venous systems), excretory system, sense organs and reproductive system].

Topics for Assignments/ Seminars

1. Aquatic mammals and their adaptations

2. Dentition in mammals [adaptations related to food)

3. Endangered mammals of Kerala

4. Flying mammals

REFERENCES

•Johnsingh, A. J. T. & Manjrekar, N. (2012). Mammals of South Asia – Volume 1 & 2. Orient BlackSwan Publishing, Hyderabad.

•McKenna, M. C. & Bell, S. K. (1997). Classification of Mammals: Above the Species Level. Columbia University Press, USA.

•Menon, V. (2014). Indian Mammals: A Field Guide. Hachette India, New Delhi.

•Wilson, D. E. & Reeder, D. M. (2005). Mammal Species of the World: A Taxonomic and Geographic Reference, Volume 1. Johns Hopkins University Press

FIFTH SEMESTER

ZOOLOGY CORE COURSE- V [Theory]

CELL BIOLOGY AND GENETICS

Code: ZOL5B06T

COURSE OUTCOMES (COs)

Course outcome Statements
Understand the principles and applications of various types of light microscopes, electron, Scanning-tunnelling and atomic force microscope and illustrate thehistological and histochemical processing of tissues (7 hrs)
Explain the basic structure of a eukaryotic cell and the structure and functions ofplasma membrane, mitochondria, lysosome, cytoskeletal elements and interphase nucleus (12 hrs).
Illustrate the nucleosome organization of chromatin and higher order structures;structure of chromosomes and giant chromosomes (2 hrs).
Enumerate eukaryotic cell cycle and cell division by amitosis, mitosis and meiosis (4hrs)
Explain the causes of transformation, characteristics of transformed cells and therole of protooncogenes and tumour suppressor genes in malignant transformation; mechanism and significance of apoptosis (2 hrs)

Section A: CELL BIOLOGY (27 hrs)

MODULE 1. Techniques in Cell Biology (7 hrs)

Microscopy (4 hrs)

Light microscope: principles and uses; use of oil immersion objective. Types of light Microscopes: Bright-field, Phase contrast and Fluorescence microscope. Camera lucida: Principle and uses. Micrometry. Electron microscope: Principle, applications; advantages and disadvantages. Principles and applications of - Scanning Electron Microscope (SEM); Scanning-tunnelling microscope and Atomic force microscope.

Histological Techniques (2 hrs)

Preparation of materials for light microscopy (for temporary and permanent mounts): Fixation: common fixatives: buffered formalin, ethanol, Bouin's solution and Carnoy's fluid (mention composition). Processing of the fixed tissue: mention dehydration, infiltration, and embedding. Sectioning: Rotatory microtome (brief description), uses. Staining: Mention deparaffinization, hydration, staining, dehydration and mounting. Histological stains: Haematoxylin and Eosin. Vital stains: Neutral red and Janus green.

Histochemical Techniques (1 hr)

Mention the techniques for the demonstration of proteins (mercuric bromophenol blue method),carbohydrates (PAS) and lipids (Sudan)

MODULE 2. Structure of eukaryotic cell (12 hrs)

Plasma membrane (6 hrs)

Chemical composition and structure (unit membrane concept and fluid mosaic model), membrane lipids and membrane fluidity; significance of membrane fluidity; membrane proteins-integral proteins, peripheral proteins and lipid-anchored proteins; membrane carbohydrates.

Interactions between cells and their environment – extracellular space, glycocalyx, extracellular matrix - Mention basal lamina, collagen, fibronectin, proteoglycans and laminins.

Interaction of cells with other cells – cell adhesion molecules, selectins, immunoglobulins, integrins and cadherins. Modifications of the plasma membrane

– microvilli, desmosomes, nexuses, tight junction and gap junction.

Functions: trans-membrane transport mechanisms – diffusion, osmosis, active transport, ion transport (channels), co-transport, bulk trans-membrane transport – exocytosis, endocytosis. Membrane receptors: Mention insulin receptor.

Mitochondria(2 hrs)

Ultra-structure; mitochondrial membranes; functions of mitochondria; Biogenesis of mitochondria.

Lysosomes (1 hr)

Structure and function; polymorphism in lysosomes, lysosomal enzymes. Concept of GERL (Golgi body – Endoplasmic Reticulum – Lysosome complex).

Cytoskeleton(1 hr)

Location, ultrastructure, biochemical composition and functions of microfilaments, intermediate filaments and microtubules.

Interphase nucleus(2 hrs)

General structure and functions; nucleo-cytoplasmic index; ultrastructure of nuclear membrane and nuclear pore complex (NPC), functions of NPC;

Nucleoplasm - Composition and function; Nucleolus - Structure, composition, nucleolar organizer, nucleolar cycle and functions of nucleolus. Chromatin: Euchromatin and heterochromatin.

MODULE 3. Structure of chromatin (2 hrs)

Nucleosome organization and higher order structures; Chromosome structure; Giant chromosomes - Polytene chromosomes: structure, puffs and bands; Endomitosis; significance. Lamp brush chromosomes: structure, loops and significance.

MODULE 4. Cell Cycle & Cell division (4 hrs)

Cell Cycle: G1, S, G2 and M phases – Check points; G0 phase. Cell division: Amitosis (brief account); Mitosis: description of all stages, cytokinesis and significance; Meiosis: description of all stages and significance. Role of centriole in animal cell division.

MODULE 5. Cancer and Apoptosis (2 hrs)

Characteristics of cancer cells; causes of transformation; protooncogenes and tumor suppressor genes and their role in transformation. Apoptosis, mechanism of apoptosis and its significance.

Topics for assignments/seminars

1. Ribosomes: structure and functions
2. Golgi bodies: structure and functions

REFERENCES

•Gerald Karp (2013): Cell Biology; 7th Edition, ISBN-10: 1118318749, Wiley, 872 pages

•Gupta, P. K.(2018): Cell and Molecular Biology, Revised 5th edition, ISBN, 978-93-5078-154-8, Rastogi Pubs.,1192 pages

FIFTHSEMESTER

BIOTECHNOLOGY, MICROBIOLOGY AND IMMUNOLOGY

Code: ZOL5B07T

COURSE OUTCOMES (COs)

Course Outcome statements
Illustrate the steps in genetic engineering and animal cell culture (12 hrs)
Explain transfection methods, transgenic animals and ethical issues of
transgenic animals (5 hrs)
Enumerate the applications of biotechnology (7 hrs)
Understand the biological diversity of microbial forms and the various techniques for handling microbes in the laboratory (8 hrs)
Enumerate the basic structure and life cycle of bacteria and virus (8 hrs)
Understand the industrial and medical importance of microorganisms (8 hrs)

Section A: BIOTECHNOLOGY (24 hrs)

MODULE 1: Genetic Engineering and Animal cell culture (12 Hrs)

Genetic Engineering (10 hrs)

Concept and scope of biotechnology – Mention branches of biotechnology. Introduction to the concept of Recombinant DNA Technology: Cloning vectors (Plasmid, pBR322, Phages, Cosmids, Virus vectors, YAC vector and Bac vector).

Enzymes: Type II Restriction endonucleases, polynucleotide kinase, exonuclease, terminal transferase, reverse transcriptase and DNA ligase.

Construction of Recombinant DNA: Preparation of vector and donor DNA, Joining of vector DNA with the donor DNA, Introduction of recombinant DNA into the host cell and selection of transformants (brief account).

Animal Cell Culture (2 hrs)

Cell culture media (Natural and Defined), Preparation and Sterilization, Primary cell culture, Cell Lines, Pluripotent Stem Cells, Cryopreservation of cultures. Somatic cell fusion and HAT selection of hybrid clones – production of monoclonal antibodies.

MODULE 2: Transgenic Organisms (5 hrs)

Transfection Methods: (Chemical treatment, Electroporation, Lipofection, Microinjection, Retroviral vector method, Embryonic stem cell method and Shot

Gun Method). Transgenic Animals: (Fish, Pig, Sheep, Rabbit, Mice, Goat andInsects), Knock Out Mice. Human Cloning and Ethical Issues of transgenic Animals.

MODULE 3: Applications of Biotechnology (7hrs)

Molecular diagnosis of genetic diseases (Cystic Fibrosis, Huntington's Disease and Sickle Cell Anemia). Vaccines and Therapeutic agents, Recombinant DNA in Medicines (Recombinant Insulin and Human Growth Hormone).

Human gene therapy (gene therapy for severe combined immune deficiency).

Enzymes in detergents and leather industries, Heterologous protein production, Biofiltration, Bioremediation, Bioleaching, Molecular pharming and Bioreactors.

Molecular markers (brief account) RFLP, RAPD, VNTR, SNPs and their uses.

Section B: MICROBIOLOGY (24 hrs)

MODULE 4: Introduction and Methods in Microbiology (8 hrs)

Introduction (1 hr)

Microbial Diversity: Archaebacteria, Eubacteria, Prochlorophyta, Algae, Fungi, Protozoa, Viruses, Viroids, Prions, Mycoplasma and Rickettsias

Methods in Microbiology (7 hrs)

Sterilization: Physical and Chemical methods - Dry and Moist Heat, Pasteurization, Radiation, Ultrasonication. Disinfection, Sanitization, Antiseptics, Sterilants and Fumigation. Preparation of culture media: Selective, Enrichment and Differential media. Plating techniques and Isolation of pure colonies. Staining: Simple staining, Negative staining and Gram staining. Culture preservation techniques: Refrigeration, Deep freezing, Freezing under liquid Nitrogen and Lyophilisation.

MODULE 5: Basic Concepts in Bacteriology and Virology (8 hrs)

Bacteria: Structure of a typical Bacterium, Different types of bacterial culture (Batch, Synchronous, Arithmetic), Bacterial growth: Growth phases, Methods of growth determination.

Basic Concepts of Virology: General characteristics and classification of viruses. Bacteriophages: Diversity, lytic and lysogenic Phages (Lambda and P1 Phage), Applications of bacteriophages. Oncogenic Viruses. Prevention and control of Viral diseases: Antiviral compounds, Interferons and viral vaccines.

MODULE 6: Industrial and Medical Microbiology (8 hrs)

Industrial Microbiology (4 hrs)

Bioengineering of microorganisms for industrial purposes: Microbial production of industrial products (micro-organisms involved, media, fermentation conditions, downstream processing and uses) - citric acid, ethanol, wine, penicillin, glutamic acid, riboflavin, enzymes (amylase, cellulase, protease, lipase, glucose isomerase, glucose oxidase). Bioinsecticides (Bt) and Steroid biotransformation.

Medical Microbiology(4 hrs)

Normal microflora of the human body: skin, throat, gastrointestinal tract and urogenital tract. Diseases caused by: (with reference to causative agent, symptoms and mode of transmission).

a)Bacteria: anthrax, tuberculosis, typhoid, whooping cough, pneumonia, cholera, gonorrhea, and syphilis.

b)Viruses: polio, chicken pox, herpes, hepatitis, rabies, dengue, AIDS and chikungunya.

c)Protozoa: malaria, kala-azar and toxoplasmosis.

d)Fungi: dermatomycoses and opportunistic mycoses Bacterial drug resistance.

Topics for assignments/seminars

1. Microbiological analysis of drinking water
2. Biogas plant
3. Social acceptance of biotechnology
4. Biofertilizers
5. DNA vaccines

REFERENCES

Module 1-3 (Biotechnology)

•Bernard R. Glick and Jack J. Pasternak (2002) Molecular Biotechnology-Principles and applications of recombinant DNA, 3rd Edition, ISBN-10: 1555812244, ASM press, 860 pages

•Butler, M. (2003) Animal cell culture and technology: The basics, 2nd Edition, ISBN 9781859960493, CRC Press, 256 pages

•Dubey, R.C.(2006) A text book of biotechnology, 4th Revised Edition, S. Chand & Co., 725 p.

Module 4-6 (Microbiology)

•Atlas RM. (1997) Principles of Microbiology, 2nd Edition, ISBN-10: 0815108893 William T.Brown Publishers, 1298 pages

•Chakraborty.P.A.(2009) Text Book of Microbiology, ISBN-10: 8173810818 New Central Book Agency, 1026

•Prescot L.M., Harley, J..P. and Klein. D.A.(2008) Microbiolgy, 7th Edition, McGraw Hill Inc., New York.

FIFTH SEMESTER

BIOCHEMISTRY AND MOLECULAR BIOLOGY

Code: ZOL5B08T

COURSE OUTCOMES (COs)

Course Outcome statements
Understand the elements of biological importance and the non-covalentinteractions that stabilize biomolecules (1 hr).
Describe the classification, types, structure, reactions and biological roles ofcarbohydrates, and diabetes Type I and II (6 hrs)
Enumerate the properties and classification of amino acids and their standard abbreviations; hierarchial levels of protein structure, classification, separation,purification and sequencing of proteins (7 hrs).
Explain the classification and functions of lipids and fatty acids; chemistry andstructure of nucleic acids and sequencing of DNA (7 hrs)
Understand the classification, nomenclature and properties of enzymes; enzymeaction, co-enzymes, cofactors, isozymes, ribozymes and allosteric enzymes (3 hrs)
Explain glycolysis, Kreb's cycle, glycogenesis, glycogenolysis, gluconeogenesis,HMP pathway; amino acid and fatty acid oxidation and oxidative phosphorylation (12 hrs).

BIOCHEMISTRY (36 hrs)

MODULE 1. Introduction (1 hr)

Elements of biological importance; non-covalent bonds that stabilize biomolecules – Hydrogen bonds, hydrophobic interactions and Van der Waals Interactions.

MODULE 2. Carbohydrates (6 hrs)

Monosaccharides: Aldoses and ketoses, trioses, tetroses, pentoses and hexoses; glyceraldehyde, dihydroxyacetone, ribose, deoxyribose, ribulose, glucose and fructose. Cyclization of pentoses and hexoses, optical activity and mutarotation, inversion and invert sugar, monosaccharides as reducing agents, Osazones.

Disaccharides: Glycosidic bond, reducing and non-reducing disaccharides, maltose and sucrose as examples.

Polysaccharides: Starch and glycogen, amylose and amylopectin, homo and heteropolysaccharides.

Biological functions of carbohydrates; Mention diabetes Type I and II.

MODULE 3. Amino acids, peptides and protein (7 hrs)

Proteinogenic amino acids, abbreviations (three letter and single letter) of the standard amino acids, structure and classification and general properties of amino acids, isoelectric point, peptide bonds, nonstandard amino acids.

Peptides and proteins: Classification of proteins - simple, conjugated and derived. Structure of proteins: primary, secondary, tertiary and quaternary structure. Denaturation of proteins.

Separation and purification of proteins: Paper chromatography, column chromatography, ion exchange chromatography, size exclusion chromatography, affinity chromatography and high - performance liquid chromatography (Brief account only). Polyacrylamide Gel Electrophoresis.

Sequencing of peptides: Sanger's method, Edman degradation procedure and Mass spectrometry (Brief account only)

MODULE 4. Lipids and Nucleic acids (7 hrs)

Lipids(2 hrs)

Classification and functions (simple, compound, derived and miscellaneous lipids).

Fatty acids: saturated and unsaturated; triglycerides; mention phospholipids; lecithins; cephalins; phosphoinositides; prostaglandins and cholesterol. Mention the clinical significance of lipid profile estimation.

Nucleic acids(5 hrs)

Chemistry and structure of purines and pyrimidines, structure of nucleotides (ATP, dATP and cAMP), Watson – Crick model of DNA, Different forms of DNA, secondary and tertiary structure of tRNA. Sequencing of DNA by Sanger's method. Mention Maxam-Gilbert sequencing.

MODULE 5. Enzymes and co-enzymes (3 hrs)

Classification, nomenclature and properties of enzymes; Active centre, mechanism and theories of enzyme action, enzyme inhibition, co-enzymes (NAD, FAD) and cofactors. Mention isozymes, ribozymes and allosteric enzymes.

MODULE 6. Metabolism of carbohydrates, proteins and lipids (12 hrs)

Glycolysis, Kreb's cycle, glycogenesis, glycogenolysis, gluconeogenesis and HMP pathway. Amino acid oxidation and production of urea. β-oxidation of fatty acids.

Brief account on redox reactions, redox potentials, electrochemical gradients, electron transport chain, oxidative phosphorylation, proton gradient and chemiosmotic synthesis of ATP.

Topics for assignments/seminar

1. B-Complex vitamins as co-enzymes
2. Different types of eukaryotic RNAs
3. Biological functions of steroids

REFERENCES

•David L. Nelson and Michael Cox (2012):– Lehninger Principles of Biochemistry 6th Edition, ISBN-10: 1429234148, W.H. Freeman, 1328 pages

•David L. Nelson and Michael Cox (2017): Lehninger Principles of Biochemistry 7th Edition, ISBN-10: 1-4641-2611-9, W.H. Freeman, 1172 pages

•Donald Voet, Charlotte W. Pratt and Judith G. Voet (2001): Principles of Biochemistry 4th Edition, ISBN-10: 9780471417590, Wiley

•Jeremy M Berg, LubertStryer, John L. Tymoczko, Gregory J Gatto (2015): Biochemistry 8th Edition, ISBN-10: 1464126100, W.H. Freeman, 1120 pages

SIXTH SEMESTER

ENVIRONMENTAL AND CONSERVATION BIOLOGY

Code: ZOL6B12T

COURSE OUTCOMES [Cos]

Understand the threats to biodiversity, and strategies adapted for theconservation of diversity of organisms (10 hrs)
Describe the various international strategies for conserving biodiversity (4 hrs)
Describe the toxic chemicals, their toxicity levels and the health hazards caused bythem (4 hrs).

Section B: CONSERVATION BIOLOGY (14 hrs)

MODULE 7. Biodiversity (10 hrs)

Introduction, Components of biodiversity: Genetic diversity, species diversity (mention Shannon diversity index and Simpson's dominance index), community

diversity and ecosystem diversity, landscape diversity; Levels of diversity in community and ecosystem diversity: Alpha, beta and gamma diversities.

Hot spots of biodiversity. Mention hotspots in Indian region (Western Ghats and Sri Lanka, Himalayas, Indo Burma and Sundaland).

Threats to biodiversity; Loss of biodiversity and its causes.

Threatened species, Extinction of species, red data book and IUCN Red list categories.

Conservation of biodiversity and wildlife: conservation measures; Wild life (protection Act) 1972, Conservation projects: Project Tiger, Elephant, Lion, Crocodile, Gangetic Dolphins, Kashmir Red Deer and Brow-antlered Deer (Sangai).

Biodiversity conservation strategies: Protection of endangered species- Ex situ conservation (conservation in Seed banks, Gene banks, Germ plasm banks, Zoo, Botanical gardens etc.).

In situ conservation: Wildlife Sanctuaries -Thattekkad bird sanctuary, ParambikulamWLS, PeriyarWLS, Malabar WLS); National Parks- Eravikulam NP & Silent Valley NP; Biosphere Reserves - Nilgiri BR &Agasthyamalai BR; Community reserve- Kadalundy.

MODULE 8. Global strategy for conservation (4 hrs)

Brief notes on i) Stockholm conference/Declaration (1972), ii) IUCN, iii) WWF, iv) UNEP, v) CITES, vi) Rio Declaration vii) Rio convention on Biodiversity, 1992 (Rio Earth Summit, 1992), Rio (2012). viii) Kyoto Agreement (1997), Paris Agreement (2016) and Conference of the Parties (COP) on climate change (2018), ix) Ramsar convention (2018).

Section C: TOXICOLOGY (4 hrs)

MODULE 9. Toxicants and public health hazards (4 hrs)

a.Toxic chemicals (biocides, automobile emissions, heavy metals, fertilizers, food additives, xenobiotics, radioactive wastes).

b.Classification of poisons; Physico-chemical characteristics and mode of action of poisons; Accidental, suicidal and homicidal poisonings; Signs and symptoms of common poisoning and their antidotes.

c.Levels of toxicity: Acute, sub-acute, chronic, Dose-response relationship. Measures of toxicity: LD50 and LC50.

Topics for Assignments/Seminars

1. Individual responsibilities – Role of Governmental and Non-Governmental Organizations in biodiversity conservation – Chipko, Green peace WWF

10.Food additives.

REFERENCES

•BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, ISBN 13: 9788188204069

•Burchan, P.C. (2013) An Introduction to Toxicology, Springer

SIXTH SEMESTER

ETHOLOGY, EVOLUTION AND ZOOGEOGRAPHY

Code: ZOL6B13T

[54 hrs] [3 hours per week] [3 credits]

COURSE OUTCOMES [COs]

Course Outcome Statements
Describe the patterns and mechanisms of animal behaviour (5 hrs)
Illustrate biological rhythms and the chemical basis of communication (7 hrs)
Explain ecological and historical foundations for understanding the distribution and abundance of species, and their changes over time and comprehend the basicprinciples of biogeography as a discipline (8 hrs)

Section A: ETHOLOGY (12 hrs)

MODULE 1 (10 hrs)

Patterns and Mechanisms in Animal Behaviour (5 hrs)

Introduction and Patterns of behavior (4 hrs)

History (brief), scope of ethology. (a) Innate behaviour: Orientation-taxes/kinesis, simple reflexes, instincts, motivation. (b) Learned behaviour: Habituation, conditioned reflex, trial and error learning; latent learning, imprinting, insight learning, memory and learning.

Neural mechanism in behavior (1 hr)

Role of hypothalamus in thirst and feeding; role of cerebral cortex in emotional behavior; mammalian limbic system and control of behavior (brief account).

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MODULE 2. Biological rhythm and Sociobiology (7 hrs)

Biological clocks/rhythms(4 hrs)

Photoperiodism, circadian rhythm; migration, orientation, navigation and homing; diapause, hibernation and aestivation (brief account)

Sociobiology(3 hrs)

Social groups in termites and elephants; Chemical communication: classification and significance of pheromones (mention human pheromones also).

Section C: ZOOGEOGRAPHY (8 hrs)

MODULE 9: Zoogeographical realms and Biogeography of India (8 hrs)

Geographical Distribution(4 hrs)

(a) Geographical distribution of animals: Cosmopolitan, discontinuous, bipolar and isolated distribution. (b) Barriers in animal distribution: Physical, climatic and biological barriers.

Zoogeographical realms(2 hrs)

Zoogeographical regions with specific fauna (faunal regions): Palaeartic region, Nearctic region, Neotropical region, Ethiopean region, Oriental region and Australian region; brief description on Wallace line, Weber line and Wallacea.

Insular fauna(1 hr)

Faunal characteristics of continental (Madagaskar and Sri Lanka) and oceanic islands (Galapagos and New Zealand).

Biogeography of India(1 hr)

Biogeographical zones of India: Himalayan, Desert zone, Semi-arid zone, Western Ghats, Deccan plateau, Gangetic plain, North east Indian zone, Island zone and Coastal zone (brief account).

REFERENCES

Module 1-2 (Ethology)

•Jerry A. Hogan. 2017. The Study of Behavior: Organization, Methods, and Principles. ISBN: 9781107191976. Cambridge University Press. 380 pages.

•John Alcock& Dustin R Rubenstein. 2019. Animal Behaviour, 11th edition. Published by Sunderland, Massachusetts Sinauer Associates, Oxford University Press. 672 pages.

•Lee Alan Dugatkin. 2013. Principles of Animal Behavior, 4th Edition. ISBN-13: 978- 0393920451. ISBN-10: 0393920453. W. W. Norton & Company.

Module 9 (Zoogeography)

•Andrews, M.I. & Joy, K.P. Ecology, Evolution & Zoogeography. S.M. Book Depot, Changanassery

•Rastogi V. B. & Jayaraj.1998. Animal Ecology and Distribution of Animals. Kedar Nath and Ram Nath. ISBN: 5551234001809.

•Tiwari, S. K. 1985. Zoogeography of India and South East Asia. CBS Pubs, New Delhi

FIRST SEMESTER ANIMALDIVERSITY: NON CHORDATA PART- I

Code: ZOL1B01T **[2 Credits]**

COURSE OUTCOMES (COs)

Course Outcome Statements
Describe the characteristic features of phylum Ctenophora (1 hrs)
Explain the salient features of phylum Platyhelminthes and illustrate its classification down to classes (3 hrs)
Explain the characteristic features and classification of super-phylum Aschelminthes and phylum Nematoda (3 hrs)
Elucidate the characters of Pseudocoelomate minor phyla Rotifera and Gastrotricha (2 hrs)

Section C. KINGDOM: ANIMALIA

Salient features of the Major Phyla of animals and their diversity.

[*Habits, habitat,morphology, functional anatomy and life history of representative types (wherever specified) and classification of each phylum down to classes, except otherwise mentioned, and examples thereof: Study of animal diversity with typical examples from each class, with emphasis on ecological and adaptive features, economic importance and such other points of biological interest expected. Only very brief account of each example is to be studied.*]

Phylum CTENOPHORA [=ACNIDARIA] (1 hr)

Unique features as exemplified by *Pleurobrachia*; mention cidippid larva.

MODULE 8. ACOELOMATA (3 hrs)

Phylum PLATYHELMINTHES

Classification down to classes and salient features of the following classes.

ClassTurbellaria e.g.*Bipalium*
Class Trematoda e.g.*Fasciola*
Class Cestoda e.g.*Taenia*

Type ***Dugesia*** (Planaria):Structural organization, Digestive system, locomotion and reproduction.

MODULE 9. PSEUDOCOELOMATA (3 hrs)

Super Phylum: ASCHELMINTHES

Classification down to phyla; highlight the heterogeneous nature of animals of this group.

Phylum: NEMATODA

Characteristic features of *Ascaris*.
Examples: *Ancylostoma, Enterobius, Wuchereria*

MODULE 10. PSEUDOCOELOMATE MINOR PHYLA (2 hrs)

Salient features of the followingpseudocoelomate minor phyla:

Phylum **Gastrotricha** e.g.*Chaetonotus*

Phylum **Rotifera** e.g.*Brachionus*

Topics for assignments/seminars

1. Helminth parasites of man.
2. Reef building corals and coral reefs.

Procedure / Process of Teaching –

Lecture
Power point presentations
Flipped class – videos of topics to be sent day before and only discussion to be held in the class.
Peer learning – topics divided among student groups – each group to teach the rest of the students their assigned topic.

Procedure/ Process of Assessment –

Seminars
Quiz in groups
Quiz individually

REFERENCES

- Animal Diveristy – Non Chordata – Bhaskaran
- Anderson, D. T. (2001). *Invertebrate Zoology*. 2nd edition. University of Michigan, Oxford University Press (Indian Edition. 2006).
- Barnes, R.D. (1982). *Invertebrate Zoology*, 5th Edition. Holt Saunders International Edition.

SECOND SEMESTER

ANIMAL DIVERSITY: NON-CHORDATA PART – II

Code: ZOL2B02T - **2 Credits**

COURSE OUTCOMES [COs]

Course Outcome Statements
Explain the classification with examples and characteristic features of phylum Annelida and describe the morphology and structural organization of *Neanthes* (7 hrs)
Describe the distribution, peculiarities and affinities of phylum Onychophora (2 hrs)

COELOMATA MODULE 1. Phylum ANNELIDA (7hrs)

Classification down to subclasses; salient features of the following classes and subclasses:

1. Class Polychaeta e.g. *Arenicola*
2. Class Clitellata
   - Subclass Oligochaeta e.g. *Megascolex*
   - Subclass Hirudinea e.g. *Hirudinaria*, *Haemadipsa*

Type: ***Neanthes*** [Nereis]

[Morphology, body wall, digestive system, respiratory system, circulatory system, excretory system, sense organs and reproductive system. Mention Heteronereis stage and Trochophore larva.]

MODULE 2. Phylum ONYCHOPHORA (2 hrs)

Peripatus [distribution, peculiarities and affinities).

MODULE 7. COELOMATE MINOR PHYLA (3 hrs)

Salient features of the following coelomate minor phyla; mention examples specified [structure and life history not required).

1. Phylum **Phoronida** e.g. *Phoronis*
2. Phylum **Ectoprocta** [**Bryozoa]** e.g. *Bugula*
3. Phylum **Echiura** e.g. *Bonellia*

Procedure / Process of Teaching –

Lecture
Power point presentations
Flipped class – videos of topics to be sent day before and only discussion to be held in the class.
Peer learning – topics divided among student groups – each group to teach the rest of the students their assigned topic.

Procedure/ Process of Assessment –

Seminars
Quiz in groups
Quiz individually

REFERENCES

- Anderson, D. T. (2001). *Invertebrate Zoology*. 2nd edition. University of Michigan, Oxford University Press (Indian Edition. 2006).
- Apte, D. (2015). *Sea Shells of India: An Illustrated Guide to Common Gastropods*. Bombay Natural History Society & Oxford University Press, New Delhi.
- Barnes, R.D. (1982). *Invertebrate Zoology*, 5th Edition. Holt Saunders International Edition.

THIRD SEMESTER
ANIMAL DIVERSITY: CHORDATA PART - I

CODE: ZOL3B03T - **3 credits**

COURSE OUTCOMES [COs]

Course Outcome Statements
Describe the salient features and affinities of class Amphibia and its classification up to orders; explain the morphology and organ systems of *Hoplobatrachus tigerinus* (13 hrs)
Elucidate the characteristic features of the class Reptilia and its classification down to orders; describe the morphology and organ systems of *Calotes versicolor* (15 hrs)

Super class **TETRAPODA**

MODULE 6. Class AMPHIBIA [13 hrs]

Classification of Amphibia down to orders with examples [of extant forms only].
Subclass **Stegocephalia** (extinct)
Subclass **Lissamphibia**

1. Order Apoda (=Gymnophiona) e.g.*Ichthyophis, Uraeotyphlus*
2. Order Caudata (=Urodela) e.g.*Necturus, Ambystoma,* mention Axolotl larva.
3. Order Anura (=Salientia) e.g.*Duttaphrynus, Rhacophorus*

Type: ***Hoplobatrachus tigerinus*** (Indian Bullfrog)
[Morphology, body wall, skeletal system,digestive system, respiratory system, circulatory system, excretory system, sense organs and reproductive system].

Mention about the diversity of bush frogs, dancing frogs and night frogs in Western Ghats and the discovery of *Nasikabatrachus sahyadrensis* (Purple frog).

MODULE 7. Class REPTILIA [15 hrs]

Classification of class Reptilia down to orders and salient features of thefollowing orders (only extant forms):

Subclass I - **Anapsida**

1. Order Cotylosauria [stem reptiles] e.g.*Hylonomus*
2. Order Chelonia [common turtles, tortoises etc.] e.g. *Melanochelys*, *Chelone*

SubclassII - **Diapsida**

1. Order Rhynchocephalia e.g. *Sphenodon*
2. Order Squamata
   - Suborder Lacertilia (Lizards) e.g. *Chamaeleo, Hemidactylus*
   - Suborder Ophidia (Snakes)

Common venomous and non-venomous snakes of Kerala: a] *Python molurus* b]*Ptyas mucosus* c] *Gongylophis* (= *Eryx*) *conicus* d] *Indotyphlops braminus* e] *Bungarus caeruleus* f] *Naja naja* g] *Daboia russellii* h] *Ophiophagus hannah*

Identification key for venomous and non-venomous snakes.

3. Order Crocodilia e.g. *Crocodylus*, *Gavialis*

[Mention the extinct subclasses **Euryapsida**, **Parapsida** and **Synapsida** (mammal-like reptiles) and mention the origin of mammals from synapsids].

Topics for Assignments/Seminars

1. Parental care in amphibians.
2. Snake venom: nature; composition; antivenin; poly antivenins; prophylaxis.

REFERENCES

- Areste, M. & Cebrian, R. (2003). *Snakes of the World*. Sterling Publishing Company, New York.
- Barbour, T. (1926). *Reptiles and Amphibians-Their Habits and Adaptations*. Houghton Mifflin Co., New York.

Procedure / Process of Teaching –

- Lecture
- Power point presentations
- Flipped class – videos of topics to be sent day before and only discussion to be held in the class.
- Peer learning – topics divided among student groups – each group to teach the rest of the students their assigned topic.

Procedure/ Process of Assessment –

- Seminars
- Quiz in groups
- Quiz individually

ZOOLOGY [CORE COURSE] PRACTICAL – I: ANIMAL DIVERSITY

Code: ZOL4B05P

[144 hours] [2 hrs per week] [Spread over first 4 semesters] [4 Credits]

COURSE OUTCOMES [COs]

COs	Course Outcome Statements
CO1	Identify and describe specified protists and acoelomate & pseudocoelomate non-chordates and perform the culture of selected protists; understand the histological features of coelenterate, platyhelminth and nematode. (36 hrs)
CO2	Identify and describe specified coelomate non-chordates and the transverse sections of annelids; Perform mounting of the specified organs of selected non-chordates. (36 hrs)
CO3	Identify and describe specified chordates and specified bones of chordates; Prepare key for identification of venomous snakes; Perform mounting and dissection of specified organ systems of chordates. (36 hrs)
CO4	Identify and describe selected vertebrates and specified bones of vertebrates.(36 hrs)

Course Outcomes

1. Students are expected to identify the specimens by their generic names and assign them to the respective phyla and classes.
2. Students should be able to identify slides or specimens related to transverse sections and osteology of the different animal groups.

1. **Prepare a Local Biodiversity Record**:
    a. Observe water samples from the locality for live protists and make a field note;
    b. Observe fishes/amphibians or any other vertebrate group (any one group) of the locality in their natural habitat and prepare a field note.
    c. Observe birds/mammals (any one group) of the locality in their natural habitat and prepare a field note.
3. Students should be able to mount the given specimens and display it.
4. Dissect and display neatly the specimens provided.

MODULE 1. [36 hrs]

MODULE 2. [36 hrs]

MODULE 3. [36 hrs]

MODULE 4. [36 hrs]

Process of teaching –

Show specimens, charts or pictures of the organisms.

Demonstration of culture methods of Protists[*Amoeba*/ *Euglena*/ *Paramecium*].

Demonstrate mounting of specimens mentioned in the syllabus

Demonstrate the dissection of the specimens mentioned in the syllabus.

Process of Assessment –

Quiz – show the specimen and student identifies it – writes its classification – gives its salient features

The student has to mount of given specimen.

The student has to dissect and display the given specimen.

FIFTH SEMESTER B.Sc. ZOOLOGY PROGRAMME

CELL BIOLOGY AND GENETICS

Code: ZOL5B06T

[54 hours] [3 hours per week] [4 Credits]

COURSE OUTCOMES (COs)

Course outcome Statements
Enumerate allelic and non-allelic gene interactions; supplementary, complementary, polymeric, duplicate and modifying genes and polygenic inheritance (5 hrs).
Illustrate multiple allelism and solve problems related to blood group inheritance (4 hrs).
Explain characteristics of linkage groups and linkage map; crossing over and calculation of recombination frequency; sex-linked, sex-influenced and sex-limited characters; sex differentiation and disorders of sexual development (8 hrs).
Describe the mechanisms of sex determination including chromosomal, genic, haploid-diploid mechanisms; the hormonal and environmental influence on sex determination and gynandromorphism (3 hrs).
Explain mutagenesis, mutagens and chromosomal and gene mutations (3 hrs).
Enumerate the classification and grouping of human chromosomes; numerical and mutational human autosomal and sex chromosomal anomalies; polygenic human traits and genetic counseling (4 hrs).

Section B: GENETICS (27 hrs)

MODULE 6. Interaction of genes (5 hrs)

Allelic interactions: incomplete dominance and co-dominance with examples. Non-allelic interactions: epistasis (inheritance of plumage colour in poultry), mention dominant and recessive epistasis. Supplementary genes (example: inheritance of comb pattern in poultry). Complementary genes, mention any one example. Polymeric genes, mention one example. Duplicate genes, mention one example. Modifying genes. Atavism, Penetrance and Expressivity. Polygenic (quantitative) inheritance (example: skin colour in man).

MODULE 7. Multiple alleles (4 hrs)

Definition and characteristics; example: coat colour in rabbits. Blood group genetics: ABO blood group system; MN blood group and Bombay phenotype. Inheritance of Rh factor; mention erythroblastosis foetalis. Problems related to blood group inheritance (5 problems). Isoalleles, mention any one example.

MODULE 8. Linkage and Recombination (8 hrs)

Definition and characteristics of linkage groups, Morgan's work on *Drosophila.* Types of linkage: complete and incomplete - examples*;* Linkage groups.

Crossing over and recombination, Calculation of Recombination Frequency and Percentage; Linkage map, Map Distance; Mitotic Recombination (brief).

Sex-Linked Characteristics: Types of sex-linkage - X linked characters - Colour blindness and haemophilia in humans, holandric genes – hypertrichosis.

Dosage compensation – Barr body – Lyon hypothesis.

Sex-Influenced and Sex-Limited Characteristics.

Sex Differentiation: Testis-determining factor (TDF), Müllerian inhibition factor. Disorders of Sexual Development (short notes) - XX males and XY females, Point mutations in the *SRY* gene and testicular feminization.

MODULE 9. Sex determination (3 hrs)

Chromosomal mechanism of Sex-Determination: Male heterogametic and female heterogametic mechanism of sex determination. Genic Sex Determining Systems - Genic balance (ratio) theory of Bridges. Haploid-diploid mechanism of sex determination, honey bee as example.

Environmental Sex Determination: Example – *Bonellia,* Crocodile.

Hormonal influence on sex determination: Example - sex reversal in fowl and free martin in cattle; Gynandromorphism – types and causes. Intersex (brief).

MODULE 10. Mutations (3 hrs)

Chromosome mutations: numerical (euploidy and aneupoloidy) and structural changes (deletion, duplication, insertion, inversion, translocation).
Gene mutations: types- spontaneous, induced, somatic, gametic, forward and reverse. Types of point mutations- deletion, insertion, substitution, transversion and transition. Mutagenesis- Natural and artificial mutagenesis, Mutagenic agents: a) UV radiation and ionising radiation b) Base analogues, alkylating and intercalating agents.

MODULE 11. Human Genetics and Genetic counselling (4 hrs)

Classification and grouping of human chromosomes (Patau's scheme). Chromosomal anomalies and disorders: Autosomal - (Down's, Patau's, Edward's and Cri du Chat syndromes). Sex chromosomal - (Turner's and Klinefelter's syndromes). Gene mutations: Autosomal mutation - albinism, PKU, alkaptonuria, galactosemia, Tay-Sach's syndrome, Gaucher's disease, Sickle cell anaemia, thalassemia and brachydactyly. Sex chromosomal mutations: haemophilia, Lesch–Nyhan syndrome, dermal hypoplasia. Polygenic traits: cleft palate / lip, club foot and hydrocephaly. Eugenics, Euthenics and Euphenics.

Topics for assignments/seminars

1. Mendel’s experiments on pea plants

2. Mendel's laws of inheritance

REFERENCES

- Brooks, R. J. (2008): *Genetics: Analysis and Principles*.3rd Edition, ISBN-10: 0071287647, Irwin/McGraw-Hill, 844 pages
- Gardner, E. J., Michael J. Simmons and Peter Snustad (2006): *Principles of Genetics*. 8th Edition, ISBN-10: 8126510439, Wiley, 740 pages

Procedure / Process of Teaching –

Lecture

Power point presentations

Flipped class – videos of topics to be sent day before and only discussion to be held in the class.

Peer learning – topics divided among student groups – each group to teach the rest of the students their assigned topic.

Procedure/ Process of Assessment –

Seminars

Quiz in groups

Quiz individually

FIFTH SEMESTER

BIOTECHNOLOGY, MICROBIOLOGY AND IMMUNOLOGY

Code: ZOL5B07T

[72 hours] [4 hours per week] [4 Credits]

COURSE OUTCOMES (COs)

Course Outcome statements
Describe different types of immunity and the cells and organs of the immune system (6 hrs)
Explain antigen, antibody, immunity and major histocompatibility complex (9 hrs)
Enumerate autoimmune and immunodeficiency diseases and immunology of tumor and organ transplantation (9 hrs)

Section C: IMMUNOLOGY (24 hrs)

MODULE 7: Cells and organs of immune system (6 hrs)

Introduction **(1 hr)**

Immunity: Natural and acquired, active and passive, immunization, vaccines, mechanisms of innate immunity - barriers, inflammation, phagocytosis.

Cells of the immune system **(3 hrs)**

B- cells, T – cells, NK cells, monocytes, macrophages, neutrophils, basophils, eosinophils, mast cells, and dendritic cells (APCs).

Organs of the immune system **(2 hrs)**

Lymphoid organs: Primary (thymus, bone marrow) and secondary (lymph nodes, spleen).

MODULE 8: Antigens, antibodies, immunity and MHC (9 hrs)

Antigens **(3 hrs)**

Types, factors for immunogenecity, exogenous antigens, endogenous antigens,

adjuvant, haptens, epitopes, antigen-antibody reaction - precipitation reaction, agglutination reaction, agglutination inhibition reaction.

Immunoglobulins (2 hrs)

Structure, classification and biological functions. Mention immunoglobulin gene families – κ and λ light chain families and the heavy chain family.

Immunity (2 hrs)

Types of Immunity: humoral and cell mediated immunity, primary and secondary response, generation of cytotoxic T- cells (CTLs), NK cell mediated cytotoxicity, ADCC and cytokines (brief).

Major Histocompatability Complex (2 hr)

MHC, HLA, Class I MHC, Class II MHC molecules and structure. Mention Class III MHC.

MODULE 9: Autoimmune and Immunodeficiency diseases, Tumor and transplantation immunology (9 hrs)

Autoimmune diseases (2 hrs)

Auto immune diseases: Systemic (SLE, multiple sclerosis and rheumatoid arthritis). Organ specific-(Hashimoto's thyroiditis, Grave's disease, Myasthenia gravis)

Immunodeficiency disease (3 hrs)

Primary (Bruton's Disease, Di-George syndrome and SCID)

Secondary (AIDS) – Clinical course of HIV – acute infection, seroconversion, window period, chronic latent phase - lymph adenopathy and crisis phase. Mention anti-retroviral therapy (ART)

Tumor immunology (2 hrs)

Malignant transformation of cells, tumor antigens, immune response to tumor antigens.

Transplantation Immunology (2 hrs)

Transplantation Antigens, Various organ transplantation (liver, kidney, heart, skin), Xenotransplantation

Topics for assignments/seminars

1. Immunity and malnutrition

REFERENCES

Abul K. Abbas, Andrew H. Lichtman & Shiv Pillai (2017) *Cellular & Molecular Immunology* 8th Edtion, Paperback ISBN: 9780323479783, Elsevier, 608 pages

- Andrew E Williams (2011) *Immunology Mucosal and Body Surface Defenses*, Ist Edition, ISBN: 0470090049, Wiley and Blackwell, 398 pages

Procedure / Process of Teaching –

Lecture

Power point presentations

Flipped class – videos of topics to be sent day before and only discussion to be held in the class.

Peer learning – topics divided among student groups – each group to teach the rest of

the students their assigned topic.

Procedure/ Process of Assessment –

Seminars
Quiz in groups
Quiz individually

FIFTH SEMESTER

METHODOLOGY IN SCIENCE, BIOSTATISTICS AND BIOINFORMATICS

Code: ZOL5B09T

[54 hours] [3 hours per week] [4 Credits]

COURSE OUTCOMES (COs)

Course Outcome Statements
Explain science, its importance, disciplines and the major steps in formulating a hypothesis, various hypothesis models, theory, law and importance of animal models, simulations and virtual testing (6 hrs)
Illustrate the principles and procedures in designing experiments and elaborate the requirements for carrying out experiments (4 hrs)
Describe the ethical concerns in practicing science (5 hrs)
Perform DNA and protein sequence analysis, including sequence alignment and sequence similarity search using BLAST, FASTA, CLUSTAL W and CLUSTAL X (4 hrs)
Understand molecular phylogenetics and tools and methods for construction of phylogenetic trees (3 hrs)
Explain genome sequencing technologies, functional genomics, proteomic technologies and molecular docking and drug design (9 hrs)

Section A: METHODOLOGY IN SCIENCE (15 hrs)

MODULE 1. Science, Scientific Studies and Methods (6 hrs)

Science and Scientific Studies

Science as a human activity; scientific attitude; Empiricism; Science disciplines; Interdisciplinary approach.

Scientific Methods

Major steps: Observation, Defining the problem, Collection of information, Formulation of a hypothesis, Experimentation, Analysis of the results and Conclusion based on interpretation of the results.

Methods in scientific enquiry: Inductive and deductive reasoning.

Hypothesis: Formulation of a hypothesis, different thought processes in developing hypothesis (analogy, induction, deduction and intuition), hypothetico-deductive model, testing hypothesis, auxiliary hypothesis, adhoc hypothesis.

Theories and laws in science; peer review; importance of models, simulations and virtual testing (brief account).

MODULE 2. Experimentation (4 hrs)

Types of experiments; design of an experiment: principles and procedures; necessity of units and dimensions; repeatability and replications; documentation of

experiments; Planning of Experiments: design, selection of controls, observational and instrumental requirements; Test animals used in experiments.

MODULE 3. Ethics in Science and Animal Ethics (5 hrs)

Scientific information: Depositories of scientific information – primary, secondary and digital sources; Sharing of knowledge: transparency and honesty, Publications, Patents, Plagiarism.

Constitution of India Article 51A (g); Prevention of cruelty to animals Act of 1960 - Section 17.1(d), Committee for the purpose of control and supervision of experiments on animals (CPCSEA).

SECTION C: BIOINFORMATICS (24 hours)

MODULE 6. Introduction and Biological Databases (8 hrs)

Overview of bioinformatics, Scope and application of Bioinformatics.

Major Databases in Bioinformatics: Biological databases, Features of a good database. Classification format of biological databases.

Primary databases: Nucleotide sequence databases – Mention EMBL, DDBJ, Genbank; Protein sequence databases – Mention Swiss Prot, PIR, MIPS.

Structure databases: PDB, NDB.

Special databases – PROSITE, Pfam, CATH, OWL, PubMed.

Secondary databases: Mention PROSITE, PRINTS. Databases of patterns, motifs and profiles, EST databases, SNP databases.

Metabolite databases – Mention KEGG, EcoCyc.

*Database Search Engines***:** Entrez at NCBI of USA, SRS at EBI of England, STAG at DDBJ of Japan. Data retrieval with Entrez and SRS.

Sequence submission to NCBI.

MODULE 7. Sequence Analysis (4 hrs)

Web based and standalone tools for DNA and protein sequence analysis. Types of sequence alignment, methods of sequence alignment. Sequence similarity search – pair wise and multiple sequence alignments; BLAST, FASTA, CLUSTAL W, CLUSTAL X.

MODULE 8. Molecular Phylogenetics (3 hrs)

Basics of Phylogenetics; molecular evolution and molecular phylogenetics, cladistics and ontology. Gene Phylogeny versus species phylogeny. Phylogenetic tree construction methods and programmes. Forms of Tree representation.

MODULE 9. Genomics and Proteomics (9 hrs)

Genome sequencing technologies; Sanger capillary sequencing, Roche 454 (pyrosequencing), Illumina/Solexa, SOLiD System, Single molecule sequencing. Whole genome sequence assembly, annotation and analysis. Functional Genomics: Microarrays, SAGE, ESTs; Transcriptomics; Metabolomics. Metagenomics: Concept and applications.

Proteomics

Aims, strategies and challenges in proteomics. Brief account on proteomics

technologies: 2D-electrophoresis, iso-electric focusing, LC/MS-MS, MALDI-TOF mass spectrometry, yeast 2-hybrid system. Protein-protein interactions: experimental and computational methods; structural proteomics. Deriving function from sequence databases.

Cheminformatics

Molecular docking and drug design; Structural Bioinformatics in drug discovery

Topics for seminar/assignment

1. Findings that changed the course of science.
2. Viral genome database (ICTVdb, VirGen).
3. Bacterial Genomes database (Genomes OnLine Database –GOLD, Microbial Genome Database-MBGD).

REFERENCES

Module 1-3 (Methodology in Science)

- Gieryn, T. F.(1999) *Cultural Boundaries of Science*, ISBN 9780226292625, Chicago Press, 412.
- Ruxton, G. D. and Colegrave, N.(2016) *Experimental Design for the Life Sciences*, 4th Edition, ISBN 9780198717355, Oxford University Press, 224 pages

Module 6-9 (Bioinformatics)

- Anna Tramontano (2006): *Introduction to Bioinformatics*, ISBN-10: 1584885696, Chapman & Hall, 192 pages.
- Atwood and Parry-Smith (1999): *Introduction to Bioinformatics*. ISBN 9780582327887, Pearson Education Asia, New Delhi, 218 pages

Procedure / Process of Teaching –

Lecture
Power point presentations
Flipped class – videos of topics to be sent day before and only discussion to be held in the class.
Peer learning – topics divided among student groups – each group to teach the rest of the students their assigned topic.

Procedure/ Process of Assessment –

Seminars
Quiz in groups
Quiz individually

FIFTH SEMESTER

REPRODUCTIVE HEALTH AND SEX EDUCATION

Code: ZOL5D01T

[54 hours] [3 hours per week] [3 credits]

COURSE OUTCOMES [COs]

Course Outcome Statements
Describe the structural and functional features of human reproductive system, fertilization, implantation, pregnancy, gestation, placenta, parturition and lactation. (17 hrs)

Understand the ethical aspects of sex (2 hrs)

MODULE 3. Human Reproduction (17 hrs)

Male reproductive system: Structure of testis, male accessory organs; Semen production and composition; ejaculation. Spermatogenesis.

Female reproductive system: Structure of human ovary; development of primary follicle; structure of graafian follicle; fallopian tubes; uterus; external genitalia; mammary glands. Ogenesis.

Menstrual cycle and hormonal control; brief account of fertilization, implantation, pregnancy, gestation, placenta, parturition and lactation (Brief account on hormonal control of lactation).

MODULE 9. Ethical aspects of sex (2 hrs)

Healthy relationship with opposite sex, role of counseling, gender discrimination in family and society.

Topics for Assignments/Seminars

1. Sexual counseling
2. Marriage counseling
3. Functions of male and female hormones
4. Hormones of pregnancy

REFERENCES

- Brian Walker Nicki R Colledge Stuart Ralston and Ian Penman (2014): *Davidson's Principles and Practice of Medicine*, 22nd edition; eBook ISBN: 9780702052248,Elsevier
- John Hall (2015): *Textbook of Medical Physiology; 13th Edition,* ISBN: 9781455770052, Elsevier Health, 1168 pages

SIXTH SEMESTER

PHYSIOLOGY AND ENDOCRINOLOGY

Code: ZOL6B10T

[54 hrs] [3 hours per week] [3 credits]

COURSE OUTCOMES [COs]

Course Outcomes Statements
Describe the regulation of digestion in man, nutrition in pregnancy and infancy, nutritional disorders, balanced diet, starvation, fasting and obesity. (5 hrs)
Understand the mechanism of transport and exchange of respiratory gases and its neurophysiological control and physiological problems in diving mammals, new-born and aged individuals. (6 hrs)
Describe functions, composition, coagulation, transfusion, agglutination and clinical analysis of blood, haemoglobinopathies, types of heart and common cardio-vascular problems. (6 hrs)
Understand the osmoregulatory mechanisms in animals; excretion and its hormonal control and common renal disorders in man. (6 hrs)
Explain the ultrastructure of skeletal muscles and biochemical events and energetics of muscle contraction. (5 hrs)

Understand the different types of nerve cells, glial cells and nerve fibres, and the mechanism of nerve impulse transmission (6 hrs)
Understand the types, physiology and significance of bioluminescence, and the structure and functions of electric organs. (2 hrs)
Describe invertebrate neuro-endocrine organs and hormones, vertebrate endocrine glands, their hormones and functions (12 hrs)
Understand the concept of neurosecretion and the mode of action of peptide and steroid hormones. (6 hrs)

Section A: PHYSIOLOGY (36 hours)

MODULE 1. Nutrition (5 hrs)

Regulation of digestive activity: Nervous and hormonal control; Ruminant digestion; Nutrition in pregnancy, infant nutrition, breast feeding, composition of breast milk; Importance of dietary fibres; Balanced diet; Nutritional disorders: anorexia, acidity, ulcer, flatulence; starvation, fasting and its significance; Obesity: causes and consequences.

MODULE 2. Respiration (6 hrs)

Gaseous exchange and transport of respiratory gases (brief account), Oxygen-Haemoglobin dissociation curve; Respiratory pigments, structure and properties of Hb; Neurophysiological control of respiration; Physiological problems in diving mammals, new-born and aged individuals.

MODULE 3. Circulation (6 hrs)

Blood: functions and composition; Coagulation of blood (Enzyme cascade theory); Clinical analysis of blood, ESR; Haemodynamics; Haemostasis, haemolysis and jaundice, haemoglobinopathies; Blood transfusion and agglutination, aphaeresis.

Types of heart; ECG; Common cardio-vascular problems: Abnormal variations in BP, Tachycardia, Bradycardia, Myocardial infarction, heart failure, cerebral hemorrhage and cerebro-vascular accident.

MODULE 4. Osmoregulation and Excretion (6 hrs)

Osmoconformers and osmoregulators; Water conservation in desert forms; Osmotic and ionic regulation in terrestrial, fresh water and marine animals; Types of excretion, urea cycle; Human kidney: Urine formation with counter-current mechanism and hormonal regulation; Common renal disorders: haematuria, uremia, proteinuria, renal hypertension, nephritis, renal calculi, oedema, acidosis and alkalosis; Dialysis.

MODULE 5. Muscle Physiology (5 hrs)

Structure of vertebrate skeletal muscle: EM structure of Myofibrils and Myofilaments, contractile proteins; Mechanism of muscle contraction: Ultra structural changes (sliding filament theory); physiology, biochemistry and energetics of muscle contraction; energy sources, role of creatine phosphate, cori cycle; Muscle twitch, fatigue, tetany and rigor mortis.

MODULE 6. Nerve Physiology (6 hrs)

Different types of nerve cells; glial cells, giant nerve fibre of crustaceans and cephalopods; regeneration of medullary fibres, neurotrophins; Nerve impulse transmission, synapses and neuromuscular junctions, synaptic transmission

(electrical and chemical), neurotransmitters.

MODULE 7. Bioluminescence and Bioelectricity (2 hrs)

Classification of bioluminescence: symbiotic, extracellular and intracellular; Physiology and significance of light production; Structure and functions of electric organs.

Section B: ENDOCRINOLOGY (18 hrs)

MODULE 8. Invertebrate and Vertebrate endocrinology (12 hrs)

Neuro- endocrine organs and hormones in crustaceans and insects.

Classification of hormones: Amine, peptide and steroid hormones; Endocrine glands in man (hypothalamus, pituitary, thyroid, parathyroid, pancreas, adrenal, thymus, pineal and gastro-intestinal): their hormones and functions (brief account); Hormonal disorders.

Hormones of reproduction: Testes, ovaries and placenta, their hormones and physiological effects; role of hormones in female sexual cycle; hormone related female and male sexual dysfunctions.

MODULE 9. Concept of neurosecretion and hormonal action (6 hrs)

Hypothalamus-hypophysial interactions, hypothalamus releasing and inhibiting hormones and their roles, Neuro-hormonal integration, Neuro-endocrine pathways, Regulation of hormone secretion.

Hormonal action :Hormone receptors; Mechanism of action of peptide and steroid hormones; mode of action of insulin and thyroxine; positive and negative feedback regulation.

Topics for assignments/seminars

1. History, aim, scope and branches of Physiology.
2. Absorption of carbohydrates, proteins, and lipids.
3. Conducting system of the heart.
4. Composition and functions of lymph.
5. Gross and micro structure of human kidney.
6. Endocrine disorders in man : Cushing's disease, Addison's disease, diabetes mellitus, diabetes insipidus, dwarfism, gigantism, cretinism, myxedema and goitre.

REFERENCES

- Arthur Vander, James Sherman and Dorothy Luciano (1998) Human Physiology: The Mechanisms of Body Function, ISBN-10: 9780070670655, William C. Brown Pub., 818 pages
- Berry, A.K (2008): *A Text book of Animal Physiology*, 12th Edition, ISBN 10 8185712034, Emkay Publications, 686 pages
- Chatterjee, C.C (2016): *Human Physiology*, 11th Edition, ISBN-10 8123928726 Medical Allied Agency.

SIXTH SEMESTER

REPRODUCTIVE AND DEVELOPMENTAL BIOLOGY

Code: ZOL6B11T

[54 hrs] [3 hours per week] [3 credits]

COURSE OUTCOMES [COs]

1. Explain teratogenesis, identify teratogens.

Teratology (2 hrs)

Environmental disruption in animal development: Teratogenic agents and their effects (alcohol, drugs, nicotine and other chemicals), infections (Herpes virus, Cytomegalovirus and Rubella virus), metabolic imbalance (malnutrition and autoimmunization) (brief account).

REFERENCES

- Balinsky, B.I. (1981*) An Introduction to Embryology*, 5th Edition, *Embryology*, ISBN-4833700298 (International ed.), Saunders College Pub., 768 pages
- Berril N. J. (1971)*Developmental Biology*, ISBN 10: 0070050201, McGraw Hill

SIXTH SEMESTER B.Sc. ZOOLOGY PROGRAMME

ZOOLOGY CORE COURSE –XI [Theory]

ENVIRONMENTAL AND CONSERVATION BIOLOGY

Code: ZOL6B12T

[54 hrs] [3 hours per week] [3 credits]

COURSE OUTCOMES [COs]

Course outcome statements
Enumerate the several tools and techniques employed for studies on populations, communities and ecosystems. (4 hrs)

MODULE 6. Ecological tools and Techniques (4 hrs)

Commonly used techniques for study of animal populations: a) Sampling of animal populations b) Trapping and collecting various groups of organisms [insects, aquatic organisms, soil organisms, birds and mammals] c) Marking of animals d) Determination of age in animal groups d) Determination of home range and territory e) Estimation of number of animals in a population f) Indirect method of estimating wild animal populations g) Recent trends- Camera trapping, Radio collaring and Remote sensing

REFERENCES

- Agarwal, K.C. (2008) *Environmental Biology*, Nidi Publishers, Bikaner.Hardcover: 552 pages, ISBN-13: 978-8189153021
- Arora, S. (1995).*Fundamentals of Environmental Biology*, Kalyani Publ.,New Delhi.
- Balachandran Thampi, K. *et al*.: *The Natural Resources of Kerala*. 1997, WWF for Nature - India, [Kerala State Office], Trivandrum.

SIXTH SEMESTER

ETHOLOGY, EVOLUTION AND ZOOGEOGRAPHY

Code: ZOL6B13T

[54 hrs] [3 hours per week] [3 credits]

COURSE OUTCOMES [COs]

Course Outcome Statements
Identify major evolutionary transitions over time, and explain the tools and evidences that support current hypotheses of the history of life on earth (8 hrs)
Describe the evidences for evolution and its required corollaries (5 hrs)
Explain the various theories of evolution (6 hrs)
Describe the mechanisms by which evolution occurs (5 hrs)
Recognize the significance of reproductive isolation in reducing gene flow between populations, biological and morphological species concepts and distinguish between prezygotic and postzygotic barriers to reproduction (7 hrs)
Review the events in human evolution (3 hrs)

Section B: EVOLUTION (34 hrs)

MODULE 3. Course of Evolution (8 hrs)

History of Evolutionary thought **(1 hr)**

History of evolutionary thought: Ideas of evolution during Pre-Darwinian, Darwinian and Post- Darwinian periods (brief account).

Origin of life (6 hrs)

Biochemical origin of life (Modern hypothesis–Oparin-Haldane Theory). Major steps in the biochemical evolution of life (brief account): Origin of Earth and the primordial atmosphere, formation of simple organic molecules, formation of macromolecules or polymers, and formation of coacervates, microspheres, protocells and full-fledged living cells; origin of mitochondria and chloroplast. Experimental evidence for biochemical origin of life: Urey-Miller experiment; Other experiments; Modern ideas on the origin of life. Mention origin of prokaryotes and eukaryotes.

History of Life on Earth (1 hrs)

Geological time scale (simple chart), mention Cambrian explosion. Fossils, Fossilization and Dating of fossils (brief account). Living fossils: *Peripatus*, *Limulus* and *Sphenodon* as examples.

MODULE 4. Evidences of Organic Evolution (5 hrs)

i) Morphological and anatomical, ii) physiological and biochemical, iii) embryological, iv) palaeontological, v) molecular, vi) taxonomical evidences and vii) biogeographical evidences

MODULE 5. Theories of Evolution (6 hrs)

Lamarck's theory: Explanation of the major postulates of the Lamarck's theory with examples, Criticism against Lamarckism, Neo-Lamarckism, Present status of Lamarckism.

Darwin's theory: Explanation of important postulates of Darwin's theory, Examples for natural selection, Criticism against Darwinism, Neo-Darwinism (Synthetic theory of evolution).

Weismann's germplasm theory; Mutation theory of De Vries. Mention the contributions of Wallace.

MODULE 6. Concepts of Evolutionary Process (5 hrs)

Genetic basis of evolution: i) Mutations (brief account of gene and chromosomal mutations), ii) Variations: somatic (environmental) variations and genetic (hereditary) variations, iii) Hardy-Weinberg Principle: Hardy-Weinberg Equilibrium, Factors that upset Hardy-Weinberg Equilibrium, iv) Genetic drift: effects on population, Evolutionary bottleneck and Founder effect, genetic drift and natural selection, importance of genetic drift in evolution; theory of punctuated equilibrium and its relevance.

MODULE 7: Nature of Evolution (7 hrs)

Species and Speciation: Species concept: phylogenetic and biological species concepts; General characteristics and subdivisions of species: subspecies, semi species, sibling species, cline and deme.

Speciation: Types of speciation i) Phyletic speciation ii) Quantum speciation iii) Gradual speciation; Major methods of natural speciation: Allopatric, parapatric and sympatric speciation.

Isolation and Isolating mechanisms: Types of isolating mechanisms i) Geographic isolation: mention examples, ii) Reproductive isolation (a) Prezygotic isolation (habitat, seasonal, ethological, morphological, physiological and cytological isolation with examples), (b) Postzygotic isolation (hybrid inviability, hybrid sterility and F2 breakdown isolation with examples).

Adaptive Radiation (Divergent Evolution): cause and significance, adaptive radiation in Darwin's finches; Convergent Evolution; Pre-adaptation; Co-evolution (mention examples also).

MODULE 8: Evolution of Modern Man (3 hrs)

Evolutionary trends in humans; Fore-runners of anthropoids-*Parapithecus*; Fore-runners of apes-*Dryopithecus*; Fore-runners of modern man-*Ramapithecus* (Kenyapithecus), *Australopithecus* (The ape-man), *Homo habilis* (The handy man), *H.erectus* (Pithecanthropines), *H.sapiens neanderthalensis* (Neanderthal man), *Homo sapiens fossilis* (The Cro-magnon), *Homo sapiens sapiens* (Modern man), mention Denizoans and Malapan man.

Topics for Assignments / Seminars

1. Old theories on origin of life: i) Theory of abiogenesis ii) Theory of biogenesis iii) Theory of special creation iv) Theory of Panspermia.
2. Evolution of Vertebrate Groups: Evolution of agnathans, fishes, amphibians, reptiles, birds and mammals (brief account).
3. Evolution of horse
4. Polypliody and Evolution
5. Ancestry of human population of India

REFERENCES

- Brian K. Hall & Benedikt Hallgrimsson. 2014. *Strickberger's Evolution.* 5th Edition. ISBN: 9789380853789, 9380853785. Publisher: Viva. 672 pages.
- Darlington P J 1966. Zoogeography: The Geographical Distribution of Animals. Fourth Edition. John Wiley & Sons, Inc. 675 pages.
- Jain P C & M.S. Anantharaman. *Palaeontology (Palaeobiology): Evolution and Animal distribution*. 9th Edition. ISBN-10: 9382956441; Vishal Publishing Co.

SIXTH SEMESTER

AQUACULTURE, ANIMAL HUSBANDRY AND POULTRY SCIENCE

Code: ZOL6B14BE02T

[54 hours] [3 hours per week] [3 Credits]

COURSE OUTCOMES [COs]

Course Outcome Statements
Enumerate the poultry rearing techniques and understand major breeds of fowl (7 hrs)
Understand the major breeds of cattle, cattle feeds and diseases of cattle (6 hrs)
Illustrate the steps in dairy processing and identify the role of dairy development in rural economy (5 hrs).

MODULE 4. Poultry science (7 hrs)

i. Egg production, cable bird production, nutritive value and bye products.
ii. Breeds of fowl – Exotic –Rhode Island Reds, Plymouth Rock, Naked Neck and Leghorn; Indigenous – Gramapriya, Giriraja and Kalinga Brown.
iii. Poultry rearing: Selection of eggs, hatching, incubation, brooding, sexing and vaccination.
iv. Poultry housing: Free range system, Semi-intensive system (deep litter system and individual cage system).
v. Equipments for feeding: Nutrients for starting, growing, laying hen.
vi. Common poultry feeds, food rations and feed formulation.
vii. Common diseases of poultry (Ranikket, Pullorum and Fowl pox)

MODULE 5. Animal husbandry (6 hrs) Introduction: History, origin, domestication.

Breeds of cattle:

Dairy breeds: Sindhi, Gir
Draught breeds of cattle: Nagori, Kangayam
Dual purpose breeds: Ongole, Hariana
Exotic breeds: Jersey, Holstein – Friesian
Native breeds: Conservation programmes, Vechur cow and Kasargod Dwarf

Feeding: Common cattle feeds, fodder Common diseases: Anthrax, Foot & Mouth disease. Parasites of cattle

Meat hygiene: Slaughter and clean meat production – Zoonotic diseases.

MODULE 6. Dairy science (5 hrs)

i. Role of dairy development in rural economy, employment opportunities, white revolution.
ii. Dairy processes: Straining, Filtration, Cooling, Chilling, Clarification, Pasteurisation, Freezing, Recombined milk, Soft curd milk, Skimmed and toned milk.
iii. Artificial milk, Milk adulteration.

Topics for Assignments/Seminars

1. Dairy products, manufacture and nutritive value.
2. Milk and milk spoilage.

REFERENCES

- Ashok Kumar Rathoure, Dinesh Kumar, Nazneen Z. and Deshmukh (2015): *Applied and Economic Zoology*; Daya Publishing House. 326 pages.
- Banerji, G.C (1986): *Poultry 3rd Edn.* , Oxford & IBH.148 pages.
- Banerji, G.C. (1998): *A text book of Animal husbandry 8th Edn.*, Oxford & IBH.1096 pages.

ZOOLOGY [CORE COURSE] PRACTICAL – III

Cod: ZOL6B16P

[Practical III*A + Practical III*B] [4 Credits]

PRACTICAL III*A: PHYSIOLOGY, ENDOCRINOLOGY, REPRODUCTIVE AND DEVELPOMENTAL BIOLOGY [72 hours] [4 hrs /week]

PRACTICAL III*B: ENVIRONMENTAL AND CONSERVATION BIOLOGY, ETHOLOGY, EVOLUTION, ZOOGEOGRAPHY & ELECTIVE COURSE [72 hours] [4 hrs/week]

COURSE OUTCOMES [COs]

COs	Course Outcome Statements
CO1	Perform standard laboratory experiments for the estimation of Hb, presence of hCG/abnormal constituents in urine, detection of blood pressure, bleeding and clotting time and identification of formed elements in blood (46 hrs)
CO2	Identify selected stages in the development of frog and chick and chosen larval forms of invertebrates and vertebrates (26 hrs)
CO3	Carry out experiments of laboratory standards to estimate water quality parameters including, dissolved Oxygen, Carbon dioxide, hardness and pH; determination of adulteration of selected food items and identify marine planktons and soil organisms (28 hrs)
CO4	Demonstrate the behavioural response of earthworm/dipteran larva to selected stimuli (11 hrs)
CO5	Describe homologous , analogous and vestigial organs, connecting links, adaptive radiation and evolution of man (11 hrs)
CO6	Illustrate zoogeographical realms, Wallace line, Weber line, Wallacea and the distribution of *Peripatus*, lung fishes, *Sphenodon*, monotremes and marsupials (11 hrs)
CO7	Identify the normal and selected abnormal human karyotypes and inheritance of chosen traits from pedigree charts, ornamental and other culture fishes and chosen beneficial and harmful insects (11 hrs)

PHYSIOLOGY, ENDOCRINOLOGY, REPRODUCTIVE AND DEVELPOMENTAL BIOLOGY

[72 hours] [4 hrs/week]

Section A. PHYSIOLOGY AND ENDOCRINOLOGY (46 hrs)

1. Detection of Abnormal constituents of urine [glucose, ketone bodies and albumin] (Major).
2. Preparation human bloodsmear to study the formed elements (Major).
3. Osmotic response of RBC to saline solutions of different concentrations (Minor).
4. Determination of Hb content in man using Haemoglobinometer (Minor)
5. Determination blood clotting time (Demonstration).
6. Determination of blood pressure (Demonstration).
7. Determination of Body mass index (individuals).
8. Study of the histology of the following endocrine glands - pituitary, thyroid, adrenal and endocrine pancreas using slides/photographs.
9. Detection of pregnancy using standard kits (Demonstration).

Section B. REPRODUCTIVE AND DEVELOPMENTAL BIOLOGY (26 hrs)

1. Demonstration of chick blastoderm.
2. Induced ovulation in fish.
3. Study of life cycle in *Drosophila.*
4. Spotters:
   - Types of eggs (Insect, Amphioxus, frog, chick, and human).
   - Cleavage in frog (use slides / diagrams/models).
   - Shark: Yolk sac placenta.
   - Development of Frog: Blastula, gastrula, neurula.
   - Development of Chick: 18, 24, 32, 48 hours of incubation.
   - Mammal: Any two mammalian embryos.
   - Larval forms of invertebrates (any five) and vertebrates (any two).

REFERENCES

- F. S. Billet and A. E. Wild: Practical studies of animal development, ISBN: 9789401168861, Springer
- George Van Ness Dearborn (2016): A Text-Book of Human Physiology, Theoretic and Practical, ISBN-10: 1373146265, Wentworth Press, 572 pages
- G.K. Pal and Parvathy Pal (2016): Text book of practical physiology, 4th Edition, ISBN-10: 8173719969, Orient blackswan
- V.P. Varshney , Mona Bedi (2018): Ghai's Textbook of Practical Physiology, 9th Edition, ISBN-10: 9352705327, Jaypee Brothers, 376 pages

PRACTICAL III*B

ENVIRONMENTAL AND CONSERVATION BIOLOGY, ETHOLOGY,EVOLUTION, ZOOGEOGRAPHY & ELECTIVE [HUMAN GENETICS/AQUACULTURE, ANIMAL HUSBANDRY & POULTRY SCIENCE/APPLIED ENTOMOLOGY]

[72 hrs] [4hrs/week]

Section A: ENVIRONMENTAL AND CONSERVATION BIOLOGY (28 hrs)

1. Estimation of dissolved O_2 in water sample using Winkler's method (Major).
2. Estimation of dissolved CO_2 in pond and tap water (Major).
3. Estimation of total hardness of water (Major).
4. Determination of pH using pH paper / digital pH meter (Minor).
5. Extraction of soil organism by hand picking, floatation and Berlese funnel method (Minor).
6. Study of marine planktons (any five items up to genus level) (Minor).
7. Study of a pond ecosystem and preparation of food chains and food web (Minor).
8. Detection of food adulteration in selected food items (Minor).
   i) Detection of starch and urea in milk.
   ii) Detection of tea adulterated by colouring.
   iii) Detection of maida and chalk powder in wheat flour.

Section B: ETHOLOGY, EVOLUTION & ZOOGEOGRAPHY (33 hrs)

Ethology (Any three) **(11 hrs)**

1. Demonstration of the effect of alarm pheromones in ants.
2. Demonstration of phototaxis using Earth worm.
3. Study of Chaemotaxis in third instar larvae of Drosophila melanogaster to odours [Fructose, Yeast and Ethyl acetate].
4. Locomotory behaviour of dipteran larvae (Housefly/blowfly/fruitfly): on different types of substrata (writing paper, plastic sheet and sand paper].
5. Effects of light intensity and light quality on the rate of locomotion of dipteran larva.

Evolution **(11 hrs)**

Study of models, charts and specimens related to comparative study of:

1. Study of homologous organs (limbs of 5 different groups of vertebrates).
2. Study of analogous organs (wings of bird, insect and bat).
3. Study of any four vestigial organs in humans.
4. Study of evolution of man based on three hominid fossils.
5. Study of connecting links (*Peripatus* and *Archeopteryx*).
6. Study of adaptive radiation in feet of birds / mouth parts of insects.

Zoogeography **(11 hrs)**

1. Preparation of world map to show six zoogeographical realms.
2. Preparation of world map to show islands of zoogeographical significance.
3. Preparation of world map to show Wallace line, Weber line and Wallacea.
4. Locate the distribution of following animals in the world map: *Peripatus*, lung fishes, *Sphenodon*, monotremes, marsupials

Section C: ELECTIVE COURSE [11 hrs]
[Human Genetics/Aquaculture, Animal Husbandry & Poultry Science/Applied Entomology]

HUMAN GENETICS

1. Problems on (a) autosomal dominant and recessive (b) polygenic traits (skin colour), (c) Sex linkage (X-linked genes and Y-linked genes).
2. Study of identical and fraternal twins.
3. Dermatoglyphics: Identification of arch, loop and whorl patterns; total ridge count in male and female; Tri- radii, importance of atd angle, simian line.
4. Ischiara chart (to detect red-green colour blindness).
5. Seminars on genetics in cardiology, oncology and genetic counselling, Pre-natal sexing, amniocentesis, importance of genetic screening.
6. Pedigree studies and identification of the nature of inheritance from pedigree chart (any one trait).
7. Identification of human karyotypes (Edwards and Patau's) from ideogram

AQUACULTURE, ANIMAL HUSBANDRY AND POULTRY SCIENCE

1. Culture of fish food organisms: protozoans, rotifers and crustaceans.
2. Maintenance of spawn and its transportation to hatching or rearing tanks.

3. Identification of major food fishes (fresh water, estuarine and marine – 5 from each group).
4. Study of different crafts and gears.
5. Study of common ornamental fishes (record any seven with photograph).
6. Breeding techniques: preparation of hormone extracts and injection of hormones to fishes; Eyestalk ablation in prawns.
7. Study of fish products and by-products.
8. Identification of larval forms of prawn, pearl oyster, mussel, lobster and crab.
9. Identification of major edible crustaceans and molluscs.
10. Identification of edible sea weeds.

Process of teaching –

Show specimens, charts or pictures of the organisms.

Demonstration of various experiments as prescribed in the syllabus.

Process of Assessment –

Quiz – show the specimen and student identifies it – writes its classification – gives its salient features

The student has to mount of given specimen.

The student has to dissect and display the given specimen.

Monthly Academic Planner

Month: June

Class	Paper Code	Modules to be covered
III DC	Z05B07T	Evolution - concepts of organic & inorganic evolution & theories related to evolution Geological time scale
II DC	Z03B03T	Chordata - Part I Amphibian characters. Type - Frog. - external features
II DC	Practical	All chordate part I spotters.

Month: July

Class	Paper Code	Modules to be covered
III DC	Z05B09T	Science and Scientific studies.
II DC	Z03B03T	Chordata - Amphibian classification
III DC	Z05B07T	Evidences of organic evolution
II DC	Z03B03T	Chordata - Reptile classification
III DC	Z05B06T	Ecological tools and techniques.

Month: August

Class	Paper Code	Modules to be covered
II DC	Zoo3B03T	Chordata - Classification of reptiles
III DC	205B06T	Biodiversity - different levels, red data book, conservation methods.
III DC	205B09T	Types of hypotheses, Theories
III DC	205B07T	Darwin and Lamark's theories of evolution.
I DC	205B01T	Non Chordata - Phylum Ctenophora

Month: September

Class	Paper Code	Modules to be covered
II DC	203B03T	Chordata - Classification of amphibia.
III DC	205B07T	Darwinism, Criticisms and Neo-Darwinism
I DC	205B01T	Non Chordata - Principles of classification
III DC	IV Semester Practical	Model exam. University exam.

Month: October

Class	Paper Code	Modules to be covered
III DC	Z05B07T	Convergent evolution, adaptive radiation
III DC	Z05B06T	Toxicology
III DC	Z05B09T	Experimentation in Science.
II DC	Z03B03T	Amphibia - type frog - revision
I DC	Z05B01T	Phylum - Platyhelminthes Type Digenia.
III DC	Z05B09T	Ethics in Science

Month: November

Class	Paper Code	Modules to be covered
III DC	Z05B07T	Evolution of vertebrates.
III DC	Z05B06T	Conservation strategies
III DC	Z05B07T	Evolution of man.
II DC	Z03B03T	Classification of reptiles.
I DC	Z05B01T	Classification of platyhelminths

Month: December

Class	Paper Code	Modules to be covered
IDC	Z01B01T	Cestoda examples - Echinococcus and Fasciola.
IIDC	Z03B03T	Examples of Chelonia - Chelone Rhynchocephalia - Sphenodon.
IIIDC	Z06B11T	Nutrition - ruminant digestion
IIIDC	Z06B14T	Natural & acquired, Active & Passive immunity.

Month: January

Class	Paper Code	Modules to be covered
IDC	Z01B01T	Super Phylum Aschelminthes. Classification
IIDC	Z03B03T	Examples of snakes, Lizards, Crocodiles.
IIIDC	Z06B11T	Respiration - gas transport
IIIDC	Z06B12T	Bioinformatics - introduction
IIIDC	Z06B11T	Endocrinology - invertebrate, hormonal action.

Month: February

Class	Paper Code	Modules to be covered
TDC	201B01T	Examples of Nematodes - ancylostoma, Enterobius
IIIDC	206B11T	Circulation - enzyme cascade theory.
IIIDC	206B2T	Bioinformatics - major database
IDC	201B01T	Minor phyla - Gastrotricha, rotifera.
IIIDC	206B11T	Osmoregulation & Excretion.
IIIDC	206B15(E) 02T	Poultry - housing, feeding, feeds

Month: March

Class	Paper Code	Modules to be covered
IDC	202B02T	Phylum Annelida.
IIIDC	206B11T	Osmoregulation - counter current mechanism
IIIDC	206B12T	Database search engine
IIIDC	206B15(E) 02T	Poultry science - egg production in different breeds
IIIDC	206B11T	Nerve physiology

Weekly Work Format

Month : June	Week 1	Week 2	Week 3	Week 4	Week
1. No. of teaching days in the week	3	5	5	5	4
2. Total number of contact hours as per time table	8	16	16	16	13
3. Total number of contact hour engaged	8	16	3	3	2
4. Total number of contact hours not engaged	-	-	13	13	11
5. Reason for not engaging			III DC on study leave	III DC - University exam	III DC Univ. exam

V. Nalha.
Signature of faculty

Signature of Head of Dept.

Signature of Princi

Month : July	Week 1	Week 2	Week 3	Week 4	Wee
1. No. of teaching days in the week	1	3	4	5	5
2. Total number of hours as per time table	3	11	13	15	15
3. Total number of hour engaged	3	11	13	15	15
4. Total number of hours not engaged	-	-	-	-	-
5. Reason for not engaging	-	-	-	-	-

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Signature of Princ

Month : August	Week 1	Week 2	Week 3	Week 4	W
1. No. of teaching days in the week	4	5	4	4	
2. Total number of hours as per time table	11	15	13	13	8
3. Total number of hour engaged	11	15	9	9	6
4. Total number of hours not engaged	0	0	4	4	-
5. Reason for not engaging	-	-	Adoration Day Took leave for personal reason.	Talents Day class on disaster	III 5t

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Signature of Princ

Month : September	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	2	5	0	4	5
2. Total number of contact hours as per time table	5	15		13	15
3. Total number of contact hour engaged	5	10		8	10
4. Total number of contact hours not engaged	0	5		5	5
5. Reason for not engaging	-	1st sem Botany Onam practical celebration	Onam holidays.	1st Semester Practical	PTA meeting Principal Staff Council Faculty

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Month : October	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	5	1	5	5	
2. Total number of hours as per time table	15	3	15	15	
3. Total number of hour engaged	13	3	15	13	
4. Total number of hours not engaged	2	0	0	2	
5. Reason for not engaging	1st sem. Chem. Comp. practical Bus strike	Pooja holidays.	-	Not well - took leave.	

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Month : November	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	4	5	5	5	3
2. Total number of hours as per time table	11	15	15	15	10
3. Total number of hour engaged	11	15	15	15	10
4. Total number of hours not engaged	0	0	0	0	0
5. Reason for not engaging					

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Month : December	Week 1	Week 2	Week 3	Week 4	W
1. No. of teaching days in the week	2	5	4	5	
2. Total number of contact hours as per time table	5	15	11	15	
3. Total number of contact hour engaged	5	15	11	15	
4. Total number of contact hours not engaged	0	0	0	0	
5. Reason for not engaging	–	–	–	–	

V. Neetha

Signature of faculty Signature of Head of Dept. Signature of Prin

Month : January	Week 1	Week 2	Week 3	Week 4	W
1. No. of teaching days in the week	4	4	5	4	2
2. Total number of hours as per time table	7	10	15	13	8
3. Total number of hour engaged	3	6	15	13	1
4. Total number of hours not engaged	4	4	0	0	
5. Reason for not engaging	Value education & Sports days	leave to attend family func. ARTS day College day	–	–	

V. Neetha

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Month : February	Week 1	Week 2	Week 3	Week 4	W
1. No. of teaching days in the week	3	4	4	3	
2. Total number of hours as per time table	7	11	11	10	
3. Total number of hour engaged	7	11	6	10	
4. Total number of hours not engaged	0	0	5	0	
5. Reason for not engaging	–	–	Hartal. wetland Day celebration Fashion Designing Prog.	Science Day	

V. Neetha

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Month : March	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	3	5	5	5	5
2. Total number of hours as per time table	7	15	15	3	3
3. Total number of hour engaged	7	15	15	0	0
4. Total number of hours not engaged	0	0	0	3	3
5. Reason for not engaging	-	-	-	ON LEAVE - ADMITTED IN HOSPITAL	

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Record of Special Coaching

Remedial Classes		Classes for gifted / talented	
Date, Class& number of students	Subject / Paper	Date, Class & number of students	Subject/ Paper
6/6/16. II DC, 1	Zoology-core		
13/6/16, II DC, 1	Zoology-core		
7/9/16. II DC 1	Zoology core for I sem exam		
17/10/16 II DC 1	Zoology core for III sem.		
24/10/16 II DC 1	III sem core		
14/0/16 II DC 1	III sem core		

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Monthly Academic Planner

Month: June

Class	Paper Code	Modules to be covered
III DC	Z05B08T	Genetics - Mendelian Genetics.
III DC	Practical I Z04B05P	Dissection - prawn nervous system
III DC	Z05B08T	Variations from Mendelian ratios
III DC	Z04B05P	Prawn appendages.
III DC	Z05B08T	Interaction of genes. - codominance incomplete dominance

Month: July

Class	Paper Code	Modules to be covered
II DC	Z04B03T	Amphibians - General characters.
III DC	Z05B08T	Multiple alleles

Month: August

Class	Paper Code	Modules to be covered
II DC	205B08T	Codominance, incomplete dominance with egs
II DC	205B03T	Frog - type study external features.
I DC	205B01T	Planaria - type study
III DC	205B07T	Evolution - theories.
III DC	205B09T	General Methodology - Science & scientific studies.

Month: September

Class	Paper Code	Modules to be covered
III DC	205B09T	Scientific methods.
III DC	20508T	Linkage, crossing over recombination
III DC	205B03T	Digestive and respiratory system - Frog
I DC	205B01T	General characters - Phylum Platyhelminth
III DC	205B07T	History of life on earth.

Month: October

Class	Paper Code	Modules to be covered
III DC	205B02T	Evolution of vertebrates
II DC	205B03T	Classification of Phylum Amphibia
III DC	205B01T	Modern theories on evolution
II DC	205B08T	Sex linkage, Sex determination
I DC	201B01T	Reproduction and life cycle of planaria
III DC	205B09T	Ethical aspects in Science

Month: November

Class	Paper Code	Modules to be covered
III DC	206B11T	Nutrition.
II DC	206B14T	Introduction & History
I DC	201B01T	Classification of playhelminthes
II DC	205B03T	Classification of Reptiles.

Month: December

Class	Paper Code	Modules to be covered
III DC	Z06B14T	Immune System.
III DC	Z06B11T	Respiration - Transport of gases
II DC	Z05B03T	Identification chart for Snakes
III DC	Z06B11T	Neurophysiological control.
I DC	Z001B01T	Classification of Aschelminthes

Month: January

Class	Paper Code	Modules to be covered
III DC	Z06B14T	Structure and classes of immunoglobulins
III DC	Z06B11T	Circulation - enzyme cascade theory -
I DC	Z01B02T	Annelida
III DC	Z06B14T	Antigens, autoimmune diseases.
III DC	Z06B11T	Osmoregulation & excretion Muscle & Nerve physiology

Month: February

Class	Paper Code	Modules to be covered
III DC	206B11T	Endocrinology, Bioluminescence
III DC	206B14T	Auto immunity, antigen antibody reactions
III DC	206B15T	Poultry – introduction
III DC	206B11T	Hypothalamus – as a nervous & endocrina gland.
III DC	206B11T	Hormone action

Month: March

Class	Paper Code	Modules to be covered
III DC	206B11T	Invatebrate endocrinology
III DC	206B14T	ELISA, PCR, – techniques.
I DC	201B02T	Nereis – Digestive System
I DC	201B02T	Nereis – Nervous system Reproductive system.
		classification of platyhelminthes.

Signature of Head of the Dept.

Weekly Work Format

Month : June	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	1	5	4	5	5
2. Total number of contact hours as per time table	3	15	12	15	15
3. Total number of contact hour engaged	3	15	12	7	15
4. Total number of contact hours not engaged	-	-	-	8	-
5. Reason for not engaging			Ramzan Holiday	IV Sem Uty Practical exam	

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Month : July	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	5	5	4	5	2
2. Total number of hours as per time table	15	15	11	15	5
3. Total number of hour engaged	15	4	4	15	5
4. Total number of hours not engaged	0	11	7	0	0
5. Reason for not engaging		IV Sem Uty exam Study leave			

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Month : August	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	3	5	2	0	5
2. Total number of hours as per time table	7	15	8	-	15
3. Total number of hour engaged	7	15	8	-	0
4. Total number of hours not engaged	-	-	-	-	15
5. Reason for not engaging	-	-	-	Onam	Cl

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Month : September	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	5	3	3	6	
2. Total number of contact hours as per time table	15	8	10	17	
3. Total number of contact hour engaged	15	8	10	17	
4. Total number of contact hours not engaged	-	-	-	-	
5. Reason for not engaging					

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Month : October	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	4	5	2	5	3
2. Total number of hours as per time table	11	15	8	15	10
3. Total number of hour engaged	11	7	8	13	10
4. Total number of hours not engaged	-	8	-	2	-
5. Reason for not engaging		TIDC Refresher & Foundation		D.L - Orientation on FLAIR at TVM	

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Month : November	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	2	5	5	3	5
2. Total number of hours as per time table	5	15	15	8	5
3. Total number of hour engaged	5	2	2	8	5
4. Total number of hours not engaged	-	13	13	-	-
5. Reason for not engaging	-	TIDC University exam & study leave		-	TIDC Univ exam

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Month : December	Week 1	Week 2	Week 3	Week 4	W
1. No. of teaching days in the week	5	5	5	-	-
2. Total number of contact hours as per time table	15	15	15		
3. Total number of contact hour engaged	14	14	15		
4. Total number of contact hours not engaged	1	1	-		
5. Reason for not engaging	TI/DL Univ. exam & study leave		-	Inventory	

V.Vanitha

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Month : January	Week 1	Week 2	Week 3	Week 4	Wee
1. No. of teaching days in the week	1	3	5	5	4
2. Total number of hours as per time table	4	9	15	15	1
3. Total number of hour engaged	2	9	15	15	1
4. Total number of hours not engaged	2	-	-	-	-
5. Reason for not engaging	Vanitha, Madhil, Bharat, Bandh.				

V.Vanitha

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Month : February	Week 1	Week 2	Week 3	Week 4	Wee
1. No. of teaching days in the week	1	4	5	5	4
2. Total number of hours as per time table	3	11	15	15	1
3. Total number of hour engaged	3	-	-	-	
4. Total number of hours not engaged	-	11	15	15	
5. Reason for not engaging	-	Zoo. assoc. inaugural Vaiada fest WWS - Chennai visit	10-day industry trained - IIT Madras for FDP		2

V.Vanitha

Signature of faculty Signature of Head of Dept. Signature of Princ

Month : March	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	1	4	5	5	5
2. Total number of hours as per time table	3	11	15	15	15
3. Total number of hour engaged	3	7	15	2	2
4. Total number of hours not engaged	—	4	-	13	13
5. Reason for not engaging		6, 7/Mar sent off social		III yr study Leave 20/5/19 onw camp	Th DC. Invigilation duty

Signature of faculty

Signature of Head of Dept.

Signature of Principal

Record of Special Coaching

Remedial Classes		Classes for gifted / talented	
Date, Class& number of students	Subject / Paper	Date, Class & number of students	Subject/ Paper
4/7/18 1 C (III DC)	Genetics		
4,5,6/12 Th DC	Physiology		

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Monthly Academic Planner

Moth: June

Class	Paper Code	Portions to be taught
III DC	204B05P	Demonstration of dissection of Cockroach salivary apparatus.
II DC	203B03T	Introduction to Amphibians.
III DC	205B08T	Introduction - Genetics - Non Mendelian ratios.
III DC	205B07T	Evolution - Origin of life
III DC	205B09T	Introduction to General Methodology is Science.

Moth: July

Class	Paper Code	Portions to be taught
II DC	203B03T	Amphibia - general characters
III DC	205B08T	Non allelic interactions.
III DC	205B07T	Evolution - theories.
II DC	203B03T	External morphology - Type Euphrayltis

Moth: August

Class	Paper Code	Portions to be taught
II DC	203B03T	External features of Euphyllis
III DC	205B08T	Linkage - groups, interactions
III DC	205B07T	Darwin's theory of evolution
III DC	205B08T	Sex linkage - types and egs.
II DC	203B03T	Digestive system of frog

Moth: September

Class	Paper Code	Portions to be taught
III DC	205B08T	Mutation - Types, classification
III DC	205B07T	Lamark's theory of evolution.
II DC	203B03T	Circulatory system of frog.
I DC	201B01T	Phylum Platyhelminthes

Moth: October

Class	Paper Code	Portions to be taught
IIIDC	205B08T	Human Genetics.
IIIDC	205B07T	Speciation and its mechinism
IIIDC	205B09T	Science and Scientific studies
IIDC	205B03T	Nervous system of frog.
IDC	201B01T	Phylum Platyhelminthes Type Nereis

Moth: November

Class	Paper Code	Portions to be taught
IIIDC	206B11T	Nutrition introduction
IIIDC	206B12T	Bioinformatics - History & scope
IIIDC	206B14T	Immunity - Natural & Acquired
IDC	201B01T	classification of platyhelminthes
IIDC	20B03T	Classification of raptiles

Moth: December

Class	Paper Code	Portions to be taught
III DC	206B14T	Immune System
III DC	206B12T	Databases in bioinformatics
III DC	206B11T	Respiration – transport of resp. gases
I DC	201B01T	Aschelminthes – examples and classification + Minor phyla.

Moth: January

Class	Paper Code	Portions to be taught
III DC	206B12T	Database search engines
III DC	206B14T	Antibodies & Antigens – structure, classification, types
III DC	206B11T	Circulation – blood composition, function clinical analyses Osmoregulation and excretion
I DC	202B02T	Annelida – general characters

Moth: February

Class	Paper Code	Portions to be taught
IIIDC	206B14T	Autoimmune diseases. Techniques in immunology Tumour immunology
IIIDC	206B12T	Sequence similarity searches Microarrays, genomics, proteomics, Metabolomics Applications & ethical issues
IIIDC	206B11T	Muscle physiology, Nerve physiology, Bioluminogen Endocrinology (full)

Moth: March

Class	Paper Code	Portions to be taught
IDC		

Weekly Work Format

Month : June	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	2	5	5	5	
2. Total number of contact hours as per time table	5	15	15	15	
3. Total number of contact hour engaged	5	13	14	10	
4. Total number of contact hours not engaged	-	2	1	5	
5. Reason for not engaging	-	To attend Seminar	First year not arrived	Board meeting CMV camp	

Signature of faculty V.Nathe Signature of Head of Dept. Signature of Principal

Month : July	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	4	5	5	5	2
2. Total number of hours as per time table	13	15	15	15	
3. Total number of hour engaged	10	10	15	11	
4. Total number of hours not engaged	3	5	-	4	
5. Reason for not engaging	On Duty as Ext. Examiner S.N.Nathe	CL due to personal reasons	-	CMV-OD Camp -I Sem	

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Month : August	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	2	4	1	4	3
2. Total number of hours as per time table	5	12	3	12	10
3. Total number of hour engaged	5	12	3	12	10
4. Total number of hours not engaged	-	-	-	-	-
5. Reason for not engaging					

Signature of faculty V.Nathe Signature of Head of Dept. Signature of Principal

Month : September	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	1	0	4	5	1
2. Total number of contact hours as per time table	15		11	15	4
3. Total number of contact hour engaged	10		8	15	4
4. Total number of contact hours not engaged	5		3	-	-
5. Reason for not engaging	Evening Celebration Unscheduled		20/9/19 Up to 9 1 session given		

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Month : October	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	3	4	6	5	4
2. Total number of hours as per time table	9	7	19	15	12
3. Total number of hour engaged	9	7	19	-	12
4. Total number of hours not engaged	-	-	-	15	-
5. Reason for not engaging				I, II, III DC II internal exam	

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Month : November	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	2	4	6	5	5
2. Total number of hours as per time table	5	13	18	15	15
3. Total number of hour engaged	3	13	15	13	15
4. Total number of hours not engaged	2	-	3	2	-
5. Reason for not engaging	III DC Field visit on 2/11/19		13/11/19 returning of Univ. Papers	20/11/19 CL	

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Month : December	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	5	5	4	0	2
2. Total number of contact hours as per time table	15	15	13		8
3. Total number of contact hour engaged	15	15	7		2
4. Total number of contact hours not engaged	-	-	6		-
5. Reason for not engaging			Arts Day and [illegible] club.	Christmas Holidays	

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Month : January	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	2	4	5	5	
2. Total number of hours as per time table	5	13	15	15	
3. Total number of hour engaged	5	10	8	15	
4. Total number of hours not engaged	-	3	7	-	
5. Reason for not engaging	-	Sport Day hartal	Bharatiyapuzha Sampling - STAR		

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Month : February	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	1	5	4	4	5
2. Total number of hours as per time table	4	15	11	12	15
3. Total number of hour engaged	-	15	11	12	8
4. Total number of hours not engaged	4	-	-	-	7
5. Reason for not engaging	College Day				CV camp Vimala College

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UNIVERSITY OF CALICUT

B.Sc. ZOOLOGY PROGRAMME

[CBCSS UG 2019]

Lesson Plan

Dr. Tessy K.L

ODD SEMESTERS

FIRST SEMESTER: ANIMALDIVERSITY: NON-CHORDATA PART- I,

Code: ZOL1B01T

Section A. CONCEPTS OF CLASSIFICATION OF ORGANISMS

MODULE 1. Principles of classification and nomenclature (5 hrs)

Systematics: natural and classical. Nomenclature: Binomial and Trinomial nomenclature; International rules of Zoological nomenclature (brief account); Mention modern trends in systematics: Chemotaxonomy, Serotaxonomy, Cytotaxonomy, Evolutionary taxonomy, Numerical taxonomy (Phenetics), Cladistics (Phylogenetics), Molecular systematics, DNA barcoding.

MODULE 2. Five kingdom classification of living organisms (1 hr)

Mention Cavalier-smith's eight kingdom classification also.

MODULE 3. Concepts of classification of animals (4 hrs)

Classification based on number of cells, tissue or organ system level of organization, development of germ layers, development of symmetry, development of coelom, segmentation, homology and analogy of organs and their origin, development of mouth and digestive tract (brief account).

Section B. CLASSIFICATION OF KINGDOM PROTISTA

MODULE 4. Kingdom: PROTISTA (6 hrs)

Characteristic features and classification of Kingdom Protista down to phyla. [*Salient features of the major groups of protists given below with notes on the examples cited*]

Phylum: Rhizopoda	e.g.*Entamoeba*
Phylum: Dinoflagellata	e.g.*Noctiluca*
Phylum:Parabasilia	e.g.*Trichonympha*
Phylum: Apicomplexa [=Sporozoa]	e.g. *Plasmodium*
Phylum: Ciliophora	e.g.*Vorticella.*

Type ***Paramecium***: Morphology and structural organization [as revealed by compound microscopy]; locomotion, nutrition, excretion, osmoregulation and reproduction; conjugation in detail.

Section C. KINGDOM: ANIMALIA

Salient features of the Major Phyla of animals and their diversity.

[*Habits, habitat,morphology, functional anatomy and life history of representative types (wherever specified) and classification of each phylum down to classes, except otherwise mentioned, and examples thereof: Study of animal diversity with typical examples from each class, with emphasis on ecological and adaptive features, economic importance and such other points of biological interest expected. Only very brief account of each example is to be studied.*]

MODULE 5. Subkingdom: MESOZOA (1 hr)

A brief account of Dicyemid (=Rhombozoans) mesozoans [e.g. *Dicyema*] and Orthonectid mesozoans [e.g. *Rhopalura*]

MODULE 6. Subkingdom: PARAZOA (3 hrs)

Phylum: PORIFERA

Classification down to classes and salient features of each class.

Class Calcarea (=Calcispongiae)	e.g.*Leucosolenia*
Class Demospongiae	e.g.*Spongilla*
Class Hexactinellida (=Hyalospongiae)	e.g.*Euplectella*

Give an account of canal system (Asconoid, Syconoid, Leuconoid and Rhagonoid); Mention amphiblastula, parenchymula and sponge gemmule.

COURSE OUTCOMES (COs)

Describe the principles of classification and nomenclature (5 hrs)
Explain the five kingdom classification of living organisms (1 hr)
Understand the concepts of classification of animals (4 hrs)
Explain the classification with examples and characteristic features of kingdom Protista and describe the morphology and structural organization of Paramecium
(6 hrs)
Describe the characteristic features of subkingdom Mesozoa (1 hr)
Explain the classification of phylum Porifera and elucidate the salient features of each class (3 hrs)
Describe the characteristic features of phylum Cnidaria and Ctenophora, illustrate the classification of phylum Cnidaria down to classes and explain the structural organization of Obelia (8 hrs)

REFERENCES

- Anderson, D. T. (2001). *Invertebrate Zoology*. 2nd edition. University of Michigan, Oxford University Press (Indian Edition. 2006).
- Barnes, R.D. (1982). *Invertebrate Zoology*, 5th Edition. Holt Saunders International Edition.

THIRD SEMESTER: ANIMAL DIVERSITY: CHORDATA PART – I, CODE: ZOL3B03T

MODULE 1. Introduction [**2 hrs**]

Chordate characters (fundamental, general and advanced); chordates versus non-chordates; diversity of chordates; outline classification down to classes; salient features of each subphylum.

MODULE 2.Subphylum UROCHORDATA [Tunicata] [**5 hrs**]

Classification of the subphylum down to classes. Affinities of urochordates with cephalochordates and vertebrates.

Class Ascidiacea	e.g. *Herdmania*
Class Larvacea	e.g. *Oikopleura*
Class Thaliacea	e.g. *Doliolum*

Type: ***Ascidia*** [Morphology and retrogressive metamorphosis]; add a note on neoteny and paedogenesis.

MODULE 3.Subphylum CEPHALOCHORDATA [**4 hrs**]

Type: ***Branchiostoma*** [=Amphioxus]

Morphology and anatomical features; digestive system in detail; primitive,degenerate and specialized features [affinities and systematic position to be emphasized).

MODULE 4. Subphylum VERTEBRATA [3 hrs]

Salient features of subphylum vertebrata and its outline classification down to classes.

Division 1. AGNATHA

Characters, classificationdown to classes and examples: *Myxine; Petromyzon* [mention Ammocoetes larva]

Division 2. GNATHOSTOMATA

MODULE 5. Superclass PISCES [12 hrs]

Classification of Pisces down to orders; salient features of the following extant groups:

Class Chondrichthyes [Cartilaginous fishes]

Subclass Selachii e.g.*Scoliodon, Trygon*

Subclass Holocephali e.g.*Chimaera*

Class Osteichthyes [Bony fishes]

Subclass **Sarcopterygii**

1. Order Crossopterygii [Coelacanths] e.g. *Latimeria*
2. Order Dipnoi [Lung fishes] e.g. *Neoceratodus, Protopterus, Lepidosiren* (Add a note on the distribution of lung fishes).

Subclass **Actinopterygii**

1. Superorder Chondrostei e.g. *Acipenser*
2. Superorder Holostei e.g. *Amia*, *Lepidosteus*
3. Superorder Teleostei [Spiny-rayed fishes] e.g. *Sardinella, Rastrelliger*

Type: ***Mugil cephalus*** (Grey Mullet)

[Morphology, body wall, digestive system, respiratory system, circulatory system, excretory system, sense organs (neuromast organ in detail) and reproductive system].

Sub-terranean fishes from Kerala: *Aenigmachanna Gollum* (Gollum Snakehead), *Kryptoglanis shajii, Horaglanis krishnai* (Blind Catfish) *& Monopterus digressus* (Blind cave eel). Mention recent addition to ornamental fish trade - *Sahyadria denisonii* (Miss Kerala).

Course Outcome -

Explain the characteristics of chordates and outline classification of the phylum Chordata (2 hrs)

Describe the salient features and affinities of subphylum Urochordata and its classification down to classes; elucidate the morphology and structural organization of Ascidia (5 hrs)

Explain the salient features and affinities of subphylum Cephalochordata with reference to Branchiostoma (4 hrs)

Describe the salient features of subphylum Vertebrata, illustrate its classification down to classes and elucidate the characteristics of division Agnatha (3 hrs)

Enumerate the salient features of superclass Pisces and illustrate its classification down to orders and the morphology and structural organization of Mugil cephalus (12 hrs)

REFERENCES

- Areste, M. & Cebrian, R. (2003). *Snakes of the World*. Sterling Publishing Company, New York.
- Barbour, T. (1926). *Reptiles and Amphibians-Their Habits and Adaptations*. Houghton Mifflin Co., New York.

FIFTH SEMESTER - BIOCHEMISTRY AND MOLECULAR BIOLOGY, **Code: ZOL5B08T**

MOLECULAR BIOLOGY (36 hrs)

MODULE 7. DNA Replication (4 hrs)

Semi-conservative and semi-discontinuous, priming of Okazaki fragments, primer removal and joining of Okazaki fragments, Meselson and Stahl experiment.

MODULE 8. Gene and genetic code (6 hrs)

Gene concept (2 hrs)

Classical and modern concepts, housekeeping and luxury genes. Gene action: gene expression and gene products; one gene one enzyme hypothesis; one gene one polypeptide hypothesis. Central dogma of molecular biology, reverse transcription and modified central dogma.

Genetic code (4 hrs)

Deciphering of genetic code, experiments of Nirenberg and Khorana, codon assignments, properties of the genetic code and wobble hypothesis.

MODULE 9. Transcription (7 hrs)

RNA polymerases of eukaryotes and prokaryotes; promoters, terminators, enhancers and silencers.

Transcription unit, mono and polycistronic transcription units; coupling of transcription with translation in bacteria.

Initiation, elongation and termination of transcription (brief account).

Post transcriptional modification of the primary transcript – hnRNA, capping, poly
(A) tailing and splicing (brief account), spliceosomes.

MODULE 10. Translation (7 hrs)

Activation of amino acids and aminoacyl tRNA synthetases; role of tRNA as adaptor molecules in translation. Role of ribosomes and active centres of ribosomes. Initiation, elongation and termination of translation.

Post translational modification of the peptide chain: cleavage, formation of disulfide-bridges, acetylation, glycosylation, myristoylation, sulphation, hydroxylation, prenylation, nitrosylation, ubiquitination and SUMOylation.

Protein folding and role of molecular chaperones; Protein targeting (brief account)

MODULE 11. Regulation of gene expression and organization of genome(8 hrs)

Regulation of gene expression (4 hrs)

Operon organization of bacterial transcription units; *trp* operon and its regulation. Regulatory RNAs – ncRNAs, miRNAs, piRNAs, siRNAs and RNA interference. Mention CRISPR–Cas9 and targeted genome editing.

Organization of genome (4 hrs)

Sequence components of eukaryotic genome – non-repetitive, moderately repetitive and highly repetitive DNA; satellite DNA. Mention selfish DNA. C-value and C-value paradox. Overlapping genes, pseudogenes, cryptic genes, transposons and retrotransposons. Human genome and human genome project (brief account). Mitochondrial and chloroplast genome (brief account).

MODULE 12. Genetics of bacteria and phages (4 hr)

Conjugation in bacteria. Transduction – generalized and specialized; sexduction. Structure and life cycle of a bacteriophage; temperate and virulent phages; lysogeny and lysis.

Course Outcomes

Describe the mechanism of DNA duplication and the role of enzymes (4 hrs).

Understand the concept of gene and gene expression; genetic code and wobble hypothesis (6 hrs).

Explain the mechanism of transcription and post-transcriptional modification of hnRNA (7 hrs).

Enumerate the processes of translation and post-translational modification and targeting of peptides (7 hrs).

Describe the regulation of trp operon, C-value, repetitive DNA, satellite DNA, selfish DNA, overlapping genes, pseudogenes, cryptic genes, transposons and retrotransposons (8 hrs).

Explain the structure and life cycle of bacteriophages and the gene transfer mechanisms in bacteria (4 hrs).

REFERENCES

Module 7-12 (Molecular Biology)

- Brooks, R. J. (2011): *Genetics: Analysis and Principles*.4th Edition, ISBN-10: 0073525286, Addison Wesley, McGraw-Hill Higher Education, 864 pages
- Bruce Alberts, Dennis Bray Karen Hopkin and Alexander D. Johnson (2013) Essential Cell Biology, 4th Edition, ISBN-10: 0853696470, Garland Publishing, 864 pages

FIFTH SEMESTER: METHODOLOGY IN SCIENCE, BIOSTATISTICS AND BIOINFORMATICS, **Code: ZOL5B09T**

Section B: BIOSTATISTICS (15 Hrs)

MODULE 4. Introduction (5 hrs)

Definition; scope; role of statistics in life sciences; terminology and variables. Sample and Sampling: Sample size, sampling errors, methods of sampling.

Collection/documentation of data of the experiments.

Classification of data; Presentation of data: Tabular, Graphical and Diagrammatic (histogram, frequency polygon and frequency curve; line diagram, bar diagram and pie diagram).

[Short answers/Paragraphs/Essays]

MODULE 5. Analysis and Interpretation of data (10 hrs)

Measures of central tendency: *(raw data, discrete series data, continuous series data- problems are to be discussed)*

a) Mean, b) Median and c) Mode.

Measures of Dispersion: *(raw data, discrete series data, continuous series data - problems to be discussed)*

a) Range, b) Mean deviation, c) Standard deviation, d) Standard error. Hypothesis testing and Interpretation of results: *(problems to be discussed)*

a)'t' test, b) F- test - ANOVA

Significance of statistical tools in data interpretation; Statistics-based acceptance or rejection of hypothesis.

Course Outcomes:

Understand the Scope and role of statistics; methods and procedures of sampling; Construction of tables, charts and graphs (5 hrs)

Calculate central tendency and measures of dispersion and application of its

knowledge on hypothesis testing as well as in problem solving (10 hrs)
Enumerate major biological databases and database search engines (8 hrs)

References

Module 4-5 (Biostatistics)

- Antonisamy B, Prasanna S. Premkumar and Solomon Christopher (2017) Principles and Practice of Biostatistics, ISBN-10: 8131248879, Elsevier, 390 pages
- Bailey, N. T. J (1995): *Statistical Methods in Biology*, 3rd Edition, CUP, 272 pages

FIFTH SEMESTER: REPRODUCTIVE HEALTH AND SEX EDUCATION, **Code: ZOL5D01T**

MODULE 1. Introduction (2 hrs)

Definition; Reproductive health - problems and strategies; reproductive rights; importance of sex education for teen and youth.

MODULE 4. Infertility and Assisted reproductive technologies (10 hrs)

Infertility: Causes and problems in male and female. Infertility management: semen collection, preservation and storage, artificial insemination, surrogacy. Cryopreservation and embryo transfer: Collection, care and preservation of embryos. *In vitro* fertilization (IVF) and embryo transfer: Major steps; Test tube babies. Assisted Reproductive Techniques (ART): GIFT, ZIFT, ICSI, oocyte donation and embryo donation.

MODULE 5. Prenatal Diagnosis (4 hrs)

Different methods: Ultrasonography, amniocentesis, chorionic villus sampling and alpha-foetoprotein estimation; female foeticide: ethical issues and laws (Mention– PNDT Act).

MODULE 6. Fertility Control (4 hrs)

Natural methods; artificial methods; chemical methods; hormonal methods; contraceptive devices; surgical contraception; abortion, legal termination of pregnancy.

MODULE 7. Sexually transmitted infectious diseases (7 hrs)

Symptoms, mode of transmission, diagnosis, treatment and prophylaxis of AIDS, syphilis, gonorrhea, herpes (genital), human papilloma virus and genital warts, hepatitis, gonococcal vulvo vaginitis, Trichomonal vaginitis. Mention the term venereal disease. Socio economic dimensions of STD.

MODULE 8. Sexual orientation, sexual abuse and myths (5 hrs)

Homosexuality and bisexuality (mention LGBT), oral sex, animal sex, cyber sex, sexual abuse, premarital and extramarital sex, sexual perversions, paraphilia, child abuse, prostitution, sexual hygiene, protection of children from sexual offences (POCSO) Act, 2012 (brief account only), sexual myths.

Course Outcome

Understand the reproductive health, and importance of sex education for teen and youth. (2 hrs)

Explain the scope of reproductive technologies in infertility management and the assisted reproductive techniques. (10 hrs)

Understand the different methods of prenatal diagnosis and associated ethical

issues (4 hrs)

Describe the different methods of fertility control. (4 hrs)

Understand the symptoms, mode of transmission, diagnosis and treatment of

different sexually transmitted diseases and their socio economic dimensions. (7 hrs)

Describe sexual orientation, sexual abuse and myths (5 hrs)

REFERENCES

- Brian Walker Nicki R Colledge Stuart Ralston and Ian Penman (2014): *Davidson's Principles and Practice of Medicine*, 22nd edition; eBook ISBN: 9780702052248,Elsevier
- John Hall (2015): *Textbook of Medical Physiology; 13th Edition,* ISBN: 9781455770052, Elsevier Health, 1168 pages

EVEN SEMESTERS

FOURTH SEMESTER B. Sc. ZOOLOGY PROGRAMME ANIMAL DIVERSITY: CHORDATA PART-II

Code: ZOL4B04T

CLASS: AVES [25 hrs]

MODULE 1. Classification of Aves [11 hrs]

Classification of class Aves down to the orders specified; mention at least one example for each order.

Subclass **Archaeornithes** **[2 hrs]**

1. Order Archaeopterygiformes e.g. *Archaeopteryx lithographica* – a brief account on its discovery and evolutionary significance.

Subclass **Neornithes** **[2 hrs]**

Super order **Palaeognathae** [=Ratitae]

2. Order Casuariiformes e.g. *Casuarius* (Cassowary)
3. Order Dinornithiformes [=Apterygiformes] e.g. *Apteryx* (Kiwi)
4. Order Rheiformes e.g. *Rhea*
5. Order Struthioniformes e.g. *Struthio* (Ostrich)

Super order **Neognathae** [=Carinatae] **[7 hrs]**

6. Order Galliformes [pheasants, quail, turkeys, grouse] e.g. *Pavo cristatus*
7. Order Anseriformes [screamers, water fowls] e.g. *Anas poecilorhyncha*
8. Order Passeriformes [perching birds] e.g. *Passer domesticus*
9. Order Piciformes [woodpeckers, barbets, honeyguides] e.g. *Dinopium*
10. Order Coraciiformes [kingfishers & allies] e.g. *Alcedo atthis*
11. Order Apodiformes [swifts, humming birds] e.g. *Apus nipalensis*
12. Order Strigiformes [owls] e.g. *Bubo*
13. Order Cuculiformes [cuckoos, roadrunners, turacos] e.g. *Eudynamys*
14. Order Psittaciformes [parrots, lories, cockatoos] e.g. *Psittacula krameri*
15. Order Gruiformes [cranes, rails, coots, bustards] e.g. *Ardeotis nigriceps*
16. Order Charadriiformes [plovers, gulls, terns, auks, sand pipers] e.g. *Tringa*
17. Order Columbiformes [pigeons, doves, dodoes, sand grouse] e.g. *Columba*
18. Order Falconiformes [diurnal birds of prey – falcons, hawks] e.g. *Mylvus*
19. Order Ciconiiformes [herons, storks, ibis, spoon bills] e.g. *Ardeola grayii*
20. Order Pelecaniformes [pelicans, cormorants] e.g. *Pelecanus*
21. Order Sphenisciformes [Impennae] (penguin) e.g. *Aptenodytes*
22. Order Phoenicopteriformes [flamingos] e.g. *Phoenicopterus*

Recent Extinctions: Passenger Pigeon [*Ectopistes migratorius*), Dodo [*Raphus cucullatus*], Pink-headed Duck [*Rhodonessa caryophyllacea*], Elephant Bird [*Aepyornis*].

Rediscovery of Jerdon's Courser [*Cursorius bitorquatus*] & Forest Owlet [*Athene blewitti*].

MODULE 2. Type: ***Columba livia*** (Rock Pigeon) **[14 hrs]**

[External characters, integumentary system (structure of feather in detail

– exclude development of feather), skeletal system (skull excluded), digestive system, respiratory system, circulatory system, excretory system, sense organs and reproductive system].

MODULE 5. Comparative Anatomy [4 hrs]

Compare the circulatory, excretory and nervous systems of vertebrates.

REFERENCES

- Burnie, D. & Wilson, D. E. (2001). *Animal*. Dorling-Kindersley, London.
- Colbert, E. H. (1980). *Evolution of the Vertebrates: A History of the Backboned Animals through Time*, 3rd Edition. J. Wiley & Sons, Wiley – Interscience Publication, New Jersey.

Course Outcomes

Describe the classification of class Aves down to orders, salient features of eac order with suitable examples (11 hrs)
Describe the external characters and functional systems of Columba livia (14 hrs)
Enumerate the salient features and classification of class Mammalia down t orders with suitable examples (11 hrs)
Elucidate the external characters and functional systems of Oryctolagus cuniculus (14 hrs)
Compare the circulatory, excretory and nervous systems of vertebrates (4 hrs)

SIXTH SEMESTER B.Sc. ZOOLOGY PROGRAMME ZOOLOGY CORE COURSE – X [Theory]

REPRODUCTIVE AND DEVELOPMENTAL BIOLOGY

Code: ZOL6B11T

SECTION A: REPRODUCTIVE BIOLOGY (14 hrs)

MODULE 1. Introduction and Human Reproductive system (6 hrs)

Introduction to Reproductive Biology (1 hr)

Importance and scope. Reproductive strategies in invertebrates and vertebrates; semelparity and iteroparity. Sex patterns; Mention sex reversal with examples.

[Short answers/Paragraphs]

Human Reproductive system (5 hrs)

Male reproductive system: structure of testis, semen production and composition. Female reproductive system: structure of ovary and graafian follicle, ovulation, mention corpus haemorrhagicum, corpus luteum and corpus albicans. Accessory reproductive organs.

Secondary sexual characteristics. Menstrual cycle and its hormonal control (brief account of oestrous cycle in mammals). Gametogenesis: spermatogenesis and oogenesis.

[Short answers/Paragraphs]

MODULE 2. Fertilization, Pregnancy, Gestation, Placentation, parturition and lactation (3 hrs)

Fertilization: Fertilizin and anti-fertilizin, capacitation, agglutination, sperm penetration, activation of egg and amphimixis. Physiological and biochemical changes during and after ferti

MODULE 3. Reproductive technologies (5 hrs)

Reproductive technologies (3 hrs)

Infertility and its management: Brief account of semen collection, preservation, storage, artificial insemination, surrogacy.

Cryopreservation and embryo transfer: Collection, care and preservation of embryos; *in vitro* fertilization and embryo transfer: major steps; Test tube babies.

Assisted Reproductive Techniques (ART): GIFT, ZIFT, ICSI, oocyte donation and embryo donation.

Prenatal Diagnosis (1 hr)

Different Prenatal Diagnostic techniques (invasive and non-invasive); Prevention of Female foeticide - ethical issues and laws (Mention–PNDT Act).

Fertility control (1 hr)

Natural methods, artificial methods, chemical methods, hormonal methods, surgical contraception, removal of gonads and uterus; abortion.

SECTION B: DEVELOPMENTAL BIOLOGY (40 hrs)

MODULE 4. Introduction and Types of eggs (3 hrs)

Introduction to Embryology (1 hr)

Historical Perspective (brief account): Mention phases in development. Theories: preformation, epigenesis, recapitulation and germplasm theory.

Types of eggs (2 hrs)

Classification of eggs with examples based on: Amount of yolk (micro, meso & macrolecithal); Distribution of yolk (iso, centro and telolecithal); Presence or absence of shell (cleidoic & non cleidoic); Types of development (determinate and indeterminate).

Egg membranes: primary, secondary and tertiary; functions of egg envelopes.

MODULE 5. Cleavage and cell lineage (3 hrs)

Types of cleavage with examples based on: Plane of cleavage (Meridional, Vertical, Equatorial and Latitudinal); Amount of yolk (Holoblastic and Meroblastic); Types of development (Determinate and Indeterminate); Pattern of arrangement of blastomeres (Radial and Spiral).

Germ layers and derivatives. Cell lineage studies in Planocera (brief account only). Different types of blastula.

MODULE 6. Development of Amphioxus, frog, chick and man (22 hrs)

Early development of Amphioxus (3 hrs)

Brief account of fertilization. Cleavage, Blastulation, Gastrulation and Neurulation.

Development of Frog (8 hrs)

Fertilization, Cleavage, Blastulation and fate map, Gastrulation (Morphogenetic movements) and formation of germ layers, neurulation and notochord formation, mesoderm and coelom formation; organogeny

of brain and eye. Hormonal control of amphibian metamorphosis.

Development of Chick (7 hrs)

Structure of egg; fertilization, cleavage, blastulation, gastrulation and formation of germ layers. Salient features of chick embryo at primitive streak stage, 24, 33 and 48 hours stages. Development and functions of extra embryonic membranes.

Development of Man (4 hrs)

Cleavage and formation of morula, development of blastocyst, implantation, gastrulation up to the formation of germ layers. Human placenta; functions of placenta.

MODULE 7. Cell Differentiation and Gene action during development (3 hrs)

Cell differentiation, totipotency, pluripotency, dedifferentiaton and redifferentiation. Controlled gene expression during development; Homeotic genes, Mention Hox- genes. Stem cells – embryonic and adult stem cells; their significance and applications.

MODULE *8*. Parthenogenesis (2 hrs)

Definition and types. Natural parthenogenesis: Arrhenotoky, Thelytoky, Obligatory and Facultative. Artificial parthenogenesis. Significance of parthenogenesis.

Course Outcomes

Explain the reproductive strategies in invertebrates and vertebrates and structural
and functional features of human reproductive system (6 hrs)
Describe process of fertilization, pregnancy, gestation, placentation, parturition and
lactation in humans. (3 hrs)
Explain the scope of reproductive technologies in infertility management; prenatal
diagnostic techniques and methods of fertility control (5 hrs)
Understand the phases and theories of development, and classification of eggs (3 hrs)
Enumerate the types of cleavage, arrangement of blastomeres, germ layers and their derivatives, cell lineage in Planocera and different types of blastula. (3 hrs)
Illustrate the early developmental process of egg in Amphioxus, frog, chick and man
(22 hrs)
Explain the basics of cell differentiation and its genetic control, stem cells and applications of stem cell technology (3 hrs)
Describe parthenogenesis, types, and significance (2 hrs)
Explain fate map construction, Spemann's constriction experiments on amphibian embryos, organizers in development, embryonic induction, gradient experiments in
sea urchin eggs, cloning experiments in sheep and teratogenesis (7 hrs)

REFERENCES

- Balinsky, B.I. (1981) *An Introduction to Embryology*, 5th Edition, *Embryology*, ISBN- 4833700298 (International ed.), Saunders College Pub., 768 pages
- Berril N. J. (1971) *Developmental Biology*, ISBN 10: 0070050201, McGraw Hill

SIXTH SEMESTER B.Sc. ZOOLOGY PROGRAMME ENVIRONMENTALANDCONSERVATION BIOLOGY Code: ZOL6B12T

Section A: ENVIRONMENTAL BIOLOGY (36 hrs)

MODULE 1. Introduction, Ecosystem and Energetics (6 hrs)

Introduction to Environmental biology: Definition, divisions of ecology, modern branches and scope.

Ecosystem-Structure and functions: Concept of ecosystem, characteristics; Structure (components) of ecosystem (pond as an example); Mention kinds of ecosystems.

Ecosystem Energetics: Photosynthetic production and energy fixation; Energy flow in the ecosystem, Energy flow and laws of thermodynamics, Energy transfer and energy transformations [Trophic dynamics or community dynamics (Lindeman's model of energy flow)]; Ecological efficiency.

Productivity of ecosystem: Concept of productivity- standing crops, material removed and production rate; Kinds of productivity: a) Primary productivity (GPP, NPP, NCP) b) Secondary productivity).

[Short answer/Paragraph/Essays]

MODULE 2. Biogeochemical Cycles and Limiting factors (5 hrs)

Biogeochemical Cycles: Basic types of biogeochemical cycles: Gaseous cycles (Carbon and nitrogen cycles) Sedimentary cycle (Phosphorous cycle).

Limiting factors: Basic concepts. Leibig's law of minimum; Shelford's law of tolerance and combined concept of limiting factors. Ecological indicators.

MODULE 3. Population, Community and Habitat Ecology (14 hrs) Population Ecology

Properties of population: density, natality, mortality, age distribution, biotic potential, environmental resistance, migration, emigration, immigration and carrying capacity. Population growth forms, J and S shaped curves.

Community Ecology

Biotic community: Definition and kinds of communities.

Characteristics: Species diversity, abundance, dominance, stratification, succession, growth forms, trophic structure, co-existence, interdependence and key stone species; Concept of ecotype, ecotone and edge effect.

Habitat ecology

a) Marine ecology: Biotic divisions of the marine habitat, their characteristics. Pelagic realm- planktonic and nektonic adaptations. Benthic realm – littoral and abyssal adaptations. Adaptations of animals of rocky, sandy and muddy sea shores.
b) Fresh water ecology: Lentic and lotic habitats, their characteristics, faunal characteristics and adaptations.
c) Terrestrial ecology: Tropical wet evergreen forests and Tropical dry deciduous forests, their characteristics, adaptations of animals of forests.

MODULE 4. Population Interactions (3 hrs)

a) Intraspecific interactions b) Inter specific interactions: Positive interactions- Mutualism, Commensalism and Proto-cooperation (with examples). Negative interactions- Competition, Predation and Parasitism (with examples).

MODULE 5. Social issues and Environment (4 hrs)

Sustainable development; Joint Forest Management; Goals of United Nations; Environmental ethics: Issues and possible solutions, Habitat destruction and its consequences- socio-ecological concern: wetland, paddy fields, mangrove, river encroachment, sand and clay mining; Ecological impacts of tourism.

Disaster management: Natural & Artificial - floods, drought, earthquake, cyclone and landslides.

Course Outcomes

Explain the structure of ecosystem and its functioning through energy flow and nutrient cycling (6 hrs).

Enumerate biogeochemical cycles and understand the concept of limiting factors (5 hrs).

Describe the ecology of population, community and habitat as a self regulating system (14 hrs)

Understand various types of population interactions and appraise the co-evolution (3 hrs).

Comprehend the diverse environmental and sustainability challenges ranging from local to global and the establishment of perfect harmony between economic development, social issues and environmental conservation (4 hrs).

REFERENCES

- Agarwal, K.C. (2008) *Environmental Biology*, Nidi Publishers, Bikaner.Hardcover: 552 pages, ISBN-13: 978-8189153021
- Arora, S. (1995).*Fundamentals of Environmental Biology*, Kalyani Publ.,New Delhi.

SIXTH SEMESTER B. Sc. ZOOLOGY PROGRAMME ZOOLOGY ELECTIVE CORE COURSE- II (Theory) AQUACULTURE,ANIMALHUSBANDRYANDPOULTRYSCIENCE

Code: ZOL6B14BE02T

MODULE 1. Aquaculture (10 hrs)

Types of aquaculture **(3 hrs)**

Brief account of classification of aquaculture based on:

Environment – Freshwater, brackish water and mariculture. Temperature – Warm water/cold water culture.
Culture techniques – pond aquaculture, cage culture, pen culture, raft culture, pole culture, rack culture and long line culture.
Number of species – Mono culture and poly culture.
Type of organism – prawn culture, shrimp culture, edible oyster culture, lobster culture etc.

Mariculture **(7 hrs)**

Prawn culture: Important cultivable species in India, seed collection, spawning and larval rearing, induced breeding, types of culture systems - Pokkali culture, culture in bheries/ponds, culture and harvesting.

Mussel culture: *Perna indica*, *Perna viridis*, Seed collection, artificial seed production, induced spawning, culture techniques and harvesting.

Pearl culture: Method of pearl formation, selection and preparation of host, preparation of nucleus and implantation, post-operation care, post-operation culture and collection of pearls.

MODULE 2. Pisciculture (13 hrs)

i. Egg collection; induced spawning; construction, preparation and maintenance of ponds; manuring; feeding and harvesting. Cryopreservation of fish germplasm, semen bank and preservation media.
ii. Biology and culture of following Indian major carps: *Catla catla*, *Labeo rohita*, *Cirrhinus mrigala*.
iii. Biology and culture of Exotic carps: *Cyprinus carpio* (common carp), *Hypophthalmichthys molitrix* (Silver carp).
iv. Inland fishes and Fisheries (Brief account): *Channa, Clarias* and *Etroplus suratensis*
v. General account and fishery aspect of Sardine, Shark and Tuna. Mention GIFT Tilapia and Nutter (*Pygocentrus nutterei*)
vi. Ornamental fisheries: Common aquarium fishes: e.g: *Carassius auratus* (Gold fish), *Pterophyllum* spp. (Angel fish), *Astronotus ocellatus* (Oscar cichlid), *Poecilia reticulata (*Guppy), *Poecilia sphenops* (Black molly), aquarium management.
vii. Plankton and Fishery production: Zoo and Phytoplankton – Vertical migration
– Plankton and Productivity.

MODULE 3. Fishing Crafts and Gear, fish preservation and utilization (13 hrs)

i. Fishing crafts – Mention Catamaran, Canoes and dug-out-canoes.
ii. Fishing gears – Gillnet/drift gillnet, purse-seines, harpoon, Chinese dipnets, echo sounders, sonar, remote sensing.
iii. Fish Spoilage and Preservation: Biochemical changes, spoilage, use of ice, freezing, canning, dehydration, salting and smoking.
iv. Fish utilisation: Nutritive value, bye products, liver oil, body oil, fish meal, fish flour, Isinglass, glue, skin, fin soup, lime, chitin and chitosan.
v. Diseases and parasites of Fish: Fungal infection – Epizootic Ulcerative Syndrome (EUS), Saprolegnia, Fin and tail rot disease, Dropsy.
vi. Mud banks of Kerala coast.

Course Outcomes

Explain aquaculture and the process of prawn, mussel and pearl culture (10 hrs).
Illustrate the methodology of pisciculture and understand common culture fishes and ornamental fishes (13 hrs)
Identify major fishing crafts and gear and enumerate fish utilization and preservation (13 hrs)

REFERENCES

- Alikunhi, K H (1957): *Fish culture in India:* CMFRI Farm Bulletin (20). 144 pages

- Ashok Kumar Rathoure, Dinesh Kumar, Nazneen Z. and Deshmukh (2015): *Applied and Economic Zoology*; Daya Publishing House. 326 pages.
- Banerji, G.C (1986): *Poultry 3rd Edn.* , Oxford & IBH.148 pages.
- Banerji, G.C. (1998): *A text book of Animal husbandry 8th Edn.*, Oxford & IBH.1096 pages.

Mode of Instruction–

Lecture
Powerpoint presentation

Mode of Assessment –

Questions asked to the students, Open book tests, Quiz

Monthly Academic Planner

Month: June

Class	Paper Code	Modules to be covered
I DC	Animal Diversity Non-chordata part I	Introduction to Animal Diversity.
II DC	Animal Diversity chordata	phylum chordata – Introduction – Advanced, Primary and degenerate characters. Subphylum – urochordata, classification Examples – class Ascidiacea – Type Ascidia. Affinities: ① Thaliacea – Doliolum ② Larvacea – Oikopleura.
III DC	Environmental Biology	– Introduction to envt. biology, different branches
"	Biostatistics	Introduction – Definition, Scope, Terminology, Collection of data, classification, tabulation of data interpretation of data

Month: July

Class	Paper Code	Modules to be covered
II DC	Chordata II	Affinities, Subphylum Vertebrata
III DC	Biostatistics	Diagrammatic & graphical representation of bar diagram, Curves, Histogram, Pie chart Frequency polygon, Curve
	Ecology	Population interaction :- Intraspecific and interspecific interaction :- Competition, Cooperation, Amensalism, Predation, parasitism -
I DC	Non chordata	Classification :- Meth, reasons, organization

Month: August

Class	Paper Code	Modules to be covered
I DC	201BOST1	Animal Diversity :- Principles & classificat Significance, Binomial nomenclatu
II DC	203 BOST	Animal diversity - chordata 1 - Bord Fishes - classification. - Type.
III DC	Biostatistics	Analysis of Data :- Mean Median Mo Standard deviation
	Environmental Biology	Man & Env't, Ecological block lakes -
	Open course	Sexual abuse & Myths, Control & Pesticid ART,

Month: September

Class	Paper Code	Modules to be covered
I DC	201BOT1	Animal diversity - New System & classifi Cladistics, characters, Numerical systemati
II DC	203BOST	Chordata : Fishes = Respiration, Circulat System, Digestive System. Reproductive System..
III DC	205BOMT	Interpretation of data : tests Significan t'-test F' x^2 tests. Hypothesis based acceptan & Rejection.
IV DC	Environmental Biology	Biogeochemical cycle, Energy flow
	Open course	Sexually transmitted diseases -

Month: October

Class	Paper Code	Modules to be covered
I DC	201B01T	Phylum: Ciliophora – Paramecium Phylum: Rhombozoa, Acanthocephala. Phylum: Porifera, Coelenterata examples.
II DC	203 B03T	Animal diversity – Revision.
III DC	Envtal biology	Ecological energetics, Population, Community
III DC	Open course	STD.

Month: November

Class	Paper Code	Modules to be covered
I DC	201B01T	Revision, Test papers - Chapters I, II, IV. Assignment/Seminar - Nutrition in Protists. Reproduction in Protists/Protozoans. Polymorphism in Cnidaria. Parasitic Protozoans of man Reef building Corals and Coral reefs.
II DC	203 B03T	Assignment/ Seminar / Test papers - Revision Migration in fishes. Parental care among Fishes Accessory respiratory organs in fishes Economic importance of fishes.
III DC	Envtal biology	Revision / Test papers.
	Biostatistics	Revision / Test papers.

Month: December

Class	Paper Code	Modules to be covered
	TII DC Aquaculture	Prawn culture :- Pokkali ; Sabellite - Culture method Mussel culture :- Raft culture seed collection harvest Pisciculture :- Culture method candidate sps. Spawn collection. Pond construction, maintenance of pond : Induced breeding.

Month: January

Class	Paper Code	Modules to be covered

Weekly Work Format

Month : June	Week 1	Week 2	Week 3	Week 4	Wee
1. No. of teaching days in the week	1	5	4	5	5
2. Total number of contact hours as per time table	3	16	13	16	16
3. Total number of contact hour engaged	3	16	10	16	1
4. Total number of contact hours not engaged	–	–	3	–	
5. Reason for not engaging			CL		

Signature of faculty Signature of Head of Dept. Signature of Princip

Month : July	Week 1	Week 2	Week 3	Week 4	Wee
1. No. of teaching days in the week	5	5	4	5	2
2. Total number of hours as per time table	16	16	13	16	6
3. Total number of hour engaged	16	16	10	16	6
4. Total number of hours not engaged	–	–	3	–	
5. Reason for not engaging	–	–	CL	–	–

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Month : August	Week 1	Week 2	Week 3	Week 4	Wee
1. No. of teaching days in the week	05	05	–	–	05
2. Total number of hours as per time table	10	10	–	–	10
3. Total number of hour engaged	10	–	–	–	10
4. Total number of hours not engaged	–	–	–	–	–
5. Reason for not engaging	–	–	–	–	–

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Month : September	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	6	5	5	4	4
2. Total number of contact hours as per time table	—	16	16	13	13
3. Total number of contact hour engaged	—	—	10	13	13
4. Total number of contact hours not engaged	—	—	6	—	—
5. Reason for not engaging	—	—	CL	—	—

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Month : October	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	5	5	2	5	3
2. Total number of hours as per time table	16	16	6	16	10
3. Total number of hour engaged	16	16	6	16	10
4. Total number of hours not engaged	—	—	—	—	—
5. Reason for not engaging	—	—	—	—	—

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Month : November	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	2	4	5	4	5
2. Total number of hours as per time table	5	13	16	13	15
3. Total number of hour engaged	5	13	16	13	15
4. Total number of hours not engaged	5	13	16	13	15
5. Reason for not engaging	—	—	—	—	—

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Month : December	Week 1	Week 2	Week 3	Week 4
1. No. of teaching days in the week	–	5	5	5
2. Total number of contact hours as per time table	–	16	16	16
3. Total number of contact hour engaged	–	16	16	16
4. Total number of contact hours not engaged	–	16	16	16
5. Reason for not engaging	–	–	–	–

Signature of faculty Signature of Head of Dept. Signature of Pri

Month : January	Week 1	Week 2	Week 3	Week 4
1. No. of teaching days in the week				
2. Total number of hours as per time table				
3. Total number of hour engaged				
4. Total number of hours not engaged				
5. Reason for not engaging				

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Month : February	Week 1	Week 2	Week 3	Week 4
1. No. of teaching days in the week				
2. Total number of hours as per time table				
3. Total number of hour engaged				
4. Total number of hours not engaged				
5. Reason for not engaging				

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Month : March	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	5	5			
2. Total number of hours as per time table					
3. Total number of hour engaged					
4. Total number of hours not engaged					
5. Reason for not engaging					

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Record of Special Coaching

Remedial Classes		Classes for gifted / talented	
Date, Class& number of students	Subject / Paper	Date, Class & number of students	Subject/ Paper

Monthly Academic Planner

Moth: June

Class	Paper Code	Portions to be taught
I DC	Animal Diversity non-chordate I	Introduction
II DC	Animal Diversity chordata 1	Phylum - chordata, Introduction Advanced, primary & degenerate characters Subphylum :- Urochordata, classification. Examples. class :- Ascidiacea - Type Ascidia Affinities :- " 2 Thaliacea, Doliolum 3- Larvacea, Oikopleura
III DC	Envtal biology	- Introduction
"	Biostatistics	- Introduction :- Sampling, random, non random

Moth: July

Class	Paper Code	Portions to be taught
I DC	Animal Diversity non-chordate	Animal classification.
II DC	Animal diversity chordata	Subphylum- cephalochordata Amphioxus - affinities - primitive degenerate and specialized characters.
IV DC	open course	Need for Sex education
	Envtal biology	Ecosystem and energy flow.

Moth: August

Class	Paper Code	Portions to be taught
I BSc	20L1B01	Five kingdom classification Eight kingdom classification
II BSc	20L3B03T	phylum - chordata classification Superclass: Pisces: classification upto orders Osteichthyes Dipnoi Acanthopterygii
III BSc	20L5B05T	Biostatistics :- Tabular representation, graphic and diagrammatic representation Limiting factor, Liebig's law, minimum, Shelford's law, tolerance, combined effect of limiting factors.
	open course	Fertility control, Contraceptive measures Sexual abuse and myths.

Moth: September

Class	Paper Code	Portions to be taught
I BSc	20L1B01	Principles in classification Kingdom - Protista.
II BSc	20L3B03T	Type: Pisces Mullet. External, digestive system
III BSc	20L5B05T	Biostatistics :- hypothesis - testing. Test statistics
	Open course 20OL01	Infertility; Sexually Transmitted diseases

Moth: October

Class	Paper Code	Portions to be taught
IDC		Phylum: Porifera. classification :-
IIDC		Seminal topics - Ilustration of fishes Parental care in fish Accessary respiratory organs in fishes Economic importance of fishes
IIIDC	Opt. course	Fertility Control :- Test paper.
	20SB06T	Population interaction : Positive and negative interactions: Mutualism, Commensalism, Parasitism, Predation, Competition.

Moth: November

Class	Paper Code	Portions to be taught
IDC	20HB01T	Phylum :- Coelenterata, classification..
IIDC		Test papers and Assignment Presentations.
IIIDC		Test papers assignment Presentation, study tour to Mysore, & Coorg.

Moth: December

Class	Paper Code	Portions to be taught
IInd	chordata	class :- Aves . classification -
IInd	Molecular biology	Introduction - bacterial transformation, transduction, one gene - one enzyme hypothesis
IIIrd	Reproductive biology	Introduction - Theories of developmental biology.

Moth: January

Class	Paper Code	Portions to be taught

Weekly Work Format

Month : June	Week 1	Week 2	Week 3	Week 4	Week
1. No. of teaching days in the week	2	5	5	5	
2. Total number of contact hours as per time table	6	16	16	16	
3. Total number of contact hour engaged	6	16	16	16	
4. Total number of contact hours not engaged	-	-	-	-	
5. Reason for not engaging	-	-	-	-	

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Month : July	Week 1	Week 2	Week 3	Week 4	Week
1. No. of teaching days in the week	4	5	5	5	2
2. Total number of hours as per time table	12	16	16	16	6
3. Total number of hour engaged	9	13	16	16	6
4. Total number of hours not engaged	3	3	0	0	-
5. Reason for not engaging	External Revaluation practical	CL	-	-	-

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Month : August	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	2	4	1	4	3
2. Total number of hours as per time table	6	13	3	13	9
3. Total number of hour engaged	6	13	3	11	9
4. Total number of hours not engaged	-	-	-	2	-
5. Reason for not engaging	-	-	-	CL ½ day	-

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Month : September	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	5	—	4	5	1
2. Total number of contact hours as per time table	16	—	13	16	3
3. Total number of contact hour engaged	16	—	13	16	3
4. Total number of contact hours not engaged	—	—	—	—	—
5. Reason for not engaging	—	—	—	—	—

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Month : October	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	3	3	6	5	4
2. Total number of hours as per time table	9	10	16+3	16	13
3. Total number of hour engaged	9	10	13	—	—
4. Total number of hours not engaged	—	—	13	16	13
5. Reason for not engaging			Refresher Course at Calicut University from 18th to 31st Oct.		

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Month : November	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	2	5	5	5	5
2. Total number of hours as per time table	6	16	16	16	16
3. Total number of hour engaged	6	16	16	16	16
4. Total number of hours not engaged	—	—	—	—	—
5. Reason for not engaging	—	—	—	—	—

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Month : December	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	5	5	4	-	2
2. Total number of contact hours as per time table	16	16	13	-	6
3. Total number of contact hour engaged	16	16	13	-	6
4. Total number of contact hours not engaged	-	-	-	-	-
5. Reason for not engaging	-	-	-	-	-

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Month : January	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	2	5	5	5	5
2. Total number of hours as per time table	7	16	16	16	16
3. Total number of hour engaged	7	16	16	16	16
4. Total number of hours not engaged	-	-	-	-	-
5. Reason for not engaging	-	-	-	-	-

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Month : February	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	1	5	4	4	5
2. Total number of hours as per time table	3	16	13	13	16
3. Total number of hour engaged	3	16	13	13	09
4. Total number of hours not engaged	-	-	-	-	7
5. Reason for not engaging	-	-	-	-	CU camp

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UNIVERSITY OF CALICUT

M.Sc. ZOOLOGY PROGRAMME

[CBCSS PG 2020]

LESSON PLAN

Ms. RANI PAULY

THIRD SEMESTER THEORY
ZOL3C07 – IMMUNOLOGY (90 Hours)

3. **Antigens** (8 hours)

3.1. Immunogenicity, Antigenicity.
3.2. Factors that influence immunogenicity.
3.3. Adjuvants.
3.4. Haptens.
3.5. Epitopes.
3.6. Properties of B-cell and T- cell epitopes.

4. **Immunoglobulins** (Antibodies) (10 hours)

4.1. Structure and function of Antibody molecules.
4.2. Generation of Antibody diversity.
4.3. Immunoglobulin gene.
4.4. Antigenic determinants of immunoglobulin - (a) Isotype (b) Allotype (c) Idiotype.
4.5. B-cell receptor (BCR).
4.6. Monoclonal Antibodies.
4.7. Production of Monoclonal Antibodies (Hybridoma technology).
4.8. Clinical uses of Monoclonal Antibodies.
4.9. Antibody Engineering.

12. **Vaccines**. (5 hours)

12.1. Active and passive immunization.
12.2. Whole organism vaccines.
12.3. Recombinant vector vaccines.
12.4. DNA vaccines.

12.5. Synthetic peptide vaccines.
12.6. Multivalent vaccines.

13. Immunity and malnutrition and immune deficiency diseases. (6 hours)

13.1. Immunity and malnutrition.
13.2. Primary immune deficiency diseases. (a)Burton''s disease (b) Di-George syndrome and SCID.
13.3. Secondary immune deficiency - AIDS.
13.4. Transmission of HIV.
13.5. Vaccines to prevent AIDS.
13.6. Autoimmunity (systemic and organ specific brief)

References

1. Abdul K Abbas and Andrew H. Lichtman (2004). Basic immunology – Functions and Disorders of
the immune system. (second edition, Elsevier Science, USA)
2. Janis Kuby (2000) .Immunology.7th ed. W.H. Freeman& Co. New York.

Course outcomes

- The student gain conceptual knowledge regarding key principles, procedure and applications of different Immunetechniques used in the biomedical field and to develop new methods and techniques on the basis of the earned knowledge.
- Mechanisms of humoral and cellular immunity, immune cell receptor and intracellular signal cascades related to immune system activation and response.

THIRD SEMESTER THEORY

ZOL3C08–DEVELOPMENTAL BIOLOGY

& ENDOCRINOLOGY (90hours)

1.Endocrine glands and their Hormones

(Brief account) (5 hrs)

- Hormone secreting organs and tissues -skin, liver, kidney, heart.
- General classes of chemical messengers- Peptide, thyroid, steroid hormones, neurotransmitters and pheromones
- Synthesis and delivery of hormones- storage, secretion and transportation Control of hormone secretion.
- Physical characteristics of hormones - latency, post-secretary modification and half- life Physiological roles of hormones.

2. General mechanisms of Hormonal action (5 hrs)

- Hormone Receptors and transducers;
- Types of receptors- g protein coupled receptors, steroid receptors and nitric oxide receptors,
- Regulation of receptor number, receptor activation
- Second messengers of hormone action- cAMP, cGMP, inositol triphosphate, diacylglycerol
- Receptor signal transduction Eicosanoids and hormone action

3. Anatomy of endocrine glands; structure, physiological functions, and control of secretion of their hormones and pathophysiology (13 hrs)

- Hypothalamus
- Hypophysis
- Thyroid
- Parathyroid
- Adrenal
- Pancreas

4. Hormones and male reproductive physiology (7 hrs)

- Synthesis**,** chemistry, and metabolism of androgens
- Endocrine control of testicular function Physiological roles of androgens and estrogens
- Pathophysiology

Course Outcomes

- Describe different classes of chemical messengers and their physical characteristics.
- Explain how the secretion of hormone is regulated through positive and negative feedback mechanisms.
- Summarize the anatomy, regulation, and physiological functions of the hormones of the hypophysis, thyroid, parathyroid, pancreas adrenal, hypothalamus and adrenal glands.
- Describe the anatomy of male and female reproductive systems including hormonal functions and pathophysiology.

UNIVERSITY OF CALICUT

M.Sc Zoology Programme
(CBCSS PG 2019)
Under Choice Based Credit Semester System

LESSON PLAN

THANZEEN.P.S

FIRST SEMESTER THEORY

ZOL1C01 - BIOCHEMISTRY AND CYTOGENETICS

Part A. Biochemistry

UNIT I - Chemistry and functions of Biomolecules

1. Introduction (2 hrs)

1.1Macromolecules and their subunits

1.1. Chemical bonds of biomolecules (Covalent and Non-covalent bonds)

3. Proteins (6 hrs)

3.1. Amino acids

3.1.1. Classification: (a) on the basis of number of amino and carboxyl group (b) on the basis
of the chemical composition of side chain (c) based on the polarity of side chain (R)

3.1.2. Amphoteric properties of amino acids

3.1.3. pK value and Isoelectric point (pI) of amino acids

3.1.4. Peptide bond and peptides (di, tri, tetra, oligo and polypeptide).

3.2. Structure of protein

3.2.1. Primary structure, Secondary structure (Alpha helix, Beta-parallel & antiparallel and
Beta-pleated sheet), random coil conformation, Tertiary structure, Quarternary structure.

3.2.2. Brief note on protein domains, motifs, folds and Ramachandran plot.

3.2.3. Biological roles of proteins

4. Lipids (5 hrs)

4.1. Classification of lipids -Simple lipids (fats, oils and waxes), compound lipids (phospholipids, glycolipids, lipoproteins and sulpholipids) and derived lipids.

4.2. Biological roles of lipids - as food reserves (storage lipids), structural lipids in membrane,
as signals, as co-factors, as pigments, as insulators, as vitamin carriers etc

4.3. Prostaglandins - Chemical nature and functions.

4.4. Fatty acids - definition; essential fatty acids

4.5. Classification with examples- Saturated, unsaturated, hydroxyl and cyclic fatty acids

4.6. Nomenclature of fatty acids - Genevan system

5. Nucleic acids (3 hrs)

5.1. Structural organization of DNA (Watson -Crick model)

5.2. Structural organization of t-RNA; brief note on micro-RNA

5.3. Biological roles of nucleotides and nucleic acids

Unit - II - Enzymes (7 hrs)

1. Classification- (I.U.B. system)

2. Mechanism of enzyme action: Formation of enzyme substrate complex- Michaelis-Menten
theory, Fischer's template theory and Koshland's induced fit theory. Factors influencing
enzyme action
3. Enzyme kinetics - Michaelis-Menten equation - derivation; significance of Km and Vmax
Values. Lineweaver-Burk equation and double reciprocal plot of enzyme reaction.
4. Enzyme inhibition - Competitive, non-competitive and uncompetitive inhibition (distinguish
kinetically), suicide inhibition and feedback inhibition
5. Classification, Structure and functions of Vitamins.Vitamins as co-enzymes.

Unit - III - Bioenergetics (2 hrs)

1. Laws of thermodynamics and biological system- Enthalpy, Entropy, Free energy concept .
2. Energy of activation, Standard free energy change.
3. Role of ATP as a free energy carrier in the biological system.

Unit - IV - Metabolism and biosynthesis of biomolecules

1. Carbohydrate metabolism (4 hrs)

1.1. Glycolysis - (PFK as pacemaker - Hexokinase conformation and change by glucose), Fate
of pyruvic acid
1.2. Citric acid cycle; Pyruvate dehydrogenase complex and ketoglutarate dehydrogenase
complex
1.3. Electron transport system and oxidative phosphorylation; Redox potential, Chemiosmotic
hypothesis; inhibitors of electron transport chain

2. Amino acid metabolism (4 hrs)

2.1. Biosynthesis and degradation of amino acids - glutamic acid, phenyl alanine,methionine,
tryptophan, isoleucine, histidine, valine.
2.2. Fate of amino acids in the body
2.3. Transamination, Decarboxylation and deamination reactions in the biological system.

3. Lipid metabolism (5 hrs)

3.1. Oxidation of fatty acids
3.2. Biosynthesis of fatty acids
3.3. Biosynthesis of cholesterol

4. Nucleic acid metabolism (4 hrs)

4.1. Biosynthesis and degradation of purines and pyramidines

Course Outcomes

The student will describe the importance of various chemical interactions in the biological system

The student develops the ability to describe classification, structural organization, and purification techniques of proteins.

The student acquire knowledge regarding the classification and functions of lipids and fatty acids

The student develops appreciation on the mechanisms of enzyme action, inhibition, and acquire knowledge regarding classification of enzymes that facilitate the functioning of enzymes

The student develops appreciation on Watson and Crick model of DNA

The student will explore various anabolic and catabolic pathways of biomolecules such as glucose,nucleic acids, amino acids and lipids.

The student develops a conceptual knowledge regarding the principles of energetics in biological systems.

References

Biochemistry

1. David L Nelson & Michael M Cox Lehninger, Principles of Biochemistry, VIth edition, (2013) Mac Millan
2. Robert Harper's Biochemistry, (2012) 29th Edition, K. Murray, Daryl K. Granner, Peter, A. Mayes and Victor, W. Rodwell Appleton and Lange, Prentice Hall of India Private limited, New Delhi,
3. Lubert Stryer,(2011) Biochemistry, VII th edition, W.H. Freeman & Co.
4. Eric E. Conn, Paul K. Stumpf, George Bruening, Roy H. Doi, (2007) Outlines of Biochemistry, Vth edition, John Wiley & Sons, Inc.
5. Deb, A.C.(2004) Fundamentals of biochemistry, New Central Book Agency (P) Ltd.
6. Keith Wilson and John Walker (2008) Principles and techniques of Biochemistry and Molecular biology - 6th edn, Cambridge University Press
7. Voet, D. and Voet, J.G. & Pratt (2012). Principles of Biochemistry, John Wiley & sons .
8. Zubay, G (1997). Biochemistry, Mc Graw – Hill Publications
9. Devlin,T.M. (2010). A Text of Biochemistry with clinical correlations, John Wiley& sons.
10. Lenhninger, A. L. (2008). Principles of Biochemistry. (5th edn). CBS Publishers and Distributors, New Delhi.
11. Mathews, H. R., Freeland, R. and Miesfeld, R. L. (1997). Biochemistry: A Short Course – Wiley- Liss, Inc. NY.
12. Mary, K. Campbell (1995) Biochemistry. II Ed. Harcourt Bracce and Co. Florida.
13. Murray, Robert, Granner, K. and Harper, Daryl K. (2006). Harper¨s Illustrated Biochemistry. Mc Graw-Hill, New York.

14. Nelson, D. L. Cox, M. M. and Lehninger, A. L. (2007). Principles of Biochemistry, 4th Ed. Freeman and Co, NY.
15. Stryer, L. (2011). Biochemistry. 7th Ed. W. H. Freeman & Co. New York.
16. Zubay, G. L., Parson, W. W. and Vance, D. E. (1995). Principles of Biochemistry,Brown Publishers, England.

Part B. Cytogenetics (36 hrs)

1. Introduction to Cytogenetics (1 hr)
2. Membrane structure and function . (4 hrs)
2.1. Molecular organization of cell membrane - Lipid bilayer and membrane protein. Molecular
models of cell membrane.
2.2. Cell permeability-osmosis, diffusion, ion channels, active transport, membrane pumps.
2.3. Mechanism of sorting and regulation of intracellular transport.
2.4. Electrical properties of membranes.
2.5. Microvilli and cell coat.
3. Structural organization and function of intracellular organelles- (6 hrs)
Nucleus, Mitochondria, Golgi complex, Lysosomes, Endoplasmic reticulum, Ribosomes,
Peroxisomes and Cytoskeleton.
4. Organization of chromosomes and genes. (6hrs)
4.1. Structure of chromatin and chromosomes, heterochromatin, euchromatin –unique and
repetitive DNA
4.2. Chromosomal changes- euploidy, aneuploidy, chromosomal aberrations- Structural
alterations- gene mutations- molecular changes- deletion, duplication, translocation,
inversion and sister chromatid exchange.
4.3. Interrupted genes and gene families.
4.4. Concept of gene- Allele, multiple alleles, pseudoallele, complementation tests.
4.5. Extrachromosomal inheritance- inheritance of mitochondrial and chloroplast genes,
maternal inheritance.
5. Cellular communication (6 hrs)
5.1. General principles of cell communication
5.2. Cell-cell interactions – cell adhesion and roles of different adhesion molecules

5.3. Intercellular attachments- gap junctions, desmosomes, intermediary and tight junctions.
5.4. Interaction of cells with extracellular matrix: Integrins. Focal adhesion and hemidesmosomes.
5.5. Interaction of cells with other cells: Selectins, Immunoglobulins, Cadherins, Adherens.
6. Cell signaling (8 hrs)
6.1. Signal transduction
6.2. Concept of cell-signaling
6.3. Signaling through cell surface receptors: G protein linked receptors; signaling via cAMP,
PKA, IP3, Ca2+/calmodulin, PKC, Ca-MK, Enzyme linked receptors, Receptor tyrosine
kinase (RTK), signaling of growth factors, Tyrosine kinase associated receptors, JAKSTAT
signaling pathway, Receptor protein tyrosine phosphatase (PTP), Receptor serine/threonine kinase, Receptor guanyl cyclase, cGMP, PKG, Histidine kinase associated
receptors
6.4. Receptor desensitization
6.5. Signaling by nitric oxide, carbon monoxide
6.6. Signaling network
7. Apoptosis and its significance (5 hrs)
7.1 Necrosis; Programmed and induced cell death
7.2 Process of apoptosis: Initiation, Execution: cytochrome C, caspases, Phagocytosis
7.3 Regulation of apoptosis - Extracellular and Intracellular
7.4 Apoptosis in Caenorhabditis elegans, Drosophila, mammals and bacterial population
7.5 Mechanism of cell death
7.6 Genes involved in apoptosis.

Course Outcomes

The student acquire knowledge about the structure and functions of Cellular components, plasma membrane and its models, membrane transport mechanisms and properties , cytoskeletal elements and Intracellular trafficking.

The student gain knowledge of Chromatin structure and chromosomal alterations, Interrupted genes, gene families and extra chromosomal inheritance.

The student explore and appreciate the importance of cellular adhesion molecules, cell-cell and cell -matrix interactions, intercellular communications along with noted signal transduction pathways and intracellular signaling mechanisms and their significance.

The student will describe the process and significance of necrosis and apoptosis and, its regulation in the cellular level

References

Cytogenetics

1. Becker, W. M., Reece, J. B. and Poenie, M. F. (1999; 2000). The World of the Cell, 4th edition, Benjamin/Cummings Publishing Co.
2. Benjamin Lewin (2008). Genes IX. Jones & Bartlett Learning Publishers, New York.
3. Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts and Peter Walter(2002). Molecular Biology of the Cell. 4th Edition, Garland Science, New York.
4. De Robertis, E. D. P. and De Robertis, Jr. E. M. F. (1996). Cell and Molecular Biology,Eighth Edition, B.I. Waverly Pvt Ltd, New Delhi.
5. Karp, G. (2002). Cell and Molecular Biology. John Wiley, New York.
6. Kleinsmith, L. J. and Kish, V. M. (1995). Principles of Cell and Molecular Biology (Second Edition). Harper Collins College Publishers, New York
7. Peter Snustad, D. and Michael J. Simmons (2000). Principles of Genetics. 2nd Ed. John Wiley & Sons Inc.
8. Purves W. K., Orians G. H. and Heller H. C. (1995). Life: The Science of Biology, 4th Edition. Sinauer Associates, Sunderland.
9. Robert H. Tamarin (2002). Principles of Genetics, 7th Edition, Tata McGraw-Hill Education Pvt Ltd, New Delhi.
10. Sheeler, Philip and Donald, E. Bianchi. (1987) Cell and Molecular Biology. III Ed. John Wiley.
11. Watson J. D., Hopkins N. H., Roberts, J. W., Steits, J. A. and Weiner, A. M. (1987). Molecular Biology of the Gene 4th Edition. The Benjamin Cumming. Publishing Company. Menlo Park, California.

FIRST SEMESTER THEORY

ZOL1C02 - BIOPHYSICS AND BIOSTATISTICS

3. PH (2 hrs)

3.1 Dissociation of water.
Dissociation of a weak acid.
Henderson Hasselbalch equation.
Electrometric determination of pH, pH meter
PH value calculation.

Buffer –Importance of buffers in biology.

6. Biophysical methods (Brief account of the following) (5 hrs).

Properties of electromagnetic radiations.
Molecular analysis using UV / visible spectroscopy.
Mass spectroscopy.
NMR and Electron Spin Resonance (ESR) spectroscopy -Applications
Structure determination using X-ray diffraction crystallography.
Circular dichroism.
Surface Plasma Resonance (SPR)

9. Separation Techniques (10 hrs)

Chromatography - Different types - Adsorption, Partition and Ion exchange chromatography
Column chromatography
Paper chromatography
Thin- layer chromatography
Gel-filtration.
Gas chromatography,
Affinity chromatography,
HPLC
Electrophoresis
Paper electrophoresis
Disc electrophoresis
PAGE, Two dimensional PAGE, Highvoltage Electrophoresis
Isoelectric focusing.

Course Outcomes

The student develops conceptual knowledge regarding the basic principles of physics involved in biological processes.

The student may familiarize with various biophysical and electrophysiological methods

The student explore the possibilities of the applications of separation techniques.

References

Biophysics

1. Ackerman, E. (1962).Biophysical Science. Prentice Hall Inc.
2. Alonso, A and Arrondo, J.L.R (2006) - Advanced techniques in Biophysics, Springer
3. Alok Srivastava and Ipsita Roy-(2009)-Bio-Nano- Geo Sciences- The future challenge-Ane Books Ltd.
4. Baker, E.J and Silverton, R.E. (1978) - Introduction to medical laboratory technology, ELBS
5. Bengt Nolting (2006), Methods in modern Biophysics 2nd edn.Springer.

6. Daniel, M (2002), Basic Biophysics for Biologists. Agro Botanics, Bikaner
7. Das, D. (1991) Biophysics and Biophysical Chemistry, Academic Publishers, Calcutta.
8. Ernster, L (1985), Bioenergetics, Elsevier, New York.
9. Frank H. Stephenson (2006)- Calculations for Molecular Biology and Biotechnology- A guide to Mathematics in the laboratory-Academic Press- An imprint of Elsevier.
10. Ghatakk.L. (2011).Techniques and methods in Biology.PHI, Learning Pvt. New Delhi.
11. Gupta.A. (2009). Instrumentation and Bio-analytical techniques.Pragati Prakashan, Meerut.
12. Hoppe, W, Lohmann,W, Markl,H and Ziegler,H (1983). Biophysics. Springer Verlag, New York.
13. Keith Wilson and John Walker (2008), Principles and techniques of Biochemistry and Molecular biology - 6th edn, Cambridge University Press
14. Marshall, A.G. (1978) Biophysical Chemistry, Principles, Techniques and Applications-John Wiley and Sons, New York
15. Mohan P. Arora-(2007), Biophysics -Himalaya Publishing House.
16. Muralidharan.V.S. and Subramania, A (2010)- Nanoscience and Technology- Ane Books Ltd.

Part B –Biostatistics

4. Probability distributions (4 hrs)

Basic concepts and definition:
Laws of probability
Probability distribution: - Binomial, Poisson and Normal

5. Statistical inference (problems to be discussed) (7 hrs)

Difference between parametric and non-parametric statistics;
Testing of hypothesis
Errors
Confidence interval; levels of significance, Critical region;
Normality test
t-test, chi-square test, F-test, ANOVA
Kruskal-Wallis, Mann-Whitney

6. Correlation and Regression (problems to be discussed) (7 hrs)

Types of correlation.
Methods to measure correlation- Scatter diagram.
Karlpearson's coefficient of correlation, Spearman's correlation
Types of regression analysis
Regression equations
Difference between regression and correlation analysis

Course Outcomes

The student skills in various methods of data collection, tabulation and presentation of data for biological research

The student develops the ability to apply measures of central tendency and dispersion in biological research, and various types of probability distribution.

The student analyze and apply parametric and non parametric tests and its applications in biological research

References

Biostatistics

1. Agarwal, B.L. (1996) Basic statistics, New Age International(P) Ltd. Publishers, New Delhi.
2. Bailey, N.T.J. (1981) Statistical methods in Biology. Hodder and Stongtton, London.
3. Campell, R.C. (1978), Statistics for biologists. Blacker and Sons Publishers, Bombay.
4. Gupta, C.B. and Gupta, V. (2002) Statistical methods. Ikas Publishing House, New Delhi.
5. Rostogi, V. B. (2009) Fundamentals of Biostatistics. Ane's Students Edition, New Delhi.
6. Magurran AE. 2004. Measuring Biological Diversity. Blackwell Publishing
7. Stephen W,Looney(2008) Methods in Molecular Biology-Biostatistical Methods Springer International Edition
8. Zar, J.H. (2003) Biostatistical Analysis - Fourth edition. Pearson Education. New Delhi.

SECOND SEMESTER THEORY

ZOL2C04-PHYSIOLOGY

1. Nutrition (10 hrs)

Constituents of normal diet and their daily requirements.
Physiological calorie value of food stuffs.
Antioxidant nutrients.
Movements of GI tract: deglutition, gastric motility and emptying, intestinal motility and defecation.
The role of hormones and neurotransmitters in the control of gastrointestinal motility.
Energy balance and obesity-causes and consequences.
BMR and its significance.

2. Excretory System (12 hrs)

Introduction: Brief description of different types of excretory organs in different animal groups (flame cells, green glands, malpighian tubules).
Functional anatomy of mammalian kidney, nephron and juxtaglomerular apparatus structure, parts and function.
Urine formation (glomerular filtration, tubular reabsorption and tubular secretion)
Regulation of water balance -Mechanism of concentration of urine – CounterCurrent system (counter current multiplier and counter current exchanger).
Renal regulation of acid- base balance & electrolyte balance.
Structure of urinary bladder, micturition reflex and micturition.
Renal clearance – definition, concept and significance; clearance value of urea,creatinine, phosphate, potassium, chloride and sodium.

3. Respiratory system (10 hrs)

Introduction: Brief description of major respiratory organs (tracheal system, book lungs, gills and ctenidia).

Physiological anatomy and histology of respiratory passage and lungs.

Mechanism of pulmonary ventilation (inspiration & expiration) .

Alveolar ventilation, dead space and its effect on alveolar ventilation.

Role of surfactant in alveolar expansion.

Pulmonary volumes and capacities – definition & normal values (tidal volume, inspiratory reserve volume, expiratory reserve volume, residual volume, functional residual capacity, inspiratory capacity, vital capacity, total lung capacity).

Exchange of gases- partial pressures involved-lung and tissues.

Oxygen dissociation curve – factors affecting binding of oxygen to haemoglobin (PO_2, PCO_2, CO, pH, body temperature, diphosphoglyceric acid level, foetal haemoglobin and also myoglobin).

Neural and chemical regulation of respiration: Respiratory centres & factors regulating respiration.

4. Nervous system (21 hrs)

Organisation of human brain.

Cerebrum and cerebral lobe.

Cerebral cortex and its functional areas- Motor cortex, Broca's area , somatosensory cortex and its association area, gustatory cortex, visual cortex and its association area, auditory cortex and its association area, olfactory cortex, wernick's area, Brodman map, cerebral dominance .

Cortical white matter- commissures, association fibers, projection fibers,corpus callosum and fornix, basal nuclei-organisation and function.

Brain stem- organisation and function.

Cerebellum- structure and function.

Diencephalon – organisation and function.

Functional brain systems - Limbic system and reticular formation.

Protection of brain – Meninges, cerebrospinal fluid- formation and function, blood brain barrier and its function.

Diseased states of brain - schizophrenia, Alzheimer's disease, Senile dementia & Parkinso's disease.

Memory- definition, types of memory- short term, intermediate long term and long term memory, consolidation of memory.

PNS and Autonomic nervous system.

Spinal cord – structure.

Reflex action, reflex arc, monosynaptic and polysynaptic reflexes, inverse stretch reflex and golgi tendon organ

5. Special senses (16 hrs)
Vision:
Structure of eyeball
Fluid systems of the eye
Layers of Retina and photoreceptors (rods & cones)
Brief notes on the neuronal cell types and neural circuitary of the retina and visual pathways from retina to visual cortex
Image formation
Formation of image on the retina.
A brief general account of electrophysiology of vision
Photochemistry of vision & colour vision
Taste:
Primary sensations of taste (agents and site of sensation)
Taste buds (location, structure, receptors and nerve supply)
Physiology of taste (receptor stimulation, generation of nerve impulse by taste buds and its transmission to CNS)
Smell:
Olfactory membrane and receptor cells
Physiology of olfaction (stimulation of olfactory cells and transmission of smell signals to CNS)
6. Tactile response: (brief note) (4hrs)
Mechanoreceptors and their stimulation
Pain receptors and their stimulation
Thermal receptors and their stimulation
7. Cardiovascular system (8hrs)
Introduction: Brief description of vertebrate hearts
Structural organization of myogenic heart (in human beings).
Physiological anatomy of cardiac muscle – specialized tissue.
Heart as a pump.
Cardiac cycle.
Neural and chemical regulation of heart function.
Blood volume and blood pressure.
Physiological anatomy of coronary blood flow, coronary blood flow and its control.
Ischemic heart disease – mention causes.
8. Lymphatic System (5 hrs)
Lymph channels of the body.
Composition and formation of lymph.
Functions of lymph and lymphatic system including role of it in controlling Interstitial fluid protein concentration, interstitial

fluid volume and interstitial fluid pressure.

9. Environmental Physiology (4 hrs)

Thermal regulation.

Comfort zone, normal body temperatures (oral, skin & core).

Temperature regulating mechanism (hot & cold), mention the role of hypothalamus, thyroid and adrenal glands.

Acclimatization

Course Outcomes

The student create an awareness among the society to promote balanced lifestyle and improve people's diet

The student will be able to explain the role of nutrition in health
Discuss the physiology of various organ systems in the body

The student will be able to differentiate the structure and functions of various organs in the human body

The student will describe different functional areas of cerebral cortex
The student will describe the cardiac cycle

The student will be able to discuss the physiology and mechanisms of respiration
The student will Identify and define neuro-anatomical structures

The student will summarize the various neurological disorders
Discuss different types of excretory organs in different animal groups

Explain the role of excretory system in the regulation of water balance, ,acid base balance and electrolyte balance

Identify the symptoms of life style diseases and suggest ways to control them
Explain the environment's influence on the physiological function and performance of living organisms

References

1. Arthur C.Guyton & John E. Hall (2003): Textbook of Medical Physiology, Saunders (An imprint of Elsevier).
2. William F.Ganong (1999): Review of Medical Physiology, Lange Medical Publications(Appleton & Lange).
3. Jain A.K. (2009): Text Book of Physiology (Vol. I & II), Avichal Publishing Company, New Delhi.
4. Deb, A.C. (2002): Fundamentals of Biochemistry (2002): New Central Book Agency(P) LTD, India.
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6. William S. Hoar.(1966). Comparative Animal Physiology . Prentice Hall, Inc. USA.
7. Kunt-Schmidt-Nielsen.(1994).Animal Physiology, Adaptation and

Environment.Cambridge University Press.
8. Jensen D. (1976): Principles of Physiology, Appleton Century Crafts, N.Y.
9. Lonco,G.N.(1993):PhysiologicalAnimalEcology.Longman Scientific and Techhnical Essex.
10. Oser,B.L.-(1965).Haw"s Physiological chemistry. Tata McGraw Hill Pub. Co. New Delhi.
11. 11.Shepherd, G.M: Neurobiology-Principles of Neural Science, E. Kandel & P. Schwartz.
12. Campbell et al. (1984): Clinical Physiology, 5th Edn. Blackwall Scientific Publications, Oxford.
13. Pragnelli,C.V& Farhi, L.E. (1989): Physiological function of special Environment-Springerverlag, N.Y.
14. Davie IV & Lewid S.M.- Practical Haematology, 6th Edn. Churchill, Livingstone, Edinburgh.

SECOND SEMESTER THEORY

ZOL2C06 - SYSTEMATICS AND EVOLUTION

Part –A: Systematics

5. Classification (7 hrs)

Uses of Classification
Purpose of Classification
Theories of Classification
(a) Essentialism (b) Nominalism
(c) Empiricism (d) Cladism (e) Evolutionary Classification
Hierarchy of Categories
The objectives of classification

6. Taxonomic Collections and the Process of identification (8 hrs)

Taxonomic collections: Types of collections, Value of Collection
Purpose of scientific collection
Preservation of Specimens
Labeling
Curating of collections
Curating of types
Identification- Methods of identification
Use of keys, types of keys.
Merits and demerits of different keys
Description and publication

7 .Taxonomic Characters (6 hrs)

Nature of taxonomic characters
Taxonomic characters and adaptation
Kinds of taxonomic characters
(a) Morphological (b) Physiological (c) Ecological (d) Ethological and (e) Geographical characters

Taxonomic characters and classification
Taxonomic characters and evolution
Functions of taxonomic characters

8. Zoological Nomenclature (6 hrs)

Brief History of nomenclature
International Code of Zoological Nomenclature
The nature of scientific names
Species and infraspecies names
Gender of generic names
Synonyms and Homonyms
The Law of Priority
Rejection of names
Type method and different kinds of types

9. Newer trends in systematics (4 hrs)

DNA Bar coding
Molecular systematics
Chemo taxonomy and serotaxonomy
Cytotaxonomy
Numerical taxonomy
Cladistics

10. Ethics related to taxonomic publications (4 hrs)

Authorship of taxonomic papers
Correspondence
Suppression of data
Undesirable features of taxonomic papers
Taxonomist and user communities

Course Outcomes

The student develops skills in the identification and taxonomic classification of organisms based on their characters

The student will be able to describe different levels of taxonomy

Aware about Place, importance, applications and goals of taxonomy
Learn about purpose of classification, use of classification, theories of biological classification and types classification

Explain taxonomic procedures like Taxonomic collections,Curation, Recording of field data, storage of collection, labelling and cataloguing of collection
Identification- methods of identification, Use of keys,Taxonomic descriptions, Taxonomic and ecological publication and their difference.

The student will acquire knowledge regarding Species concept and the taxonomic diversity within species, different kinds of species, sub species and other infra specific categories, hybrids

Recognize the importance of Zoological nomenclature, International Code of Zoological Nomenclature

Interpret Principle of priority, Homonymy and Synonymy and Different kinds of types in descriptive taxonomy

Use new trends in Systematics especially Chemo and Serotaxonomy, Cytotaxonomy, Numerical taxonomy, Cladistics, Molecular systematics and DNA bar coding vs traditional taxonomy

Recognize the ethics related to taxonomic collections and publication

References

Part -A Systematics
1. David.M.H, Craig Mortiz and Barbara K.M (1996) Molecular Systematics. Sinauer Associates, Inc
2. Dalela, R.C. and Sharma, R.S.(1992). Animal Taxonomy and Museology, Jai Prakash Nath & Co Meerut City U.P (India)
3. Kapoor V.C (1998) Theory and practice of animal taxonomy. Oxford & IBH, Publi.Co New Delhi
4. Mayr. E (1969) Principles of Systematic Zoology. McGraw Hill Book Company, Inc, New York
7. Narendran, T.C (2008) An introduction to Taxonomy. Zoological Survey of India
8. Sneath P.H.A.(1973) Numerical Taxonomy: The Principles and Practice of Numerical Classification.W.H. Freeman &Co

Part- B Evolution

I. Natural Selection: (7 hrs)

Mechanism of natural selection- directional, disruptive and stabilizing selection
Natural selection in islands
Sexual selection; intrasexual and intersexual selection- secondary sexual characteristics-sexy son hypothesis, good gene hypothesis

3 Tempo of evolution (5hrs)

Gradualism Vs punctuated equilibrium
Anagenesis Vs Cladogenesis

4 Molecular evolutions (8 hrs)

Neutral theory of molecular evolution
Molecular divergence
Molecular drive
Molecular clocks, genetic equidistance, human mitochondrial molecular clock
Phylogenetic relationships- Homology, homologous sequence of proteins and DNA, orthologous and paralogous evolution, nucleotide sequence analysis

5 Evolutionary trends (9 hrs)

Biochemical evolution- Collapse of orthogenesis
Stages in primate evolution including Homo: dry and wet nosed primates, prosimians and simians, human and the African apes, African origin for modern humans, Y chromosome Adam and mitochondrial Eve
Can evolution explain language? Communication, speech, language and self awareness in primates

Course Outcomes

Describe the mechanism of natural selection and the evolutionary mechanisms

Explain tempo of evolution

Describe molecular evolutionary theories like Neutral theory of molecular evolution,Molecular clocks- genetic equidistance- human mitochondrial molecular clock and Phylogenetic relationships

Recognize Evolutionary trends in Biochemical evolution and primates evolution

An enhanced knowledge about the Mechanism of natural selection

The student develops appreciation about the major processes involved in the Co-evolution; Microevolution, Macroevolution etc.

The process involved in the Gradualism and punctuated equilibrium along with anagenesis and cladogenesis will be acquired

An enhanced level of conceptual learning regarding Neutral theory of molecular evolution

References

1. Coyne, J.A and Allen O.H (2004) Speciation. Sinauer Associates Inc. Massachusetts, USA
2. David, M.H, Craig Moritz and Barbara K.M (1996) Molecular Systematics. Sinauer Associates, Inc.
3. David, M.S (2009) DNA bar-coding will frequently fail in complicated groups: an example in wild
potatoes. American journal of Botany 96(6) : 1177-1189. Downloadable from
www.vcru.wisc.edu/spoonerlab/.../ Bar Codes %20 and % 20 wild % 20 Potatoes.pdf
4. Gould, S.J (1997) Ontogeny & Phylogeny, Belkrap Press. Harvard University Cambridge
5. Kipling, W.W; Brent, D.M and Quentin, D.W.(2005) The perils of DNA bar-coding and the need for
Integrative Taxonomy. Syst. Biol. 54(5): 844-851, Downloadable from
sysbio.oxfordjournals.org/cgi/reprint/54/5/844.pdf
6. McHenry, H.M (2009) Evolution. In Michael Ruse & Joseph Travis. Evolution: The first four Billion
Years. Cambridge, Massachusetts: The Belknap Press of Harvard University Press.p 265.
7. Motoo Kimura (1983) The neutral theory of molecular evolution. Cambridge University Press.

8. Roderick D.M. Page and Edward. C.H. (2000) Molecular Evolution: A Phylogenetic Approach: Blackwell Science.
9. Strikberger, M.W. (2000) Evolution, Jones and Bartett Publishers, London. 38
10. Brain,K.Hall and Benedikt, Hallgrinmson (2008). Strickberger¨s Evolution, 4th ed. Jones and Barlett
Publishers International ,London.
11. Futuyama, D.J.(2005). Evolution. Sinauer Associates Inc. Sunderland, Massachusetts.

THIRD SEMESTER THEORY

ZOL3C07 – IMMUNOLOGY

1. Introduction (1 hour)

2. Hematopoiesis (7 hours)

Hematopoiesis – Lymphoid and myeloid lineages.
Hematopoietic growth factors.
Genes that regulate hematopoiesis.
Regulation of hematopoiesis.
B- Lymphocytes, T- lymphocytes and Antigen presenting cells.

5. Antigen Antibody interactions (10 hours)

Strength of antigen – antibody interactions.(a) Antibody affinity
(b) Antibody avidity.
Cross- reactivity.
Precipitation reactions.
Immunotechnics – ELISA, RIA, WesternBlot, Immunoelectrophoresis,
Flow cytometry and fluorescence.

6. Generation of B-cell and T-cell responses. (9 hours)

Humoral immunity.
Cellular immunity.
T- Cell receptor, TCR-CD3 complex.
Activation, maturation and differentiation of B-Cells.
Activation, maturation and differentiation of T- Cells.

8. The Complement system. (3 hours)

The complement components.
The functions of complement components.
Complement activation (a) Classical pathway (b) Alternate pathway
(c) Lectin pathway.

Course Outcomes

An in-depth knowledge in the process of immune cell synthesis and maturation, antigen receptor structure and the mechanisms of antigen recognition by B-cell and T-cells.

The student gains conceptual knowledge regarding key principles, procedure and applications of different Immune Techniques used in the biomedical field and to develop new methods and techniques on the basis of the earned knowledge.

Mechanisms of humoral and cellular immunity, immune cell receptor and intracellular signal cascades related to immune system activation and response.

The complement system and its components, hypersensitivity and allergic responses, diseases related to hypersensitivity, autoimmune disorders and complement deregulation

References

1. Abdul K Abbas and Andrew H. Lichtman (2004). Basic immunology –Functions and Disorders of the immune system. (6th edition, Elsevier Science, USA)
2. Abdul K Abbas and Andrew H. Lichtman (2003). Cellular and Molecular Immunity (9th edition, Elsevier Science, USA).
3. Godkar, P.B (1998): A Text Book of Medical Laboratoy Technology.Bhalani Bhalani Publishing House Mumbai.
4. Janis Kuby (2000) .Immunology.9th ed. W.H. Freeman& Co. New York.
5. Joshi K. R and Osamo. N. O (1994) : Immunology. Agro Bios Publishers. Jodhpur.
6. Chakraborty ,A.K.(2006).Immunology and Immunotechnology.Oxford University Press.
7. Peter Parham (2004): The immune system (Second edition, Garlands, New York).
8. Ivan .M.Roit(2002). Essentials of Immunology.ELBS, New Delhi.
9. Shetty, N (1993) Immunology: Wiley Eastern Ltd, New Delhi.
10. Richard, Coico and Geoffrey, Sunshine (2009).Immunology- A short course.Wiley Blackwell. C A, USA.
11. David Male, Jonathan Brastoff, David Roth and Ivan Roitt (2006). Immunology. Mosby, Edinburgh, UK.
12. Hannigan, B.M., Moore, C.B.T. and Quinn, D.G.(2010). Immunology. Viva Books, New Delhi.
13. Khan F,H,(2009). Elements of Immunology. Pearson Education ,New Delhi.
14. Thomas J. Kindt, Barbara, A., Osborne And Richard, A.Goldsby.(2007). Kuby Immunology.6th ed. W.H.Freeman,New York.
15. Helen Chappel and Moused Harney (2006). Essentials of clinical Immunology. 5th ed. Blackwell Scientific Publications.

THIRD SEMESTER THEORY

ZOL3C08–DEVELOPMENTAL BIOLOGY

4. Cellular and Molecular basis of development (7 hrs)

Induction and competence- cascade of induction- reciprocal and sequential inductive events, instructive and permissive interactions.

Epithelial- Mesenchymal interactions- paracrine factors - The Hedhog family, The Wnt family, Juxtacrine signaling and cell patterning, notch pathway.

Cellular interactions concerned in fertilization, blastulation, gastrulation and organogenesis.

Molecular basis of cellular differentiation – Cadherins.

5. Genetic basis of development (8 hrs)

Differential gene transcription –Promoters and Enhancers, DNA

methylation, Transcription factors, Silencers and Insulators.
Differential RNA processing- X chromosome inactivationdosage compensation.
Control of gene expression at the level of translation-Differential mRNA longevity, selective inhibition of mRNA translation, Selective activation of mRNA translation, micro RNAs, Control of RNA expression by cytoplasmic localization.
Post translational regulation of gene expression.
Models of cell differentiation- hematopoiesis, myogenesis, differentiation of neural crest cells.
Reversibility of patterns of gene activity-cell fusion, transdifferentiation.

6. Metamorphosis, Regeneration and Ageing (7 hrs)

Metamorphosis in Amphibians and Insects and their hormonal control
Types of regeneration - Super, Hetero, Epimorphic, Morphallactic and Compensatory regeneration, Histological process during regeneration
Ageing – The biology of senescence, cellular and extra cellular ageing, Genes and ageing, DNA repair enzymes, Ageing and the insulin signaling cascade, The mTOR pathway, Chromatin modification, Wear and tear Oxidative damage, Mitochondrial genome damage, genetically programmed ageing

7. Environmental regulation of animal development (4 hrs)

Environmental regulation of normal development - types of polyphenism
Environmental disruptions of normal development (Teratogenesis)
Teratogenic agents - Alcohol, retinoic acid, Bisphenol A(BPA), heavy metals, pathogen, Testicular Dysgenesis Syndrome, DES as an endocrine disruptor, Endocrine disruptors as obesogens
Environmental oestrogens.
Impact of pesticide on development.

Course Outcomes

The student will appreciate the genetic, cellular and molecular basis of development.

The student will describe the process of ageing and mechanisms.

The student realize the impact of environment on development

References

Developmental biology
1. Balinsky, B. I.(1981). An introduction to Embryology. Holt Saunders, Philadelphia
2. Berril, N. J.and Karp.G.(1978). Developmental biology.Tata McGraw Hill., New Delhi.
3. Deuchar, E. M. Cellular interactions in animal development.
4. Gilbert, S. F.(2003). Developmental Biology. 7th ed. Sinauer Associates Inc. Massachusetts.
5. Hodge, R. Developmental Biology: From a Cell to an Organism.
6. Hopper, A. S. & N. H. Hart. Foundation of animal development.

7. Lash, J & J. R. Whittaker. Concepts of development.
8. Muller, W. A. Developmental biology. Springer.
9. Snustad, D. P., J. M. Simmons & J. B. Jenkins. Principles of Genetics.
10. Wolpert, L. Beddington,R.,Jessel,T., Lawrence, P., Meyerowitz,E.and
11. Smith, J.(2002). Principles of Development. Oxford university press, 2nd edition.
12. Slack, J, (2001). Essential Developmental Biology. Blackwell Publishing ,UK.
13. Twyman,R.M.(2001). Instant notes in Developmental Biology. Bios Scientific Publishers Ltd. Oxford.
14. Vasudeva Rao, K.(1994). Developmental Biology-a modern synthesis. Oxford IBH, New Delhi.

Part B- ENDOCRINOLOGY

5. Hormones and female reproductive physiology (3 hrs)

Synthesis, chemistry, and metabolism of Ovarian steroid hormones
Physiological roles of Ovarian steroid hormones
Hormonal regulation of female monthly rhythm
Hormonal factors in pregnancy, parturition and lactation

Course Outcomes

Describe the anatomy of male and female reproductive systems including hormonal functions and pathophysiology

References

1. Ganong, W. F. (2005). Review of medical physiology, Mc Graw Hill, New Delhi.
2. Hadley, M. E. (2000). Endocrinology, Pearson education, Inc., New Delhi.
3. Nelson R. J. Introduction to behavioral endocrinology
4. Norris D. O. (2005). Vertebrate endocrinology.
5. Williams, R. H.(1988). Text Book of Endocrinology. W. B. Saunders Company, Philadelphia.
6. Turner,K. and Bagnara, G. (1976). General Endocrinology.W.B. Saunders Company,Philadelphia.
7. Brook, C.G. and Marshall, N.J.(1996).Essential Endocrinology.3rded.Blackwell Science , London.
8. 17.Guyton, A.C. and Hall, J. E. (2001). Text Book of Medical Physiology.10thed. Prism Books, Pvt. Ltd. Harcourt Asia Ltd.India ed.
9. Hadley, M.G. (2000). Endocrinology .3rd ed. Prentice Hall International Inc. New Jersey

Mode of Instructions

PowerPoint Presentations
Lectures
Animated Videos

Mode Of Assessment

Regular Class Tests, Interactive Discussions, Presentations by Students, Quizzes,Q & A Sessions,Periodic Examinations

LESSON PLAN
M.Sc. Zoology
University of Calicut -2019 onwards

ZOL1C01 - BIOCHEMISTRY AND CYTOGENETICS

COURSE OUTCOMES (COs)

CO2	The Student develops the ability to analyse the structure, classification, and biochemical properties of carbohydrates from other organic molecules.
CO7	The student will explore various anabolic and catabolic pathways of biomolecules such as glucose, nucleic acids, amino acids and lipids.

2. Carbohydrates (8hrs)

2.1. Classification of carbohydrates with examples-
2.1.1 Structure of monosaccharides- glucose, fructose, galactose, mannose and ribose.
2.1.2. Methods of representation of sugars (Ball and stick, projection formula and perspective Formula)
2.1.3. Isomerism - Structural isomerism (functional group isomerism) and stereo isomerism (Optical isomerism)- mention epimer, anomer and enantiomer with examples, Mutarotation
2.1.4. Biological roles of monosaccharides.
2.2. Structure and biological roles of maltose, sucrose, lactose, trehalose and cellobiose.
2.3.1. Hompolysaccharides - Structure and biological roles of cellulose, starch, glycogen, Inulin and chitin
2.3.2. Heteropolysaccharide - Structure and biological roles of hyaluronic acid, chondroitin, Chondroitin sulphate, keratan sulphate, heparin and agar-agar.

Unit - IV - Metabolism and biosynthesis of biomolecules

1. Carbohydrate metabolism (4 hrs.)

1.4. Gluconeogenesis, Glycogenesis, Glycogenolysis; regulation of glycogen synthesis and breakdown.
1.5. Pentose phosphate pathway (HMP pathway) and its significance
1.6. Uronic acid pathway

Procedure / Process of Teaching –

- Lecture
- Power point presentations
- Illustrations
- Videos
- Peer learning – topics divided among students- each of them present their topic and discuss in class.

Procedure/ Process of Assessment –
Tests

Seminars

Individual quiz

REFERENCES

- Lenhninger, A. L. (2008). Principles of Biochemistry. (5th edn). CBS Publishers and Distributors, New Delhi.
- Lubert Stryer,(2011) Biochemistry, VII th edition, W.H. Freeman & Co.

ZOL1C02 - BIOPHYSICS AND BIOSTATISTICS
Part A. Biophysics

Course outcomes (COs)

CO 1	The student develops conceptual knowledge regarding the basic principles of physics involved in biological processes.
CO2	The student appreciate the biological aspects and implications of sound energy
CO4	The student may familiarize with various biophysical and electrophysiological methods
CO5	The student gain conceptual knowledge on the principles of microscopy and apply
CO7	The student explore the possibilities of the applications of separation techniques.
CO8	The student will describe gravity 'G' force and its multi-faceted applications.

1. Colloidal System (3 hrs)
1.1. Crystalloids and Colloids,
1.2. Properties of colloids- Kinetic, optical and electrical properties- Electrosmosis, Cataphoresis, Coagulation.
1.3. Forms of colloids, Suspensions and Emulsions, preparation and properties of emulsions.
1.4. Biological importance of colloids.

2. Diffusion and Osmosis (4 hrs)
2.1. Fick's laws and diffusion coefficient.
2.2. Gibb's Donnan equilibrium.
2.3. Application of diffusion processes in biology: haemolysis.
2.4. Osmosis, Osmotic concentration, Osmotic pressure and osmotic gradient.
2.5. Vant Hoff's laws
2.6. Electrolytic and ionic balance in biological fluid.

4. Bioacoustics (5 hrs)
4.1. Characteristics of sound.
4.2. Physical basis of hearing.
4.3. Physical organization of ear.
4.4. Physical aspects of sound transmission in the ear.
4.5. Audible sound frequency.
4.6. Pitch perception and theories.
4.7. Infrasonic and ultrasonic sounds.
4.8. Echolocation; receiving and analyzing echoes

5. Radiation Biology (9 hrs)
5.1. Radioactivity, different types ionizing radiations and their sources
5.2. Radioactive disintegration. Decay curve, half-life.
5.3. Biological effects of ionizing radiations – effects at macromolecular,cellular and organ system level, effects of whole body irradiation-Radiation therapy.
5.4. Biological applications of radioisotopes.
5.5. Radiation dosimetry- dose units and dose measurement.
5.6. Radiation Detectors - GM Counter, Solid and Liquid Scintillation Counter, Proportional counter, Semiconductor detectors.
5.7. Autoradiography

7. Electrophysiological methods (Brief) (3 hrs)
7.1. Single neuron recording.
7.2. Patch clamp recording.
7.3. ECG.
7.4. Brain activity recording.
7.5. Lesion and stimulation of brain.
7.6. Pharmacological testing.
7.7. PET (Positron Emission Tomography), MRI, fMRI, CAT.

8. Principles and applications of (8 hrs)
8.1. Fluorescent, Interference, Scanning and Transmission electron microscopes (SEM &TEM) .
8.2. Resolving powers of different microscopes.
8.3. Different fixation and staining techniques for EM (freeze-etch and freeze fracture methods for EM-image processing methods in microscopy).
8.4. Laser and its applications in Biology

10. Influence of gravity (3 hrs)
10.1. Human body posture in the gravitational field
10.2. Influence of G force.
10.3. s Force of centrifugal acceleration - importance of aviation and space travel
10.4. Effect of positive G. Force & negative G. Forces.
10.5. Protection against G. Force
10.6. Influence of linear acceleration on the body

11. Nanotechnology (2 hrs)
11.1. Definition
11.2. Nanotechnology and its applications in the field of health care.
11.3. Role of nanotechnology in environmental management.

Procedure / Process of Teaching –

- Lecture
- Power point presentations
- Illustrations
- Videos
- Peer learning – topics divided among students- each of them present their topic and discuss in class.

Procedure/ Process of Assessment –

- Tests
- Seminars
- Individual quiz

References

Roy, R.N (1996)-A text book of Biophysics-New central book Agency Calcutta

Part B –Biostatistics

Course outcomes (COs)

CO 10	The student develops ability to apply measures of central tendency and dispersion in biological research, and various types of probability distribution.
CO 11	The student analyse and apply parametric and non-parametric tests and its applications in biological research
CO 12	The student learn how to apply different types of ecological indexes in biological research

1. Introduction (2 hrs)
1.1 Biostatistics: Definition,
1.2 Characteristics of Statistics
1.3 Importance and usefulness of statistics
1.4 Limitations of Statistics
2. Data (5 hrs)
2.1. Types of data: classification based on Source of data, Compilation, Variable, Nature .
2.2. Methods of data collection and classification.
2.3. Types of sampling methods.
2.4. Advantages and disadvantages of census and sampling method.
2.5. Class intervals- exclusive and inclusive method
2.6. Frequency curve (types. skewness, kurtosis, ogive)
3. Statistical Methods: Measures of central tendency and dispersal (4 hrs)
3.1. Mean, (raw data, discrete series and continuous series)
3.2. Standard deviation, Standard error, degree of freedom (raw data, discrete series and continuous series)
3.3. Quartile deviation- Box- whisker plot

7. Ecological data analysis (problems to be discussed) (7 hrs)
7.1. Alpha diversity

Shannon diversity index, Simpsons Dominance index, Pielou‟s evenness index,

Margalef species Richness, Fisher‟s apha,

7.2. Beta diversity
Morisita Horn index, Sorenson index, Bray-Curtis similarity

Procedure / Process of Teaching –

- Lecture
- Power point presentations
- Illustrations
- Videos
- Peer learning – topics divided among students- each of them present their topic and discuss in class.

Procedure/ Process of Assessment –

- Tests

- Seminars
- Individual quiz

References

1. Agarwal, B.L. (1996) Basic statistics, New Age International(P) Ltd. Publishers, New Delhi.
2. Bailey, N.T.J. (1981) Statistical methods in Biology. Hodder and Stongtton, London.
3. Campell, R.C. (1978), Statistics for biologists. Blacker and Sons Publishers, Bombay.
4. Gupta, C.B. and Gupta, V. (2002) Statistical methods. Ikas Publishing House, New Delhi.
5. Rostogi, V. B. (2009) Fundamentals of Biostatistics. Ane's Students Edition, New Delhi.

ZOL1C03 - ECOLOGY AND ETHOLOGY (90 Hours)
Part-A-Ecology (54 hrs)

CO1	The student develops ability to differentiate between the concepts of Habitat, Niche
CO2	The student explain the concepts of, Ecosystem energetic sand Mineral cycling.
CO3	The student learn to appreciate nature's way to maximize efficiency in utilization of energy and resources; to reduce competition.
CO4	The student will be able describe the characteristics of population growth and species interaction.
CO5	The student will explain the components of Ecological community, the process of Ecological succession, Biomes etc.
CO6	The student will appreciate the complexity of relationship between organisms.
CO7	The student will be able to describe the characteristics of various biogeographically realms, and Indian biodiversity.
CO8	The student will be able to give explanation to the differential distribution of organisms across the world.
CO9	The student will describe the characteristics of various biogeographically realms, and Indian biodiversity
CO 10	The student will explain the concept of Carbon credit, Carbon trading etc.
CO 11	The student will learn to analyse various aspects of Green building technology and interlinking of rivers.
CO 12	The student learn to appreciate the richness of Indian biodiversity and various strategies of Wildlife conservation
CO 13	The student will be able to describe the components of animal behaviour, factors of motivation and conflict behaviour, properties of instinctive behaviour, types of learning, adaptiveness of behaviour, importance of biological rhythms and parental care, influence of hormones on behaviour.
CO 14	The student develops appreciation about the importance of nature watch and field study.

1. Introduction (3hrs)

1.1. Habitat and niche

1.1.1. Concept of habitat and niche

1.1.2. Niche width and overlap

1.1.3. Fundamental and realized niche

1.1.4. Resource partitioning

1.1.5. Character displacement

2. Ecosystem (9 hrs)

2.1. Structure and function

2.2. Ecosystem energetics

2.3. Primary production

2.4. Energy flow models

2.5. Mineral cycling (CNP)

2.6. Trophic levels, Food chain, food web and secondary production

2.7. Decomposers and detritivores

3. Population Ecology (7 hrs)

3.1. Characteristics of a population

3.2. Methods of estimating population density of animals, ranging patterns through direct,

indirect and remote observations
3.3 Sampling methods in the study of behaviour, habitat characterization
3.4. Ground and remote sensing methods
3.5. Population growth curves, Life tables, survivorship curves, population regulation, Life history strategies, r and k selection, Demes and dispersal, interdemic extinctions, age structure of populations.
3.6. Growth and regulation of human population

4. Species interaction (5 hrs)

4.1. Types of interactions, interspecific competition
4.2. Herbivory, Carnivory, Pollination, Symbiosis; mutualism, commensalisms and proto cooperation

5. Community Ecology (4 hrs)

5.1. Nature of communities**.**
5.2. Characteristics of a biotic community**.**
5.3. Species diversity and latitudinal gradients in diversity.
5.4 Edges and ecotones.

6. Ecological succession (4 hrs)

6.1. Types, mechanisms ,changes involved in succession .
6.2 Concept of climax

7. Biogeography (6 hrs)

7.1. Major terrestrial biomes: (a) Tropical rain Forest (b) Grassland (c) Desert (d) Chaparral (e) Temperate deciduous Forest (f) Temperate boreal forest (g) Tundra (h) Savanna

8. Biogeographical zones of India (4 hrs)

(a) Trans Himalayan zone; (b) Himalayan zone; (c) Desert zone; (d) Semiarid zone; (e) Western Ghats zone; (f) Deccan plateau zone; (g) Gangetic plain zone; (h) North east zone. (i) Coastal zone; (j) Islands present near the shore line.

9. Applied Ecology (8 hrs)

9.1 Carbon credit, Carbon trading, Blue Carbon
9.2 Green building technology and its ecological importance.
9.3 Discuss the benefits and disadvantages of the idea of (brief)
a. Inter linking of major rivers of India,
b. Sethusamudram ship canal project.
c. Biodiversity with special reference to India-status monitoring and documentation, major drivers of biodiversity change.

10. Conservation Biology (4 hrs)

10.1 Principles of conservation.
10.2 Major approaches to management,
10.3 Indian case studies on conservation & management strategy (concepts of project tiger, Biosphere reserves).

Part B. Ethology (36 hrs)

1. Introduction (1 hr)

2. Concepts of Ethology (4 hrs)

2.1. Ethology as different from the other schools studying animal behavior like behaviourism.
2.2. Behaviour as a reaction to stimuli - sign stimuli, social releasers, Ethograms, super normal stimuli, stimulus filtering.
2.3. Concepts of Fixed Action Patterns (FAP), Innate Releasing Mechanism(IRM),Action Specific Energy(ASE),Concepts of Learning and Imprinting.

3. Motivating factors (3 hrs)

3.1. General factors in motivation; Studies of motivation in guppies;
3.2. Mating systems-parental investment and reproductive success

4. Conflict behaviour- stress-displacement activities- Ritualization. (2 hrs)

5. **Instinctive behaviour & reflex action, neural basis of sleep and arousal. (2hrs)**

6. Learning- Neural basis of learning, memory, cognition, sleep and arousal **(3hrs)**
Biological clocks

7. Adaptiveness of behaviour (3 hrs)

JP Scott‟s categories of behaviour.

8. External stimulus - circadian rhythms (3 hrs)
8.1- Proximate and Ultimate factors.
8.2-Types of orientation-reafference theory of Von Holst & Mittel Steadt.
8.3-Navigation & migration

9. Parental care – (6 hrs)
9.1. Mating systems, Parental investment and Reproductive Success.
9.2. Development of behavior.
9.3. Social communication; Social dominance; Use of space and territoriality; domestication and behavioural changes; Social behaviour of termites & Primates;

10. Evolution and advaptiveness of behaviour (4 hrs)
Altruism, Kin selection, inclusive fitness, selfish gene theory, cultural transmission of behaviour.

11. Hormones and Behaviour- (5 hrs)
Hormones of gonads, adrenal gland , Pituitary gland,-Hormonal effects on different behavioural patterns , Maternal behavour- mechanism of hormonal action.

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Procedure/ Process of Assessment –

- Tests
- Seminars
- Individual quiz

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Ethology

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SECOND SEMESTER
ZOL2C05 - MOLECULAR BIOLOGY
Course outcomes

CO1. The student will acquire knowledge regarding the mechanism of DNA replication- both chromosomal and extra chromosomal, enzymes involved, models of replication, inhibitors and the significance of DNA replication
CO2. The student learn to know the safeguard systems of DNA, restriction enzymes and their significance, mechanisms involved in damage and repair of eukaryotic DNA and its importance.
CO3. Learn to explain the general features of genetic code, special features of the genetic code in mitochondria, and variations in genetic code.
CO4. The student gain in-depth knowledge regarding the structural organization of mRNA in prokaryotes and eukaryotes, the mechanism of transcription, translation, post transcriptional and translational modifications, structure , biogenesis and role of ribosomes in protein synthesis ; and RNA editing.
CO5. The student will gain knowledge regarding the regulation of gene expression in Phages, Bacteria, and in Eukaryotes ; recent research findings like antisense RNA strategies and role of si RNA and mi RNA in the regulation of eukaryotic gene expression and their applications.
CO6. The components , organization and special features of eukaryotic genome, interrupted genes and their evolution; concept of gene families, and molecular evolutionary clock.
CO7. Introduction to transposition mechanisms in prokaryotes and eukaryotes, and their significance.
CO8. Molecular mechanisms of genetic recombination models, and significance.
CO9. Special features of microbial genetics, and organelle genome, their replication and mapping.
CO10. The student gain an in depth knowledge regarding the events and regulation of cell cycle, its alteration and causes of cancer. Genes involved in the regulation of cancer and modern therapeutic interventions like immunotherapy and gene therapy.

1. DNA replication (11 Hrs)

1.1. Semidiscontinuous synthesis-Okazaki fragments
1.2. Replication origin and replication fork
1.3. Unit of replication, extra chromosomal replicon of bacterial Ti plasmid
1.4. Enzymes/proteins of replication- Primase, Replisomes, Helicase, DNA polymerases, Single strand binding proteins, Topoisomerases and Ligase;
1.5. Fidelity of replication
1.6. Replication of the ends of eukaryotic chromosome – role of telomerase
1.7. Models of DNA replication –Rolling circle model and looped rolling circle model, D-loop model, θ-model.
1.8. Inhibitors of DNA replication – Methotrexate and Fluorodeoxyuridylate

2. Safeguard systems of DNA (5 Hrs)

2.1. Restriction: significance, role and features of Type I, II & III restriction enzymes
2.2. Modification: enzymes and significance
2.3. Repair:
2.3.1. Major kinds of damage to DNA and causes
2.3.2. Repair mechanisms: Direct reversal, Mismatch repair, Excision repair, Recombination repair, SOS response

3. Transcription of mRNA in prokaryotes and eukaryotes (10 Hrs)
3.1. Structural organisation and life span of mRNA; monocistronic and polycistronic mRNA
3.2. Transcription in prokaryotes and eukaryotes
3.2.1. Promoter (mention Pribnow, TATA, CAAT and GC box), enhancer and silencer sites
3.2.2. Transcription factors; Transcription activators and repressors
3.3. Characteristic features of RNA polymerases of phages, prokaryotes and eukaryotes and their functions
3.4. Post transcriptional modification of RNA
3.4.1. Capping
3.4.2. Polyadenylation
3.4.3. Splicing
3.5. RNA editing: site specific deamination and role of gRNAs
3.6. mRNA transport
4. Genetic code (5 Hrs)
4.1. Characteristics of genetic code
4.2. Start codons and stop codons
4.3. Degeneracy of the code: Wobble hypothesis and isoacceptor tRNAs
4.4. Special features of the genetic code in mitochondria, mitochondrial tRNA
4.5. Variations in the genetic code in *Mycoplasma* and *Tetrahymena*
4.6. Point mutations that alter genetic code (missense, nonsense & frameshift)
5. Ribosome: The site of protein synthesis: (2 Hrs)
5.1. Structure

5.2. Composition; Reconstitution experiments
5.3. Active centres
5.4. Biogenesis of ribosome in eukaryotes
6. Translation in prokaryotes and eukaryotes: (8 Hrs)
6.1. Aminoacylation of tRNA & initiation, elongation and termination of protein synthesis
6.2. Aminoacyl tRNA synthetases & initiation, elongation and termination factors
6.3. Translational proof-reading
6.4. Differences in protein synthesis between prokaryotes and eukaryotes
6.5. Translational inhibitors in prokaryotes and eukaryotes – role of tetracycline, streptomycin, neomycin, chloramphenicol, erythromycin, puromycin and diphtheria toxin
6.6. Post- translational modification of proteins: protein folding (role of chaperones) and biochemical modifications
7. Control of gene expression at transcription and translation level: (9 Hrs)
7.1. Regulation of gene expression in Phages – alternate patterns of gene expression for control of lytic and lysogenic cycle in λ phage
7.2. Regulation of gene expression in bacteria – basic features of tryptophan, arabinose and galactose operons
7.3. Regulation of gene expression in eukaryotes –
7.3.1. Role of chromatin in regulating gene expression
7.3.2. Activation and repression of transcription
7.3.3. Regulation of translation by gene arrangement
7.3.4. Regulation of translation by alternate pathways of transcript splicing
7.3.5. Antisense RNA strategies for regulating gene expression
7.3.6. si RNA and mi RNA in regulation
8. Eukaryotic genome: (5 Hrs)
8.1. Special features of eukaryotic genome
8.2. Features, components and reassociation kinetics of Unique, Moderately repetitive and Highly repetitive DNA
8.3. Junk DNA, Satellite DNA and Selfish DNA

8.4. Cot value and complexity of genome
8.5. Organisation of human genome (brief account)

9. Interrupted genes (4 Hrs)

9.1. Definition and explanation
9.2. Organisation and special features of interrupted genes
9.3. Evolution of interrupted genes

10. Gene families: (6 Hrs)

10.1. Definition and concept
10.2. Classification with example
10.2.1. Simple multigene family - organisation of rRNA gene in *Xenopus*
10.2.2. Complex multigene family - organisation of histone genes in sea urchin and tRNA genes in *Drosophila*
10.2.3. Developmentally controlled complex multigene family e.g., globin gene
10.2.3.1. Globin genes and its products

10.2.3.2. Organisation of globin genes and its expression in Man
10.2.3.3. Evolution of globin genes
10.2.4. Concept of an evolutionary clock
10.2.5. Pseudogenes

11. Transposable genetic elements - Transposons (6 Hrs)

11.1. Definition, features and types
11.2. Transposition and mechanism
11.3. Transposons in bacteria
11.3.1. IS elements
11.3.2. Tn family
11.3.3. Mu phage as a transposable element
11.4. Transposons in eukaryotes
11.4.1. SINE, Alu family; LINE, L1
11.4.2. P elements in *Drosophila*
11.4.3. Transposons in Maize
11.5. Retroviruses and transposition

12. Molecular mechanisms involved in recombination of DNA: (5 Hrs)

12.1. Genetic recombination – types with example
12.1.1. Site specific recombination
12.1.2. Non-homologous recombination
12.1.3. Homologous recombination
12.2. Molecular mechanism involved in homologous recombination of DNA in eukaryotes- Holliday model: Holliday intermediate, heteroduplex DNA, gene conversion
12.3. Role of Rec A protein in genetic recombination

13. Microbial genetics (5 Hrs)

13.1. Prokaryotic genome- *Escherichia coli* genome – basic features
13.2. Methods of genetic transfers in bacteria– transformation (in *Streptococcus pneumonia*), conjugation and sexduction, transduction
13.3. Brief note on mapping genes by interrupted mating (in bacteria)

14. Organelle genome (4 Hrs)

14.1. Chloroplast genome: special features
14.2. Mitochondrial genome
14.2.1. Special features of yeast mitochondrial genome, petite mutants
14.2.2. Special features of human mitochondrial genome.

15. Cancer (5 Hrs)

15.1. Genetic rearrangements in progenitor cells, oncogenes, protooncogenes and tumour suppressor genes
15.2. Virus-induced cancer

15.3. Alteration of cell cycle regulation in cancer
15.4. Interaction of cancer cells with normal cells
15.5. New therapeutic interventions of uncontrolled cell growth (immunotherapy and gene therapy).

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Procedure/ Process of Assessment –

- Tests
- Seminars
- Individual quiz

References

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SECOND SEMESTER
ZOL2C06 - SYSTEMATICS AND EVOLUTION

CO1. The student develops skills in the identification and taxonomic classification of organisms based on their characters
CO2. The student will be able to describe different levels of taxonomy
CO3. Aware about Place, importance, applications and goals of taxonomy
CO4. Learn about purpose of classification, use of classification, theories of biological classification and types classification
CO11. Realize the taxonomic impediments
CO17. The student develops conceptual understanding on Hardy-Weinberg law, founder principle, bottleneck effect and genetic drift, process of Isolating mechanisms-Prezygotic and Postzygotic isolating mechanisms; speciation-allopatric, peripartric-parapatric heteropatricsympatric speciation; ecotypes etc.
CO18. The student develops appreciation about the major processess involved in the Co-evolution; Microevolution, Macroevolution etc

Part –A: Systematics

I. Introduction (1 hr)

2. Definition and basic concepts in Systematics and Taxonomy (4 hrs)

2.1 Levels of Taxonomy

(a) Alpha, Beta and Gamma taxonomy

2.2 Importance and applications of taxonomy

2.3 Goals of taxonomy

2.4 Definition of systematics

2.5 Definition of classification

3. Species (4 hrs)

3.1 Monotypic species

3.2 Polytypic species

3.3 Ecospecies and Cenospecies

3.4 Morphospecies

3.5 Super species

3.6 Species as a Population Complex

4. Species Concepts (6 hrs)

4.1 Typological Species Concept

4.2 Nominalistic Species Concept

4.3 Biological Species Concept

4.4 Evolutionary Species Concept

4.5 Difficulties in the application of the biological species concept

11. Taxonomic impediments (4 hrs)

11.1 Impediments in taxonomic collections and maintenance

11.2 Shortage of man power

11.3 Lack of funding for taxonomic research

11.4 Lack of training and library facilities

11-5 Impediments in publishing taxonomic work

11.6 Solutions to overcome the impediments

(a) Improve international co-operation (b) Development of taxonomic centers
(c) Need for efficient international networking (d) the desired end product

Part- B Evolution

2 The Mechanisms (7 hrs)
2.1 Population genetics- populations, gene pool, gene frequency, Hardy-Weinberg law, founder principle, bottleneck effect and genetic drift as factors in evolution
2.2 Evidence for evolution: DNA evidence, fossil evidence, embryological evidence, geological evidence, evolution in action, imperfection of evolution
2.3 Co-evolution: microevolution, macroevolution, convergent evolution (homoplasy), divergent (parallel) evolution

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References

Part -A Systematics
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Part- B Evolution
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THIRD SEMESTER

ZOL3C07 – IMMUNOLOGY

CO5. The student explore the fundamentals of Immune effector mechanisms, chemical signalling through cytokines, its therapeutic uses and cytokine related diseases.
CO6. The complement system and its components, hypersensitivity and allergic responses, diseases related to hypersensitivity, autoimmune disorders and complement deregulation.

7. Immune effector mechanism. (7 hours)
7.1. Cytokines.
7.2. Properties of cytokines.
7.3. Cytokine antagonists.
7.4. Cytokine secretion by TH1 and TH2-cells.
7.5. Cytokine related diseases. (a) Bacterial septic- shock (b) chaga's disease) (c) lymphoid and myeloid cancers.
7.6. Therapeutic uses of cytokines.
7.7. Toll- like receptors.

8. The Complement system. (6 hours)
8.4. Regulation of complement system.
8.5. Biological consequences of complement activation.
8.6. Complement deficiencies.

9. Major Histocompatibility Complex (MHC) (8 hours).
9.1. General organization and inheritance of MHC.
9.2. MHC molecules and genes.
9.3. Cellular distribution of MHC.
9.4. Antigen- processing and presentation- Exogenous and Endogenous pathways.
9.5. Presentation of non- peptide antigens.

10. Transplantation immunology (8 hours)
10.1. Auto graft, Allograft, Isograft and xenograft
10.2. Immunological basis of graft rejection.
10.3. Role of cell- mediated responses.
10.4. Transplantation antigens.
10.5. General immune suppressive therapy.

11. Hypersensitivity Reactions. (5 hours)
11.1. Allergens.
11.2. IgE- mediated (type- I) hypersensitivity.
11.3. Antibody- mediated cytotoxic (type- II) hypersensitivity.
11.4. Immune complex- mediated (type- III) hypersensitivity.

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References

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the immune system. (second edition, Elsevier Science, USA)
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THIRD SEMESTER
ZOL3C08–DEVELOPMENTAL BIOLOGY & ENDOCRINOLOGY

CO1: The student will gain knowledge on basic concepts in development.
CO2: The student will explain the process of gametogenesis, fertilization and embryonic development.
CO3: The student will appreciate the genetic, cellular and molecular basis of development.
CO8: Summarize the anatomy, regulation, and physiological functions of the hormones of the hypophysis, thyroid, parathyroid, pancreas adrenal, hypothalamus and adrenal glands.

PART A DEVELOPMENTAL BIOLOGY

1. Introduction: Basic concepts of development (6 hrs)
1.1. Cell fate, potency, determination and differentiation.
1.2 Commitment
1.3. Specification - autonomous, conditional, syncytial .
1.4. Genomic equivalence and cytoplasmic determinants
1.5. Morphogenetic gradients
1.6. Genomic Imprinting
1.7. The stem cell concept- Progenitor cells, Adult stem cells, Mesenchymal stem cells, Multipotent adult stem cells, Pluripotent Embryonic stem cells, Stem cell therapy.
2. Gametogenesis, fertilization and early development (10 hrs)
2.1. Production of gametes- Spermatogenesis and Oogenesis, Ultra structure of gamates
2.2 Cell surface molecules in sperm-egg recognition in animals (sea urchin and mammals)
2.3 Zygote formation-
2.3.1. Encounter of sperm and egg
2.3.2. Capacitation
2.3.3. Acrosome reaction
2.3.4. Activation of ovum
2.3.5 Amphimixis
2.3.6. Prevention of Polyspermy (Fast block and Slow block)
2.4 Cleavage and blastula formation
2.5 Gastrulation and formation of germ layers in amphibia
2.6 Embryonic fields
3. Embryogenesis and Organogenesis (10 hrs)
3.1 Axis formation in amphibians - The phenomenon of the Organizer- Nieuwkoop center, primary embryonic induction, mechanism of axis formation
3.2 Anterior posterior patterning in Amphibians - Hox code hypothesis
3.3 Anterior posterior patterning in *Drosophila* – anterior forming genes (bicoid, hunchback),

posterior forming genes (nanos, caudal), terminal forming gene (torso), segmentation genes- gap genes, pair rule genes, segmentation polarity genes, homeotic selector genes, realistor genes
3.4 Dorso- ventral patterning in *Drosophila*- dorsal protein gradient
3.5. Limb development in chick- Formation of the Limb Bud, Generating the Proximal-Distal Axis of the Limb, Specification of the Anterior-Posterior Limb Axis, Generation of the Dorsal-Ventral Axis
3.6. Insect wings and legs formation
3.7. Vulva formation in *Caenorhabditis elegans.*
3.8. Eye lens induction.

8. Developmental Mechanisms of Evolutionary change- (1hrs)
Heterotopy, Heterochrony

Part B- ENDOCRINOLOGY

6. Neurohormones (3 hrs)
6.1. Gases as neural messengers
6.2. Endorphins- physiological roles, mechanism of action and pathophysiology
6.3. Brain hormones and behaviour
6.4. Neuroendocrine pathophysiology

Procedure / Process of Teaching –

- Lecture
- Power point presentations
- Illustrations
- Videos
- Peer learning – topics divided among students- each of them present their topic and discuss in class.

Procedure/ Process of Assessment –

- Tests
- Seminars
- Individual quiz

References
Developmental biology
1. Balinsky, B. I.(1981). An introduction to Embryology. Holt Saunders, Philadelphia
2. Berril, N. J.and Karp.G.(1978). Developmental biology.Tata McGraw Hill., New Delhi.
3. Deuchar, E. M. Cellular interactions in animal development.
4. Gilbert, S. F.(2003). Developmental Biology. 7th ed. Sinauer Associates Inc. Massachusetts.
5. Hodge, R. Developmental Biology: From a Cell to an Organism.
6. Hopper, A. S. & N. H. Hart. Foundation of animal development.
7. Lash, J & J. R. Whittaker. Concepts of development.
8. Muller, W. A. Developmental biology. Springer.

9. Snustad, D. P., J. M. Simmons & J. B. Jenkins. Principles of Genetics.

10. Wolpert, L. Beddington,R.,Jessel,T., Lawrence, P., Meyerowitz,E.and
11. Smith, J.(2002). Principles of Development. Oxford university press, 2nd edition.
12. Slack, J, (2001). Essential Developmental Biology. Blackwell Publishing ,UK.
13. Twyman,R.M.(2001). Instant notes in Developmental Biology. Bios Scientific Publishers Ltd.
Oxford.
14. Vasudeva Rao, K.(1994). Developmental Biology-a modern synthesis. Oxford IBH, New Delhi.

Endocrinology

1. Bentley, P. J. (1998). Comparative vertebrate endocrinology.3rd ed.Cambridge University Press
2. Bern, H. A. Text book of comparative endocrinology
3. Bolander, F. F.(2006). Molecular endocrinology, Academic press, New Delhi.
4. Ganong, W. F. (2005). Review of medical physiology, Mc Graw Hill, New Delhi.
5. Hadley, M. E. (2000). Endocrinology, Pearson education, Inc., New Delhi.
6. 6.Harris, G. W. (1995). Neural control of the pituitary gland, Edward Arnold, London.

Lesson Plan – Dr. Betty K.P

FIRST SEMESTER B Sc. COMPLEMENTARY BOTANY COURSE: 1

ANGIOSPERM ANATOMY AND MICROTECHNIQUE

Semester	Course code	Credits	Hrs/wk
1	BOT1C01T	2	4

COURSE OUTCOMES (COs)

By the end of the course, students are expected to:

1. Explain the types, structure and functions of plant tissues.
2. Explain primary and secondary (normal and anomalous) structures of plant organs.
3. Identify plant organs by observing anatomical features.
4. Illustrate primary and secondary (normal and anomalous) structures of plant organs.
5. Apply the histochemical techniques in laboratory works.

ANGIOSPERM ANATOMY

Module – I (**9** hrs)

1 Tissues - Definition, Kinds - Meristematic & Permanent. (**8** hrs)

1. Meristematic tissues - Classification – based on origin & position; Organization of root apex and differentiation of tissue – Histogen theory; Organization of stem apex and differentiation of tissues - Tunica & Corpus theory.
2. Permanent tissues - Definition - classification; Simple tissues (Parenchyma, Collenchyma and Sclerenchyma), Complex tissues (Xylem & Pholem) Secretory tissues - Glandular tissues (Nectaries in *Euphorbia pulcherrima*, Stinging hairs in *Tragia*) Oil glands in *Citrus, Eucalyptus*; Digestive glands in *Nepenthes*; Laticiferous tissues (Non-articulate latex ducts in *Euphorbia* and articulate latex duct – latex vessels in *Hevea*), Hydathodes.

2 Vascular bundles – types: conjoint - collateral, bicollateral, concentric and radial. (**1** hr)

Module – II (**6** hrs)

1. Primary structure of dicot and monocot root, dicot and monocot stem and leaf in dicot and monocot. (**6** hrs)

Module – III (**12** hrs)

1. Normal secondary thickening in dicot stem (*Vernonia*). (**10** hrs)
   a. Intra stelar thickening: formation of cambial ring, its structure, fusiform and ray initials, storied and non - storied cambium, activity of the cambium, formation and structure of secondary wood, secondary phloem and vascular rays.
   b Extra stelar thickening: formation, structure and activity of the phellogen, formation of periderm in stem and root; bark and lenticel.
   c Growth rings, ring and diffuse porous wood, sapwood and heart wood,

tyloses.d Normal secondary thickening in dicot root (*Tinospora*)

2 Anomalous secondary growth in *Boerhaavia*. (**2** hrs)

PRACTICAL (ANGIOSPERM ANATOMY)

1 Identity simple and complex tissues and determine the type of vascular bundles using microscope.

2 Make suitable micro preparations to study the anatomy of the following:

A Dicot stem: *Cephalandra Centella* (Primary); *Vernonia* (secondary).

b. Monocot stem: Bamboo

c. Dicot root: Tinospora (young –Primary; mature –Secondary)

d. Monocot root: *Colocasia*,

e. Anomalous secondary growth (*Boerhaavia*).

f. Dicot leaf: *Ixora* and Monocot leaf: grass.

REFERENCES: (ANGIOSPERM ANATOMY)

1. Cuttler, EG. 1969. Plant Anatomy - Part I Cells & Tissue. Edward Arnold Ltd., London.
2. Cuttler, E.G. 1971. Plant Anatomy, Part III Organs Edward Arnold Ltd., London.
3. Esau K. 1985. Plant Anatomy (2nd ed.) Wiley Eastern Ltd. New Delhi.
4. Pandey B.P. Plant Anatomy, S. Chand & Co. Delhi.
5. Vasishta P.C. 1974. Plant Anatomy, Pradeep Publication, Jalandhar.
6. Tayal M.S Plant Anatomy. Rastogi Publishers, Meerut.

MICROTECHNIQUE

Module – I (**9** hrs)

1. Microtechnique - Brief Introduction
2. Microscopy: simple, compound and electron microscope
3. Microtomy: Rotary type, serial sectioning, paraffin method, significance.
4. Killing and fixing: Killing and fixing agents and their composition (Farmer's fluid and FAA.)
3. Dehydration and clearing - reagents (mention only)
4. Stains – Saffranin and acetocarmine, preparation and use.

PRACTICAL (MICROTECHNIQUE)

1 Familiarise the structure and working of compound microscope (drawings not required)

2 Preparation of Safranin, FAA and Acetocarmine

REFERENCES (MICROTECHNIQUE)

1. Johansen, D.A. (1940) Plant Microtehnique. Mc Graw – Hill Book Company, Inc. New York.
2. Kanika, S. (2007) Manual of Microbiology – Tools and Techniques. Ane's student edition.
3. Khasim, S.K. (2002) Botanical Microtechnique; principles and Practice, Capital Publishing Company, New Delhi.
4. Toji, T. (2004) Essentials of Botanical Microtechnique. Apex Infotec Publ.

COMPLEMENTARY COURSE: 2
CRYPTOGAMS, GYMNOSPERMS AND PLANT PATHOLOGY

Semester	Course code	Credits	Hrs/wk
2	BOT2C02T	2	4

COURSE OUTCOMES (COs)

By the end of the course, students are expected to:

1. Analyze the role of the lower plants in the process of evolution.
2. Explain the ecological significance of lower plants.
3. Identify plant diseases and take remedial measures to control them.

CRYPTOGAMS & GYMNOSPERMS

Module – I : Virus, Bacteria, BGA (**9** hrs)

1. Virus: General account of viruses, including structure of TMV & Bacteriophage. (**2** hrs)
2. Bacteria: Classification based on shape of flagella, structure, nutrition (brief account), reproduction and economic importance - agriculture, industry and medicine. (**5** hrs)
3. Cyanobacteria: General Account structure, life - history and economic importance of *Nostoc*. (**2** hrs)

Module – II : Phycology, Mycology, Lichenology (**12** hrs)

1. Phycology: General characters, classification, evolutionary trends in algae. (**2** hrs)
2. Structure, reproduction, life history and economic importance of the following classes with suitable examples: (**4** hrs)
   a) Chlorophyceae (*Spirogyra*)
   b) Phaeophyceae (*Sargassum*)
   c) Rhodophyceae (*Polysiphonia*).
3. Mycology: General characters, classification (Alexopoulos, 1979) (brief mention only) and evolutionary trends, economic importance in fungi. (**2** hrs)
4. Important features of the following divisions (brief account only) (**1** hr)
   a) Mastigomycotina
   b) Zyomycotina
   c) Ascomycotina
   d) Basidiomycotina.
5. Structure and life history of *Puccinia* (developmental details not required) (**2** hrs)
6. Lichenology: General account and economic importance of Lichens with special reference to Usn*ea*. (**1** hrs)

Module – III : Bryology, Pteridology , Gymnosperms (**12** hrs)

1. Bryology: General account, morphology and life - history of *Riccia* (**4** hrs)
2. Pteridology: General account, morphology and life history of *Selaginella* (**4** hrs)
3. Gymnosperms: General account, morphology and life history of *Cycas* (**4** hrs)

PRACTICAL (CRYPTOGAMS & GYMNOSPERMS)

1. Make suitable micro preparations of vegetative and reproductive structures of *Sargassum, Puccinia, Riccia, Selaginella* and *Cycas*
2. Identify and draw labeled diagrams of all the types mentioned in the syllabus

REFERENCES (CRYPTOGAMS & GYMNOSPERMS)

1 Fritsch, F.E. (1935). The structure and reproduction of the algae. Vol. 1 and II, Uni. Press. Cambridge.
2 Papenfuss, G.F. (1955) Classification of Algae.
3 B.R. Vasishta. Introduction to Algae
4 Sanders, W.B. (2001) Lichen interface between mycology and plant morphology. Bioscience, 51: 1025-1035.
5 B.R. Vasishta. Introduction to Fungi.
6 P.C. Vasishta Introduction to Bryophytes.
7 B.P. Pandey Introduction to Pteridophytes
8 Chamberlain C.J., (1935) Gymnosperms – Structure and Evolution, Chicago University Press.
9 Vasishta P.C. (1980) Gymnosperms. S. Chand and Co., Ltd., New Delhi.

PLANT PATHOLOGY

Module – I (**3** hrs)

1. Plant Pathology: Study the following plant diseases with special reference to pathogens, symptoms, method of spreading and control measures.
   1) Leaf mosaic of Tapioca 2) Citrus canker 3) Blast of paddy.

PRACTICAL (PLANT PATHOLOGY)

1. Identify the diseases (mentioned in the theory syllabus) on the basis of symptoms and causal organisms. (Drawings can be replaced by photos pasted in the record).

REFERENCES: PLANT PATHOLOGY

1. Agros, G.N. (1997) Plant Pathology (4th ed) Academic Press.
2. Bilgrami K.H. & H.C. Dube. (1976) A textbook of Modern Plant Pathology. International Book Distributing Co. Lucknow.
3. Pandey, B.P. (1999) Plant Pathology. Pathogen and Plant diseases. Chand & Co. New Delhi.

COMPLEMENTARY COURSE : 3
MORPHOLOGY, SYSTEMATIC BOTANY, ECONOMIC BOTANY, PLANT BREEDING AND HORTICULTURE

Semester	Course code	Credits	Hrs/wk
3	BOT3C03T	2	5

COURSE OUTCOMES (COs)

By the end of the course, students are expected to:

1. Appreciate the diverse morphology of angiosperms.
2. Identify and classify plants based on taxonomic principles
3. Make scientific illustrations of vegetative and reproductive structures of plants
4. Identify the economically important plants
5. Understand the basic principles of plant breeding
6. Apply various horticultural practices in the field.

MORPHOLOGY

Module - I

1. Leaf – Structure, simple, compound, venation and phyllotaxy. (**2** hrs)
2. Inflorescence - racemose, cymose , special, types with examples (**3** hrs)
3. Flower - as a modified shoot- structure of flower - floral parts, their arrangement, relative position, cohesion and adhesion of stamens, symmetry of flowers, types of aestivation and placentation. (**3** hrs)

PRACTICAL (MORPHOLOGY)

1. Identify the types of inflorescence mentioned in the syllabus. All the types mentioned must be represented in the photo album. (All drawings in record are replaced by photo album submission).

REFERENCE (MORPHOLOGY)

1 Sporne, K.R. (1974) Morphology of Angiosperms. Hutchinson.

SYSTEMATIC BOTANY

Module- I

1. Introduction, scope and importance (**1** hrs)
2. Herbarium techniques: collection, drying, poisoning, mounting & labeling. Significance of herbaria and botanical gardens; important herbaria and botanical gardens in India. (**3** hrs)
3. Nomenclature - Binomial system of nomenclature, basic rules of nomenclature (validity, effectivity and priority), ICN for algae, fungi and plants. (**4** hrs)
4. Systems of classification - Artificial, Natural of Phylogenetic (Brief account only). Bentham & Hooker's system of classification in detail. (**4** hrs)
5. Modern trends in taxonomy - Chemotaxonomy, Numerical taxonomy and Cytotaxonomy (brief account only) (**4** hrs)

6. Study the following families: Malvaceae, Fabaceae (with sub-families) Rubiaceae, Apocynaceae, Euphorbiaceae and Poaceae. (1**2** hrs)

RACTICAL (SYSTEMATIC BOTANY)

1. Determine the systematic position of local plants comes under the syllabus based on their vegetative and floral characters
2. Students shall be able to describe the plants in technical terms and draw the L.S. of flower of two plants belong to each family and record the same.
3. Familiarization of herbarium techniques (Demonstration only).
4. Mounting of a properly dried and pressed specimen of any wild plant from any one of the families mentioned in the syllabus, with proper herbarium label (to be submitted in the record book).
5. Students shall submit original images of plants, at least one from each family mentioned in the syllabus duly certified by HoD, at time of examination. Web sourced and outsourced images should not be used. The images of plants should be properly identified and they should carry details like systematic position, GPS location, date, name and register no. of the student etc. Habitat, Habit, Inflorescence and single flower should be represented. The images can be submitted along with the photo album containing images of inflorescence mentioned under morphology. Individuality should be strictly maintained while preparing the photo album.

REFERENCES (SYSTEMATIC BOTANY)

1 Sivarajan, V.V. (1991) Introduction to Principles of Plant Taxonomy. Oxford & IBH, New Delhi.
2 Jeffrey, C. (1968) An introduction to Plant Taxonomy, Cambridge University Press, London.
3 Gurucharan Singh, (2019) Plant Systematics - An Integrated Approach, 4th edition. CRC Press. Florida.
4 Sharma O.P. (1990) Plant Taxonomy – Tata McGraw Hills. Publishing company Ltd.
5 Subramanyam N.S. (1999) Modern Plant Taxonomy. Vikas Publishing House Pvt Ltd.
6 Pandey & Misra. (2008) Taxonomy of Angiosperms. Ane books Pvt Ltd.

ECONOMIC BOTANY

Module –I (**4** hrs)

1 Brief account on the various categories of plants based on their economic importance

2. Study the following plants with special reference to their binomial, family, morphology of the useful part and their uses.
    1. Cereals: Paddy, Wheat
    2. Pulses: Black gram, Green gram
    3. Oil: Coconut, Gingelly
    4. Fibre: Cotton
    5. Latex: Rubber
    6. Beverages : Tea, Coffee
    7. Spices: Pepper, Cardamom, Clove
    8. Medicinal plants: *Rauvolfia serpentina, Justicia adhatoda, Santalum album* and

Curcuma longa.

PRACTICAL (ECONOMIC BOTANY)

1 Identify at sight the economically important plant produces and products mentioned in module III, and learn the binomial and family of the source plants, morphology of the useful parts and uses. (Drawing not required)

REFERENCES (ECONOMIC BOTANY)

1. Pandey B. P (1987) - Economic Botany
2. Verma V. (1984) - Economic Botany
3. Hill A.W (1981) - Economic Botany, McGraw Hill Pub

PLANT BREEDING

1. Objectives of plant breeding (**1** hr)

2. Methods of plant breeding: a) Plant introduction b) Selection - Mass, Pure line and clonal, b) Hybridization: intervarietal, interspecific and intergeneric hybridization. d) Mutation breeding e) polyploidy breeding and f) breeding for disease resistance. (**6** hrs)

PRACTICAL (PLANT BREEDING)

1 Demonstration of hybridization techniques.

REFERENCES (PLANT BREEDING)

1 Allard. R.W. (1960) Principles of Plant breeding, John Wiley & Sons, Inc, New York.
2 Singh, B.D. (2005) Plant Breeding - Principles & methods, Kalyani Publishers, New Delhi.
3 Chaudhari. H.K. Elementary Principles of Plant breeding, Publishers. Oxford & IBH

HORTICULTURE

1. Horticulture- introduction: definition, branches, significance (**1** hr)
2. Methods of plant propagation (**6** hrs)
   a. Seed propagation
   b. Vegetative propagation
      1. Cutting – stem, root, leaf
      2. Layering –air layering
      3. Grafting: Approach grafting, Tongue grafting
      4. Budding: Patch and T-budding

PRACTICAL (HORTICULTURE)

1 Demonstration of layering, grafting and budding

REFERENCES (HORTICULURE)

1. K. Manibhushan Rao. (2005). Text book of Horticulture, Macmillan India Ltd.
2. N. Kumar. (1996) Introduction to Horticulture – First Edition, Rajalakshmi Publication,

COMPLEMENTARY COURSE: 4
PLANT PHYSIOLOGY, ECOLOGY AND GENETICS

Semester	Course code	Credits	Hrs/wk
4	BOT4C04T	2	5

COURSE OUTCOMES (COs)

By the end of the course, students are expected to:

1. Explain the physiological processes in plants.
2. Understand the basic principles of heredity and variation.
3. Realize the importance of ecology.
4. Spread awareness of the necessity of conservation of biodiversity and natural resources
5. Solve problems related to classical genetics

PLANT PHYSIOLOGY

Module – I (1**6** hrs)

1. Structure of plant cell and cell organelles (Brief account only)
2. Water relations - Permeability, Imbibition, Diffusion, Osmosis and water potential
3. Absorption of water- Active and passive mechanisms
4. Ascent of sap -Root pressure theory, Transpiration pull or cohesion-tension theory.
5. Transpiration -Types, mechanism of stomatal movement: K^+ ion theory, significance of transpiration, antitranspirants.
6. Mineral nutrition- General account on Micro and macro nutrients. Methods of studying plant nutrition- solution culture-The essential elements - criteria of essentiality. function and deficiency symptoms of the following mineral nutrients: N, P, K, Mg, Fe, Zn, Mn

Module – II (1**0** hrs)

1. Photosynthesis: Introduction, significance, Two pigment systems, red drop, Emerson enhancement effect, action and absorption spectra, Mechanism of photosynthesis - Light reaction, cyclic & non-cyclic photo phosphorylation, Dark reactions–Calvin cycle, C_4 cycle, photorespiration (a brief account only). Factors affecting photosynthesis.

Module – III (**10** hrs)

1. Plant growth: Definition, phases of growth, natural plant hormones, synthetic auxins (Brief account only)
2. Senescence and abscission, Photo-periodism & vernalization.
3. Dormancy of seeds- Factors causing dormancy, photoblastin, techniques to break dormancy, physiology of fruit ripening.

PRACTICAL (PLANT PHYSIOLOGY)

Learn the principle and working of the following apparatus/experiments

1. Thistle funnel osmoscope
2. Ganong's potometer

3. Ganong's light-screen
4. Absorbo transpirometer .
5. Kuhne's fermentation vessel
6. Mohl's half-leaf experiment
7. Experiment to show evolution of O_2 during photosynthesis

REFERENCES (PLANT PHYSIOLOGY)

1 William G. Hopkins (1999). Introduction to Plant Physiology, 2nd edition, John Wiley & Sons, Inc.
2 Frank B. Salisbury and Cleon W. Ross (2002). Plant Physiology 3rd edition. CBS publishers and distributers.
3 G. Ray Noggle and George J.Fritz (1983) Introductory Plant Physiology Prentice Hall.
4 Goodwin Y.W. and Mercer E.I. (2003) Introduction to Plant Biochemistry. 2nd edition. CBS Publishers and distributors.

PLANT ECOLOGY

Module – I (**9** hrs)

1. Ecology-Definition, Ecosystem: ecological factors –biotic and abiotic.
2. Ecological adaptations: Morphological, anatomical and physiological adaptations of the following types: Hydrophyte (*Vallisnaria, Hydrilla*), Xerophyte (*Opuntia, Nerium*), Halophyte (*Avicennia*), Epiphytes (*Vanda*) and parasites. (*Cuscuta*).
3. Ecological succession –Process of succession, types of succession, Hydrosere.

PRACTICAL (PLANT ECOLOGY)

Study the morphological and anatomical adaptations of the hydrophytes, xerophytes, halophytes, epiphytes and parasites mentioned in the syllabus (drawing not required)

REFERENCES (PLANT ECOLOGY)

1 Ambasht R.S. 1988. A text book of Plant Ecology. Students Friends Co. Varanasi.
2 Dash M.C. 1993. Fundamentals of Ecology. Tata McGraw Hill Publishing Company Ltd. New Delhi.
3 Michael S. 1996. Ecology. Oxford University Press, London.
4 Sharma, P.D. 2008-2009. Ecology and Environment. Rastogi Publication.
5 Kumar H.D. 1977. Modern Concepts of Ecology. Vikas Publications. New Delhi.

GENETICS (**9** hrs)

1. Introduction and brief history of genetics
2. Mendel's experiments, symbolisation, terminology, heredity and variation;
3. Monohybrid cross, Dihybrid cross, Laws of Mendel, test cross and back cross.
4. Modified Mendelian ratios : Incomplete dominance in *Mirabilis jalapa.*
5. Gene interactions: Complementary genes -flower colour in *Lathyrus odoratus* (9:7 ratio), Epistasis - Fruit colour in *Cucurbita pepo* (12:3:1 ratio).

PRACTICAL (GENETICS)

1 Students are expected to work out problems related to Monohybrid, Dihybrid, Test cross,

Incomplete dominance and Modified Mendelian ratios and has to be recorded.

REFERENCES (GENETICS)

1. Sinnot, W.L.C. Dunn & J. Dobzhansky (1996) Principles of Genetics. Tata McGraw Hill Publishing Company Ltd., New Delhi.
2. Verma, P.S. & Agarwal (1999). Text book of Genetics. S. Chand & Co., New Delhi.
3 RastogiV.B. (2008), Fundamentals of Molecular Biology, Ane Books, India.
4 Gupta, P.K. Text Book of Genetics. Rastogi Publications, Meerut.

Procedure/ Process of Teaching

- Lecture
- Powerpoint presentations
- Videos
- Discussion
- Peer learning
- Assignments

Procedure/ Process of Assessment

- Seminars
- Quiz
- Tests

Monthly Academic Planner

Month: June

Class	Paper Code	Modules to be covered
III Sem	BOT3C03T	Module I Leaf - Inflorescence Flower / Morphology

Month: July

Class	Paper Code	Modules to be covered
III Sem	BOT3C03T	Systematic Botany Introduction Herbarium techniques Botanical gardens Systems of Classification

Month: August

Class	Paper Code	Modules to be covered
III Sem	BOT3C03T	Description of families Malvaceae, Fabaceae, Papilionideae, Mimosoideae, Caesalpinioideae, Rubiaceae, Apocynaceae
	Practicals	Hibiscus, Malvaceae - families above 2 from Each family
I Sem	BOT1C01T	Meristematic tissues Assarginment

Month: September

Class	Paper Code	Modules to be covered
III Sem	BOT3C03T	Families Euphorbiaceae, Poaceae
	Practicals	Families 2 from each family
I Sem	BOT1C01T	Simple Tissues - Parenchyma, Collenchyma, Sclerenchyma
		Complex Tissues - Xylem & Phloem
		Dicot Stem, Root, leaf
		Monocot Stem, Root, leaf

Month: October

Class	Paper Code	Modules to be covered
III Sem	BOT3C03T	Economic Botany. Nomenclature - ICN.
	Practicals	Economic Botany, Modern Trends in Taxonomy
I Sem	BOT1C01T	Sec. Thickening in Dicot Stem & Root Anomalous Sec. Thickening in Boerhaavia Secretory tissues, Microscope, Microtome.

Month: November

Class	Paper Code	Modules to be covered
III Sem	BOT3C03T	Plant Breeding
I Sem	BOT1C01T	Paraffin method
	Practicals	Microtomy, Primary Structure of Dicot Stem.

Month: December

Class	Paper Code	Modules to be covered
I Sem		Botany Practicals Dicot, Monocot, Secondary structure Stem, Root Anomalous Boerhaavia leaves
III Sem		Horticulture, Practicals & theory

Month: January

Class	Paper Code	Modules to be covered
II Sem		Introduction to Microbiology Virus - General account, TMV, Bacteriophage Bacteria - Classification, reproduction economic importance.
IV Sem		Plant Physiology - Structure of Plant Cell Photosynthesis Respiration

Month: February

Class	Paper Code	Modules to be covered
I Sem		Cyanobacteria,
IV Sem		water relations, Absorption of water Ascent of sap, Transpiration Ecology, Ecosystem. Plant growth growth hormones

Month: March

Class	Paper Code	Modules to be covered

Weekly Work Format

Month : June	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	2	5	5	5	5
2. Total number of contact hours as per time table	4	9	9	9	9
3. Total number of contact hour engaged	2	5	5	5	5
4. Total number of contact hours not engaged	-	-	-	-	-
5. Reason for not engaging	only	II DC	classes		

Signature of faculty Signature of Head of Dept. Signature of Principal

Month : July	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	4	5	5	5	
2. Total number of hours as per time table	8	9	9	9	
3. Total number of hour engaged	4	5	5	9	
4. Total number of hours not engaged	-	-	-	-	
5. Reason for not engaging	only	II DC	classes		

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Month : August	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	4	5	4	5	4
2. Total number of hours as per time table	8	9	8	9	8
3. Total number of hour engaged	8	9	6	7	5
4. Total number of hours not engaged	-	-	2 Practical	2	3 Exams
5. Reason for not engaging	-	-	-	-	-

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Month : September	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	0	4	4	4	
2. Total number of contact hours as per time table	-	8	8	8	
3. Total number of contact hour engaged	-	8	8	8	
4. Total number of contact hours not engaged	-	-	-	-	
5. Reason for not engaging	-	-	-	-	

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Month : October	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	4	5	3	5	2
2. Total number of hours as per time table	7	9	6	9	4
3. Total number of hour engaged	3	7	6	8	4
4. Total number of hours not engaged	4	2	-	1	-
5. Reason for not engaging	IDC Uty Exam	Adv Exam		Exam	

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Month : November	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	3	5	5	5	4
2. Total number of hours as per time table	6	9	9	9	8
3. Total number of hour engaged	6	9	2	-	-
4. Total number of hours not engaged	-	-	-	-	-
5. Reason for not engaging	-	-	I, II DC Internal	I, II DC Internal	CV Camp

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Month : December	Week 1	Week 2	Week 3	Week 4	Wee
1. No. of teaching days in the week		5	5	5	
2. Total number of contact hours as per time table		9	9	9	
3. Total number of contact hour engaged		9	9	4	
4. Total number of contact hours not engaged		-	-	Study holidays for IIPDC	
5. Reason for not engaging	X'mas	Celebrations			

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Month : January	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	3	5	5	3	3
2. Total number of hours as per time table	6	9	9	6	6
3. Total number of hour engaged	6	7	7	6	6
4. Total number of hours not engaged	-	2	2	-	-
5. Reason for not engaging		PTA meeting,	Sports Day	Hostal	

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Month : February	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	2	4	4	6	3
2. Total number of hours as per time table	4	8	8	11	6
3. Total number of hour engaged	4	6	8	9	6
4. Total number of hours not engaged	-	2	-	2	-
5. Reason for not engaging	World wetland day, fest, Confession, Holy mass			Verhamhal	

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Monthly Academic Planner

Month: June

Class	Paper Code	Modules to be covered
III Sem	BOT3C03T	Module 1 Leaf Inflorescence Flower Morphology

Month: July

Class	Paper Code	Modules to be covered
III Sem	BOT3C03T Practicals	Systematic Botany - Introduction Herbarium techniques Systems of Classification Family - Malvaceae, Papilionaceae, Rubiaceae, Mimosaceae, Caesalpiniaceae Hibiscus, Clitorea, Crotalaria, Acacia Caesalpinia, Cassia, Ixora, Hamelia
I Sem	BOT1C01T	Anatomy - Introduction Tissues - Meristematic Classification

Month: August

Class	Paper Code	Modules to be covered
I Sem	BOT1 CO1T	Permanent tissues - Simple tissues - parenchymas collenchyma Sclerenchyma complex tissues - xylem
III Sem	BOT3CO3T	Family - Apocynaceae, Nomenclature ICBN. Practicals - Allamanda Catheranthus

Month: September

Class	Paper Code	Modules to be covered
I Sem	BOT1 CO1T	Complex tissue - Phloem Dicot stem, Monocot stem Dicot Root, Monocot Root Dicot leaf, Monocot leaf Dicot stem Secondary thickening
III Sem	BOT3CO3T	Chemotaxonomy, Cytotaxonomy, Numerical taxonomy Seminar Preparation Practicals

Month: October

Class	Paper Code	Modules to be covered
ISem	BOT1C01	Anomalous Sec. Thickening in Boerhaavia, Microtechnique, Microscopy.
	BOT3C03	Family Poaceae, Economic Botany Plant Breeding, Introduction, Selection, Hybridisation.
		Practicals

Month: November

Class	Paper Code	Modules to be covered
ISem	BOT1C01	Microscopy, Microtomy Practicals
	BOT3C03	Breeding for disease resistance, ~~Cha~~ Polyploidy Breeding, Horticulture, Seed Propagation, Cutting, layering grafting
IK	Practical	Dicot stem, Root, Monocot stem, Root.

Month: December

Class	Paper Code	Modules to be covered
I DC	BOT1 C01	Practicals - Dicot stem Sec. thickening, Root Secondary Anomalous.
	BOT2 C02	Microbiology - introduction. Viruses.
II DC		Practicals - Poaceae.

Month: January

Class	Paper Code	Modules to be covered
I DC	BOT2 C02	Bacteria, Algae, Cyanophyceae Chlorophyceae, Rhodophyceae, Phaeophyceae.
II DC	BOT4 C04	Plant Physiology, Cell, Water relations, Transpiration

Weekly Work Format

Month : June	Week 1	Week 2	Week 3	Week 4	Week
1. No. of teaching days in the week	1	5	4	4	4
2. Total number of contact hours as per time table	1	9	8	8	8
3. Total number of contact hour engaged	1	5	4	4	4
4. Total number of contact hours not engaged	1	4	4	4	4
5. Reason for not engaging		IDC not yet come	Ramzan Holiday	IV Sem Uty Practical Exam	

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Month : July	Week 1	Week 2	Week 3	Week 4	Wee
1. No. of teaching days in the week	5	5	5	5	2
2. Total number of hours as per time table	9	9	9	9	4
3. Total number of hour engaged	—	85	95	9	4
4. Total number of hours not engaged	9	9	9	—	4
5. Reason for not engaging	Practical Exam	IV sem University		Exams	

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Month : August	Week 1	Week 2	Week 3	Week 4	W
1. No. of teaching days in the week	5	5	—	—	5
2. Total number of hours as per time table	9	9	—	—	9
3. Total number of hour engaged	8	—	—	—	—
4. Total number of hours not engaged	1	—	—	—	—
5. Reason for not engaging	—	Onam celebration	flood		

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Month : September	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	0	5	5	4	4
2. Total number of contact hours as per time table	-	9	9	8	8
3. Total number of contact hour engaged	-	-	7	5	3
4. Total number of contact hours not engaged	-	-	-	-	-
5. Reason for not engaging	flood	Cleaning	-	-	-

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Month : October	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week					
2. Total number of hours as per time table					
3. Total number of hour engaged					
4. Total number of hours not engaged					
5. Reason for not engaging					

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Month : November	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week					
2. Total number of hours as per time table					
3. Total number of hour engaged					
4. Total number of hours not engaged					
5. Reason for not engaging					

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Monthly Academic Planner

Moth: June

Class	Paper Code	Portions to be taught
IIDC	BOT3C03	Plant Morphology, leaf, Inflorescence, Flower, Classification.
	Practical	Riccia thallus, Selaginella stem & Rhizophore, Sargassum.

Moth: July

Class	Paper Code	Portions to be taught
IIDC	BOT3C03	Herbarium Techniques. Botanic Gardens, Malvaceae Family.
	Practical	Puccinia, Practical exam for 4th Sem students.
IDC	BOT1C01	Introduction to Anatomy.

Moth: August

Class	Paper Code	Portions to be taught
BDC	BOT3C03	Nomenclature - Binomial basic rules, ICBN. Systems of classification Tobaceae family with Subfamilies
IDC	BOT1C01	Meristematic tissues Simple tissues

Moth: September

Class	Paper Code	Portions to be taught
BDC	BOT3C03	Rubiaceae, Apocynaceae, Euphorbiaceae Poaceae, Economic importance of various categories of Plants
IDC	Practicals	Ixora, Hamelia, Vinca, Allamanda, Phyllanthus, Euphorbia, Pubscins
IDC	BOT1C01	complex tissues. Secretory tissues

Moth: October

Class	Paper Code	Portions to be taught
IIDC	BOT3 C03	Economic Botany Objective of Plant breeding Plant introduction, selection, Hybridization Breeding for disease resistance Horticulture. Seed propagation - Vegetative propagation
IDC	BOT1 C01	vascular bundles, Primary structure of Dicot and monocot stem, root, leaf. Normal secondary thickening in dicot stem and root

Moth: November

Class	Paper Code	Portions to be taught
IIDC	BOT3 C03	Modern trends in taxonomy Chemotaxonomy, Numerical taxonomy Cytotaxonomy, Mutation breeding polyploidy breeding
IDC	BOT1 C01	Anomalous secondary growth in Boerhaavia Microtechnique. Microscopy, Microtomy
IDC	Practical	Dicot stem, Root, Monocot Stem, Root

Moth: December

Class	Paper Code	Portions to be taught
IDC	Practical	Dicot Root and Stem Secondary growth Microtome. Leaf - Dicot & Monocot.
IDC	BOT2CO2	Microbiology - Viruses Classification
IDC	Practicals	Poaceae,
~~IDC~~	~~BOT4CO4~~	~~Root tissue Grading~~,

Moth: January

Class	Paper Code	Portions to be taught
IDC	BOT2CO2	Bacteria, Algae - different groups Chlorophyceae Cyanophyceae Rhodophyceae Phaeophyceae
IIDC	BOT4CO4	Plant Physiology, Cell, Water relations, Transpiration
"	Practicals	Physiology Experiments.

Moth: February

Class	Paper Code	Portions to be taught
IDC	BOT2C02	Fungi – Introduction, Features, Puccinia
IDC	BOT4C04	Respiration, Photosynthesis, Genetics, Ecology Introduction all the rest Physiology chapters. Genetics Problems.

Moth: March

Class	Paper Code	Portions to be taught
I		

Signature of Head of the Dept.

Weekly Work Format

Month : June	Week 1	Week 2	Week 3	Week 4	Wee
1. No. of teaching days in the week	2	5	5	5	
2. Total number of contact hours as per time table	4	9	9	9	
3. Total number of contact hour engaged	4-	2	2	9	
4. Total number of contact hours not engaged	4	7	7	-	
5. Reason for not engaging	University Examinations				

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Month : July	Week 1	Week 2	Week 3	Week 4	Week
1. No. of teaching days in the week	4	5	5	5	2
2. Total number of hours as per time table	8	9	9	9	4
3. Total number of hour engaged	4	5	5	7	2
4. Total number of hours not engaged	4	4	4	2	2
5. Reason for not engaging	Practical Examination, casual leave			CMV camp.	

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Month : August	Week 1	Week 2	Week 3	Week 4	Week
1. No. of teaching days in the week	2	4	1	4	3
2. Total number of hours as per time table	4	7	2	7	6
3. Total number of hour engaged	4	7	2	7	6
4. Total number of hours not engaged	-	-	-	-	-
5. Reason for not engaging	-	-	-	-	-

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Month : September	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	5	-	4	5	1
2. Total number of contact hours as per time table	9	-	8	9	1
3. Total number of contact hour engaged	9	-	8	9	1
4. Total number of contact hours not engaged	-	-	-	-	-
5. Reason for not engaging	-	-	-	-	-

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Month : October	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	3	3	6	5	4
2. Total number of hours as per time table	6	6	11	9	8
3. Total number of hour engaged	6	6	2	-	-
4. Total number of hours not engaged			9	9	8
5. Reason for not engaging			Refresher course at Calicut University		

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Month : November	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	2	5	5	5	6
2. Total number of hours as per time table	3	9	9	9	10
3. Total number of hour engaged	1	9	9	9	5
4. Total number of hours not engaged	2	-	-	2	5
5. Reason for not engaging		DDC OD	DL Study leave Attended seminar Paper valuation		

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Month : December	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	5	5	4	–	2
2. Total number of contact hours as per time table	9	9	8	–	4
3. Total number of contact hour engaged	9	9	8	–	4
4. Total number of contact hours not engaged	–	–	–	–	–
5. Reason for not engaging	–	–	–	–	-

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Month : January	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	2	5	5	5	5
2. Total number of hours as per time table	4	9	9	9	9
3. Total number of hour engaged	4	6	9	9	9
4. Total number of hours not engaged	–	3	–	–	–
5. Reason for not engaging	–	Sports day Hartal	-	–	-

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Month : February	Week 1	Week 2	Week 3	Week 4	Week 5
1. No. of teaching days in the week	1	5	4	4	5
2. Total number of hours as per time table	2	9	8	7	9
3. Total number of hour engaged	2	9	8	7	4
4. Total number of hours not engaged	–	–	–	–	CV
5. Reason for not engaging	–	–	–	–	Comp

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Department of Physics

Lesson Plan - B.Sc. Physics

PH1 B01: METHODOLOGY OF SCIENCE AND PHYSICS

Semester: 1
Course Number: I
Number of hours of Lectures per week: 2
Number of Credits: 2
Number of Contact Hours: 36
Course Evaluation: Internal – 20 Marks + External – 80 Marks

OBJECTIVES

- To get a general idea about what is science, what is scientific temper,history of science and scientific revolutions
- To Familiarize with the different steps involved in the scientific method with the help of a flow chart, explaining what is hypothesis and how they become scientific laws
- To get awareness of a brief history of physics, giving emphasis on the birth of quantum theory using black body radiation, photoelectric , X rays and DeBroglie waves and a general idea about theory of relativity
- To understand mathematical methods physicists often use, including differential Calculus,The operator ∇- Gradient, Divergence, Curl, integral calculus, matrices and curvilinear coordinates

Prerequisites: Background of the basic science at +2 level

COURSE OUTLINE

Part A: Methodology And Perspectives Of Sciences
Unit I – Science and Science Studies - Types of knowledge: Practical, Theoretical, and Scientific knowledge, Information. What is Science; what is not science; laws of science. Basis for scientific laws and factual truths. Science as a human activity, scientific temper, empiricism, vocabulary of science, science disciplines. Revolution in science and Technology.

Unit II – Methods and tools of science- Hypothesis: Theories and laws in science. Observations, Evidences and proofs. Posing a question; Formulation of hypothesis; Hypothetico-deductive model, Inductive model. Significance of verification (Proving), Corroboration and falsification (disproving), Auxiliary hypothesis, Ad-hoc hypothesis.
Revision of scientific theories and laws, Importance of models, Simulations and virtual testing, Mathematical methods vs. scientific methods. Significance of Peer Review.

Reference Books:

1. Gieryn, T F. Cultural Boundaries of Science., Univ. of Chicago Press, 1999
2. Collins H. and T Pinch., The Golem: What Everyone Should Know About Science., Cambridge Uni. Press, 1993
3. Hewitt, Paul G, Suzanne Lyons, John A. Suchocki & Jennifer Yeh, Conceptual Integrated Science. Addison-Wesley, 2007
4. Newton R G. The Truth of Science: New Delhi, 2nd edition
5. Bass, Joel E and et. al. Methods for Teaching Science as Inquiry, Allyn & Bacon, 2009

Part B: Methodology and Perspectives of Physics

What does Physics deal with? - brief history of Physics during the last century-the inconsistency between experiments and theories- Birth of new science concepts - Quantum concepts-Black body radiation, Photoelectric effect, X-rays, De Broglie waves,Relativity-Special relativity, Time dilation, Length contraction, Twin paradox Laser- Concepts of ordinary and monochromatic light, Coherent and incoherent light, Spontaneous and stimulated emission, Metastable state, pumping and population inversion Design of an experiment , experimentation , Observation, data collection: Interaction between Physics and technology.

References:

1. Concepts of Modern Physics- Arthur Beisser
2. A brief history and Philosophy of Physics - Alan J. Slavin- http:/ www.trentu. Ca/ academic / history- 895 .html
3. The inspiring History of Physics in the Last One Hundred Years : Retrospect and prospect Prof. Dr-Ing . Lu Yongxiang http :// www.twas .org.cn/twas/proLu.asp

Part C – Mathematical Methods in Physics

Vector Analysis: – Vector Operations - Vector Algebra – Component form – How vectors transform, Applications of vectors in Physics. Differential Calculus: – The operator - Gradient, Divergence, Curl – Physical interpretation - Product rules of - Second derivatives. Integral Calculus: – Line integral, surface integral and volume integral - Fundamental theorem of Gradients – Gauss's Divergence Theorem (Statement only)– The fundamental theorem of curl – Stoke's theorem(Statement only). Divergence less and curlless fields. Curvilinear co-ordinates: – Spherical polar coordinates – cylindrical coordinates(Basic ideas).

Matrices: – Basic ideas of matrices – addition, subtraction, scalar multiplication, Transpose of a matrix, conjugate of a matrix, diagonal matrix - Representation of vectors as column matrix – Determinants – Cramer's rule – EigenValues and EigenVectors - Hermitian Matrix,Unitary Matrix.

References:

1. Introduction to Electrodynamics – David J . Griffiths, Prentice Hall India Pvt. Ltd., Chapter – 1
2. Mathematical Physics - Satya Prakash, Sultan Chand &Sons, New Delhi
3. Mathematical Physics – BD Guptha
4. Mechanics-J.C .Upadhyaya

COURSE OUTCOMES

CO1	Understand and apply the methodology and perspectives of science
CO2	Understand and apply the methodology and perspectives of science
CO3	Understand and apply the mathematical method in Physics

LESSON PLAN

Unit/ session/ hours (timerequired)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
UNIT I (10 Hours)	What is Science; what is not science; laws of science. Basis for scientific laws and factual truths. Science as a human activity, scientific temper Formulation of hypothesis; Hypothetico-deductive model, Inductive model. Significance of verification (Proving), Corroboration and falsification (disproving), Auxiliary hypothesis, Ad-hoc hypothesis	Lecture Numerical problem solving	Discussion Assignment	Understanding basic methodology of science	Class participation , test papers
UNIT II (9 Hours)	brief history of Physics during the last century- Birth	Lecture Numerical problem	Assignment seminar\presentation	Understanding the methodolo	Class participation Quiz

	of new science concepts - Quantum concepts-Black body radiation, Photoelectric effect, Laser- Concepts of ordinary and monochromatic light, Coherent and incoherent light, Spontaneous and stimulated emission,	solving discussion		gy of physics	Test papers
UNIT III (17 Hours)	Vector Analysis:Differential Calculus, Integral Calculus, Curvilinear co-ordinates, Matrices	Lecture and discussion Numerical problem solving	Assignment Seminar	Understadi ng the mathemati cal methods in physics	Test papersAssign ment class participation

Faculty In-charge
Dr.Nijo Varghese & Dr. Salini Jose

PH2 B02: PROPERTIES OF MATTER, WAVES & ACOUSTICS

Semester: 2
Course Number: II
Number of hours of Lectures per week: 2
Number of Credits: 2
Number of Contact Hours: 36
Course Evaluation: Internal – 20 Marks + External – 80 Marks

OBJECTIVES

- To Learn the basics of properties of matter, how Young's modulus and rigidity modulus are defines and how they are evaluated for different shapes of practical relevance
- To Learn the fundamentals of harmonic oscillator model, including damped and forced oscillators and grasp the significance of terms like quality factor and damping coefficient
- To Study the general equation of wave motion in general and TM waves in stretched strings and longitudinal waves in gases

- To get Familiarise with general terms in acoustics like intensity, loudness, reverberation etc, and study in detail about production, detection, properties and uses of ultrasonic waves.

Prerequisites: Background of the basic science at +2 level

COURSE OUTLINE

Unit-1: Properties of Matter

Elasticity: Basic ideas, Work Done per Unit Volume, Relations between elastic constants, Poisson's Ratio, Limiting Values of Poisson's Ratio, Twisting Couple on a Cylinder (or a Wire), Torsion pendulum, Determination of Rigidity Modulus, Bending of Beams, Bending Moment, Cantilever Loaded at Free End, Depression of a Beam Supported at the Ends and Loaded at the Centre (weight of the beam neglected), Determination of Y by Bending of a Beam, I form of Girders.

Unit-2 Harmonic Oscillator

Periodic Motion, Simple Harmonic Motion and Harmonic Oscillator, Energy of a Harmonic Oscillator, Examples of Harmonic Oscillator, Anharmonic Oscillator, Composition of Two Simple Harmonic Motions of Equal Periods in a Straight Line, Composition of Two Rectangular Simple Harmonic Motions of Equal Periods: Lissajous Figures, Damping Force, Damped Harmonic Oscillator, Examples of Damped Harmonic Oscillator, Power Dissipation, Quality Factor, Forced Harmonic Oscillator

Unit-3 Waves

Wave Motion, General Equation of Wave Motion, Plane Progressive Harmonic Wave, Energy Density for a Plane Progressive Wave, Intensity of a Wave, Transverse Waves in Stretched Strings, Modes of Transverse Vibrations of Strings, Longitudinal Waves in Rods and Gases, Fourier's Theorem, Wave Velocity and Group Velocity

Unit-4 Acoustics

Intensity of Sound- Decibel and Bel, Loudness of Sound, Noise Pollution, Ultrasonics: Production of Ultrasonic Waves- Piezo Electric Crystal Method, Determination of Velocity of Ultrasonic Waves in a Liquid - Acoustic Grating , Application of Ultrasonic Waves, Reverberation, Sabine's Formula (Derivation not required), Absorption Coefficient, Acoustics of Buildings

Text books for Study

1. Elements of Properties of Matter by D.S. Mathur 2008

2. Mechanics by J.C Upadhyaya 2003
3. Properties of Matter and Acoustics by R.Murugeshan & Kiruthiga Sivaprasath 2005

Reference

1. Mechanics -- D.S. Mathur
2. Text book of Sound –Brij Lal& Subramaniam
3. Text book of Sound –Khanna .D.R. & Bedi.R.S.
4. Berkeley Physics course Vol 3 on Waves
5. Elements of Mechanics – K Rama Reddy, S Raghavan & D V N Sarma- Universities Press
6. Introduction to Mechanics – Mahendra K Verma – Universities Press

COURSE OUTCOMES

CO1	Understand the properties of matter
CO2	Understand and apply the Harmonic oscillator
CO3	Understand the concept of waves
CO4	Understand and apply the concept of acoustics

LESSON PLAN

Unit/ session/ hours (timerequired)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
UNIT I (9 Hours)	Elasticity:Poisson's Ratio,Torsion pendulum, Bending of Beams, Bending Moment, Cantilever Loaded at Free End, Depression of a Beam Supported at the Ends and Loaded at the Centre	Lecture Numerical problem solving	Discussion Assignment	Understanding basic properties of matter	Class participation , test papers
UNIT II	Periodic Motion,	Lecture	Assignment	Understan	Class

(14 Hours)	Simple Harmonic Motion and Harmonic Oscillator, Energy of a Harmonic Oscillator, Examples of Harmonic Oscillator, Anharmonic Oscillator, Composition of Two Simple Harmonic Motions of Equal Periods in a Straight Line,	Numerical problem solving discussion	seminar\presentation	ding the harmonic oscillator	participation Quiz Test papers
UNIT III (8 Hours)	Wave Motion, General Equation of Wave Motion, Plane Progressive Harmonic Wave, Energy Density for a Plane Progressive Wave, Intensity of a Wave, Transverse Waves in Stretched Strings,	Lecture and discussion Numerical problem solving	Assignment Seminar	Understanding the concept of waves	Test papers Assignment class participation
UNIT IV (5 Hours)	Intensity of Sound-Decibel and Bel, Loudness of Sound, Noise Pollution, Ultrasonics: Production of Ultrasonic Waves-Piezo Electric Crystal Method,	Lecture and discussion Numerical problem solving	Assignment Seminar	Understanding the concept of Acoustics	Test papers Assignment class participation

Faculty In-charge
Dr.Nijo Varghese & Dr. Salini Jose

PH3 B03: MECHANICS

Semester: 3
Course Number: III
Number of hours of Lectures per week: 3
Number of Credits: 4
Number of Contact Hours: 54
Course Evaluation: Internal – 20 Marks + External – 80 Marks

OBJECTIVES

- To Understand the motion of objects in different frame of references
- To Understand laws of motion, reference frames, and its applications i.e. projectile motion, simple harmonic oscillator, Rocket motion, elastic and inelastic collisions.
- To Understand the idea of conservation of angular momentum, central forces and the effective potential
- To Develop understanding of special theory of relativity and its applications

Prerequisites: Background of the basic science at +2 level

COURSE OUTLINE

UNIT-1

1. Frames of reference - Laws of Mechanics, Inertial frames of reference, Galilean transformation equations, Hypothesis of Galilean invariance, Conservation of Momentum, Non inertial frames and fictitious forces, Rotating frames of reference, Centrifugal force and Coriolis force, Foucault's pendulum

2. Conservation of Energy
Conservation laws, Conservative forces, Conservation of energy for a particle: Energy function, Potential energy curve, Non conservative forces

3. Linear and Angular Momentum
Conservation of linear momentum, Centre of mass, ,Centre of mass frame of reference, Collision of two particles ,Deflection of a moving particle by a particle at rest, Rockets, Angular momentum and torque, Motion under central force, Areal velocity, Conservation of angular momentum with examples

4. Potentials and Fields
Central force, Inverse square law force, Potential energy of a system of masses, Gravitational field and potential, Escape velocity, Keplar's laws, Newton's deductions from Keplar's laws

UNIT-2

5 Lagrangian formulations of Classical Mechanics

Constraints, Generalized co-ordinates, Principle of virtual work, D'Alembert's principle, Lagrange's equations, Kinetic energy in generalized co-ordinates, Generalized momentum, Cyclic co-ordinates, Conservation laws and symmetry properties-Hamiltonian of a system

UNIT-3

6. Special Theory of Relativity

Electromagnetism and Galilean transformation, Michelson Morley experiment, Ether hypothesis, Postulates of Special Theory of Relativity, Lorentz transformation equations, Velocity transformation, Length contraction, Time dilation, Simultaneity, Mass in relativity, Mass and energy ,Space time diagram, Geometrical interpretation of Lorentz transformation, Principle of covariance, Four-vectors in Mechanics

Text books for study

1. Mechanics by J C Upadhyaya 2003 edition
2. Classical Mechanics by Takwale and Puranik
3. Classical Mechanics by Hans and Puri
4. Classical Mechanics by J C Upadhyaya

References

1. Mechanics by D.S.Mathur
2. Classical Mechanics by Goldstein
3. Berkeley Physics course Vol 1
4. Feynman Lectures on Physics Vol 1
5. Elements of Mechanics – K Rama Reddy, S Raghavan & D V N Sarma- Universities Press
6. Introduction to Mechanics – Mahendra K Verma – Universities Press
7. Classical Mechanics-Aruldhas

COURSE OUTCOMES

CO1	Understand and apply the basic concepts of Newtonian Mechanics to Physical Systems
CO2	Understand and apply the basic idea of Classical Mechanics

CO3	Understand and apply the special theory of relativity

LESSON PLAN

Unit/ session/ hours (timerequired)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
UNIT I (32 Hours)	1. Frames of reference 2. Conservation of Energy 3. Linear and Angular Momentum 4. Potentials and Fields	Lecture Numerical problem solving	Discussion Assignment	Understanding basic laws of nature , observing the systems of physics	Class participation , test papers
UNIT II (9 Hours)	Central force, Inverse square law force, Potential energy of a system of masses, Gravitational field and potential	Lecture Numerical problem solving discussion	Assignment seminar\presentation	Understanding the concepts of classical Mechanics	Class participation Quiz Test papers
UNIT III (13 Hours)	Electromagnetism and Galilean transformation, Michelson Morley experiment, Ether hypothesis, Postulates of Special Theory of Relativity, Lorentz transformation equations, Velocity transformation, Length contraction, Time dilation,	Lecture and discussion Numerical problem solving	Assignment Seminar	Understanding the concept of special theory of relativity	Test papers Assignment class participation

Faculty In-charge
Dr.Nijo Varghese & Fency K F

PH4 B04: ELECTRODYNAMICS – I

Semester: 4
Course Number: IV
Number of hours of Lectures per week: 3
Number of Credits: 4
Number of Contact Hours: 54
Course Evaluation: Internal – 20 Marks + External – 80 Marks

OBJECTIVES

- To Understand and analyze the electrostatic properties of physical systems
- To Understand the special techniques for calculating potentials
- To Understand the mechanism of electric field in matter.
- To Understand the mechanism of magnetic field in matter.

Prerequisites: Background of the basic science at +2 level

Unit 1 – Electrostatics

Electrostatic field – Coulomb's law, Electric field, Continuous charge distributions - Divergence and curl of electrostatic field, Field lines and Gauss's law, The divergence of E, Applications of Gauss law, Curl of E – Electric potential – Comments on potential, Poisson's equation and Laplace's equation, The potential of a localized charge distribution, Electrostatic boundary conditions – Work and energy in electrostatics, The work done in moving a charge, The energy of point charge distribution, The Energy of a continuous charge distribution, Comments on Electrostatic energy – Conductors, Basic properties of conductors, Induced charges, The Surface charge on a conductor, The force on surface charge, Capacitors.

UNIT 2 - Special Techniques for Calculating Potentials

Laplace's equation in One Dimension, Two Dimensions and Three Dimensions, Uniqueness theorems - Method of images, The classic image problem, induced surface charge, force and energy.

Unit 3 – Electric fields in matter

Polarization – Dielectrics, Induced dipoles, Alignment of polar molecules, Polarization – The field of a polarized object , Bound charges, Physical interpretation of bound charges, The field inside a dielectric – The electric displacement – Gauss's law in presence of dielectrics, Boundary conditions for D – Linear dielectrics, Susceptibility, Permittivity, Dielectric constant,

Boundary value problems with linear dielectrics, Energy in dielectric systems, Forces on dielectrics.

Unit 4 – Magnetostatics

The Lorentz force law – Magnetic fields, Magnetic forces, cyclotron motion, cycloid motion, Currents, Linear, Surface and Volume current density – Biot -Savart law, The magnetic field of steady current – Divergence and curl of B, Straight line currents, Applications of Ampere's law, Magnetic field of a toroidal coil, Comparison of magnetostatics and electrostatics – Magnetic vector potential , Vector potential, Magnetostatic boundary conditions.

Unit 5 – Magnetostatic fields in matter

Magnetization – Diamagnets, Paramagnets and Ferromagnets, Torques and forces on magnetic dipoles, Effect of a magnetic field on atomic orbits, Magnetization – Field of a magnetised object, Bound Currents, Physical interpretation of bound currents, Magnetic field inside matter – Auxiliary field H, Ampere's law in magnetized materials, Boundary conditions – Linear and nonlinear media, Magnetic susceptibility and permeability, Ferromagnetism.

Textbook for study

Introduction to Electrodynamics by David J Griffiths, 3rd Ed.

References

1. Electricity and magnetism by Arthur F Kip
2. Physics Vol. II by Resnick and Halliday
3. Electricity and Magnetism- Berkley series
4. Electricity and Magnetism-Hugh D Young and Roger A Freedman

COURSE OUTCOMES

CO1	Understand and analyze the electrostatic properties of physical systems
CO2	Understand the special techniques for calculating potentials
CO3	Understand the mechanism of electric field

	matter.
CO4	Understand and analyze the magnetic properties of physical systems
CO5	Understand the mechanism of magnetic field in matter.

LESSON PLAN

Unit/ session/ hours (timerequired)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
UNIT I (20 Hours)	Coulomb's law, Gauss's law, Applications of Gauss law, Electric potential, Work and energy in electrostatics, Conductors, Capacitors	Lecture Numerical problem solving	Discussion Assignment	Understanding basic concepts of Electrostatics	Class participation , test papers
UNIT II (6 Hours)	Laplace's equation in One Dimension, Two Dimensions and Three Dimensions, Uniqueness theorems - Method of images, The classic image problem,	Lecture Numerical problem solving discussion	Assignment seminar\presentation	Understanding the Special Techniques for Calculating Potentials	Class participation Quiz Test papers
UNIT III (8 Hours)	Polarization, The electric displacement, Gauss's law in presence of dielectrics, Linear dielectrics, Susceptibility, Permittivity, Energy	Lecture Numerical problem solving	Discussion Assignment	Understanding electric field in matter	Class participation , test papers

	in dielectric systems, Forces on dielectrics				
UNIT IV (12 Hours)	The Lorentz force law, Biot -Savart law, Applications of Ampere's law, Comparison of magnetostatics and electrostatics, Magnetostatic boundary conditions.	Lecture Numerical problem solving discussio n	Assignme nt seminar\p resentatio n	Understandin g the concepts of Magnetostati cs	Class participation Quiz Test papers
UNIT V (8 Hours)	Magnetization – Diamagnets, Paramagnets and Ferromagnets, Bound Currents, Boundary conditions – Linear and nonlinear media, Magnetic susceptibility and permeability, Ferromagnetism	Lecture Numerical problem solving	Discussio n Assignme nt	Understandin g basic concepts of magnetic field	Class participation , test papers

Faculty In-charge
Dr.Nijo Varghese & Fency K F

PH4B05 Practical-I (Credit 5)

Semester: 1,2,3 &4
Course Number: XIV
Number of hours of Lectures per week: 4
Number of Credits: 5
Number of Contact Hours:72
Course Evaluation: Internal – 30 Marks + External – 120 Marks

Objectives

- To Apply and illustrate the principles of semiconductor diode and transistor through experiments
- To Apply and illustrate the principles of transistor amplifier and oscillator through experiment
- To Apply and illustrate the principles of digital electronics through experiments
- To Analyze and apply computational techniques in Python programming

Prerequisites: Background of the basic practical knowledge at +2 level

Course Outline

1st, 2nd , 3rd & 4th SEMESTER EXPTS
(Any Ten from Each Part)

Part A

1. Young's modulus-non uniform bending-using pin and microscope-(load-extension graph).
2. Young's modulus-Uniform bending-using optic lever
3. Young's modulus-Angle between the tangents
4. Surface Tension-capillary rise method-radius by vernier microscope
5. Viscosity-Poiseuille's method –(Variable Pressure head, radius by mercury pellet method, sensibility method to find mass)
6. Moment of inertia-Flywheel
7. Moment of Inertia-Torsion Pendulum
8. Rigidity modulus-static torsion
9. Compound pendulum-acceleration due to gravity, Radius of gyration
10. Liquid lens-Refractive index of liquid and glass
11. Spectrometer-solid prism-Refractive index of glass measuring angle of minimum deviation.
12. Spectrometer-solid prism- Dispersive power

Part B

13. Deflection magnetometer-Tan A, Tan B positions
14. Deflection magnetometer -Tan C Position-moment of moments
15. Searle's vibration magnetometer-moment & ratio of moments
16. Box type vibration magnetometer-m & Bh
17. Melde's string arrangement-Frequency, relative density of liquid and solid (both modes)
18. Ballistic galvanometer-figure of merit
19. Potentiometer-measurement of resistance
20. Potentiometer-calibration of ammeter
21. Ballistic Galvanometer- BG constant using HMS-then find Bh.
22. B.G.-Comparison of capacities Desauty's method.
23. Spectrometer- i-d curve
24. Verification of Thevenin's theorem.

Books of Study:

1. Electronics lab manual- K A Navas (vol 1 &2)
2. B.Sc Practical Physics- C L Arora
3. Practical Physics- S L Gupta & V Kumar

Reference Books:

1. Advanced Practical Physics for students – B L Worksnop and H T Flint

COURSE OUTCOMES

CO1	Apply and illustrate the concepts of properties of matter through experiments
CO2	Apply and illustrate the concepts of electricity and magnetism through experiments
CO3	Apply and illustrate the concepts of optics through experiments
CO4	Apply and illustrate the principles of electronics through experiments

LESSON PLAN

Experiments to be done (input)	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Part A 1. Young's modulus-non uniform bending-using pin and microscope-(load-extension graph). 2. Young's modulus-Uniform bending-using optic lever 3. Young's modulus-Angle between the tangents 4. Surface Tension-capillary rise	● Demonstrations ●ComparativeStudy	● Assignment ● Seminars	Getting practical knowledge about Physics Experiments	● Practical exams ● Assignment

method-radius by vernier microscope 5. Viscosity-Poiseuille's method –(Variable Pressure head, radius by mercury pellet method, sensibility method to find mass) 6. Moment of inertia-Flywheel 7. Moment of Inertia-Torsion Pendulum 8. Rigidity modulus-static torsion 9. Compound pendulum-acceleration due to gravity, Radius of gyration 10. Liquid lens-Refractive index of liquid and glass 11. Spectrometer-solid prism-Refractive index of glass measuring angle of minimum deviation. 12. Spectrometer-solid prism- Dispersive power **Part B** 13. Deflection magnetometer-Tan A, Tan B positions 14. Deflection magnetometer -Tan C				

Position-moment of moments 15. Searle's vibration magnetometer-moment & ratio of moments 16. Box type vibration magnetometer-m & Bh 17. Melde's string arrangement-Frequency, relative density of liquid and solid (both modes) 18. Potentiometer-measurement of resistance 19. Potentiometer-calibration of ammeter 20. B.G.-Comparison of capacities Desauty's method. 21. Spectrometer- i-d curve 22. Verification of Thevenin's theorem.				

Faculty In-charge
Dr.Nijo Varghese & Fency K F

PH5 B06: ELECTRODYNAMICS-II

Semester: 5
Course Number: VI
Number of hours of Lectures per week: 3
Number of Credits: 3
Number of Contact Hours: 54
Course Evaluation: Internal – 20 Marks + External – 80 Marks

OBJECTIVES

- To enable to solve a variety of problems related to Faraday's law of induction and Maxwell's equations.
- To understand the relevance of displacement current in the context of electromagnetic wave propagation.
- To study in depth the transient current response of CR, LC, CR and LCR circuits, which is essential in designing as well as understanding the working of electronic circuits.
- To solve complex problems involving linear electrical networks employing the symmetry concepts together with various network theorems .

Prerequisites: Background of the basic science at +2 level

COURSE OUTLINE

Unit 1 – Electrodynamics

Electromotive force – Ohm's law, electromotive force, motional emf – Electromagnetic induction - Faraday's law, induced electric field, inductance, energy in magnetic fields – Maxwell's equations – Electrodynamics before Maxwell, Maxwell's modification of Ampere's law, Maxwell's equations, Magnetic charge, Maxwell's equations inside matter, Boundary conditions – Continuity equation – Poynting's theorem

Unit 2 – Electromagnetic waves

Waves in one dimension, The wave equation, sinusoidal waves, boundary conditions :reflection and transmission, Polarization – Electromagnetic waves in vacuum , Wave equation for E and B, monochromatic plane waves in vacuum, energy and momentum ofE.M. waves, Poynting vector - Electromagnetic waves in matter, Propagation through linear media, reflection and transmission at normal incidence.Potential formulation – Scalar and vector potentials, Gauge transformations, Coulomb gauge and Lorentz gauge.

Unit 3 – Transient currents

Types of transients – DC transient currents in R-L circuits – Short circuit current – Time constant – DC transient currents in R-C circuits – Double energy transients – Theory of BG

Unit 4 – AC circuits

A resonant circuit – Alternating current – Alternating current networks – Admittance and impedance – Power and energy in AC circuits

Unit 5 – Network theorems

Kirchhoff's laws, Voltage sign and current direction, Solution of simultaneous equations using determinants, Source conversion, Superposition theorem, Ideal equivalent circuits,Thevenin's theorem, Reciprocity theorem, Delta / Star transformation – Star / Delta transformation – Norton's theorem, Maximum power transfer theorem.

Textbooks for study

1. Introduction to Electrodynamics by David J Griffiths, 3rd ed.
2. Electricity and Magnetism by R.Murugeshan (Third revised edition)
3. Electrical technology by Theraja

References

1. Electricity and magnetism by Arthur F Kip
2. Physics Vol. II by Resnick and Halliday
3. Electricity and Magnetism by D.N Vasudeva (Twelfth revised edition)
4. Introductory AC Circuit theory – K Mann & G J Russell- Universities Press
5. Electrical Circuit analysis –K Sureshkumar,NIT

COURSE OUTCOMES

CO1	Understand the basic concepts of electrodynamics
CO2	Understand and analyze the properties of electromagnetic waves
CO3	Understand the behavior of transient currents
CO4	Understand the basic aspects of ac circuits
CO5	Understand and apply electrical network theorems

LESSON PLAN

Unit/ session/ hours (timerequired)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
UNIT I (15 Hours)	Electromotive force – Ohm's law, Electromagnetic induction, Maxwell's equations, Boundary conditions – Continuity equation – Poynting's theorem	● Lecture ● Demonstrations	● Assignment ● Discussion ● Simplifications	To acquire knowledge about emf, Ohm's law, poynting theorem	Class test Questioning
UNIT II (15 Hours)	Waves in one dimension, The wave equation, Polarization, Wave equation for E and B, energy and momentum ofE.M. waves, Electromagnetic waves in matter, Potential formulation, Gauge transformations	● Lecture ● Demonstrations	● Assignment ● Discussion ● Simplifications	To learn about waves	Class test Questioning
UNIT III (8 Hours)	Types of transients, DC transient currents in R-L circuits, Time constant, DC transient currents in R-C circuits, Theory of BG	● Lecture ● Demonstrations	● Assignment ● Discussion ● Simplifications	To know more about transient currents	Class test Questioning
UNIT IV (8 Hours)	A resonant circuit, Alternating current, Alternating current networks, Admittance and	● Lecture ● Demonstrations	● Assignment ● Discussion ● Simplific	To acquire knowledge about AC, Power and energy	Class test Questioning

	Impedance, Power and energy in AC circuits		ations		
UNIT V (8 Hours)	Kirchhoff's laws, Thevenin's theorem, Reciprocity theorem, Delta / Star transformation, Star / Delta transformation, Norton's theorem, Maximum power transfer theorem	● Lecture ● Demonstrations	● Assignment ● Discussion ● Simplifications	● To acquire knowledge about Kirchhoff's Laws, norton's , maximum power transfer theorem etc	● Class test ● Questioning

Faculty In-charge
Dr.Nijo Varghese

PH5 B07: QUANTUM MECHANICS

Semester: 5
Course Number: VII
Number of hours of Lectures per week: 3
Number of Credits: 3
Number of Contact Hours: 54
Course Evaluation: Internal – 20 Marks + External – 80 Marks

OBJECTIVES

- To become familiar with Blackbody radiation, Ultraviolet catastrophe,PhotoElectric effect and Compton Effect
- To gain a clear knowledge about wave properties of particles,De Broglie waves and its implications on the uncertainty principle.
- To Study the Bohr Atom model in detail and understand about atomic excitations
- To grasp the idea of Wave Mechanics and gain the concept of eigen values, eigen functions and learn the basic postulates of quantum mechanics
- To find solution to Schrödinger's equation for many systems such as particle in a box, Hydrogen Atom and familiarize with different quantum numbers.

Prerequisites: Background of the basic science at +2 level

COURSE OUTLINE

UNIT 1

1. Particle Properties of Waves

Electromagnetic waves, black body radiation, ultraviolet catastrophe, Photoelectric effect, nature of light, wave particle duality, Compton Effect & its demonstration. Pair production, photons & gravity.

2. Wave Properties Of Particles

De Broglie waves, waves of probability, phase velocity & group velocity, particle diffraction, Davisson And Germer experiment, Electron Microscope, Uncertainty principle I, Uncertainty principle II, Applying the uncertainty principle, Energy & time uncertainty.

3. Atomic Structure

The Bohr atom-energy levels and spectra, correspondence principle, nuclear motion, atomic excitation, Frank-Hertz experiment

UNIT 2

4. Wave Mechanics

Classical mechanics is an approximation of quantum mechanics, wave function, Schrodinger equation-time dependant form, linearity & super position, expectation values, operators, Schrodinger equation-steady state form, eigen values & eigen functions, postulates of quantum mechanics, particle in a box, finite potential well, tunnel effect scanning tunneling microscope, harmonic oscillator wave function, energy levels, zero point energy.

5. Hydrogen Atom

Schrodinger equation for the hydrogen atom, separation of variables, quantum numbers, principal quantum number, orbital quantum number, magnetic quantum number, electron probability density, radiative transitions, selection rules, Zeeman effect, electron spin, exclusion principle, Stern-Gerlach experiment.

Textbooks for study

Concepts of Modern Physics 6th Edition-By Arthur Beiser

References

1. Modern Physics(II Edn.)-Kenneth Krane
2. Quantum Physics Of Atom, Molecules, Solids, Nuclei & Particles By R.Eisberg & R. Resnick (John Wiley)
3. Quantum Mechanics By G. Aruldhas

4. Berkeley Physics Course: Quantum Physics By Wichmann
5. University Physics – Zemansky
6. Quantum Mechanics – Trilochan Pradhan – Universities Press
7. Advanced Physics Second Edition – Keith Gibbs – Cambridge University Press
8. Introduction to Vector spaces in Physics - K A I L Wijewardena Gamalath – Foundation Books
9. Quatum Mechanics –Iswarsingh Thyagi
10. Feynman Lectures

COURSE OUTCOMES

CO1	Understand the particle properties of electromagnetic radiation
CO2	Describe Rutherford – Bohr model of the atom
CO3	Understand the wavelike properties of particles
CO4	Understand and apply the Schrödinger equation to simple physical systems
CO5	Apply the principles of wave mechanics to the Hydrogen atom

LESSON PLAN

Unit/ session/ hours (timerequired)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
UNIT I (24 Hours)	1. Particle like Properties of Electromagnetic Radiation - Review of electromagnetic waves , Photoelectric effect, Blackbody radiation, Compton effect, Other photon processes	● Lecture ● Demonstrations	● Assignment ● Discussion ● Simplifications	● To understand particle like properties of em radiation ● To understand wave like properties of	● Class test ● Questioning

	2. Wavelike Properties of Particles- De Broglie hypothesis, Uncertainty relationships for classical waves, Heisenberg uncertainty relationships 3. Rutherford-Bohr Model of the Atom - Basic properties of atoms, Thomson model, Rutherford nuclear atom, Line spectra, Bohr Model, Frank-Hertz experiment, Correspondence principle			particles To learn Atom model and its properties	
UNIT II (16 Hours)	4. The Schrodinger Equation -The Schrodinger recipe, Probabilities and Normalization, Applications, Free particle, Particle in a box 5. Hydrogen Atom in Wave Mechanics -Schrodinger equation in spherical coordinates, Radial probability densities,Zeeman effect	● Lecture ● Demonstrations	● Assignment ● Discussion ● Simplifications	To understand Schrodinger equation, Hydrogen atom	Class test Questioning

Faculty In-charge
Dr.Nijo Varghese & Dr. Salini Jose

PH5 B08: PHYSICAL OPTICS AND MODERN OPTICS

Semester: 5
Course Number:VIII
Number of hours of Lectures per week: 3
Number of Credits: 3
Number of Contact Hours: 56

Course Evaluation: Internal – 20 Marks + External – 80 Marks

OBJECTIVES

1. To give the idea about the basic Fermat's Principle
2. To empower students to understand the concept of interference
3. To understand the concept of diffraction.
4. To give a thorough understanding about holography and its applications
5. To acquire the basic knowledge Fibre optics

.

Prerequisites: Background of the basic science at +2 level

Course Outline

Unit 1

Fermat's Principle, verification of laws of reflection and refraction
Refraction and reflection by spherical surfaces : Refraction and reflection at a single spherical surfaces. The thin lens, The Principal Foci, and Focal length of a lens, The Newton formula, Lateral magnification.
Unit 2

2. Interference by division of wave front - Superposition of two sinusoidal waves, Interference, coherence ,conditions for interference, the interference patterns, intensity distribution .Fresnel's two mirror arrangement, Fresnel's Biprism, Determination of λ and dλ of Sodium Light

3. Interference by division of amplitude - Interference by a plane film illuminated by a plane wave, cosine law, non reflecting films (the subsections excluded), interference by a film with two nonparallel reflecting surfaces, colours of thin films, Newton's rings, The Michelson interferometer, white light fringes-

Unit 3
4. Fraunhofer Diffraction - Preliminaries, single slit diffraction pattern, diffraction by circular aperture, limit of resolution, two slit Fraunhofer diffraction pattern, N slit diffraction pattern, plane diffraction grating, resolving power.

5. Fresnel Diffraction - Preliminaries, Fresnel half period zones, explanation of rectilinear propagation of light, zone plate

Unit 4

6. Polarization - Huygene's explanation of double refraction, positive and negative uniaxial crystals, quarter and half wave plates, types of polarized light, production and analysis of plane, circularly and elliptically polarized light, optical activity, Laurentz half shade polarimeter

Unit 5

7. Holography- Principles of holography, theory of construction and reconstruction of Hologram, Applications of Holography.

Unit 6

8. Fibre Optics - Optical fibre, Numerical aperture, step index fibre, pulse dispersion, graded index fibre, fibre optic sensors.

References

1. Optics by Ajoy Ghatak
2. Optics by Subramaniam, Brijlal & Avadhanulu – New edition
3. Optics by Mathur
4. Nonlinear Optics- B.B.Laud
5. Laser Fundamentals- Silfast
6. Wave Optics and its Applications – Rajpal S Sirohi – Orient Longman
7. Optical Communications – M Mukunda Rao – Universities Press
8. 8 Optics – Hetch and A RGanesan

COURSE OUTCOMES

CO1	Understand the fundamentals of Fermat's principles and geometrical optics
CO2	Understand and apply the basic ideas of interference of light
CO3	Understand and apply the basic ideas of diffraction of light
CO4	Understand the basics ideas of polarization of light
CO5	Describe the basic principles of holography and fibre optics

LESSON PLAN

Unit/ session/ hours (timerequi re d)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assess ment
UNIT I (5 Hours)	1.Fermat's Principle, verification of laws of reflection and refraction, Refraction and reflection by spherical surfaces	● Lecture ● Demonstratio ns ● Numerical problem solving	● Assignm ent ● Discussi on ● Simplific ations	● To understand the Fermat's principle, refraction and reflection	● Class test ● Question ing
UNIT II (14 Hours)	2. Interference by division of wave front - conditions for interference, the interference patterns, intensity distribution .Fresnel's two mirror arrangement, Fresnel's Biprism 3. Interference by division of amplitude - Interference by a plane film illuminated by a plane wave, cosine law, non reflecting films	● Lecture ● Demonstratio ns	● Assignm ent ● Discussi on	● To understand the different concepts of interference	● Class test ● Question ing
UNIT III (13 Hours)	4. Fraunhofer Diffraction- single slit diffraction pattern, diffraction by circular aperture, limit of resolution, two slit Fraunhofer diffraction pattern, 5. Fresnel Diffraction - Fresnel half period zones, explanation of	● Lecture ● Demonstratio ns	● Assignm ent ● Discussi on	● To understand the fraunhofer diffraction and fresnel diffraction	● Class test ● Questioni ng

	rectilinear propagation of light, zone plate				
UNIT IV (8 Hours)	6. Polarization -Huygene's explanation of double refraction, quarter and half wave plates,Laurentz half shade polarimeter	● Lecture ● Demonstrations	● Assignment ● Discussion	● To understand the concept of polarization	● Class test ● Questioning
UNIT V (6 Hours)	7. Holography -Principles of holography, theory of construction and reconstruction of Hologram, Applications of Holography	● Lecture ● Demonstrations	● Assignment ● Discussion	● To understand the holography and its applications	● Class test ● Questioning
UNIT VI (8 Hours)	8. Fibre Optics - Optical fibre, Numerical aperture, step index fibre, pulse dispersion, graded index fibre, fibre optic sensors.	● Lecture ● Demonstrations	● Assignment ● Discussion	● To understand the concepts of Fibre optics	● Class test ● Questioning

Faculty In-charge
Dr. Salini Jose

PH5 B09: ELECTRONICS (ANALOG & DIGITAL)

Semester: 5
Course Number: IX
Number of hours of Lectures per week: 4
Number of Credits: 4
Number of Contact Hours: 72
Course Evaluation: Internal – 20 Marks + External – 80 Marks

OBJECTIVES

The objectives are to study

1. To give the idea about the basic principles of rectifiers and dc power supplies.
2. To empower students to understand the principles of transistors.
3. To prepare students to perform the designing of transistor amplifiers and oscillators.
4. To give a thorough understanding of the basic operation of Op –Amp and its applications.
5. To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.

Prerequisites: Background of the basic science at +2 level

Course Outline

Unit 1

1. Semiconductor rectifiers and DC Power supplies - Preliminaries of rectification- Bridge rectifier- Efficiency- Nature of rectified output- Ripple factor- different types of filter circuits- voltage multipliers- Zener diode- voltage stabilization

2. Transistors - Different transistor amplifier configurations:- CB, CE, CC and their characteristics- amplification factors- their relationships- Load line Analysis- Expressions for voltage gain- current gain and power gain of C.E amplifier- cut-off and saturation points- Transistor biasing- Different types of biasing - Base resistor, voltage divider bias method- single stage transistor amplifier circuit- load line analysis- DC and AC equivalent circuits

3. Multistage Transistor amplifiers - R.C coupled amplifier- frequency response and gain in decibels- Transformer coupled Amplifiers -Direct Coupled Amplifier-Comparison

4. Feedback Circuits and Oscillators - Basic principles of feedback- negative feedback and its advantages- positive feedback circuits- Oscillatory Circuits-LC, RC oscillators- tuned collector oscillator- Hartley, Colpitt's, phase shift oscillators - their expressions for frequency

UNIT II

5. Digital Communication

Transmission and reception of radio waves, types of modulation, AM, FM their comparison advantages, demodulation, pulse code modulation

6. Special Devices and Opamp

LED, basic idea of UJT, FET, MOSFET, OP-amp: basic operation, application, inverting, Noninverting, summing amplifiers, Differentiator integrator

7. Number systems - Binary number system, conversions from one system to another (Binary, octal, Hexa decimal), Binary arithmetic, Compliments and its algebra.

8. Logic gates and circuits - Fundamental gates, Universal gates, De Morgan's theorem, Exclusive OR gate, Boolean relations, Half adder, Full adder, RS Flip Flop, JK Flip flop

Text books for study

1. Principles of electronics - VK Mehta - 2008 edition (S. Chand)
2. Introduction to Microprocessors - Aditya P Mathur (Tata McGarw Hill)
3. Digital principles and applications - Leach and Malvino (Tata McGraw Hill)

References

1. Digital Computer Fundamentals (Thomas.C. Bartee)
2. Electronics principles - Malvino
3. Physics of Semiconductor Devices- Second Edition – Dilip K Roy – Universities Press
4. Digital Fundamentals –Thomas L Floyd
5. Digital Technology-Principles and Practice-Virendrakumar
6. The Art of Electronics-Paul Herowitz & Winfield Hill
7. Electronic Principles and applications-A B Bhattacharya
8. Electronics-Classical and Modern-KAR

COURSE OUTCOMES

CO1	Understand the basic principles of rectifiers and dc power supplies
CO2	Understand the principles of transistor
CO3	Understand the working and designing of transistor amplifiers and oscillators
CO4	Understand the basic operation of Op – Amp and its applications
CO5	Understand the basics of digital electronics

LESSON PLAN

Unit/ session/ hours (timerequired)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment

UNIT I (34 Hours)	1. Semiconductor rectifiers and DC Power supplies - Bridge rectifier, different types of filter circuits- voltage multipliers- Zener diode 2. Transistors -CB, CE, CC, Load line Analysis, Transistor biasing- Different types of Biasing, single stage transistor amplifier circuit 3. Multistage Transistor amplifiers - R.C coupled amplifier, Transformer coupled Amplifiers -Direct Coupled Amplifier 4. Feedback Circuits and Oscillators - negative feedback and its advantages, positive feedback circuits- Oscillatory Circuits	● Lecture ● Demonstrations ● Numerical problem solving	● Assignment	To Understand the basic principles of rectifiers and dc power supplies To Understand the principles of transistor	● Test papers ● Assignment ● Quiz
UNIT II (38 Hours)	5. Digital Communication Transmission and reception of radio waves, types of modulation, AM, FM their comparison 6. Operational amplifier and its applications - OP-amp: basic operation, application7. Number systems- Binary number system, conversions	● Lecture ● Demonstrations ● Numerical problem solving	● Assignment ● Discussion ● Simplifications ● Designing Circuits	● To Understand the basic operation of Op – Amp and its applications ● To Understand the basics of digital electronics	● Evaluating Problem-Solutions ● Test

	from one system to another 8. Logic gates and circuits - Fundamental gates, Universal gates, De Morgan's theorem, Exclusive OR gate, Boolean relations, Half adder, Full adder, RS Flip Flop, JK Flip flop				

Faculty In-charge
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PH5 D01(1): NON CONVENTIONAL ENERGY SOURCES

Semester: 5
Course Number: Open course I
Number of hours of Lectures per week: 2
Number of Credits: 2
Number of Contact Hours: 36
Course Evaluation: Internal – 10 Marks + External – 40 Marks

OBJECTIVES

1. To Demonstrate the generation of electricity from various Non-Conventional sources of energy
2. To Estimate the solar energy, Utilization of it, Principles involved in solar energy collection and conversion of it to electricity generation.
3.To Explore the concepts involved in the wind energy conversion system by studying its components, types and performance.
4. To Illustrate ocean energy and explain the operational methods of their utilization.
5. To Acquire the knowledge on Geothermal energy.

Prerequisites: Background of the basic science at +2 level

Course Outline

Unit 1

Solar energy- Solar Energy Terms and Definitions- Solar Constant, Solar radiation measurements, Solar energy collector, Physical principle of the conversion of solar radiation in to heat, solar air heaters and drying, solar cookers, solar distillation, solar furnaces, solar greenhouses, solar power plants, solar photovoltaic cells(no need of mathematical equations)

Unit 2

Wind energy - Introduction, Utilisation aspects of wind energy, Advantages and Disadvantages of wind energy, Environmental impact of wind energy, Sources/Origins of wind, Principle of wind energy conversion and wind power, Basic components of wind energy conversion system(WECS), Advantages and Disadvantages of WECS, Wind-Electric Generating Power Plant, Wind Energy Economics, Problems in operating large wind power generators.

Unit 3

Geothermal energy- Introduction to Geothermal energy, Important aspects of Geothermal Energy, Structure of Earth's interior, Geothermal system-Hot Spring structure, Geothermal Resources (Hydrothermal, Geopressured, Petro-thermal system, Magma Resources), Advantages and disadvantages of geothermal energy over other energy forms, application of geothermal energy.

Energy from biomass: Introduction to biomass, Biomass resource, Biomass Conversion process (Densification, Combustion and incineration, Thermo Chemical conversion, Biochemical conversion), Biogas: Biogas Applications, Biogas Plants (Raw materials used, Main Components of a Biogas Plant)

Unit 4.

Energy from Oceans and Thermal and Chemical effects- Ocean Energy, Ocean Energy Sources, Tidal energy, Components of a Tidal Power Plant, Economic aspects of tidal energy conversion, Wave energy, Advantages and disadvantages, Factors affecting Wave energy, Ocean Thermal Energy Conversion (OTEC), Working principle of OTEC, Efficiency of OTEC, Types of OTEC Plants (Closed system, Thermoelectric OTEC system), Advantages and Disadvantages and Applications of OTEC. Thermo electric effects, Fuel Cells, Hydrogen energy, Nuclear Reactors, Advantages and Disadvantages of Nuclear power plants (Basic Principles/concepts only)

Text books:

1. Non – Conventional Energy Resources by G. D. Rai, Khanna Publishers, 2008.
2. Solar Energy Fundamentals and application by H.P. Garg and J. Prakash, Tata McGraw- Hill Publishing company ltd, 1997.
3. Solar energy by S. P. Sukhatme, Tata McGraw- Hill Publishing company ltd, 1997.
4. Solar energy by G.D. Rai, 1995**.**

References

1. Energy Technology by S. Rao and Dr. B.B. Parulekar, 1997, 2nd edition
2. Power Technology by A. K. Wahil. 1993.

COURSE OUTCOMES

CO1	Understand the importance of non conventional energy sources
CO2	Understand basic aspects of solar energy
CO3	Understand basic principles of wind energy conversion
CO4	Understand the basic ideas of geothermal and biomass energy and recognize their merits and demerits
CO5	Understand the basic ideas of oceans and chemical energy resources and recognize their merits and demerits

LESSON PLAN

Unit/ session/ hours (timerequired)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
UNIT I (10 Hours)	Solar Constant, Solar radiation measurements, Solar energy collector, Physical principle of the conversion of solar radiation in to heat, solar air heaters and drying, solar cookers, solar distillation,	● Lecture ● Demonstrations	● Assignment	To understand basic idea about solar energy	● Test papers ● Assignment
UNIT II (7 Hours)	Principle of wind energy conversion and wind power, Basic components of wind energy conversion system(WECS), Advantages and Diadvantages of	● Lecture ● Demonstrations	● Assignment	To acquire knowledge about wind energy	● Test papers ● Assignment

	WECS, Wind-Electric Generating Power Plant, Wind Energy Economics,				
UNIT III (10 Hours)	Important aspects of Geothermal Energy, Structure of Earth's interior, Geothermal system-Hot Spring structure, Geothermal Resources, Energy from biomass: Introduction to biomass, Biomass resource, Biomass Conversion process	● Lecture ● Demonstrations	● Assignment	To study important aspects of Geothermal energy	● Test papers ● Assignment
UNIT IV (9 Hours)	Ocean Energy, Tidal energy, Wave energy, Ocean Thermal Energy Conversion(OTEC), Thermo electric effects, Fuel Cells, Hydrogen energy, Nuclear Reactors	● Lecture ● Demonstrations	● Assignment ● Discussion	To understand the concepts of OCean energy	● Test papers ● Assignment

Faculty In-charge
Fency K F & Dr. Salini Jose

PH6 B10: THERMAL AND STATISTICAL PHYSICS

Semester: 6
Course Number: X
Number of hours of Lectures per week: 4
Number of Credits: 4
Number of Contact Hours: 72
Course Evaluation: Internal – 20 Marks + External – 80 Marks

Objectives

- To Become familiar with various thermodynamic processes and work done in each of these processes.
- To Have a clear understanding about Reversible and irreversible processes and also working of a Carnot engine, and knowledge of calculating change in entropy for various processes.
- To Realize the importance of Thermo dynamical functions and applications of Maxwell's relations.
- To Familiarize in depth about statistical distribution and have basic Ideas about Maxwell Boltzmann,Bose-Einstein and Fermi Dirac Statistics and their applications

Prerequisites: Background of the basic science at +2 level

Course Outline
Unit- I

Thermodynamic system- Thermal equilibrium-zeroth law-concept of heat and temperature - thermodynamic equilibrium- quasistatic process -extensive and intensive variables-thermodynamic process (cyclic and non cyclic)-indicator diagram- workdone in isothermal, adiabatic, isobaric and isochoric –cyclic processes- concept ofpath and point functions-internal energy- first law of thermodynamics-relation between P,T,V,in adiabatic process-slope of adiabatic and isothermal process -application of first law to heat capacities-(relation between Cp and Cv) and latent heat– adiabatic and isothermal elasticity of a gas)

UNIT 2
Reversible and irreversible processes , Conditions for reversibility-second law of thermodynamics-heat engine, Carnot engine, derivation for expression for efficiency, efficiency, Carnot's refrigerator-thermodynamic scale of temperature- Carnot's theorem and its proof.-application of second law(Clausius-Clapyron equation)- internal combustion engine-otto engine ,diesel engine -its efficiencies

UNIT 3
Entropy and adiabatics- definition of entropy-Change of entropy in a Carnot cycle-Change of entropy in an reversible cycle (Claussius theorem) -Change of entropy in an irreversible cycle (Claussius inequality)- Change in entropy of a perfect gas during a process-Change in entropy in a irreversible process-change in entropy due to free expansion-Change in entropy due to spontaneous cooling by conduction, radiation….etc, - Principle of increase of entropy-Entropy and available energy-Entropy and disorder-Nernst heat theorem entropy temperature diagrams

UNIT 4.

Thermodynamic functions-Enthalpy, Helmhlotz function, Gibbs function-Maxwell's thermodynamic relations-TdS relations-application of Maxwell's thermodynamical relations-1.variation of intrinsic energy with volume-2.Joule-Kelvin coefficient-3.Claussius-Clapeyron equation from Maxwell's thermodynamic relations- changes of phase.

UNIT 5

Statistical distributions-Maxwell-Boltzmann statistics (no derivation)-Distribution of molecular energies in an ideal gas-Average molecular energy- Equi partition theorem- Maxwell-Boltzmann speed distribution law-Expressions for rms speed, most probable speed and mean speed.

UNIT 6

Bose Einstein and Fermi Dirac distribution laws (no derivations)- Application of BE distribution law to black body radiation-Planck's radiation law-Stefan's law-Wien's displacement law-Fermi energy-Expression for Fermi energy of electron system-electron energy distribution- average electron energy at absolute zero-Degeneracy pressure and its astrophysical significance.

Text book of study

Heat and Thermodynamics by D S Mathur- Revised fifth edition)

References:

1. Heat and Thermodynamics-DS Mathur (V Edn.)
2. Statistical Mechanics – An Elementary Outline – Avijit Lahiri – Universities Press
3. Physics- Resnick and Halliday
4. Heat and Thermodynamics-Zemansky
5. Thermodynamics – Y V C Rao – Universities Press
6. Advanced Physics Second Edition – Keith Gibbs – Cambridge University Press
7. Thermodynamics and statistical mechanics-Brijlal Subramanium
8. Heat and Thermodynamics- A Manna

COURSE OUTCOMES

CO1	Understand the zero and first laws of thermodynamics
CO2	Understand the thermodynamics description of the ideal gas
CO3	Understand the second law of thermodynamics and its applications
CO4	Understand the basic ideas of entropy
CO5	Understand the concepts of thermodynamic potentials and phase transitions

LESSON PLAN

Unit/ session/ hours (timerequired)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
UNIT I (18 Hours)	Zeroth Law and First Law of Thermodynamics - Thermal equilibrium and Zeroth Law, Intensive and extensive coordinates, PV diagram, Mathematical formulation of First Law, Differential form of the First Law	● Lecture ● Demonstrations	● Assignment	To understand the laws of thermodynamics	● Test papers ● Assignment
UNIT II (11 Hours)	Reversible and irreversible processes , Conditions for reversibility-second law of thermodynamics-heat engine, Carnot engine, derivation for expression for efficiency, efficiency, Carnot's refrigerator-thermodynamic scale of temperature-Carnot's theorem	● Lecture ● Demonstrations	● Assignment	To acquire knowledge about Carnot engine	● Test papers ● Assignment
UNIT III (14 Hours)	Entropy – Entropy of the ideal gas – TS diagram – Entropy and reversibility – Entropy and	● Lecture ● Demonstrations	● Assignment	To study important aspects of entropy	● Test papers ● Assignment

	irreversibility-Entropy and disorder – Exact differentials				
UNIT IV (10 Hours)	Thermodynamic Potentials and Phase Transitions - Enthalpy – Joule-Thomson expansion – Helmholtz and Gibbs functions, Maxwell's relations – TdS equations, First-order phase transitions, Clausius-Clapeyron equation and phase diagrams	● Lecture ● Demonstrations	● Assignment	To understand basic idea about Enthalpy, Maxwell's reations	● Test papers ● Assignment
UNIT V (8 Hours)	Statistical distributions-Maxwell-Boltzmann statistics (no derivation)-Distribution of molecular energies in an ideal gas-Average molecular energy	● Lecture ● Demonstrations	● Assignment	To acquire knowledge about MB Statistics	● Test papers ● Assignment
UNIT VI (11 Hours)	Bose Einstein and Fermi Dirac distribution laws (no derivations)-Application of BE distribution law to black body radiation-Planck's radiation law-Stefan's law-Wien's displacement law-Fermi energy-Expression for Fermi energy of electron system	● Lecture ● Demonstrations	● Assignment	To study important aspects of BE and FD statistics	● Test papers ● Assignment

Faculty In-charge
Fency K F

PH6 B11 : SOLID STATE PHYSICS, SPECTROSCOPY AND LASER PHYSICS

Semester: 6
Course Number: XI
Number of hours of Lectures per week: 4
Number of Credits: 4
Number of Contact Hours: 72
Course Evaluation: Internal – 20 Marks + External – 80 Marks

Objectives

- To Have a clear picture of crystal structures and a clear understanding about x-ray diffraction
- To gain knowledge of superconductivity,,its underlying principles and its applications in modern world
- To Become familiar with molecular spectroscopy and have gained basic ideas regarding microwave spectroscopy, infrared spectroscopy and Raman Spectroscopy.
- To gain basic knowledge of laser and working of different type of lasers

Prerequisites: Background of the basic science at +2 level

Course Outline

SOLID STATE PHYSICS

UNIT 1.Crystal Physics

Lattice Point & Space Lattice-Basis and crystal structure, unit cells and lattice Parameters, Unit cells v/s primitive cells, Crystal systems, crystal symmetry. The symmetry elements in a cubical crystal, rotation axis and inversion. Symmetry elements, Bravais space lattices-metallic crystal structure , sodium chloride, diamond, zinc sulphide, hexagonal and closed packed structure, directions, planes and Miller indices.

UNIT 2. X-ray Diffraction:

Bragg's law – Braggs X-ray spectrometer-Rotating Crystal method

UNIT 3. Super conductivity

A survey of superconductivity-Mechanism of Superconductors-Effects of Magnetic Field-Meissner Effect-isotope Effect-Energy Gap -Coherence Length- Josephson effect-BCS Theory (Qualitative idea only) -Application of Superconductivity, Type I and Type II superconductors.

MOLECULAR SPECTROSCOPY

UNIT 4 . Basic Elements of Spectroscopy

Quantum of Energy-Regions of Spectrum-Representation of Spectrum-Basic Elements of Practical Spectroscopy-Signal to Noise Ratio-Resolving Power-Width & Intensity of Spectral Transitions

UNIT 5. Microwave Spectroscopy

Classification of Molecules-Interaction of Radiation with Rotating Molecules-Rotational Spectrum of Rigid Diatomic Molecule-Example of CO-Selection Rule-Intensity-Spectrum of non –rigid Rotator-Example of HF- Spectrum of symmetric Top molecule- Example of Methyl chloride-Enformation derived from Rotational Spectrum.

UNIT 6. Infra Red Spectroscopy:

Vibrational Energy of an Anharmonic Oscillator-Diatomic Molecule (Morse Curve)-IR Spectra-Spectral Transitions & Selection Rules-Example of HCL-Vibration-Rotation Spectra of Diatomic Molecule-Born Oppenheimer Approximation-Instrmentation for Infra Red Spectroscopy

UNIT 7. Raman Spectroscopy

Raman Effect, Elements of Quantum theory & Applications-Pure Rotational Raman Spectrum-Examples of Oxygen and carbon-dioxide-Rotational Raman spectrum of symmetric Top molecule-Example of chloroform.Vibrational Raman spectrum of Symmetric Top Molecule-Example of Chloroform. (Molecular Structures & Spectroscopy by G Aruldhas &

UNIT 8. Laser Physics

Induced Absorption-Spontaneous Emission & Stimulated Emission-Einstein Coefficients Principle of Laser-Population inversion-Pumping-Properties of Laser-Types of Laser- Principle & working of Ruby laser, Helium Neon Laser & Semiconductor Laser- -Yag Lasers (Qualitative ideas only). Application of Lasers

Text Books for Study :

1. Solid State Physics by S O Pillai
2. Fundamentals of Molecular Spectroscopy by Banwell & Elaine M Mccash
3. Molecular Structure & Spectroscopy by G Aruldhas

References

1. Solid Sate Physics by M A Wahab
2. Introduction to Molecular Spectroscopy by G M Barrow
3. Raman Spectroscopy by Long D A
4. Modern Physics by R Murugeshan
5. Optical Communications – M Mukunda Rao – Universities Press
6. Principles of Condensed Matter Physics – P M Chaikin & T C Lubensky – Cambridge University Press

COURSE OUTCOMES

CO1	Understand the basic principles of statistical physics and its applications
CO2	Understand the basic aspects of crystallography in solid state physics
CO3	Understand the basic elements of spectroscopy
CO4	Understand the basics ideas of microwave and infra red spectroscopy
CO5	Understand the fundamental ideas of Laser physics

LESSON PLAN

Unit/ session/ hours (timerequired)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
UNIT I (15 Hours)	Lattice Point & Space Lattice-Basis and crystal structure, unit cells and lattice Parameters, Unit cells v/s primitive cells, Crystal systems, crystal symmetry.	● Lecture ● Demonstrations	● Assignment	To understand the Crystal structures	● Test papers ● Assignment
UNIT II (5 Hours)	Bragg's law – Braggs X-ray spectrometer-Rotating Crystal method	● Lecture ● Demonstrations	● Assignment	To acquire knowledge about X ray Diffraction	● Test papers ● Assignment
UNIT III (8 Hours)	Mechanism of Superconductors-Effects of Magnetic	● Lecture ● Demonstrations	● Assignment	To study important aspects of	● Test papers ● Assignment

	Field-Meissner Effect-isotope Effect-Energy Gap -Coherence Length-Josephson effect-BCS			Superconductivity	
UNIT IV (5 Hours)	Quantum of Energy-Regions of Spectrum-Representation of Spectrum-Basic Elements of Practical Spectroscopy-Signal to Noise Ratio-Resolving Power-	● Lecture ● Demonstrations	● Assignment	To understand basic idea about Spectroscopy	● Test papers ● Assignment
UNIT V (8 Hours)	Microwave Spectroscopy- Bond length of CO Molecule,	● Lecture ● Demonstrations	● Assignment	To understand basic idea about Microwave spectroscopy	● Test papers ● Assignment
UNIT VI (9 Hours)	Infra Red Spectroscopy-Simple harmonic oscillator – Anharmonic oscillator, Born-Oppenheimer approximation	● Lecture ● Demonstrations	● Assignment	To understand basic idea about Infrared spectroscopy	● Test papers ● Assignment
UNIT VII (10 Hours)	Raman Effect, Elements of Quantum theory & Applications-Pure Rotational Raman Spectrum-Examples of Oxygen and carbon-dioxide-Rotational Raman spectrum of symmetric Top molecule	● Lecture ● Demonstrations	● Assignment	To understand Raman Spectroscopy	● Test papers ● Assignment

UNIT VIII (12 Hours)	Spontaneous Emission & Stimulated Emission-Einstein Coefficients Principle of Laser-Population inversion-Pumping-Properties of Laser-Types of Laser-Principle & working of Ruby laser, Helium Neon Laser	● Lecture ● Demonstrations	● Assignment	To understand basic idea about Laser Physics	● Test papers ● Assignment

Faculty In-charge
Dr.Salini Jose

PH6 B12 : NUCLEAR PHYSICS, PARTICLE PHYSICS & ASTROPHYSICS

Semester: 6
Course Number: XII
Number of hours of Lectures per week: 4
Number of Credits: 4
Number of Contact Hours: 72
Course Evaluation: Internal – 20 Marks + External – 80 Marks

Objectives

- To get a clear picture of nuclear composition and various nuclear models.
- To get deep knowledge about Radioactivity,nuclear Fission and Nuclear Fusion,the relevance of nuclear transformation.
- To Understand the working of nuclear detectors and counters,realize the importance of Cosmic rays and its effects on earth
- To familiarize with nuclear particles and different particle accelerators.
- To get Peripheral ideas about astronomy and astrophysics

Prerequisites: Background of the basic science at +2 level

Course Outline

UNIT: 1 Nuclear Structure

Nuclear composition – nuclear electrons – discovery of neutron, Nuclear properties – nuclear radii –spin and magnetic moment - nuclear magnetic resonance, Stable nuclei, Binding energy, Liquid drop model -semi empirical binding energy formula- mass parabolas, Shell model, Meson theory of nuclear forces – discovery of pion.

UNIT 2. Nuclear Transformations

Elementary ideas of radio activity- Alpha decay-tunnel theory of alpha decay-derivation for the formula for decay constant-Beta decay-negatron emission-positron emission electron capture -inverse beta decay and the discovery of neutrino, Gamma decay fundamental ideas of nuclear isomerism and internal conversion, The concept of interaction cross section--reaction rate-nuclear reactions-center of mass frame of reference and Q value of a nuclear reaction, Nuclear fission, Nuclear reactors-breeder reactors, Nuclear fusion-nuclear fusion in stars-proton-proton cycle-carbon nitrogen cycleformation of heavier elements, Fusion reactors-confinement methods.

UNIT 3. Nuclear Detectors And Counters

Interactions of radiation with matter – fundamental ideas, Gas filled counters- ionization chamber – proportional counter – G.M. counter, Cloud chamber, Bubble chamber, Semi conductor detectors and scintillation counters

UNIT 4. Cosmic Rays

Nature of Cosmic rays, the origin of cosmic rays, geomagnetic effects, Cosmic ray showers

UNIT 5. Particle Physics

Leptons –electron and positron-neutrinos and anti-neutrinos-other leptons, Hadronsresonance particles, Elementary particle quantum numbers-baryon number- lepton number - strangeness - isospin-electric charge-hyper charge-basic ideas on symmetries and conservation laws, Quarks -color and flavor, Fundamental interactions

UNIT 6. Particle Accelerators

Classification of accelerators-electrostatic accelerators-cyclic accelerators, the linear accelerator, the cyclotron, the betatron, the electron synchrotron .

UNIT 7. Astrophysics and astronomy

Stellar magnitudes an sequences, Absolute magnitude, The bolometric magnitude - Different magnitude standards, The colour index of a star, Luminosities of stars, Stellar parallax and the units of stellar distances, Stellar positions: The celestial co-ordinates. A Qualitative study on stellar positions and constellations

Text books for study

1. Concepts of Modern Physics – Arthur Beiser (5th Edition),
2. Nuclear Physics – Irving Kaplan (17.8)
3. Nuclear Physics-An Introduction: T.A. Littlefield and N. Thorley)
4. An introduction to AstroPhysics-Baidyanath Basu)

References

1. Nuclear Physics: D.G. Tayal
2. Atomic Physics: J.B. Rajam
3. Atomic Physics: John Yarwood
4. Introduction to Astrophysics: H L Duorah & Kalpana Duorah
5. Mayer – Jensen Shell Model and Magic Numbers: R Velusamy, Dec 2007
6. The Enigma of Cosmic Rays: Biman Nath, Resonance – Feb 2004, March 2004
7. Black body radiation: G.S. Ranganath, Resonance – Feb. 2008.
8. Advanced Physics Second Edition – Keith Gibbs – Cambridge University Press

COURSE OUTCOMES

CO1	Understand the basic aspects of nuclear structure and fundamentals of radioactivity
CO2	Describe the different types of nuclear reactions and their applications
CO3	Understand the principle and working of particle detectors
CO4	Describe the principle and working of particle accelerators
CO5	Understand the basic principles of elementary particle physics

LESSON PLAN

Unit/ session/ hours (timerequired)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
UNIT I (12 Hours)	Nuclear Structure and Radioactivity - Liquid drop model – Shell model - Nuclear	● Lecture ● Demonstrations	● Assignment	To understand the Nuclear structures	● Test papers ● Assignment

	force – Radioactive decay –Conservation laws in radioactive decay – Alpha decay – Beta decay – Gamma decay				
UNIT II (16 Hours)	.Nuclear Reactions and Applications -Fission – Fission reactors – Fusion – Fusion processes in stars – Fusion reactors – Applications of nuclear physics Semiconductor Counters – Spark Chamber – Cerenkov Counter	● Lecture ● Demonstrations	● Assignment	To acquire knowledge about Nuclear transformations	● Test papers ● Assignment
UNIT III (7 Hours)	Particle Detectors- Wilson Cloud Chamber – Bubble Chamber – Ionization Chambers– Proportional Counter – Geiger-Muller Counter – Scintillation Counters and I	● Lecture ● Demonstrations	● Assignment	To study important aspects of Particle detectors	● Test papers ● Assignment
UNIT IV (4 Hours	Nature of Cosmic rays, the origin of cosmic rays, geomagnetic effects, Cosmic ray showers	● Lecture ● Demonstrations	● Assignment	To acquire knowledge about cosmic rays	● Test papers ● Assignment
UNIT V (15 Hours	Elementary Particles - Particles and antiparticles – Families of particles – Conservation laws,	● Lecture ● Demonstrations	● Assignment	To understand the Particle physics	● Test papers ● Assignment

	Particle interactions and decays – Resonance particles, The Quark Model – The Standard Mode				
UNIT VI (8 Hours	Classification of accelerators-electro static accelerators-cyclic accelerators, the linear accelerator, the cyclotron, the betatron, the electron synchrotron	● Lecture ● Demonst rations	● Assign ment	To study important aspects of particle accelerators	● Test papers ● Assignment
UNIT VII (10 Hours	Stellar magnitudes an sequences, Absolute magnitude, The bolometric magnitude - Different magnitude standards, The colour index of a star, Luminosities of stars	● Lecture ● Demonst rations	● Assign ment	To understand the concepts of Astrophysics	● Test papers ● Assignment

Faculty In-charge
Fency K F & Dr. Nijo Varghese

PH6 B13(E1): Elective- Computational Physics

Semester: 6
Course Number: XIII
Number of hours of Lectures per week: 3
Number of Credits: 3
Number of Contact Hours: 54
Course Evaluation: Internal – 20 Marks + External – 80 Marks

Objectives

- To get a clear picture of Python programming
- To get deep knowledge about Numerical methods in Physics

- To Introduce computational approach in Physics

Prerequisites: Background of the basic computer knowledge at +2 level

Course Outline

UNIT I.

Introduction to Python Programming:

Concept of high level language, steps involved in the development of a Program – Compilers and Interpreters - Introduction to Python language, Advantages of Python in comparison with other Languages - Different methods of using python: Using python as a calculator, Writing python programs and execution - Inputs and Outputs - Variables, operators, expressions and statements -- Strings, Lists, list functions (len, append, insert, del, remove, reverse, sort, +, *, max, min, count, in, not in, sum), sets, set functions(set, add, remove, in, not in, union, intersection, symmetric difference)-Tuples and Dictionaries, Conditionals, Iteration and looping - Functions and Modules - File input and file output, Pickling.

UNIT II.

Numerical Methods in physics

General introduction to numerical methods, Comparison between analytical and numerical techniques - Curve Fitting: Principle of least squares, fitting a straight line - Interpolation: Finite difference operator, Newton's forward difference interpolation formula, Solution of algebraic equations: Newton-Raphson method - Numerical differentiation and integration: Difference table, Trapezoidal and Simpson's (1/3) method - Solution of differential equations :Runge Kutta method (Second order) -Taylor's Series : Sin(x) and Cos(x).

UNIT III

Introduction to Computational approach in physics

One Dimensional Motion: Falling Objects: Introduction – Formulation: from Analytical methods to Numerical Methods - Euler Method, Freely falling body, Fall of a body in viscous medium - Simulation of free fall and numerical integration, Two dimensional motion: Projectile motion (by Euler method)-Motion under an attractive Inverse Square- law force Accuracy considerations .

References:

1. www.python.org
2. Python Essential Reference, David M. Beazley, Pearson Education
3. Core Python Programming, Wesley J Chun, Pearson Education
4. Python Tutorial Release 2.6.1 by Guido van Rossum, Fred L. Drake, Jr., editor. This Tutorial can be obtained from website (http://www.altaway.com/resources/python/tutorial.pdf)
5. How to Think Like a Computer Scientist: Learning with Python, Allen Downey , Jeffrey Elkner , Chris Meyers, http://www.greenteapress.com/thinkpython/thinkpython.pdf
6. Numerical Methods in Engineering and Science, Dr. B S Grewal, Khanna Publishers, Newdelhi (or any other book)
7. Numerical methods for scientists and engineers, K. Sankara Rao, PHI

8. Introductory methods of numerical analysis, S.S.Shastry , (Prentice Hall of India,1983)
9. Computational Physics, V.K.Mittal, R.C.Verma & S.C.Gupta-Published by Ane Books,4821,Pawana Bhawan,first floor,24 Ansari Road,Darya Ganj,New Delhi-110 002
(For theory part and algorithms. Programs must be discussed in Python)

COURSE OUTCOMES

CO1	Introduction to programming language Python
CO2	Applying Numerical Methods in physics
CO3	Understanding Computational approach in physics

LESSON PLAN

Unit/ session/ hours (timerequired)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
UNIT I (20 Hours)	Introduction to Python language, Advantages of Python in comparison with other Languages - Different methods of using python: Using python as a calculator, Writing python programs and execution - Inputs and Outputs - Variables, operators, expressions and statements	● Lecture ● Demonstrations ●ComparativeStudy	● Assignment	To understand the Python Programming	● Test papers ● Assignment
UNIT II (22 Hours)	Comparison between analytical and numerical techniques - Curve	● Lecture ● Demonstrations	● Assignment	To acquire knowledge about Numerical methods in	● Test papers ● Assignment

	Fitting: Principle of least squares, fitting a straight line - Interpolation: Finite difference operator, Newton's forward difference interpolation formula, Solution of algebraic equations: Newton-Raphson method			physics	
UNIT III (12 Hours)	Analytical methods to Numerical Methods - Euler Method, Freely falling body, Fall of a body in viscous medium - Simulation of free fall and numerical integration, Two dimensional motion: Projectile motion	● Lecture ● Demonstrations	● Assignment	To study important aspects of computational methods in Physics	● Test papers ● Assignment

Faculty In-charge
Dr. Nijo Varghese

PH6B14 - Practical II & PHY6B16: PRACTICAL III

Semester: 5 & 6
Course Number: XV & XVI
Number of hours of Lectures per week: 4
Number of Credits: 5
Number of Contact Hours:72 + 72
Course Evaluation: Internal – 30 Marks + External – 120 Marks

Objectives

- To Apply and illustrate the principles of semiconductor diode and transistor through experiments
- To Apply and illustrate the principles of transistor amplifier and oscillator through experiment
- To Apply and illustrate the principles of digital electronics through experiments
- To Analyze and apply computational techniques in Python programming

Prerequisites: Background of the basic practical knowledge at +2 level

Course Outline
Practical II
(Any 20)
1. Spectrometer- i1-i2 curve
2. Spectrometer-Cauchy's constants
3. Spectrometer-Diffraction Grating-Normal incidence
4. Laser-wavelength using transmission grating
5. Diffraction Grating-minimum deviation
6. Spectrometer-Quartz prism-Refractive indices of quartz for the ordinary and extraordinary rays
7. Newton's rings-wavelength of sodium light
8. Air wedge-angle of the wedge, radius of a thin wire
9. Lee's Disc –thermal conductivity
10. Potentiometer-calibration low range and high range voltmeters
11. Potentiometer- Reduction factor of TG
12. Variation of field with distance-Circular coil-moment of magnet & Bh
13. Carey Foster's bridge-resistance & resistivity
14. Carey Foster's bridge-Temperature coefficient of Resistance
15. Conversion of Galvanometer to voltmeter and calibrating using Potentiometer.
16. Conversion of Galvanometer to ammeter and calibrating using Potentiometer.
17. BG Absolute Capacity
18. BG-High resistance by leakage method
19. BG Mutual inductance
20. Planck's constant using LED's (3no.s)
21. Polarimeter-Specific rotation of sugar solution.
22. Searls and Box vibration magnetometers- m & Bh.
23. Numerical aperture of an optical fibre by semiconductor laser
24. Frequency of AC using sonometer

Practical III
Unit 1 (Any 15 experiments)

1. Construction of full wave, Centre tapped and Bridge rectifiers
2. Characteristics of Zener diode and construction of Voltage regulator.
3. Transistor characteristics and transfer characteristics in Common Base Configuration- current again
4. Transistor characteristics and transfer characteristics in Common Emitter Configuration- current again
5. CE Transistor Amplifier-Frequency response.
6. Full adder using NAND gates-construction & verification
7. Negative feedback amplifier
8. LC Oscillator (Hartley or Colpitts)
9. Phase shift oscillator

10. Operational Amplifier –inverting, non inverting, Voltage follower
11. LCR circuits-Resonance using CRO
12. Construction of basic gates using diodes(AND, OR) & transistors (NOT), verification by measuring voltages
13. Voltage multiplier (doubler, tripler)
14. Multivibrator using transistors.
15. Flip-Flop circuits –RS and JK using IC's
16. Verification of De-Morgan's Theorem using basic gates.
17. Half adder using NAND gates

Unit : II Numerical Methods Using Python :All programmes to be done.
18. Solution of equations by bisection and Newton-Raphson methods
19. Least square fitting – straight line fitting.
20. Numerical differentiation using difference table.
21. Numerical Integration – Trapezoidal and Simpson's 1/3 rd rule.
22. Taylor series - Sin θ, Cos θ
23. Solution of differential equation Runge-Kutta method (Harmonic Oscillator).
24. Simulation of freely falling body. Tabulation of position, velocity and acceleration as a function of time.
25. Simulation of projectile – Tabulation of position, velocity and acceleration as a function of time – Plot trajectory in graph paper from tabulated values

Books of Study:
1. Electronics lab manual- K A Navas (vol 1 &2)
2. B.Sc Practical Physics- C L Arora
3. Practical Physics- S L Gupta & V Kumar
4.Computational Physics, V.K.Mittal, R.C.Verma & S.C.Gupta-Published by Ane Books
5. Introductory methods of numerical analysis, S.S.Shastry , (Prentice Hall ofIndia,1983)
6.Introduction to Python for Engineers and Scientists by Dr.Sandeep Nagar, Apress publications.
7.Python for Education by Dr. B P Ajithkumar, IUAC, New Delhi; e-book freely downloadable from www.expeyes.in/documents/mapy.pdf

Reference Books:
1. Advanced Practical Physics for students – B L Worksnop and H T Flint

COURSE OUTCOMES

CO1	Apply and illustrate the principles of semiconductor diode and transistor through experiments

CO2	Apply and illustrate the principles of transistor amplifier and oscillator through experiments
CO3	Apply and illustrate the principles of digital electronics through experiments
CO4	Analyze and apply computational techniques in Python programming

LESSON PLAN

Experiments to be done (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Practical II 1. Spectrometer-Cauchy's constants 2. Spectrometer-Diffraction Grating-Normal incidence 3. Laser-wavelength using transmission grating 4. Diffraction Grating-minimum deviation 5. Spectrometer-Quartz prism-Refractive indices of quartz for the ordinary and extraordinary rays 6. Newton's rings-wavelength of sodium light 7. Air wedge-angle of the wedge, radius of a thin wire 8. Lee's Disc –thermal conductivity 9. Potentiometer-calibration low range and high range voltmeters 10. Potentiometer-Reduction factor of TG	● Demonstrations ●ComparativeStudy	● Assignment ● Seminars	To get practical knowledge about Physics Experiments	● Practical exams ● Assignment

11. Variation of field with distance-Circular coil-moment of magnet & Bh 12. Carey Foster's bridge-resistance & resistivity 13. Carey Foster's bridge-Temperature coefficient of Resistance 14. Conversion of Galvanometer to voltmeter and calibrating using Potentiometer. 15. BG Absolute Capacity 16. BG-High resistance by leakage method 18. Planck's constant using LED's (3no.s) 19. Polarimeter-Specific rotation of sugar solution. 20. Searls and Box vibration magnetometers- m & Bh. 21. Numerical aperture of an optical fibre by semiconductor laser 22. Frequency of AC using sonometer Construction of full wave, Centre tapped and Bridge rectifiers 2. Characteristics of Zener diode and construction of Voltage regulator. 3. Transistor characteristics and transfer characteristics in Common Base Configuration- current again 4. CE Transistor Amplifier-Frequency response.				

5. Full adder using NAND gates-construction & verification 6. Negative feedback amplifier 7. LC Oscillator (Hartley or Colpitts) 8. Phase shift oscillator 9. Operational Amplifier –inverting, non inverting, Voltage follower 10. Construction of basic gates using diodes(AND, OR) & transistors (NOT), verification by measuring voltages 11. Voltage multiplier (doubler, tripler) 12. Multivibrator using transistors. 13. Flip-Flop circuits –RS and JK using IC's 14. Verification of De-Morgan's Theorem using basic gates. 15. Half adder using NAND gates **Unit : II Numerical Methods Using Python** 16. Solution of equations by bisection and Newton-Raphson methods 17. Least square fitting – straight line fitting. 18. Numerical differentiation using difference table. 19. Numerical Integration – Trapezoidal and Simpson's 1/3 rd rule. 20. Taylor series - Sin θ, Cos θ				

21. Solution of differential equation Runge-Kutta method (Harmonic Oscillator). 22. Simulation of a freely falling body. Tabulation of position, velocity and acceleration as a function of time.				

Faculty In-charge
Fency K F, Dr. Nijo Varghese, Dr. Sr. Irene & Dr. Salini Jose

Department of Physics

Course Plan for Post Graduation in Physics (2019 Admissions onwards)

PHY1C01:CLASSICAL MECHANICS

Semester: 1
Course Number: 1
Contact Hours: 4T
Number of Credits: 4
Number of Contact Hours: 72
Course Evaluation: Internal & External: 1:4

Objectives of the Course:
To demonstrate knowledge and understanding of the following fundamental concepts in:

- the dynamics of system of particles,
- motion of rigid body,
- Lagrangian and Hamiltonian formulation of mechanics

To represent the equations of motion for complicated mechanical systems using the Lagrangian and Hamiltonian formulation of classical mechanics

Prerequisites: Background of the mechanics I at degree level.

Course Outline

1. Lagrangian and Hamiltonian Formulation:
Constraints and Generalized coordinates,D'Alembert's principle and Lagrange's equation, Velocity dependent potentials, Simple applications, Hamilton's Principle, Lagrange's equation from Hamilton's principle, Kepler problem,Scattering in a central force field, Transformation to lab coordinates, Legendre Transformation, Hamilton's canonical equations, Principle of least action, Canonical transformations, examples (17 hours)
Text : Goldstein, Sections 1.3 – 1.6, 2.1 – 2.3, 3.10, 3.11, 8.1, 8.5, 8.6, 9.1, 9.2

2. The classical background of quantum mechanics:
Equations of canonical transformations, Examples, Poisson brackets and other canonical invariants, Equation of motion in Poisson bracket form, Angular momentum Poisson brackets, Hamilton-Jacobi equation, Hamilton's principle and characteristic function, H-J equation for the linear harmonic oscillator, Separation of variables, Action-angle variables, H-J formulation of the Kepler problem, H-J equation and the Schrödinger equation. (19 hours)
Text : Goldstein, Sections 9.1, 9.2, 9.4 - 9.6, 10.1 – 10.5, 10.7, 10.8

3. The Kinematics and Dynamics of Rigid Bodies:
Space-fixed and body-fixed systems of coordinates, Description of rigid body motion in terms of direction cosines and Euler angles, Infinitesimal rotation, Rate of change of a vector, Centrifugal and

Coriolis forces, Moment of inertia tensor, Euler's equation of motion, Force free motion of a rigid bodies. (14 hours)
Text : Goldstein, Sections 4.1, 4.4, 4.8 – 4.10

4. Small Oscillations:
Formulation of the problem, Eigenvalue equation, Eigenvectors and Eigenvalues, Orthogonality, Principal axis transformation, Frequencies of free vibrations, Normal coordinates, Free vibrations of a linear triatomic molecule.(9 hours)
Text : Goldstein, Sections 6.1 – 6.4

5. Nonlinear Equations and Chaos:
Introduction, Singular points of trajectories, Nonlinear oscillations, Limit cycles, Chaos : Logistic map,
Definitions, Fixed points, Period doubling, Universality. (13 hours)
Text : Bhatia, Sections10.1, 10.2, 10.3, 10.4, 10.5, 10.51

Textbooks :
1. Goldstein "Classical Mechanics" (Addison Wesley)
2. V.B.Bhatia : "Classical Mechanics" (Narosa Publications, 1997)
Reference books :
1. Michael Tabor : "Chaos and Integrability in Nonlinear Dynamics" (Wiley, 1989)
2. N.C.Rana and P.S.Joag : "Classical Mechanics" (Tata McGraw Hill)
3. R.G.Takwale and P.S.Puranik : "Introduction to Classical Mechanics" (Tata McGraw Hill)
4. Atam P. Arya : "Introduction to Classical Mechanics, (2nd Edition)" (Addison Wesley1998)
5. Laxmana : "Nonlinear Dynamics" (Springer Verlag, 2001)

Course Plan

Unit/hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity Learning outcome(output)	Assessment
Unit I (17 hours)	Constraints and Generalized coordinates,D'Alembert's principle and Lagrange's equation, Velocity dependent potentials, Simple applications, Hamilton's Principle, Lagrange's equation from Hamilton's principle, Kepler problem, Scattering in a central force field, Transformation to lab coordinates, Legendre Transformation, Hamilton's canonical equations, Principle of least action, Canonical transformations, examples	● Lecture ●Problem-Solving	● To understand the idea of generalised coordinates. ● To establish the Lagrangian and to derive and solve the equations of motion for many systems subject to the principle of least action. ● To be familiar with Canonical and Legendre transformation	Evaluation of problems ● Q and A
Unit II (19hours)	Equations of canonical transformations, Examples, Poisson brackets and other canonical invariants, Equation of motion in Poisson bracket form, Angular momentum Poisson brackets, Hamilton-Jacobi equation, Hamilton's principal and characteristic function, H-J equation for the linear harmonic oscillator, Separation of variables, Action-angle variables, H-J formulation of the Kepler problem, H-J equation and the Schrödinger equation.	● Lecture ●Problem-Solving	● To understand the fundamentals of Hamilton's Jacobi theory. ● To acquire a deep knowledge of the Hamiltonian formalism that is crucial for the formulation and understanding of Quantum mechanics.	● problem solving ● Q and A

UnitIII (14 hours)	Space-fixed and body-fixed systems of coordinates, Description of rigid body motion in terms of direction cosines and Euler angles, Infinitesimal rotation, Rate of change of a vector, Centrifugal and Coriolis forces, Moment of inertia tensor, Euler's equation of motion, Force free motion of rigid bodies.	●Lecture ●Problem-Solving ● Seminar ● Powerpoint presentation	● To get an idea on underlying kinematics and kinetics of Rigid body. ● To acquire a knowledge of inertia Tensor and Euyler's Equation of motion.	● Q & A ● Evaluation problem solving skill
Unit IV (9 hours)	Formulation of the problem, Eigenvalue equation, Eigenvectors and Eigenvalues, Orthogonality, Principal axis transformation, Frequencies of free vibrations, Normal coordinates, Free vibrations of a linear triatomic molecule.	● Lecture ●Problem-Solving ● Seminar	● To establish eigenvalue and eigenvectors of small oscillations ● To describe and understand the vibrations of discrete and continuous mechanical systems.	● Q & A ● Evaluation problem solving skill
Unit V (13hours)	Introduction, Singular points of trajectories, Nonlinear oscillations, Limit cycles, Chaos : Logistic map, Definitions, Fixed points, Period doubling, Universality.	●Lecture ●Problem-Solving ● Seminar	● To predict the chaotic behaviour existing in natural systems. ● To visualise the logistic map and bifurcation.	● Q & A ● Evaluation problem solving skill

Faculty In-charge
Ms. Ancy Maria Varghese

PHY1C02:MATHEMATICAL PHYSICS-I

Semester: 1
Course Number: 2
Contact Hours: 4 T
Number of Credits: 4
Number of Contact Hours: 72
Course Evaluation: Internal & External: 1:4

Objectives of the Course:

- The laws of Physics are often expressed through the relatively complex mathematical apparatus. This course is intended to give mathematical tools necessary for better understanding of the later courses in physics such as classical mechanics, electrodynamics, quantum mechanics,solid state Physics and statistical physics.

Prerequisites: Background of the basic mathematics at +2 and degree level

Course Outline

1. Vectors :
Rotation of coordinates, Orthogonal curvilinear coordinates, Gradient, Divergence and Curl in orthogonal curvilinear coordinates, Rectangular, cylindrical and spherical polar coordinates, Laplacian operator, Laplace's equation –application to electrostatic field and wave equations, Vector integration, Enough exercises. (11 hours)
Text : Arfken & Weber , Sections 1.2, 1.6 - 1.9, 1.10, 2.1 – 2.5

2. Matrices and Tensors :
Basic properties of matrices (Review only), Orthogonal matrices, Hermitian and Unitary matrices, Similarity and unitary transformations, Diagonalization of matrices, Definition of Tensors, Contraction, Direct products,, quotient rule, Pseudo tensors, Dual tensors, Levi Cevita symbol, irreducible tensors, Enough exercises. (11 hours)
Text : Arfken & Weber , Sections 3.2 - 3.5, 2.6 – 2.9

3. Second Order Differential Equations:
Partial differential equations of Physics, Separation of variables, Singular points, Ordinary series solution,Frobenius method, A second solution, Self adjoint differential equation, eigen functions and values, Boundary conditions,Hermitian operators and their properties, Schmidt orthogonalization, Completeness of functions, Enough exercises. (14hours)
Text : Arfken & Weber , Sections 8.1, 8.3 – 8.6, 9.1 – 9.4

4. Special functions :
Gamma function, Beta function, Delta function, Dirac delta function, Bessel functions of the first and second kinds, Generating function, Recurrence relation, Orthogonality, Neumann function,

Spherical Orthogonality, Associated Legendre polynomials, Spherical harmonics, Hermite polynomials, Laguerre polynomials.
Text : Arfken & Weber , Sections 10.1, 10.4, 1.15, 11.1 – 11.3, 11.7, 12.1 – 12.4, 12.6, 13.1, 13.2

5. Fourier Series :
General properties, Advantages, Uses of Fourier series, Properties of Fourier series, Fourier integral, Fourier transform, Properties, Inverse transform, Transform of the derivative, Convolution theorem, Laplace transform, Enough exercises. (12 hours)
Text : Arfken & Weber , Sections 14.1 – 14.4, 15.2 – 15.5, 15.8
Text book :
1. G.B.Arfken and H.J.Weber : “Mathematical Methods for Physicists (5th Edition, 2001)” (Academic Press)

Reference books :
1. J.Mathews and R.Walker : “Mathematical Methods for Physics” (Benjamin)
2. L.I.Pipes and L.R.Harvill : “Applied Mathematics for Engineers and Physicists (3rd Edition)" (McGraw Hill)
3. Erwin Kreyzig : "Advanced Engineering Mathematics - 8th edition" (Wiley)
4. M. Greenberg : "Advanced Engineering Mathematics – 2nd edition " (Pearson India 2002)
5. A.W. Joshi : Matrices and tensors
6. Mathematical methods in the physical sciences, 2nd edn, Mary L Boas, John Wiley & Sons
7. Elementary Differential Equations and boundary value problems, William E. Boyce, Richard C. DiPrima, John Wiley & Sons, Inc.
8. Mathematics of Classical and Quantum Physics, F. W. Byron and R. W. Fuller, Dover Publications, Inc., New York

Course Plan

Unit/hours (time required)	**Topics to be taught (input)**	**Procedure (process) Student centric Method of teaching**	**Activity Learning outcome(output)**	**Assessment**
Unit I (11hours)	Rotation of coordinates, Orthogonal curvilinear coordinates, Gradient, Divergence and Curl in orthogonal curvilinear coordinates, Rectangular, cylindrical and spherical polar coordinates, Laplacian operator, Laplace's equation – application to electrostatic field and wave equations, Vector integration, Enough exercises.	● Lecture ●Problem-Solving	● To understand the concept of coordinate system and describe orthogonal curvilinear coordinates. generalised coordinates. ● To describe Laplace's equation and its application to electrostatic fields.	Evaluation of problems ● Q and A
Unit II (11hours)	Basic properties of matrices (Review only), Orthogonal matrices, Hermitian and Unitary matrices, Similarity and unitary transformations, Diagonalization of matrices, Definition of Tensors, Contraction, Direct products,, quotient rule, Pseudo tensors, Dual tensors, Levi Cevita symbol, irreducible tensors, Enough exercises.	● Lecture ●Problem-Solving	● To learn about special types of matrices that are relevant in physics. ● To acquire a deep knowledge about tensors.	● problem solving ● Q and A

Unit III (14 hours)	Partial differential equations of Physics, Separation of variables, Singular points, Ordinary series solution, Frobenius method, A second solution, Self adjoint differential equation, eigen functions and values, Boundary conditions, Hermitian operators and their properties, Schmidt orthogonalization, Completeness of functions, Enough exercises.	●Lecture ●Problem-Solving	• To learn different ways of solving second order differential equations and familiarise with singular points and frobenius method • To acquire knowledge on schmidt orthogonalization.	• Q & A • Evaluation problem solving skill
Unit IV (24 hours)	functions : Gamma function, Beta function, Delta function, Dirac delta function, Bessel functions of the first and second kinds, Generating function, Recurrence relation, Orthogonality, Neumann function, Spherical Bessel function, Legendre polynomials, Generating function, Recurrence relation, Rodrigues‟ formula, Orthogonality, Associated Legendre polynomials, Spherical harmonics, Hermite polynomials, Laguerre polynomials, Enough exercises.	● Lecture ●Problem-Solving	• To get introduced to special functions like gamma ,beta and delta functions,dirac delta function,Bessel Function and their recurrence relations.	• Q & A • Evaluation problem solving skill

Unit V (13hours)	General properties, Advantages, Uses of Fourier series, Properties of Fourier series, Fourier integral, Fourier transform, Properties, Inverse transform, Transform of the derivative,convolution theorem, Laplace transform, Enough exercises.	●Lecture ●Problem-Solving ● Seminar	● To use the fourier series and integral. ● To understand the transformations in fourier and laplace transforms..	● Q & A ● Evaluating through internal exams

Faculty In-charge
Ms.Sukanya I S

PHY1C03:ELECTRODYNAMICS AND PLASMA PHYSICS

Semester: 1
Course Number: 3
Contact Hours: 4T
Number of Credits: 4
Number of Contact Hours: 72 Hrs.
Course Evaluation: Internal & External: 1:4

Objectives of the Course:
· This subject provides an introduction to electrodynamics and a wide range of applications including communications,plasmas.

Prerequisites: Background of the electrostatics and electrodynamics at degree level

Course Outline

1. Time varying fields and Maxwell's equations :
Maxwell's equations, Potential functions, Electromagnetic boundary conditions, Wave equations and their solutions, Time harmonic fields, Multipole expansion of electric scalar potential and magnetic vector potential, Enough exercises. (14 hours)
Text : Cheng, Sections 7.3 – 7.7, Griffiths, Sections 3.4, 5.4.2

2. Plane electromagnetic waves :
Plane waves in lossless media, Plane waves in lossy media, Group velocity, Flow of electromagnetic power and the Poynting vector, Normal incidence at a plane conducting boundary, Oblique incidence

at a plane conducting boundary, Normal incidence at a plane dielectric boundary, Oblique incidence at a plane dielectric boundary, Enough exercises. (13 hours)
Text : Cheng , Sections 8.2 – 8.10

3. Transmission lines, Waveguides and cavity resonators:
Transverse electromagnetic waves along a parallel plane transmission line, General transmission line equations,Wave characteristics on finite transmission lines, General wave behaviour along uniform guiding structures, Rectangular waveguides, Cavity resonators (Qualitative ideas only), Enough exercises. (14 hours)
Text : Cheng, Sections 9.2 - 9.4 , 10.2, 10.4, 10-7.1

4. Relativistic electrodynamics:
Magnetism as a relativistic phenomenon, Transformation of the field, Electric field of a point charge moving uniformly, Electromagnetic field tensor, Electrodynamics in tensor notation, Potential formulation of relativistic electrodynamics, Enough exercises. (15 hours)
Text : Griffiths, Sections 10.3.1 – 10.3.5

5. Plasma Physics :
Plasma - Definition, concepts of plasma parameter, Debye shielding, Motion of charged particles in an
electromagnetic field - Uniform electric and magnetic fields, Boltzmann and Vlasov equations, their moments - Fluid equations, Plasma oscillations, Enough exercises. (16 hours)
Text : Chen, Sections 1.1 - 1.6, 2.2 - 2.2.2, 3.1 - 3.3.2, 4.3, 4.18, 4.19, 7.2-7.3

Text books :
1. David K. Cheng : “ Field and Wave Electromagnetics (Addisson Wesley)
2. David Griffiths : “ Introductory Electrodynamics” (Prentice Hall of India, 1989)
3. F. F. Chen, Introduction to Plasma Physics and Controlled Fusion, Volume I and II,
Plenum Press, recent edition
Reference books :
1. K.L. Goswami, Introduction to Plasma Physics – Central Book House, Calcutta
2. J.D.Jackson : “Classical Electrodynamics” (3rd Ed.) (Wiley,1999)

Course Plan

Unit/hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity Learning outcome(output)	Assessment
Unit I (14hours)	Maxwell's equations, Potential functions, Electromagnetic boundary conditions, Wave equations and their solutions, Time harmonic fields, Multipole expansion of electric scalar potential and magnetic vector potential, Enough exercises. cises.	● Lecture ●Problem-Solving	● To explain classical electrodynamics based on Maxwell's equations including its formulation in covariant form. ● To gain a clear understanding of electromagnetics boundary conditions.	Evaluation of problems ● Q and A
Unit II (13hours)	Plane waves in lossless media, Plane waves in lossy media, Group velocity, Flow of electromagnetic power and the Poynting vector, Normal incidence at a plane conducting boundary, Oblique incidence at a plane conducting boundary, Normal incidence at a plane dielectric boundary, Oblique incidence at a plane dielectric boundary, Enough exercises.	● Lecture ●Problem-Solving	● To know that the laws of reflection,refraction are outcomes of electromagnetic boundary conditions ● Able to design dielectric coatings which act like antireflection coating and able to distinguish good metal and dielectric.	● problem solving ● Q and A

Unit III (14hours)	Transverse electromagnetic waves along a parallel plane transmission line, General transmission line equations, Wave characteristics on finite transmission lines, General wave behaviour along uniform guiding structures, Rectangular wave guides, Cavity resonators (Qualitative ideas only), Enough exercises. .	●Lecture ●Problem-Solving	• To grasp the idea of electromagnetic wave propagation through waveguides and transmission lines..	• Q & A • Evaluation problem solving skill
Unit IV (15hours)	Magnetism as a relativistic phenomenon, Transformation of the field, Electric field of a point charge moving uniformly, Electromagnetic field tensor, Electrodynamics in tensor notation, Potential formulation of relativistic electrodynamics, Enough exercises.	● Lecture ●Problem-Solving	• To extend their understanding of special theory of relativity by including relativistic electrodynamics	• Q & A • Evaluation problem solving skill
Unit V (16hours)	Plasma - Definition, concepts of plasma parameter, Debye shielding, Motion of charged particles in an electromagnetic field - Uniform electric and magnetic fields, Boltzmann and Vlasov equations, their moments - Fluid equations, Plasma oscillations, Enough exercises.	●Lecture ●Problem-Solving ● Seminar	• To understand rather complex physical phenomena observed in plasma.	• Q & A • Evaluating through internal exams

Faculty In-charge
Ms.Sukanya I S

PHY1C04:ELECTRONICS

Semester:1
Course Number: 4
Contact Hours per Week: 4T
Number of Credits:4
Number of Contact Hours: 72 hrs
Course Evaluation: Internal & External: 1:4

Objectives of the Course: Integrates the understanding and creation of modern electronic designs and systems.

Prerequisites:
· Knowledge of analog and digital electronics in degree level.

Course Outline:

1 .Field effect transistors : V-I characteristics of JFETs and device operation, construction of depletion and enhancement MOSFETs, V-I characteristics and device operation. Biasing of FETs, FETs as VVR and its applications, small signal model of FETs, analysis of Common Source and Common Drain amplifiers at low and high frequencies, MOSFET as a switch,CMOS and digital MOSFET gates (NOT, NAND, NOR). (10 hours)
Text: Integrated Electronics Millman and Halkias: Tata McGraw Hill
Reference:
Electronic devices and Circuit theory, Robert L Boylstead& L. Nashelsky – Pearson education
Micro Electronic Circuits: Sedra/Smith: Oxford University Press

2. Microwave and Photonic devices:
Tunnel diode, construction and characteristics, negative differential resistance and device operation, radiative transitions and optical absorption, Light emitting diodes (LED) – visible and IR, semiconductor lasers,construction and operation, population inversion, carrier and optical confinement, optical cavity and feedback,threshold current density. Photodetectors – Photoconductor (Light dependent resistor- LDR) and photodiode,p-n junction solar cells - short circuit current, fill factor and efficiency (14 hours)
Text: Semiconductor Devices- Physics and Technology - S.M.Sze, John Wiley and Sons
Semiconductor Optoelectronic devices: Pallab Bhattacharya: Prentice Hall
Reference:
Principles of semiconductor devices: B. Van Zeghbroeck
Principles of semiconductor devices: S.M. Sze: John Wiley & Sons

3. Operational Amplifier: Differential amplifiers, analysis of Emitter coupled differential amplifiers, OPAMP parameters:Open loop gain,CMRR, error currents and error voltages, input and output

impedances, slew rate and UGB. Frequency response, poles and zeros; transfer functions (derivation not required), expression for phase angle. Need for compensation,
dominant pole, pole zero and lead compensation (12 hours)
Text: Integrated Electronics: Millman and Halkias: Tata McGraw Hill
Reference:
OPAMPS and Linear Integrated Circuits: Ramakant A. Gaykwad

4. OPAMP Applications: Closed loop inverting, non-inverting and difference OPAMP configurations and their characteristics; OPAMP as inverter, scale changer, summer, V to I converter, practical integrator & differentiator, active low pass , high pass and band pass Butterworth filters, band pass filter with multiple feedback, OPAMP notch filter, OPAMP Wien bridge oscillator, OPAMP astable and monostable multivibrators, Schmidt triggers. (14 hours)
Text: Integrated Electronics:Millman and Halkias : Tata McGraw Hill
OPAMPS and Linear Integrated Circuits: Ramakant A. Gaekwad
Reference:
Linear Integrated circuits:D. Roychoudhuri : New Age International Publishers

5. Digital Electronics: Minimization of Boolean functions using Karnaugh map and representation using logic gates, JK and MSJK andD flip-flops, shift registers using D and JK flip flops and their operations, shift registers as counters, ring counter, design of synchronous and asynchronous counters, state diagram,cascade counters, basic idea of static and dynamic RAM,basics of charge coupled devices. R-2R ladder D/A converter, Introduction to 8 bit microprocessor; internal architecture of Intel 8085, register organisation. (22 hours)
Text:
Digital Principles and Applications: Malvino and Leach: Tata McGraw Hill
Digital Fundamentals: Thomas. L. Floyd: Pearson Education.
Fundamentals of Microprocessors and Microcomputers: B. Ram: DhanpatRai & Sons.
Reference:
Modern Digital Electronics: R.P. Jain: Tata McGraw Hill

Course Plan

Unit/hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity Learning outcome(output)	Assessment
Unit I (10hours)	V-I characteristics of JFETs and device operation, construction of depletion and enhancement MOSFETs, V-I characteristics and device operation. Biasing of FETs, FETs as VVR and its applications, small signal model of FETs, analysis of Common Source and Common Drain amplifiers at low and high frequencies, MOSFET as a switch, CMOS and digital MOSFET gates (NOT, NAND, NOR). .	● Lecture ●Problem-Solving	● To get an idea on field effect transistors,their principles and applications. ● To know about CMOS and digital MOSFET gates.	Evaluation of problems ● Q and A
Unit II (14hours)	Tunnel diode, construction and characteristics, negative differential resistance and device operation, radiative transitions and optical absorption, Light emitting diodes (LED) – visible and IR, semiconductor lasers, construction and operation, population inversion, carrier and optical confinement, optical cavity and feedback, threshold current density. Photodetectors – Photoconductor (Light dependent resistor- LDR) and photodiode,	● Lecture ●Problem-Solving ● Seminar	● To understand the concept of photonic devices like LED,laser diode,Photodetector,solar cell and their working in detail..	● problem solving ● Q and A

	p-n junction solar cells - short circuit current, fill factor and efficiency			

UnitIII (12hours)	Differential amplifiers, analysis of Emitter coupled differential amplifiers, OPAMP parameters: Open loop gain,CMRR, error currents and error voltages, input and output impedances, slew rate and UGB. Frequency response, poles and zeros; transfer functions (derivation not required), expression for phase angle. Need for compensation, dominant pole, pole zero and lead compensation	●Lecture ●Problem-Solving	• To grasp the idea of Operational amplifiers,opamp parameters. • To know about AC and DC characteristics of OPAMP and need for frequency compensation.	• Q & A • Evaluation problem solving skill
Unit IV (14hours)	Closed loop inverting, non-inverting and difference OPAMP configurations and their characteristics; OPAMP as inverter, scale changer, summer, V to I converter, practical integrator & differentiator, active low pass , high pass and band pass Butterworth filters, band pass filter with multiple feedback, OPAMP notch filter, OPAMP Wien bridge oscillator, OPAMP astable and monostable multivibrators, Schmidt triggers.	● Lecture ●Problem-Solving	• To extend their understanding of OPAMP applications as inverter,integrator,Differentiator, monostable and astable multivibrator etc.	• Q & A • Evaluation problem solving skill

Unit V (22hours)	Minimization of Boolean functions using Karnaugh map and representation using logic gates, JK and MSJK andD flip-flops, shift registers using D and JK flip flops and their operations, shift registers as counters, ring counter, design of synchronous and asynchronous counters, state diagram,cascade counters, basic idea of static and dynamic RAM, basics of charge coupled devices. R-2R ladder D/A converter, Introduction to 8 bit microprocessor; internal architecture of Intel 8085, register organisation.	●Lecture ●Problem-Solving ● Seminar	● Digital electronics discussing logic gates and representation using K Maps. ● To acquire knowledge about Flip Flops,shift registers and counters. ● To have an understanding on intel 8085 microprocessor and its architecture.	● Q & A ● Evaluating through internal exams

Faculty In-charge
Ms.Shyama I

PHY2C05:QUANTUM MECHANICS-I

Semester:2
Course Number: 1
Contact Hours per Week: 4T
Number of Credits:4
Number of Contact Hours: 72 hrs
Course Evaluation: Internal & External: 1:4

Objectives of the Course:

Prerequisites: · Background of quantum mechanics in degree level.

Course Outline:

1.Formulation of Quantum Mechanics (20 hours)
Sequential Stern-Gerlach experiments – Analogy with the polarization of light – Need for representing a quantum mechanical state as a vector in complex vector space. Dirac notation – Ket space, Bra space and Inner products – Operators– Hermitian adjoint – Hermitian operator – Multiplication – Associative axiom – Outer product. Eigenkets and eigenvalues of Hermitian operator – Eigenkets as base kets – Completeness relation – Projection operator – Matrix representation of operators, kets and bras. Measurement in a quantum mechanical system – Expectation value –Illustration with spin-½ systems – Compatible observables and simultaneous eigenkets – Maximal set of commuting observables – Incompatible observables and general uncertainty relation. Unitary operator – Change of basis and transformation matrix – Similarity transformation – Diagonalization – Unitary equivalent observables. Position eigenkets and position measurements –Infinitesimal translation operator and its properties – Linear momentum as a generator of translation – Canonical commutation relations. Position-space wave function – wave function as an expansion coefficient – Momentum operator in the position basis – Momentum-space wavefunction – Transformation function or the momentum eigenfunction in position basis –Relations between wavefunctions in position-space and momentum-space. Gaussian wave packet – Computation of dispersions of position operator and momentum operator – Minimum uncertainty product. Generalization to three
dimensions.
Text: Chapter 1, Modern Quantum Mechanics (Edn.2) by J. J. Sakurai

2.Quantum Dynamics (20 hours)
Time-evolution operator – Schrodinger equation for the time-evolution operator and its solutions according to the time-dependence of the Hamiltonian operator –Energy eigenkets – Time dependence of expectation values – Time evolution of a spin-1/2 system and Spin precession –

Correlation amplitude and energy-time uncertainty relation. Schrodinger picture and Heisenberg picture – Behaviour of state kets and observables in Schrodinger picture and Heisenberg picture – Heisenberg equation of motion – Ehrenfest's theorem. Time-evolution of base kets and transition amplitudes. Simple harmonic oscillator – energy eigenkets and energy eigenvalues – Dirac's method – Time development of the oscillator. Schrodinger's wave equation – Time-dependent wave equation – Time-independent wave equation – Continuity Equation – Interpretations
of the wavefunction – Classical limit of wave mechanics. Boundary conditions – Elementary solutions to Schrodinger's wave equation – Free particle in one dimension and three dimensions – Simple harmonic oscillator – Particle in a one-dimensional box – Particle in a finite potential well – One-dimensional potential step – Square potential barrier.
Text ::(1) Chapter 2 – upto section 2.5, Modern Quantum Mechanics (Edn.2) by J. J. Sakurai
(2) Chapter 4 – section 4.3, Quantum Mechanics (Edn.4) by V. K. Thankappan

3.Theory of Angular Momentum (15 hours)
Non-commutative nature of rotations around different axes – Rotation operator – Infinitesimal rotations in quantum mechanics – Fundamental commutation relations for angular momentum operators. Rotation operators for spin-1/2 systems– Spin precession in a magnetic field – Pauli's two component formalism – Representation of the rotation operator as 2 x 2matrix. Ladder operators and their commutation relations – Eigenvalue problem for angular momentum operators J2 and Jz–Matrix elements of angular momentum operators and rotation operator. Orbital angular momentum – Orbital angular momentum as generator of rotation – Spherical harmonics – Spherical harmonics as rotation matrices. Addition of orbital angular momentum and spin angular momentum – Addition of angular momenta of two spin-1/2 particles – Formal theory of Angular Momentum addition – Computation of Clebsch-Gordan coefficients – Clebsch-Gordan coefficients and the rotation matrices.
Text : Chapter 3 – sections 3.1, 3.2, 3.5, 3.6 and 3.8, Modern Quantum Mechanics (Edn.2) by J. J. Sakurai

4.Central Potentials (8 hours)
Schrodinger's equation for central potentials – The radial equation – Particle in an infinite spherical well – Isotropic harmonic oscillator – The Coulomb potential and the hydrogen atom problem.
Text : Chapter 3 – section 3.7, Modern Quantum Mechanics (Edn.2) by J. J. Sakurai.

5.Invariance Principles and Conservation Laws (9 hours)
Symmetry and conservation laws –Space-time symmetries – Displacement in space and conservation of linear momentum –Displacement in time and conservation of energy – Rotation in space and conservation of angular momentum – Space inversion and conservation of parity – Time reversal symmetry. The indistinguishability principle – Symmetric and antisymmetric wave functions – Eigenvalues and eigenvectors of particle-exchange operator – Spin and statistics – Pauli's exclusion principle and antisymmetric wave function – The ground state of the Helium atom.
Text: Chapter 6 and 9 – relevant sections, Quantum Mechanics (Edn.4) by V. K. Thankappan
Textbooks :

1. Modern Quantum Mechanics (Edn.2) : J. J. Sakurai, Pearson Education.
2.Quantum Mechanics (Edn.4) : V. K. Thankappan, New Age International
References:
1. Principles of Quantum Mechanics (Edn.2) : R. Shankar, Springer.
2. Introductory Quantum Mechanics: Richard L. Liboff, Pearson Education .
3. Introduction to Quantum Mechanics (Edn.2) : D.J. Griffiths, Pearson Education.
4. A Modern Approach to Quantum Mechanics: J S Townsend, Viva Books.
5. Quantum Mechanics : Non-Relativistic Theory (Course of Theoretical Physics Vol3): L. D. Landau and E. M.
Lifshitz, Pergamon Press.
6. The Feynman Lectures on Physics Vol. 3, Narosa .
7. Quantum Mechanics : Concepts and Applications (Edn.2) : Nouredine Zettili, Wiley.
8. Quantum Mechanics Demystified: David McMohan, McGrawHill 2006.
9. Quantum Mechanics (Schaum's Outline) :Yoav Pelegetal. Tata McGraw Hill Private Limited, 2/e.
10. Quantum Mechanics: 500 Problems with Solutions: G Aruldhas, Prentice Hall of India.

Course Plan

Unit/hours (time required)	**Topics to be taught (input)**	**Procedure (process) Student centric Method of teaching**	**Activity Learning outcome(output)**	**Assessment**
Unit I (20hours)	Sequential Stern-Gerlach experiments – Analogy with the polarization of light – Need for representing a quantum mechanical state as a vector in complex vector space. Dirac notation – Ket space, Bra space and Inner products – Operators– Hermitian adjoint – Hermitian operator – Multiplication – Associative axiom – Outer product. Eigenkets and eigenvalues of Hermitian operator – Eigenkets as base kets – Completeness relation –	● Lecture ●Problem-Solving	● To understand linear vector space,Hilbert's space,concept of basis and operators and bra and ket notation. ● To describe Momentum and position representation.	Evaluation of problems ● Q and A

	Projection operator – Matrix representation of operators, kets and bras. Measurement in a quantum mechanical system – Expectation value –Illustration with spin-½ systems – Compatible observables and simultaneous eigenkets – Maximal set of commuting observables – Incompatible observables and general uncertainty relation. Unitary operator – Change of basis and transformation matrix – Similarity Transformation – Diagonalization – Unitary equivalent observables. Position eigenkets and position measurements –Infinitesimal translation operator and its properties – Linear momentum as a generator of translation – Canonical commutation relations. Position-space wave function – wave function as an expansion coefficient – Momentum operator in the position basis – Momentum-space wavefunction – Transformation function or the momentum eigenfunction in position basis –Relations between wavefunctions in position-space and momentum-space. Gaussian wave packet – Computation of dispersions of position operator and momentum operator – Minimum uncertainty product. Generalization to three dimensions. .			

Unit II (20hours)	Time-evolution operator – Schrodinger equation for the time-evolution operator and its solutions according to the time-dependence of the Hamiltonian operator –Energy eigenkets – Time dependence of expectation values – Time evolution of a spin-1/2 system and Spin precession – Correlation amplitude and energy-time uncertainty relation. Schrodinger picture and Heisenberg picture – Behaviour of state kets and observables in Schrodinger picture and Heisenberg picture – Heisenberg equation of motion – Ehrenfest's theorem. Time-evolution of base kets and transition amplitudes. Simple harmonic oscillator – energy eigenkets and energy eigenvalues – Dirac's method – Time development of the oscillator. Schrodinger's wave equation – Time-dependent wave equation – Time-independent wave equation – Continuity Equation – Interpretations of the wavefunction – Classical limit of wave mechanics. Boundary conditions – Elementary solutions to Schrodinger's wave equation – Free particle in one dimension and three dimensions – Simple harmonic oscillator – Particle in a one-dimensional box – Particle in a finite potential well – One-dimensional potential step – Square potential barrier.	● Lecture ●Problem-Solving ● Seminar	● To understand the concept of both schrodinger and Heisenberg formulations of time development and their applications.	● problem solving ● Q and A

Unit III(15hours)	Non-commutative nature of rotations around different axes – Rotation operator – Infinitesimal rotations in quantum mechanics – Fundamental commutation relations for angular momentum operators. Rotation operators for spin-1/2 systems– Spin precession in a magnetic field – Pauli's two component formalism – Representation of the rotation operator as 2 x 2matrix. Ladder operators and their commutation relations – Eigenvalue problem for angular momentum operators J2 and Jz–Matrix elements of angular momentum operators and rotation operator. Orbital angular momentum – Orbital angular momentum as generator of rotation – Spherical harmonics – Spherical harmonics as rotation matrices. Addition of orbital angular momentum and spin angular momentum – Addition of angular momenta of two spin-1/2 particles – Formal theory of Angular Momentum addition – Computation of Clebsch-Gordan coefficients – Clebsch-Gordan coefficients and the rotation matrices	●Lecture ●Problem-Solving	• To grasp the idea theory of angular momentum ans spin matrices. • To know about orbital angular momentum and Clebsch -Gordan coefficients.	• Q & A • Evaluation problem solving skill

Unit IV (8hours)	Schrodinger's equation for central potentials – The radial equation – Particle in an infinite spherical well – Isotropic harmonic oscillator – The Coulomb potential and the hydrogen atom problem.	● Lecture ●Problem-Solving	● To extend their understanding of central potentials with applications..	● Q & A ● Evaluation problem solving skill
Unit V (9hours)	Symmetry and conservation laws –Space-time symmetries – Displacement in space and conservation of linear momentum –Displacement in time and conservation of energy – Rotation in space and conservation of angular momentum – Space inversion and conservation of parity – Time reversal symmetry. The indistinguishability principle – Symmetric and antisymmetric wavefunctions – Eigenvalues and eigenvectors of particle-exchange operator – Spin and statistics – Pauli's exclusion principle and antisymmetric wave function – The ground state of the Helium atom.	●Lecture ●Problem-Solving	● To acquire knowledge on symmetry and conservation laws. ● To acquire knowledge about identical particles,symmetric and antisymmetric wave functions.	● Q & A ● Evaluating through internal exams

Faculty In-charge
Ms.Ancy Maria Varghese

PHY2C06:MATHEMATICAL PHYSICS -II

Semester:2
Course Number: 2
Contact Hours per Week: 4T
Number of Credits:4
Number of Contact Hours: 72 hrs
Course Evaluation: Internal & External: 1:4

Objectives of the Course: This course is intended to give mathematical tools necessary for better understanding of the later courses in physics such as classical mechanics, electrodynamics, quantum mechanics,solid state Physics and statistical physics.

Prerequisites: Background of the basic mathematics at +2 and degree level

Course Outline:

1. Functions of Complex Variables:
Introduction, Analyticity, Cauchy-Reimann conditions, Cauchy's integral theorem and integral formula, Laurent expansion, Singularities, Calculus of residues and applications (15 hours)-
Text:Sections 6.1 to 6.5, 7.1, 7.2

2. Group Theory:
Groups, multiplication table, conjugate elements and classes, subgroups, direct product groups, isomorphism and homomorphism, permutation groups, distinct groups of given order, reducible and irreducible representations
Text :Sections 1-1.8, Joshi.
Generators of continuous groups, rotation groups SO(2) and SO(3), rotation of functions and angular momentum, SU(2)-SO(3) homomorphism, SU(2) isospin and SU(3) eightfold way (20 hours)
Text : Sections 4.2, Arfken 5th edition.

3. Calculus of Variations:
One dependent and one independent variable, Applications of the Euler equation, Generalization to several independent variables, Several dependent and independent variables, Lagrange Multipliers, Variation subject to constraints, Rayleigh-Ritz variational technique. (14 hours)
Sections 17.1 to 17.8

4. Integral equations:
Integral equations- introduction, Integral transforms and generating functions, Neumann series, separable kernel (12 hours)-
Sections 16.1 to 16.3

5. Green's function:

Green's function, eigenfunction expansion, 1-dimensional Green's function, Green's function integral-differential equation, eigenfunction, eigenvalue equation Green's function and Dirac delta function, Enough exercises.(11 hours)

Section 9.51

Text books :

1. G.B.Arfken and H.J.Weber : “Mathematical Methods for Physicists (5th Edition, 2001)” (Academic Press)

2. A.W.Joshi, Elements of Group theory for Physicists()(New Age International (P).Ltd)

Reference books :

1. J.Mathews and R.Walker : “Mathematical Methods for Physics” (Benjamin)

2. L.I.Pipes and L.R.Harvill : “Applied Mathematics for Engineers and Physicists (3rd Edition)" (McGraw Hill)

3. Erwin Kreyzig : "Advanced Engineering Mathematics - 8th edition" (Wiley)

4. M. Greenberg : "Advanced Engineering Mathematics – 2nd edition " (Pearson India 2002)

5. Mathematical methods in the physical sciences, 2nd edn, Mary L Boas, John Wiley & Sons

6. Elementary Differential Equations and boundary value problems, William E. Boyce, Richard C. DiPrima, John Wiley & Sons, Inc.

7. Mathematics of Classical and Quantum Physics, F. W. Byron and R. W. Fuller, Dover Publications, Inc., New York

Course Plan

Unit/hours (time required)	**Topics to be taught (input)**	**Procedure (process) Student centric Method of teaching**	**Activity Learning outcome(output)**	**Assessment**
Unit I (15hours)	Introduction, Analyticity, Cauchy-Reimann conditions, Cauchy's integral theorem and integral formula, Laurent expansion, Singularities, Calculus of residues and applications .	● Lecture ●Problem-Solving	● To know the method of contour integration to evaluate definite integrals of varying complexity.	Evaluation of problems ● Q and A
Unit II (20hours)	Groups, multiplication table, conjugate elements and classes, subgroups, direct product groups, isomorphism and homomorphism, permutation groups, distinct groups of given order, reducible and irreducible representations Generators of continuous groups, rotation groups SO(2) and SO(3), rotation of functions and angular momentum, SU(2)-SO(3) homomorphism, SU(2) isospin and SU(3) eightfold way	● Lecture ●Problem-Solving	● To gain the ability to apply group theory to physics problems. ● To know about different groups which are a prerequisite for deeper understanding of crystallography,particle physics,quantum mechanics and energy bands in solids.	● problem solving ● Q and A

Unit III(14 hours)	One dependent and one independent variable, Applications of the Euler equation, Generalization to several independent variables, Several dependent and independent variables, Lagrange Multipliers, Variation subject to constraints, Rayleigh-Ritz variational technique.	●Lecture ●Problem-Solving ●Seminar	• To be able to apply calculus of variation to diverse problems in physics. • The use of Lagrange Multipliers in solving physics problems.	• Q & A • Evaluation on problem solving skill
Unit IV (12 hours)	Integral equations-introduction, Integral transforms and generating functions, Neumann series, separable kernel.	• Lecture ●Problem-Solving	• To find solutions to integral equations using different methods.	• Q & A • Evaluation on problem solving skill
Unit V (11hours)	Green's function, eigenfunction expansion, 1-dimensional Green's function, Green's function integral-differential equation, eigenfunction, eigenvalue equation Green's function and Dirac delta function, Enough exercises.	●Lecture ●Problem-Solving • Seminar	• To become familiar with methods of Green's Function to solve linear differential equations with inhomogeneous terms..	• Q & A • Evaluating through internal exams

Faculty in charge
Ms Sukanya I S

PHY2C07:STATISTICAL MECHANICS

Semester:2
Course Number: 3
Contact Hours per Week: 4T
Number of Credits:4
Number of Contact Hours: 72 hrs
Course Evaluation: Internal & External: 1:4

Objectives of the Course: To under**s**tand the properties of macroscopic systems using the knowledge of properties of microscopic particles.

Prerequisites: Background of thermodynamics at +2 and degree level

Course Outline:

1. The Statistical Basis of Thermodynamics:
The macroscopic and the microscopic states – Contact between statistics and Thermodynamics: Expressing T, P and μ in terms of Ω – The classical Ideal gas - The entropy of mixing and the Gibbs paradox - Phase space of a classical system - Liouville‟s theorem and its consequences. (13 Hours)
Text : Pathria, Sections 1.1 – 1.6, 2.1 – 2.2

2. Microcanonical, Canonical and Grand Canonical Ensembles:
The microcanonical ensemble – Examples : (1) Classical Ideal gas, (2) Linear harmonic oscillator - Quantum states and the phase space – Equilibrium between a system and a heat reservoir- Physical significance of the various statistical quantities in the canonical ensemble- Alternative expressions for the partition function- Examples: (1) The classical systems: Ideal gas, (2) A system of harmonic oscillators, (3) The statistics of paramagnetism - Energy fluctuations in the canonical ensemble -Equipartition theorem - Virial theorem - Equilibrium between a system and a particle-energy reservoir- Physical significance of the various statistical quantities in the grand canonical ensemble-Example : Classical Ideal gas - Density and energy fluctuations in the grand canonical ensemble. (21 Hours)
Text : Pathria, Sections 2.3 -2.5, 3.1, 3.3 - 3.9, 4.1, 4.3 – 4.5

3. Formulation of Quantum Statistics:
Quantum-mechanical ensemble theory: The density matrix- Statistics of the various ensembles-Example: An electron in a magnetic field - Systems composed of indistinguishable particles- An ideal gas in a quantum-mechanical microcanonical ensemble- An ideal gas in other quantum-mechanical ensembles-Statistics of the occupation numbers (15 Hours)
Text : Pathria, Sections 5.1 - 5.4, 6.1 – 6.3

4. Ideal Bose Systems:
Thermodynamic behaviour of an ideal Bose gas- Thermodynamics of the blackbody radiation- The field of sound waves. (10 Hours)
Text : Pathria, Sections : 7.1 - 7.3

5. Ideal Fermi Systems:
Thermodynamic behaviour of an ideal Fermi gas- Magnetic behaviour of an ideal Fermi Gas : (1) Pauli paramagnetism, (2) Landau diamagnetism – The electron gas in metals (Discussion of heat capacity only), Enoughexercises. (13 Hours)
Text : Pathria, Sections : 8.1 – 8.3

Textbook:
1. Statistical Mechanics (2nd Edition), R. K. Pathria , Butterworth-Heinemann /Elsevier (1996)
Reference books:
1. Statistical Mechanics : An Elementary Outline, Avijit Lahiri, Universities Press (2008)
2. An Introductory Course of Statistical Mechanics, Palash. B. Pal, Narosa (2008)
3. Statistical Mechanics : An Introduction, Evelyn Guha, Narosa (2008)
4. Statistical and Thermal Physics : An Introduction, S. Lokanathan and R.S.Gambhir, Prentice Hall of India (2000).
5. Introductory Statistical Mechanics (2nd Edition), Roger Bowley and Mariana Sanchez, Oxford University Press (2007)
6. Concepts in Thermal Physics, Stephen. J. Blundell and Katherine. M. Blundell, Oxford University Press (2008)
7. An Introduction to Thermal Physics, Daniel. V. Schroeder, Pearson (2006)
8. Statistical Mechanics, Donald. A. McQuarrie, Viva Books (2005)
9. Problems and Solutions on Thermodynamics and Statistical Mechanics, Ed. by Yung – Kuo Lim, Sarat Book House (2001)

Course Plan

Unit/hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity Learning outcome(output)	Assessment
Unit I (13hours)	The macroscopic and the microscopic states – Contact between statistics and Thermodynamics: Expressing T, P and μ in terms of Ω – The classical Ideal gas - The entropy of mixing and the Gibbs paradox - Phase space of a classical system - Liouville‟s theorem and its consequences. .	● Lecture ●Problem-Solving	● To explain statistical physics and thermodynamics as logical consequences of postulates of statistical mechanics. ● Applications of classical statistical mechanics.	Evaluation of problems ● Q and A
Unit II (21hours)	The microcanonical ensemble – Examples : (1) Classical Ideal gas, (2) Linear harmonic oscillator - Quantum states and the phase space – Equilibrium between a system and a heat reservoir- Physical significance of the various statistical quantities in the canonical ensemble- Alternative expressions for the partition function- Examples: (1) The classical systems: Ideal gas, (2) A system of harmonic oscillators, (3) The statistics of paramagnetism - Energy fluctuations in the canonical ensemble -Equipartition theorem - Virial theorem - Equilibrium between a system and a	● Lecture ●Problem-Solving	● To gain ideas about ensembles. ● To know about the physical significance of statistical quantities in various ensembles.	● problem solving ● Q and A

	particle-energy reservoir- Physical significance of the various statistical quantities in the grand canonical ensemble- Example : Classical Ideal gas - Density and energy fluctuations in the grand canonical ensemble.			

Unit III(15hours)	Quantum-mechanical ensemble theory: The density matrix- Statistics of the various ensembles-Example: An electron in a magnetic field - Systems composed of indistinguishable particles- An ideal gas in a quantum-mechanical microcanonical ensemble- An ideal gas in other quantum-mechanical ensembles-Statistics of the occupation numbers	●Lecture ●Problem-Solving ●Seminar	• To learn the fundamental difference between classical and quantum statistics and to learn about quantum statistical distribution law. • .Applications of Quantum statistical mechanics	• Q & A • Evaluation problem solving skill
Unit IV (10 hours)	Thermodynamic behaviour of an ideal Bose gas- Thermodynamics of the blackbody radiation- The field of sound waves.	● Lecture ●Problem-Solving	• To study the important examples of the ideal bose system.	• Q & A • Evaluation problem solving skill

Unit V (13hours)	Thermodynamic behaviour of an ideal Fermi gas- Magnetic behaviour of an ideal Fermi Gas : (1) Pauli paramagnetism, (2) Landau diamagnetism – The electron gas in metals (Discussion of heat capacity only), Enough exercises.	●Lecture ●Problem-Solving	• To study the important examples of ideal fermi system	• Q & A • Evaluating through internal exams

Faculty in charge
Ms Shyama I

PHY2C08:COMPUTATIONAL PHYSICS

Semester:2
Course Number: 4
Contact Hours per Week: 4T
Number of Credits:4
Number of Contact Hours: 72 hrs
Course Evaluation: Internal & External: 1:4

Objectives of the Course: To study scientific problems using computational methods which combine computer science,physics and applied Mathematics to develop scientific solutions to complex problems.
Prerequisites: Background of the python programming language at degree level.

Course Outline:
1. Introduction to Python Programming: Concept of high level language, steps involved in the development of a Program- Compilers and Interpreters - Introduction to Python language: Inputs and Outputs, Variables, operators, expressions and statements - ,Strings, Lists, Tuples, and Dictionaries, Conditionals, Iteration and looping, Functions and Modules -.Mathematical functions (math module), File input and Output, Pickling. Formatted Printing. (13 hours)

2. Tools for maths and visualisation in Python (The numpy and pylab modules)*
Numpy module:- Arrays and Matrices – creation of arrays and matrices (arange, linspace, zeros, ones, random, reshape,copying), Arithmetic Operations, cross product, dot product , Saving and Restoring, Matrix inversion, solution of simultaneous equations, Data visualization- The Matplotlib, Module- Plotting graphs, Multiple plots, .Polar plots, Pie Charts, Plotting mathematical functions, Sine and other functions, Special functions – Bessel & Gamma, Fourier Series.(13 hours)

3. Numerical Methods 1*: Interpolation: linear and polynomial interpolation, equidistant points - Newton's forward/backward difference, spline interpolation. Curve fitting- Least square fit- linear and exponential. Derivatives: Lagrange polynomials, Newton difference polynomials, finite difference approximations. Numerical integration: simple quadratures (trapezoid, Simpson). Solution of nonlinear equations: closed domain methods (bisection and regula falsi.Monte Carlo Method – Simple Integration. (15 hours)

4. Numerical Methods-2* : Ordinary differential equations: Initial value problems: the first-order Euler method, the second-order single point methods (predictor), Runge-Kutta methods. Boundary value problems: the shooting method, the equilibrium method, the Numerov's method, the eigenvalue problems - the equilibrium method . Fourier transforms: discrete Fourier transforms, fast Fourier transforms. (15 hours)

5. Computational methods in Physics and Computer simulations 12 hrs (24 marks)*:
Classical Mechanics: One Dimensional Motion: Falling Objects: Introduction – Formulation: from Analytical methods to Numerical Methods - Euler Method, Freely falling body, Fall of a body in viscous medium, Two dimensional motion:Projectile motion (by Euler method) and Planetary motion (R-K Method), Accuracy considerations, -, Oscillatory motion –Ideal Simple Harmonic Oscillator (Euler method), Motion of a damped oscillator (Feynmann-Newton method)., Logistic maps. Monte-Carlo simulations: value of π, simulation of radioactivity. Quantum Mechanics: 1D Schrodinger equation –wave function and eigen values. (16 hours)
(Visualisation can be done with matplotlib/pylab)
*(Programs are to be discussed in Python)
Textbooks for Numerical Methods:
1. Introductory methods of numerical analysis, S.S. Sastry , (Prentice Hall of India,1983)
2. Numerical Methods in Engineering and Science, Dr. B S Grewal, Khanna Publishers, New Delhi (or any other book)
3. Numerical Mathematical Analysis, J.B. Scarborough

References:
(For Python any book can be used as reference. Moreover a number of open articles are available freely in internet. Python is included in default in all GNU/Linux platforms and It is freely downloadable for Windows platform as well. However use of GNU/Linux may be encouraged).
1. www.python.org
2. Python Essential Reference, David M. Beazley, Pearson Education
3. Core Python Programming, Wesley J Chun, Pearson Education
4. Python Tutorial Release 2.6.1 by Guido van Rossum, Fred L. Drake, Jr., editor. This Tutorial can be obtained from website http://www.altaway.com/resources/python/tutorial.pdf
5. How to Think Like a Computer Scientist: Learning with Python, Allen Downey , Jeffrey

Elkner , Chris Meyers, http://www.greenteapress.com/thinkpython/thinkpython.pdf
6. Numerical Recipes in C, second Edition(1992), Cambridge University Press
7. Numerical Recipes in Fortran 77, second Edition(1992), Cambridge University Press
8. Numpy reference guide, http://docs.scipy.org/doc/numpy/numpy-ref.pdf (and other free resources available on net)
9. Matplotlib , http://matplotlib.sf.net/Matplotlib.pdf (and other free resources available on net)
10. Numerical Methods, E Balagurusamy, Tata McGraw-Hill
11. Numerical Methods , T Veerarajan, T Ramachandran, Tata MCGraw-Hill
12. Numerical Methods with Programs I BASIC, Fortran & Pascal, S Balachandra Rao, C K Shantha. Universities Press
13. Numerical methods for scientists and engineers, K. Sankara Rao, PHI
14. Computational Physics, V.K.Mittal, R.C.Verma & S.C.Gupta-Published by Ane Books,4821,Pawana Bhawan,first floor,24 Ansari Road,Darya Ganj,New Delhi-110 002 (For theory part and algorithms. Programs must be discussed in Python)
15. Numerical Methods in Engineering with Python by Jaan Kiusalaas

Course Plan

Unit/hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity Learning outcome(output)	Assessment
Unit I (13hours)	Concept of high level language, steps involved in the development of a Program - Compilers and Interpreters - Introduction to Python language: Inputs and Outputs, Variables, operators, expressions and statements - ,Strings, Lists, Tuples, and Dictionaries, Conditionals, Iteration and looping, Functions and Modules -. Mathematical functions (math module), File input and Output, Pickling. Formatted Printing. .	● Lecture ●Problem-Solving	Have a strong base in the python programming language regarding different data types such as list,dictionaries etc.. ● Understand python libraries and modules.	Evaluation of problems ● Q and A
Unit II (13hours)	Numpy module:- Arrays and Matrices – creation of arrays and matrices (arange, linspace, zeros, ones, random, reshape, copying), Arithmetic Operations, cross product, dot product , Saving and Restoring, Matrix inversion, solution of simultaneous equations, Data visualization- The Matplotlib, Module- Plotting graphs, Multiple plots, .Polar plots, Pie Charts, Plotting mathematical functions, Sine and other functions, Special functions–Bessel & Gamma, Fourier Series.	● Lecture ●Problem-Solving	● To get an idea about different modules such as numpy,matplotlib etc. ● Understand arrays and matrices and enable data visualisation.	● problem solving ● Q and A

Unit III (15hours)	Interpolation: linear and polynomial interpolation, equidistant points - Newton's forward/backward difference, spline interpolation. Curve fitting- Least square fit- linear and exponential. Derivatives: Lagrange polynomials, Newton difference polynomials, finite difference approximations. Numerical integration: simple quadratures (trapezoid, Simpson). Solution of non-linear equations: closed domain methods (bisection and regula falsi. Monte Carlo Method – Simple Integration.	●Lecture ●Problem-Solving ●Seminar	• To get a wide knowledge of numerical methods in computational physics that can be used to solve many problems which does not have an analytic solution.	• Q & A • Evaluation problem solving skill
Unit IV (15hours)	Ordinary differential equations: Initial value problems: the first-order Euler method, the second-order single point methods (predictor), Runge-Kutta methods. Boundary value problems: the shooting method, the equilibrium method, the Numerov's method, the eigenvalue problems - the equilibrium method . Fourier transforms: discrete Fourier transforms, fast Fourier transforms.	● Lecture ●Problem-Solving	• To find solutions to ordinary differential equations using Euler,R K methods etc in python language.	• Q & A • Evaluation problem solving skill

Unit V (16hours)	Classical Mechanics: One Dimensional Motion: Falling Objects: Introduction – Formulation: from Analytical methods to Numerical Methods - Euler Method, Freely falling body, Fall of a body in viscous medium, Two dimensional motion: Projectile motion (by Euler method) and Planetary motion (R-K Method), Accuracy considerations, -, Oscillatory motion – Ideal Simple Harmonic Oscillator (Euler method), Motion of a damped oscillator (Feynmann-Newton method)., Logistic maps. Monte-Carlo simulations: value of π, simulation of radioactivity. Quantum Mechanics: 1D Schrodinger equation – wave function and eigen values.	●Lecture ●Problem-Solving ● Seminar	● To solve physics problems using python language.	● Q & A ● Evaluating through internal exams

Faculty in charge
Ms Shyama I

Practical for Semester I & II
a) PHY1L01 & PHY2L03 (GENERAL PHYSICS)

Contact Hours per Week: 8L
Number of Credits:3
Course Evaluation: Internal & External: 1:4

Objectives of the Course:

- Learn various experimental and computational tools thereby developing analytical abilities to address real world problems.
- Adopt the skills related to research, education, and industry- academia

Prerequisites: Background of the practical knowledge at degree level.

Course Outline:

1. All the experiments should involve error analysis. Internal evaluation to be done in the respective semesters and grades to be intimated to the controller at the end of each semester itself. Practical observation book to be submitted to the examiners at the time of examination.
2. Eight experiments are to be done by a student in a semester. One mark is to be deducted from internal marks for each experiment not done by the student if the required total of experiments are not done in the semesters.
3. The PHOENIX/EXPEYES Experimental Kit developed at the Inter University Accelerator Centre, New Delhi, may be used for the experiments wherever possible.

(At least 16 experiments should be done, 8 each for I & II semesters)

1. Y and σ - Interference method (a) elliptical (b) hyperbolic fringes. To determine Y and σ of the material of the given specimen by observing the elliptical and hyperbolic fringes formed in an interference set up
2. Y & σ by Koenig's method
3. Variation of surface tension with temperature-Jaeger's method. To determine the surface tension of water at different temperatures by Jaeger's method of observing the air bubble diameter at the instant of bursting inside water
4. Stefan's constant-To determine Stefan's constant
5. Thermal conductivity of liquid and air by Lee's disc method.

6. Dielectric constant by Lecher wire- To determine the wavelength of the waves from the given RF oscillator and the dielectric constant of the given oil by measurement of a suitable capacitance by Lecher wire setup.
7. Viscosity of a liquid - Oscillating disc method. To determine the viscosity of the given liquid by measurements on the time period of oscillation of the disc in air and in the liquid
8. Mode constants of a vibrating strip. To determine the first and second mode constants of a steel vibrating strip; Y to be measured by the Cantilever method and frequency of vibration by the Melde's string method
9. Constants of a thermocouple and temperature of inversion.
10. Study of magnetic hysteresis - B-H Curve using standard toroid / specimen in any form.
11. Maxwell's L/C bridge -To determine the resistance and inductance of the given unknown inductor by Maxwell's L/C bridge OR Anderson's Bridge – L/C and self inductance. .(The kit developed by Indian Academy of Science can also be used)
12. Susceptibility measurement by Quincke's and Guoy's methods - Paramagnetic susceptibility of salt and specimen
13. Michelson's interferometer - (a) λ and (b) d λ and thickness of mica sheet.
14. Photoelectric effect. Determination of Plank's constant
15. Frank Hertz experiment .To measure the ionization potential of Mercury by drawing current versus applied voltage.
16. Fabry Perot etalon -Determination of thickness of air film.
17. Elementary experiments using Laser: (a) Study of Gaussian nature of laser beam (b) Evaluation of beam spot size (c) Measurement of divergence (d) Diameter of a thin wire
18. Diffraction Experiments using lasers (a)Diffraction by single slit/double slit/circular aperture (b)Diffraction by reflection grating
19. Measurement of the thermal and electrical conductivity of Cu to determine the Lorents number.(The kit developed by Indian Academy of Science can also be used)
20. Passive filters .(The kit developed by Indian Academy of Science can also be used)
21. Microwave experiments - Determination of wavelength, VSWR, attenuation, dielectric constant.
22. Experiments with Lock-in Amplifier(a) Calibration of Lock In Amplifier (b) Phase sensitive detection (c) Mutual inductance determination (d) Low resistance determination.(The kit developed by Indian Academy of Science can also be used)
23. Cauchy's constants using liquid prism
24. Forbes method of determining thermal conductivity
25. Zeeman effect using Fabry-Perot etalon.

Reference Books:

1. B.L. Worsnop and H.T. Flint - Advanced Practical Physics for students - Methuen & Co (1950)
2. E.V. Smith - Manual of experiments in applied Physics - Butterworth (1970)
3. R.A. Dunlap - Experimental Physics - Modern methods - Oxford University Press (1988)
4. D. Malacara (ed) - Methods of experimental Physics - series of volumes - Academic Press Inc (1988)
5. S.P. Singh –Advanced Practical Physics – Vol I & II – Pragati Prakasan, Meerut (2003) – 13th Edition

6. A.C. Melissinos and J.Napolitano, Experiments in Modern Physics, Academic Press, 2003
7. K.Muraleedhara Varier, A Practical Approach to Nuclear Physics, Narosa Publishing House (2018)

Course Plan

Sl No.	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity Learning outcome(output)	Assessment
1 2 3 4	Y and σ - Interference method (a) elliptical (b) hyperbolic fringes. To determine Y and σ of the material of the given specimen by observing the elliptical and hyperbolic fringes formed in an interference set up Susceptibility measurement by Quincke's and Guoy's methods - Paramagnetic susceptibility of salt and specimen. Dielectric constant by Lecher wire- To determine the wavelength of the waves from the given RF oscillator and the dielectric constant of the given oil by measurement of a suitable capacitance by Lecher wire setup. Frank Hertz experiment .To measure the ionization potential of Mercury by drawing current versus applied voltage.	• Seminar • Practicals • pear learning.	• These practical papers make the student familiar with General physics experiments like Cornu's method, Quincke's method, Photoelectric effect etc	• Model Exam • Record Verification • Daily Test

5	Photoelectric effect. Determination of Plank's constant			
6	Maxwell's L/C bridge -To determine the resistance and inductance of the given unknown inductor by Maxwell's L/C bridge OR Anderson's Bridge – L/C and self inductance. .(The kit developed by Indian Academy of Science can also be used)			
7	Cauchy's constants using liquid prism			
8	Diffraction Experiments using lasers (a)Diffraction by single slit/double slit/circular aperture (b)Diffraction by reflection grating			
9	Y & σ by Koenig's method			
10	Thermal conductivity of liquid and air by Lee's disc method.			
11	Mode constants of a vibrating strip. To determine the first and second mode constants of a steel vibrating strip; Y to be measured by the Cantilever method and frequency of vibration by the Melde's string.			

12	Fabry Perot etalon -Determination of thickness of air film			
13	Passive filters .(The kit developed by Indian Academy of Science can also be used)			
14	Viscosity of a liquid - Oscillating disc method. To determine the viscosity of the given liquid by measurements on the time period of oscillation of the disc in air and in the liquid.			
15	Variation of surface tension with temperature-Jaeger's method. To determine the surface tension of water at different temperatures by Jaeger's method of observing the air bubble diameter at the instant of bursting inside water			
16	Study of magnetic hysteresis - B-H Curve using standard toroid / specimen in any form.			

Faculty in charge
Shyama I

b) PHY1L02 & PHY2L04 (ELECTRONICS)

(At least 16 experiments should be done, 8 each for I & II semesters.)
External Practical Exam for PHY1L02&PHY2L04 together will be conducted at the end of 2nd semester.

1. Study the V-I characteristics of a Silicon Controlled Rectifier – Construct half-wave and full-wave circuits using SCR.
2. a). Study the V-I characteristics of UJT. Determine intrinsic stand-off ratio. Design and construct a relaxation oscillator and sharp pulse generator for different frequencies.
b). Design and construct a time delay circuit to switch ON a suitable load driven by a SCR. Trigger the SCR using UJT.
3. a).Study the V-I characteristics of a JFET. Determine pinch-off voltage, saturation drain current and cut-off voltage of the device.
b). Design and construct a low frequency common source amplifier using JFET. Study the frequency response and measure the i/p and o/p impedances.
4. Design and construct a d.c voltage regulator using transistors and Zener diodes. Study the line and load regulation characteristics for suitable o/p voltage and maximum load current.
5. Design a single stage bipolar transistor amplifier. Compare the characteristics and performance of the circuit without feedback and with suitable negative feedback. Compare theoretical and observed magnitudes of voltage gain, i/p and o/p impedances in both cases.
6. Design and construct a differential amplifier using transistors. Study frequency response and measure i/p, o/p impedances. Also measure CMRR of the circuit.
7. a).Design and construct an amplitude modulator circuit. Study the response for suitable modulation depths.
b).Design and construct a diode A.M detector circuit to recover the modulating signal from the A.M wave.
8. Design and construct a two stage I.F amplifier circuit. Study the response of single and coupled stages.
9. Design and construct a Darlington pair amplifier using medium power transistors for a suitable output current. Study the frequency response of the circuit and measure the i/p and o/p impedances.
10.Design and construct a piezo-electric crystal oscillator to generate square waves of suitable frequencies. Compare designed and observed frequencies.
11.Design and construct an R.F oscillator using a tunnel diode. Measure frequency of the output signal.
12.Design and construct an OPAMP based summing and averaging amplifier for three suitable inputs. Compare the designed and observed outputs.
13.Design and construct a Wien bridge oscillator using OP AMP for different frequencies. Compare designed and observed frequencies.
14.Design and construct an astable multivibrator using OPAMP for suitable frequencies.
15.Design and construct a monostable multivibrator using OPAMP for suitable pulse widths.

16.Design and construct a triangular wave generator using OPAMPs for different frequencies.
17. Design and construct OPAMP based precision half and full wave rectifiers. Observe the o/p on CRO and study the circuit operation.
18.Design and construct an astable multivibrator using timer IC 555. Measure frequency and duty cycle of the o/p signal.
Modify the circuit to obtain almost perfect square waves.
19.Design and construct an monostable multivibrator using timer IC 555, for different pulse widths. Compare designed and observed pulse widths.
20.Design and construct a voltage controlled oscillator using timer IC 555. Study the performance.
21.Design and construct Schmidt triggers using OP AMPS – for symmetrical and non-symmetrical LTP/UTP. Trace hysteresis curve.
22.Design and construct OPAMP based analogue integrator and differentiator. Study the response in each case.
23. a). Design and construct OP AMP based circuit for solving a second order differential equation. Study the performance.
b). Design and construct OP AMP based circuit for solving a simultaneous equation. Study the performance.
24. Design and construct Second order Butterworth Low pass, High Pass and Band Pass filters using OPAMPs. Study the performance in each case.
25. Design and construct a narrow band-pass filter for a given centre frequency using a single OP AMP with multiple feedback. Study the frequency response.
26. 4 bit D/A converter using R-2R ladder network. Realization of 4 bit A/D converter using D/A converter.
27. Study of 4 bit binary counter (IC 7493) and 4 bit decade counter(IC 7490) in various modes. Use the counters as frequency dividers.
28. Design and construct a 3 bit binary to decimal decoder using suitable logic gates. Verify the operation.
29. Set up a four bit shift register IC 7495 and verify right shift and left shift operations for different data inputs.
References: Design and construction ideas may be obtained from standard electronics text books.
For further reference:
Basic Electronics and Lab Video Prof. T.S. Natarajan IIT Madras
http://nptel.iitm.ac.in/video.php?subjectId=122106025

Course Plan

Sl No.	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity Learning outcome(output)	Assessment
1 2 3 4 5	Study of 4 bit binary counter (IC 7493) and 4 bit decade counter(IC 7490) in various modes. Use the counters as frequency dividers. Design and construct a Darlington pair amplifier using medium power transistors for a suitable output current. Study the frequency response of the circuit and measure the i/p and o/p impedances. Design and construct an OPAMP based summing and averaging amplifier for three suitable inputs. Compare the designed and observed outputs. Design and construct a Wien bridge oscillator using OP AMP for different frequencies. Compare designed and observed frequencies. Design and construct an astable multivibrator using timer IC 555. Measure frequency and duty cycle of the o/p signal.	• Seminar • Practicals • pear learning.	• Design, development and testing of electronic circuits with OP amps, discrete electronic components and integrated circuit chips. • Designing amplifier, oscillator, and wave shaping circuits for defined specifications. • Designing electronic filters and understanding phase sensitive lock in detection technique	• Model Exam • Record Verification • Daily Test

6	Design and construct an astable multivibrator using OPAMP for suitable frequencies.			
7	Design and construct a triangular wave generator using OPAMPs for different frequencies.			
8	Design and construct OPAMP based precision half and full wave rectifiers. Observe the o/p on CRO and study the circuit operation.			
9	Design and construct an monostable multivibrator using timer IC 555, for different pulse widths. Compare designed and observed pulse widths.			
10	.Design and construct a voltage controlled oscillator using timer IC 555. Study the performance.			
11	Design and construct Schmidt triggers using OP AMPS – for symmetrical and non-symmetrical LTP/UTP. Trace hysteresis curve.			
12	Design and construct OPAMP based analogue integrator and differentiator. Study the response in each case.			
13	Design and construct Second order Butterworth Low pass, High Pass and Band Pass filters using OPAMPs. Study the performance in each case.			

14	Design and construct a narrow band-pass filter for a given centre frequency using a single OP AMP with multiple feedback. Study the frequency response			
15	Design a single stage bipolar transistor amplifier. Compare the characteristics and performance of the circuit without feedback and with suitable negative feedback. Compare theoretical and observed magnitudes of voltage gain, i/p and o/p impedances in both cases			
16	Design and construct an astable multivibrator using OPAMP for suitable frequencies.			

Faculty in charge
Sukanya I S

PHY3C09:QUANTUM MECHANICS II

Semester: 3
Course Number: 1
Contact Hours: 4T
Number of Credits: 4
Number of Contact Hours: 72
Course Evaluation: Internal & External: 1:4

Objectives of the Course: To equip them with the techniques of angular momentum, perturbation theory and scattering theory so that they can use these in various branches of physics as per their requirement.

Prerequisites: Background of Quantum mechanics I.

Course Outline

1.Time-Independent Perturbation Theory (20 Hrs.)
Non-degenerate perturbation theory – First-order theory and Second-order theory – Examples : (1) Linear harmonic oscillator (2) Anharmonic oscillator – Degenerate perturbation theory – Two-fold degeneracy – Higher-order degeneracy –The fine-structure of hydrogen – Relativistic correction – Spin-orbit coupling - Zeeman effect – Weak-field Zeeman effect– Strong-field Zeeman effect – Intermediate-field Zeeman effect – Hyperfine splitting – Linear Stark effect in the hydrogen atom.
Text : (1) Chapter 6, Introduction to Quantum Mechanics (Edn.2) by David. J. Griffiths,
(2) Chapter 8, section 8.3, Quantum Mechanics (Edn.4) by V. K. Thankappan

2.Variational Method and WKB Method (12 Hrs.)
Bound states (Ritz method) – Linear harmonic oscillator – Helium atom – WKB wavefunction in classical region – Example : Potential well with two vertical walls – WKB wavefunction in nonclassical region – Example : Tunneling – Connection formulae – Examples : (1) Potential well with one vertical wall (2) Potential well with no vertical walls.
Text : (1) Chapter 8, section 8.2A, Quantum Mechanics (Edn.4) by V. K. Thankappan
(2) Chapter 6, Introduction to Quantum Mechanics (Edn.2) by David. J. Griffiths

3.Time-dependent perturbation theory (12 Hrs.)
First order time-dependent perturbation theory – Constant perturbation – Transition to a continuum – Fermi's Golden rule – Scattering cross section in the Born approximation – Harmonic perturbation – Radiative transitions in atoms.
Text : Chapter 8, sections 8.4, 8.4A, 8.4B, Quantum Mechanics (Edn.4) by V. K. Thankappan

4. Scattering (12 Hrs.)

Scattering amplitude – Method of partial waves – Scattering by a central potential – Optical theorem – Scattering by a square-well potential

Text: Chapter 7, relevant sections, Quantum Mechanics (Edn.4) by V. K. Thankappan

5.Relativistic Quantum Mechanics (16 Hrs.)

Klein-Gordon equation – First order wave equations – Weyl equation – Dirac equation – Properties of Dirac matrices – Dirac particle is spin-1/2 particle – Spinor – Equation of continuity – Dirac particle in an external magnetic field : Non- relativistic limit – Hole theory

Text: Chapter 10, relevant sections; Quantum Mechanics (Edn.4) by V. K. Thankappan

Textbooks:

1. Quantum Mechanics (Edn.4) : V. K. Thankappan, New Age International.
2. Introduction to Quantum Mechanics (Edn.2) : D.J. Griffiths, Pearson Education.

References :

1. Principles of Quantum Mechanics (Edn.2) : R. Shankar, Springer.
2. Introductory Quantum Mechanics: Richard L. Liboff, Pearson Education .
3. A Modern Approach to Quantum Mechanics: J S Townsend, Viva Books.
4. Quantum Mechanics : Non-Relativistic Theory (Course of Theoretical Physics Vol3): L. D. Landau and E. M.
Lifshitz, Pergamon Press.
5. The Feynman Lectures on Physics Vol 3, Narosa.
6. Quantum Mechanics : Concepts and Applications (Edn.2) : NouredineZettili, Wiley.
7. Quantum Mechanics Demystified: David McMahon, McGrawHill 2006.
8. Quantum Mechanics (Schaum's Outline) :YoavPelegetal. Tata McGraw Hill Private Limited, 2/e.
9. Quantum Mechanics: 500 Problems with Solutions: G Aruldhas, Prentice Hall of India.
10. www.nptel/videos.in/2012/11/quantum-physics.html
11. https://nptel.ac.in/courses/115106066/

Course Plan

Unit/hours (time required)	**Topics to be taught (input)**	**Procedure (process) Student centric Method of teaching**	**Activity Learning outcome(output)**	**Assessment**
Unit I (20 hours)	Non-degenerate perturbation theory – First-order theory and Second-order theory – Examples : (1) Linear harmonic oscillator (2) Anharmonic oscillator – Degenerate perturbation theory – Two-fold degeneracy – Higher-order degeneracy – The fine-structure of hydrogen – Relativistic correction – Spin-orbit coupling - Zeeman effect – Weak-field Zeeman effect – Strong-field Zeeman effect – Intermediate-field Zeeman effect – Hyperfine splitting – Linear Stark effect in the hydrogen atom.	● Lecture ●Problem-Solving	● To understand the idea of time independent perturbation theory . ● To be familiar with Hydrogen atom by its properties	Evaluation of problems ● Q and A

Unit II (12hours)	Bound states (Ritz method) – Linear harmonic oscillator – Helium atom – WKB wavefunction in classical region – Example : Potential well with two vertical walls – WKB wavefunction in nonclassical region – Example : Tunneling – Connection formulae – Examples : (1) Potential well with one vertical wall (2) Potential well with no vertical walls.	● Lecture ●Problem-Solving	● To understand Approximation methods for time-independent problems like the WKB approximation ● To acquire a deep knowledge of the connection formula and its applications.	● problem solving ● Q and A

Unit III(12 hours)	First order time-dependent perturbation theory – Constant perturbation – Transition to a continuum – Fermi's Golden rule – Scattering cross section in the Born approximation – Harmonic perturbation – Radiative transitions in atoms.	●Lecture ●Problem-Solving ● Seminar ● Powerpoint presentation	● To get an idea time dependent Perturbation theory and Interaction of an atom with the electromagnetic field	● Q & A ● Evaluation problem solving skill
Unit IV (12hours)	Scattering amplitude – Method of partial waves – Scattering by a central potential – Optical theorem – Scattering by a square-well potential	● Lecture ●Problem-Solving ● Seminar	● To describe and understand Scattering, its parameters and its application	● Q & A ● Evaluation problem solving skill

Unit V (16hours)	Klein-Gordon equation – First order wave equations – Weyl equation – Dirac equation – Properties of Dirac matrices – Dirac particle is spin-1/2 particle – Spinor – Equation of continuity – Dirac particle in an external magnetic field : Non-relativistic limit – Hole theory	●Lecture ●Problem-Solving ● Seminar	● TO get an idea of Relativistic Quantum Mechanics using Dirac equation, Dirac matrices,. The Klein Gordon equation etc	● Q & A ● Evaluation problem solving skill

Faculty In-charge
Ms. Ancy Maria Varghese

PHY3C10 :NUCLEAR AND PARTICLE PHYSICS

Semester:3
Course Number: 2
Contact Hours per Week: 4T
Number of Credits:4
Number of Contact Hours: 72 hrs
Course Evaluation: Internal & External: 1:4

Objectives of the Course: The course deals with the various dimensions related to nuclear physics and structuring of atoms. It also discusses the different nuclear models.
Prerequisites: Background of Nuclear physics at degree level.

Course Outline:
1.Nuclear Forces: Properties of the nucleus, size, binding energy, angular momentum , The deuteron and two- nucleon scattering experimental data, Simple theory of the deuteron structure, Low energy n-p scattering, characteristics of nuclear forces, Spin dependence,Tensor force, Scattering cross sections, Partial waves, Phase shift, Singlet and triplet potentials, Effective range theory, p-p scattering. (12 hours)
Text: K.S.Krane : “Introductory Nuclear Physics” (Wiley), (Ch. 3 and 4)

2. Nuclear Decay: Basics of alpha decay and theory of alpha emission, Beta decay, Energetics of beta decay,Fermi theory of beta decay, Comparative half-life, Allowed and forbidden transitions, Selection rules, Parity violation in beta decay. Neutrino. Energetics of Gamma Decay, Multipole moments, Decay rate, Angular

momentum and parity selection rules, Internal conversion, Lifetimes. (12 hours)
Text: K.S.Krane : “Introductory Nuclear Physics” (Wiley), (Ch. 8, 9 and 10)

3. Nuclear Models, Fission and Fusion: Shell model potential, Spin-orbit potential, Magnetic dipole moments, Electric quadrupole moments, Valence Nucleons, Collective structure, Nuclear vibrations, Nuclear rotations,Liquid drop Model, Semi Empirical Mass formula, Energetics of Fission process, Controlled Fission reactions.Fusion process, Characteristics of fusion, solar fusion, Controlled fusion reactors. (19 hours)
Text: K.S.Krane : “Introductory Nuclear Physics” (Wiley), (Ch. 5,13.1-13.5,14)

4. Nuclear Radiation Detectors and Nuclear Electronics: Gas detectors – Ionization chamber, Proportional counter and G M counter, Scintillation detector, Photomultiplier Tube (PMT), Semiconductor detectors – Ge(Li), Si(Li) and surface barrier detectors, Preamplifiers, Amplifiers, Single channel analyzers, Multi- channel analyzers, counting statistics, energy measurements. (12 hours)
Text: S S Kapoor and V S Ramamurthy: “Nuclear Radiation Detectors” (Wiley)

5. Particle Physics: Four basic forces - Gravitational, Electromagnetic, Weak and Strong - Relative strengths, classification of particles, Yukawa's theory, Conservation of energy and masses, Electric charges, Conservation of angular momentum, Baryon and lepton numbers, Conservation of strangeness, Conservation of isospin and its components, Conservation of parity, Charge conjugation, CP violation, time reversal and CPT theorem. Extremely short lived particles, Resonances - detecting methods and experiments, Internal symmetry, The Sakata model, SU (3), The eightfold way, Gell Mann and Okubo mass formula, Quarks and quark model, Confined quarks, Experimental evidence, Coloured quarks. (17 hours)
Text : Y.Neeman and Y.Kirsh: "The particle hunters' (Cambridge University Press), Ch 6.1- 3, 3.4, 7.1-10,
8.1, 9. 1-7)
Reference Books :
1. H.S.Hans : “Nuclear Physics – Experimental and theoretical” (New Age International, 2001).
2. G.F.Knoll : “Radiation Detection and Measurement, (Fourth Edition, Wiley, 2011)
3. G.D.Coughlan, J.E.Dodd and B.M.Gripalos “The ideas of particle physics – an introduction for scientists”, (Cambridge Press)
4. David Griffiths – “Introduction to elementary particles” – Wiley (1989)
5. S.B.Patel : “An Introduction to Nuclear Physics” (New Age International Publishers)
6. Samuel S.M.Wong: “Introductory Nuclear Physics” (Prentice Hall,India)
7.B.L.Cohen : “Concepts of Nuclear Physics” (Tata McGraw Hill)
8.E.Segre : “Nuclei and Particles” (Benjamin, 1967)
9.K Muraleedhara Varier: “Nuclear Radiation Detection: Measurement and Analysis” (Narosa).

Course Plan

Unit/hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity Learning outcome(output)	Assessment
Unit I (12hours)	Properties of the nucleus, size, binding energy, angular momentum , The deuteron and two-nucleon scattering experimental data, Simple theory of the deuteron structure, Low energy n-p scattering, characteristics of nuclear forces, Spin dependence,Tensor force, Scattering cross sections, Partial waves, Phase shift, Singlet and triplet potentials, Effective range theory, p-p scattering.	● Lecture ●Problem-Solving	● have a basic knowledge of nuclear size ,shape , binding energy.etc and also the characteristics of nuclear force in detail. ● Understand different types of scattering.	Evaluation of problems ● Q and A
Unit II (12hours)	Basics of alpha decay and theory of alpha emission, Beta decay, Energetics of beta decay, Fermi theory of beta decay, Comparative half-life, Allowed and forbidden transitions, Selection rules, Parity violation in beta decay. Neutrino. Energetics of Gamma Decay, Multipole moments, Decay rate, Angular momentum and parity selection rules, Internal conversion, Lifetimes.	● Lecture ●Problem-Solving	● To acquire knowledge about nuclear decay processes and their outcomes. ● Have a wide understanding regarding beta and gamma decay.	● problem solving ● Q and A

Unit III (19hours)	Shell model potential, Spin-orbit potential, Magnetic dipole moments, Electric quadrupole moments, Valence Nucleons, Collective structure, Nuclear vibrations, Nuclear rotations, Liquid drop Model, Semi Empirical Mass formula, Energetics of Fission process, Controlled Fission reactions. Fusion process, Characteristics of fusion, solar fusion, Controlled fusion reactors.	●Lecture ●Problem-Solving ● Seminar ● Powerpoint presentation	● To be able to gain knowledge about various nuclear models and potentials associated.	● Q & A ● Evaluation problem solving skill
Unit IV (12hours)	Gas detectors – Ionization chamber, Proportional counter and G M counter, Scintillation detector, Photomultiplier Tube (PMT), Semiconductor detectors – Ge(Li), Si(Li) and surface barrier detectors, Preamplifiers, Amplifiers, Single channel analyzers, Multi- channel analyzers, counting statistics, energy measurements.	● Lecture ●Problem-Solving ● Seminar	● To Grasp knowledge about Nuclear reactions, Fission and Fusion and their characteristics	● Q & A ● Evaluation problem solving skill
Unit V (17hours)	Physics: Four basic forces - Gravitational, Electromagnetic, Weak and Strong - Relative strengths, classification of particles, Yukawa's theory, Conservation of energy and masses, Electric charges, Conservation of angular momentum, Baryon and lepton	●Lecture ●Problem-Solving ● Seminar	● To understand the basic forces in nature and classification of particles ● To study in detail conservation laws and quark models in detail.	● Q & A ● Evaluation problem solving skill

	numbers, Conservation of strangeness, Conservation of isospin and its components, Conservation of parity, Charge conjugation, CP violation, time reversal and CPT theorem. Extremely short lived particles, Resonances - detecting methods and experiments, Internal symmetry, The Sakata model, SU (3), The eightfold way, Gellmann and Okubo mass formula, Quarks and quark model, Confined quarks, Experimental evidence, Coloured quarks.			

Faculty In-charge
Ms. Shyama I

PHY3C11: SOLID STATE PHYSICS

Semester:3
Course Number: 3
Contact Hours per Week: 4T
Number of Credits:4
Number of Contact Hours: 72 hrs
Course Evaluation: Internal & External: 1:4

Objectives of the Course: To understand Energy band theory, Formation of energy bands. Gaps at Brillouin zone boundaries, distinction between metal, insulator, semiconductor, weak and tight binding approximations
Prerequisites: Background of Solid state physics at degree level.

Course Outline
1. Crystal Structure and binding:Symmetry elements of a crystal, Types of space lattices, Miller indices, Diamond Structure, NaCI Structure,BCC, FCC,HCP structures with examples, Description

of X-ray diffraction using reciprocal lattice, Brillouin zones,Vander Waals interaction, Cohesive energy of inert gas crystals, Madelung interaction, Cohesive energy of ionic crystals,Covalent bonding, Metallic bonding, Hydrogen-bonded crystals (12 hours)

2. Lattice Vibrations:
Vibrations of monatomic and diatomic lattices, Quantization of lattice vibrations, Inelastic scattering of neutrons, Einstein and Debye models of specific heat, Thermal conductivity, Effect of imperfection (9 hours)

3. Electron States and Semiconductors:
Free electron gas in three dimensions, Specific heat of metals, Sommerfeld theory of electrical conductivity, Wiedemann-Franz law, Hall effect, Nearly free electron model and formation of energy bands, Bloch functions, Kronig Penny model, Formation of energy gap at Brillouin zone boundaries, Number of orbitals in a band, Equation of motion of electrons in energy bands, Properties of holes, Effective mass of carriers, Intrinsic carrier concentration, Hydrogenic model of donor and acceptor states. Direct band gap and indirect band gap semiconductors (17 hours)

4. Dielectric, Ferroelectric and magnetic properties:
Theory of Dielectrics: polarization, Dielectric constant, Local Electric field, Dielectric polarisability, Polarisation from Dipole orientation, Ferroelectric crystals, Order-disorder type of ferroelectrics, Properties of Ba Ti O3, Polarisation catastrophe, Displasive type ferroelectrics, Landau theory of ferroelectric phase transitions, Ferroelectric domain, Antiferroelectricity, Piezoelectricity, Applications of Piezoelectric Crystals,Diamagnetism and Paramagnetism: Langevin's theory of diamagnetism, Langevin's theory of paramagnetism, theory of Atomic magnetic moment, Hund‟s rule, Quantum theory of magnetic Susceptibility Ferro, Anti and Ferri magnetism: Weiss theory of ferromagnetism, Ferromagnetic domains, Neel Model of Antiferromagnetism and Ferrimagnetism, Spin waves, Magnons in Ferromagnets (qualitative) (22 hours)

5. Superconductivity:
Meissner effect, Type I and Type II superconductors, energy gap Isotope effect, London equation and penetration of magnetic field, Cooper pairs and the B C S ground state (qualitative, Flux quantization, Single particle tunneling, DC and AC Josephson effects, High Tc Superconductors(qualitative) description of cuprates, Enough exercises. (12 hours)
Text books:
1. C.Kittel,: Introduction to Solid State Physics 5th edition (Wiley Eastern)
2. A.J.Dekker: Solid State Physics (Macmillian 1958)

Reference Books:
1. M.Ali Omar, Elementary Solid State Physics, Addison-Wesley Publishing Company
2. N.W. Ashcroft and Mermin : Solid State Physics (Brooks Cole (1976)
3. Elements of Solid State Physics, Srivastava J.P. Prentice Hall of India (2nd edn)
4. Ziman J.H. Principles of Theory of Solids - (Cambridge 1964)

5. Harald Ibach and Hans Luth, Solid State Physics : An Introduction to Principles of Solid State Physics,
Springer (2009)

Course Plan

Unit/hours (time required)	**Topics to be taught (input)**	**Procedure (process) Student centric Method of teaching**	**Activity Learning outcome(output)**	**Assessment**
Unit I (12hours)	Symmetry elements of a crystal, Types of space lattices, Miller indices, Diamond Structure, NaCI Structure, BCC, FCC,HCP structures with examples, Description of X-ray diffraction using reciprocal lattice, Brillouin zones, Vander Waals interaction, Cohesive energy of inert gas crystals, Madelung interaction, Cohesive energy of ionic crystals, Covalent bonding, Metallic bonding, Hydrogen-bonded crystals	● Lecture ●Problem-Solving	● have a basic knowledge of crystal systems and spatial symmetries ● To be able to account for how crystalline materials are studied using diffraction, including concepts like reciprocal lattice and Brillouin zones	Evaluation of problems ● Q and A

Unit II (9hours)	Vibrations of monatomic and diatomic lattices, Quantization of lattice vibrations, Inelastic scattering of neutrons, Einstein and Debye models of specific heat, Thermal conductivity, Effect of imperfection	● Lecture ●Problem-Solving	● To know what phonons are, and be able to perform estimates of their dispersive and thermal properties , be able to calculate thermal and electrical properties in the free-electron model	● problem solving ● Q and A

Unit III(17 hours)	Free electron gas in three dimensions, Specific heat of metals, Sommerfeld theory of electrical conductivity, Wiedemann-Franz law, Hall effect, Nearly free electron model and formation of energy bands, Bloch functions, Kronig Penny model, Formation of energy gap at Brillouin zone boundaries, Number of orbitals in a band, Equation of motion of electrons in energy bands, Properties of holes, Effective mass of carriers, Intrinsic carrier concentration, Hydrogenic model of donor and acceptor states. Direct band gap and indirect band gap semiconductors	●Lecture ●Problem-Solving ● Seminar ● Powerpoint presentation	● To know Bloch's theorem and what energy bands ● know the fundamental principles of semiconductors	● Q & A ● Evaluation problem solving skill

Unit IV (22hours)	Theory of Dielectrics: polarization, Dielectric constant, Local Electric field, Dielectric polarisability, Polarisation from Dipole orientation, Ferroelectric crystals, Order-disorder type of ferroelectrics, Properties of Ba Ti O3, Polarisation catastrophe, Displacive type ferroelectrics, Landau theory of ferroelectric phase transitions, Ferroelectric domain, Antiferroelectricity, Piezoelectricity, Applications of Piezoelectric Crystals, Diamagnetism and Paramagnetism: Langevin's theory of diamagnetism, Langevin's theory of paramagnetism, theory of Atomic magnetic moment, Hund‟s rule, Quantum theory of magnetic Susceptibility Ferro, Anti and Ferri magnetism: Weiss theory of ferromagnetism, Ferromagnetic domains, Neel Model of Antiferromagnetism and Ferrimagnetism, Spin waves, Magnons in Ferromagnets	● Lecture ●Problem-Solving	● To know the fundamentals of dielectric and ferroelectric properties of materials ● To know basic models of dia, para and ferro magnetism	● Q & A ● Evaluation problem solving skill

Unit V (12hours)	Meissner effect, Type I and Type II superconductors, energy gap Isotope effect, London equation and penetration of magnetic field, Cooper pairs and the B C S ground state (qualitative, Flux quantization, Single particle tunneling, DCand AC Josephson effects, High Tc Superconductors(qualitative) description of cuprates, Enough exercises. and AC Josephson effects, High Tc Superconductors(qualitative) description of cuprates, Enough exercises.	●Lecture ●Problem-Solving ● Seminar	● To be able to explain superconductivity using BCS theory	● Q & A ● Evaluation problem solving skill

Faculty in charge
Sukanya I S

PHY3E05: EXPERIMENTAL TECHNIQUES

Semester:3
Course Number: 4
Contact Hours per Week: 4T
Number of Credits:4
Number of Contact Hours: 72 hrs
Course Evaluation: Internal & External: 1:4

Objectives of the Course: To offer excellent preparation for a career in a research laboratory in the high-tech industry, or as a MSc student to get an idea about research techniques.

Prerequisites: Background of Nuclear physics at degree level.

Course Outline

1. Vacuum Techniques : Units and basic definitions, Roughing pumps - Oil sealed rotary vacuum pump and Sorption pump, High vacuum pumps – Turbo molecular pump, Diffusion pump, Oil vapour booster pump, Ion pumps - Sputter ion pump and Getter ion pump, Cryo pump, Vacuum gauges - Pirani gauge, Thermocouple gauge, penning gauge (Cold cathode
Ionization gauge) and Hot filament ionization gauge, Vacuum accessories – Diaphragm, Gate valve, Butterfly valve, Baffle and isolation valves, magnetic valves, adjustable valves, air inlet valves, Traps - Liquid nitrogen trap, Sorption traps, and, gaskets and O rings (19 hours)
Text : Muraleedhara Varier et al. "Advanced Experimental Techniques in Modern Physics", Sections 1.4, 1.6 – 1.8, 1.9.2.3 –1.9.2.5, 1.10.1, 1.10.6, 1.10.3

2. Thin film techniques : Introduction, Fabrication of thin films, Thermal evaporation in vacuum – Resistive heating, Electron beam evaporation and laser evaporation techniques, Sputter deposition, Glow discharge, Thickness measurement by quartz crystal monitor, optical interference method, electrical conductivity measurement, Thermo electric power, Interference filters - Multilayer optical filters, Technological Applications of thin films. (14 hours)
Text : Muraleedhara Varier, et al. "Advanced Experimental Techniques in Modern Physics" Sections 2.1, 2.2.1.1, 2.2.1.4, 2.2.1.5, 2.2.2, 2.3.2, 2.3.3, 2.3.1, 2.7, 2.6.1

3.Accelerator techniques : High voltage DC accelerators, Cascade generator, Van de Graaff accelerator, Tandem Van de Graaff accelerator, Linear accelerator, Cyclotron, Synchrotron (Electron and proton), Ion sources – Ionization processes,
simple ion source, ion plasma source and RF ion source, Ion implantation – techniques and profiles, Ion beam sputtering–Principles and applications. (14 hours)
Text : Muraleedhara Varier, et al. "Advanced Experimental Techniques in Modern Physics", Sections 4.3, 4.4, 4.5.1, 4.5.4,
4.5.5, 4.6, 4.8.1 – 4.8.3, 4.9

4. Materials Analysis by nuclear techniques: Introduction, Basic principles and requirements, General experimental setup, mathematical basis and nuclear reaction kinematics, Rutherford backscattering – introduction, Theoretical background – classical and quantum mechanical, experimental setup, energy loss and straggling and applications. Neutron activation analysis – principles and experimental arrangement, applications, Proton induced X-ray Emission – principle and experimental set up, applications to water samples, human hair samples and forensic samples, limitations of PIXE.
(15 hours)
Text: Advanced Experimental Techniques in Modern Physics – K. Muraleedhara Varier, Antony Joseph and P.P.Pradyumnan, Pragati Prakashan, Meerut (2006)

5. X- Ray Diffraction Technique :Introduction, Lattice planes and Bragg's Law, Diffractometer - Instrumentation, Single crystal and Powder diffraction, Scherrer equation, Structure factor,

Applications of XRD - Crystallinity, Unit Cell Parameters, Phase transition studies, thin film studies, Awareness on Powder Diffraction File (PDF) of the International Centre for Diffraction Data. (10 hours)

Text: Elements of Modern X-ray Physics, Jens Als Nielsen and Des McMorrow, (John Wiley and Sons 2000)

Reference books:

1. Scientific foundations of vacuum techniques – S. Dushman and J.M. Laffer, John Wiley New York (1962)
2. Thin film phenomena – K.L. Chopra, McGraw Hill (1983)
3. R. Sreenivasan – Approach to absolute zero - Resonance magazine Vol 1 no 12, (1996) , vol 2 nos 2, 6 and 10 (1997)
4. R. Berry, P.M. Hall and M.T. Harris – Thin film technology – Van Nostrand (1968)
5. Dennis and Heppel – Vacuum system design
6. Nuclear Micro analysis – V. Valkovic
7. B.D. Cullity, Elements of X-ray diffraction, Addison Wesley Inc (1978)
8. Useful link for XRD-http://pd.chem.ucl.ac.uk/pdnn/powintro/whatdiff.htm

Course Plan

Unit/hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity Learning outcome(output)	Assessment
Unit I (19hours)	Units and basic definitions, Roughing pumps - Oil sealed rotary vacuum pump and Sorption pump, High vacuum pumps – Turbo molecular pump, Diffusion pump, Oil vapour booster pump, Ion pumps - Sputter ion pump and Getter ion pump, Cryo pump, Vacuum guages - Pirani gauge, Thermocouple gauge, penning guage (Cold cathode Ionization guage) and Hot filament ionization gauge, Vacuum accessories – Diaphragm, Gate valve, Butterfly valve, Baffle and isolation valves, magnetic valves, adjustable valves, air inlet valves, Traps - Liquid nitrogen trap, Sorption traps, and gaskets and O rings	● Lecture ●Problem-Solving	● Have gained a clear understanding of different vacuum pumps ● the production and maintenance of vacuum systems and its uses and needs in Physics	Evaluation of problems ● Q and A

Unit II (14hours)	Introduction, Fabrication of thin films, Thermal evaporation in vacuum – Resistive heating, Electron beam evaporation and laser evaporation techniques, Sputter deposition, Glow discharge, Thickness measurement by quartz crystal monitor, optical interference method, electrical conductivity measurement, Thermo electric power, Interference filters - Multi layer optical filters, Technological Applications of thin films.	● Lecture ●Problem-Solving	● Understands in depth about thin film preparation and production controlling techniques ● the application of thin films in the field of science & Technology.	● problem solving ● Q and A

Unit III(14hours)	High voltage DC accelerators, Cascade generator, Van de Graaff accelerator, Tandem Van de Graaff accelerator, Linear accelerator, Cyclotron, Synchrotron (Electron and proton), Ion sources – Ionization processes, simple ion source, ion plasma source and RF ion source, Ion implantation – techniques and profiles, Ion beam sputtering– principles and applications.	●Lecture ●Problem-Solving ● Seminar ● Powerpoint presentation	● Extend their understanding of various particle accelerators and its industrial uses.	● Q & A ● Evaluation problem solving skill

Unit IV (15hours)	Introduction, Basic principles and requirements, General experimental setup, mathematical basis and nuclear reaction kinematics, Rutherford backscattering – introduction, Theoretical background – classical and quantum mechanical, experimental setup, energy loss and straggling and applications. Neutron activation analysis – principles and experimental arrangement, applications, Proton induced X-ray Emission – principle and experimental setup, applications to water samples, human hair samples and forensic samples, limitations of PIXE.	● Lecture ●Problem-Solving	• To understand about mathematical basis of nuclear reactors • To discuss PIXE and its applications.	• Q & A • Evaluation problem solving skill
Unit V (10hours)	:Introduction, Lattice planes and Bragg's Law, Diffractometer - Instrumentation, Single crystal and Powder diffraction, Scherrer equation, Structure factor, Applications of XRD - Crystallinity, Unit Cell Parameters, Phase transition studies, thin film studies, Awareness on Powder Diffraction File (PDF) of the International Centre for Diffraction Data.	●Lecture ●Problem-Solving ● Seminar	• To understand about different material analysis techniques and applications.	• Q & A • Evaluation problem solving skill

Faculty in charge
Sukanya I S

PHY4C12: ATOMIC AND MOLECULAR SPECTROSCOPY

Semester:4
Course Number: 1
Contact Hours per Week: 4T
Number of Credits:4
Number of Contact Hours: 72 hrs
Course Evaluation: Internal & External: 1:4

Objectives of the Course: To understand about Electron-Atom, Ion-Atom, Atom-Atom Scattering, Atoms in strong EM fields, Ionisation by charged particles and photons Diatomic Molecules, Molecular Orbitals, Angular Momentum Born-Oppenheimer Approximation, Potential Energy Curves, Electronic, Vibrational and Rotational degrees of freedom Optical, Infrared, Microwave and Raman Spectroscopy

Prerequisites: Background of Spectroscopy at degree level.

Course Outline

1. Atomic Spectroscopy: (12 hours)

Vector Atom model – L S coupling & J J coupling, effect of electric & magnetic field on atoms and molecules; Zeeman effect, Paschen Back effect and stark effect

Text: Sections 10.1 to 10.11, 12.1to12.10, 13.1 to13.9, 20.1to 20.8 –Introduction to atomic spectra by H E White

2. Microwave and Infrared spectroscopy: (17 hours)

The spectrum of non rigid rotator, e.g. of HF, spectrum of symmetric top molecule e.g. of CH3Cl, Instrumentation for Microwave Spectroscopy Stark Modulator, Information derived from Rotational Spectrum: I R Spectroscopy: Born – Oppenheimer approximation, Effect of Breakdown of Born Oppenheimer approximation, Normal modes and vibration of H2O and CO2. Instrumentation for I R Spectroscopy – Fourier transformation I R Spectroscopy

Text: Sections 6.6 ,6.7,6.8,6.9 6.11,6.13,6.14 7.1 to 7.71,7.12,7.15,7.16,7.17,7.18 Molecular structure and Spectroscopy
by G. Aruldhas

3. Raman Spectroscopy: (14 hours)

Rotational Raman Spectrum of Symmetric top molecules, e.g. of CHCl3 Combined use of Raman & IR Spectroscopy in structure determination e.g. of CO2 and NO3. Instrumentation for Raman Spectroscopy, Non-linear Raman effects, Hyper Raman effect, stimulated Raman effect and Inverse Raman Effect

Text: Sections 8.32, 8.4, 8.5, 8.6, 8.7, 8.10, 15.1, 15.215.3, 15.4 Molecular structure and Spectroscopy by G.Aruldhas

4. Electronic Spectroscopy of molecules: (12 hours)

Vibrational Analysis of band systems, Deslander's table, Progressions & sequences, Information Derived from vibrational analysis, Franck Condon Principle. Rotational fine structure and P R and R Branches, fortrat Diagram, Dissociation Energy, Example of Iodine molecule

Text: Sections 9.1 to9.9 Molecular structure and Spectroscopy by G .Aruldhas

5. Spin Resonance Spectroscopy: (17 hours)

Interaction of nuclear spin and magnetic field, level population Larmour precession, Resonance Conditions, Bloch equations, Relaxation times, Spin-spin and spin lattice relaxation. The chemical shift, Instrumentation for NMR spectroscopy, Electron Spin Spectroscopy of the unpaired e, Total Hamiltonian, Fine structure, Electron Nucleus coupling, and hyperfine spectrum ESR spectrometer. Mossbauer Spectroscopy, Resonance fluorescence of γ-rays, Recoilless emission of γ-rays and Mossbauer effect, Chemical shift, effect of magnetic field. Eg. of Fe57 Experimental techniques, Enough

exercises.

Text: Sections 10.1 to 10.9, 11.1 to11.5.4, 13.1 to13.5 Molecular structure and Spectroscopy by G.Aruldhas

Textbooks:

1. Molecular Structure & Spectroscopy G Aruldhas
2. C N Banwell & E.M. Mccash – Fundamentals of Molecular Spectroscopy
3. Atomic Spectroscopy – White

Reference books:

1. Straughan and Walker Spectroscopy Volume I, II and III
2. G.M.Barrow – Introduction to Molecular Spectroscopy
3. H.H. Willard, Instrumental Methods of Analysis,7th Edition , CBS-Publishers, New Delhi.
4. Atomic Spectroscopy –K P Rajappan Nair, MJP Publishers, Chennai
5. Elements of spectroscopy Gupta Kumar –Pragati Prakasan ,Meerut

Course Plan

Unit/hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity Learning outcome(output)	Assessment
Unit I (12hours)	Vector Atom model – L S coupling & J J coupling, effect of electric & magnetic field on atoms and molecules; Zeeman effect, Paschen Back effect and stark effect	● Lecture ●Problem-Solving	● know about different atom model and will be able to differentiate different atomic systems, ● different coupling schemes and their interactions with magnetic and electric fields.	Evaluation of problems ● Q and A
Unit II (17hours)	The spectrum of non rigid rotator, e.g. of HF, spectrum of symmetric top molecule e.g. of CH3Cl, Instrumentation for Microwave Spectroscopy Stark Modulator, Information derived from Rotational Spectrum: I R Spectroscopy: Born – Oppenheimer approximation, Effect of Breakdown of Born Oppenheimer approximation, Normal modes and vibration of H2O and CO2. Instrumentation for I R Spectroscopy – Fourier transformation I R Spectroscopy	● Lecture ●Problem-Solving	● Have gained ability to apply the techniques of microwave and infrared spectroscopy ● To elucidate the structure of molecules	● problem solving ● Q and A

Unit III(14hours)	Rotational Raman Spectrum of Symmetric top molecules, e.g. of $CHCl_3$ Combined use of Raman & IR Spectroscopy in structure determination e.g. of CO_2 and NO_3. Instrumentation for Raman Spectroscopy, Non-linear Raman effects, Hyper Raman effect, stimulated Raman effect and Inverse Raman Effect .	●Lecture ●Problem-Solving ● Seminar ● Powerpoint presentation	● Be able to apply the principle of Raman spectroscopy and its applications in the different field of science & Technology.	● Q & A ● Evaluation problem solving skill
Unit IV (12hours)	Vibrational Analysis of band systems, Deslander's table, Progressions & sequences, Information Derived from vibrational analysis, Franck Condon Principle. Rotational fine structure and P R and R Branches, fortrat Diagram, Dissociation Energy, Example of Iodine molecule	● Lecture ●Problem-Solving	● To become familiar with different resonance spectroscopic techniques and its applications	● Q & A ● Evaluation problem solving skill
Unit V (17hours)	Interaction of nuclear spin and magnetic field, level population Larmour precession, Resonance Conditions, Bloch equations, Relaxation times, Spin-spin and spin lattice relaxation. The chemical shift, Instrumentation for NMR spectroscopy, Electron Spin Spectroscopy of the unpaired e, Total Hamiltonian, Fine structure, Electron Nucleus coupling, and hyperfine spectrum ESR spectrometer. Mossbauer Spectroscopy,	●Lecture ●Problem-Solving ● Seminar	● to find solutions to problems related to different spectroscopic systems.	● Q & A ● Evaluation problem solving skill

	Resonance fluorescence of γ-rays, Recoilless emission of γ-rays and Mossbauer effect, Chemical shift, effect of magnetic field. Eg. of Fe57 Experimental techniques, Enough exercises.			

Faculty in charge
Sukanya I S

PHY4E14:COMMUNICATION ELECTRONICS

Semester:4
Course Number: 2
Contact Hours per Week: 4T
Number of Credits:4
Number of Contact Hours: 72 hrs
Course Evaluation: Internal & External: 1:4

Objectives of the Course:

Prerequisites: Background of Nuclear physics at degree level.

Course Outline

1. Amplitude and angle modulation:

Amplitude modulation – Amplitude modulation and demodulation circuits – single side band generation and detection – SSB balanced modulator – Comparison of signal to noise ratios – Frequency modulation - Phase modulation – Angle modulation circuits – Detection of FM signals –Foster–Seeley discriminator – Ratio detector – Noise in FM (12 hours)

2. Pulse modulation and digital communication:

Elements of information theory – Pulse transmission – Pulse amplitude modulation – Pulse time modulation – Pulse code modulation – Coding – Codes – Error detection and correction codes – Digital carrier systems – Teleprinter and telegraph circuits (12 hours)

3. Communication systems:

Receivers – Superheterodyne receiver – AM receivers – Automatic gain control –Communications

receivers – FM receivers – Single and independent side band receivers. Transmitters –Telegraph transmitters – AM transmitters – FM transmitters – Television transmitters HF radio systems –VHF/UHF systems – Microwave systems – Satellite communications (15 hours)

4. Signals and Systems:
Classifications of signals, concept of frequency in continuous - time and discrete –time signals. Theory of A/D and D/A conversion, Sampling of Analog signals, sampling Theorem. Quantization of continuous amplitude signal, Coding of quantized samples, Discrete time linear time invariant systems - Techniques of analysis of linear systems, Resolution of a discrete time signal into impulses- Response of LTI systems to arbitrary inputs :Convolution sum- properties of convolution and the interconnection of LTI systems-Causal LTI
systems – Stability of LTI systems. (15 hours)

5. Radiation and antennas:
Potential functions and the EM field – Radiation from an oscillating dipole –Power radiated by a current element – Radiation resistance of a short dipole – Radiation from a quarter wave monopole - Directivity – Gain and effective aperture - Antenna arrays – Two element, linear and binomial – Frequency independent antenna – Log periodic antenna – Yagi antenna. Propagation of radio waves - Ground waves, Sky wave propagation, Space waves, Tropospheric scatter propagation, Extra terrestrial communication. Ionosphere –Reflection and refraction of waves by the ionosphere – Attenuation, Enough exercises. (18 hours)
Text and Reference books:
1. “Electronic Communications”, Roddy and Coolen, J., (PHI, 1986). Chapters 7, 8, 9, 10, 11, 12, 18, 19
2. “Electronic Communication Systems”, 4th Edition, Kennedy, G. and Davis, B. (McGraw Hill, 1992). Chapter 6,8.
3. “Electromagnetic waves and Radiating Systems”, Jordan E.C. and Balmain, K.G. (PHI, 1979). Chapters 10,11,15,17.
4. “Digital Signal Processing” by Proakis and Manolakis, Prentice Hall of India (1997)

Course Plan

Unit/hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity Learning outcome(output)	Assessment
Unit I (12hours)	Amplitude modulation – Amplitude modulation and demodulation circuits – single side band generation and detection – SSB balanced modulator – Comparison of signal to noise ratios – Frequency modulation - Phase modulation – Angle modulation circuits – Detection of FM signals –Foster–Seeley discriminator – Ratio detector – Noise in FM	● Lecture ●Problem-Solving	• Describe different types of noise and predict its effect on various analog communication systems. • Express the basic concepts of analog modulation schemes.	Evaluation of problems ● Q and A
Unit II (12hours)	Elements of information theory – Pulse transmission – Pulse amplitude modulation – Pulse time modulation – Pulse code modulation – Coding – Codes – Error detection and correction codes – Digital carrier systems – Teleprinter and telegraph circuits	● Lecture ●Problem-Solving	• Understand Pulse modulation and its classifications • To know the various steps involved in pulse modulation.	● problem solving ● Q and A

Unit III(15hours)	Receivers – Superheterodyne receiver – AM receivers – Automatic gain control –Communications receivers – FM receivers – Single and independent side band receivers. Transmitters –Telegraph transmitters – AM transmitters – FM transmitters – Television transmitters HF radio systems –VHF/UHF systems – Microwave systems – Satellite communications	●Lecture ●Problem-Solving ● Seminar ● Powerpoint presentation	● Analyse different characteristics of the receiver.	● Q & A ● Evaluation problem solving skill
Unit IV (15hours)	Classifications of signals, concept of frequency in continuous - time and discrete –time signals. Theory of A/D and D/A conversion, Sampling of Analog signals, sampling Theorem. Quantization of continuous amplitude signal, Coding of quantized samples, Discrete time linear time invariant systems - Techniques of analysis of linear systems, Resolution of a discrete time signal into impulses-Response of LTI systems to arbitrary inputs :Convolution sum-properties of convolution and the interconnection of LTI systems-Casual LTI systems – Stability of LTI systems.	● Lecture ●Problem-Solving	● To understand signals and its classifications. ● To discuss linear time invariant systems.	● Q & A ● Evaluation problem solving skill

Unit V (10hours)	Potential functions and the EM field – Radiation from an oscillating dipole –Power radiated by a current element – Radiation resistance of a short dipole – Radiation from a quarter wave monopole - Directivity – Gain and effective aperture - Antenna arrays – Two element, linear and binomial – Frequency independent antenna – Log periodic antenna – Yagi antenna. Propagation of radio waves - Ground waves, Sky wave propagation, Space waves, Tropospheric scatter propagation, Extra terrestrial communication. Ionosphere –Reflection and refraction of waves by the ionosphere – Attenuation, Enough exercises.	●Lecture ●Problem-Solving ● Seminar	• To get an idea of antenna and its properties • To understand about propagation of radio waves	• Q & A • Evaluation problem solving skill

Faculty in charge
Ancy maria Varghese

PHY4E20: MICROPROCESSORS, MICROCONTROLLERS AND APPLICATIONS

Semester:4
Course Number:3
Contact Hours per Week: 4T
Number of Credits:4
Number of Contact Hours: 72 hrs
Course Evaluation: Internal & External: 1:4

Objectives of the Course: This course is designed to provide students with the necessary foundation for entry-level industrial applications in process monitoring and controlling, with an emphasis on analysis, problem solving, exposure to open-ended problems and design methods. At the end of the course, students will be able to design an application based on microcontrollers or microprocessors.

Prerequisites: Background of microprocessor in electronics at pg level

1.Microprocessor and Assembly language programming :
Microprocessor as CPU, Internal architecture of Intel 8085, Instruction set, Addressing modes, Examples of Assembly language programming, Addition and subtraction of 2 byte numbers, multiplication and division of 1 byte numbers, Sorting of 1 byte numbers (12 hrs)
Text: 1. Introduction to Microprocessors–A.P. Mathur (Tata-McGraw Hill).
2. Fundamentals of Microprocessors and Micro Computers"– B. Ram- Dhanapati Rai

2 Microprocessor timings; Interfacing memory and I/O devices :
Instruction cycles, machine cycles and timing diagram, address space partitioning, generation of control signals for memory and I/O device interfacing, memory interfacing, I/O device interfacing, Address decoding using 74LS138 (10 hrs)
Text: 1. "Introduction to Microprocessors" –A.P. Mathur (Tata-McGraw Hill).
2 Fundamentals of Microprocessors and Micro Computers"– B. Ram- Dhanapati Rai

3 Peripheral devices and interfacing :
Programmable Peripheral Interface- Intel 8255, Programmable Interval Timer- Intel 8253, Programmable DMA controller- Intel 8257, Programmable Interrupt controller- Intel 8259. ADC interfacing - General idea with block diagram, 7 segment LED display interfacing – General idea of display and driver (16 hrs)
Text 1. Fundamentals of Microprocessors and Microcomputers– B. Ram – Dhanapati Rai
2. Introduction to Microprocessors –A.P. Mathur (Tata-McGraw Hill).
3.Microprocessors – Architecture, Programming and Applications with 8085 - R.S.Gaonkar (Wiley Eastern)

4 Microcontrollers and Programming :

Microcontroller vs microprocessor, microcontrollers in embedded systems. Overview of AVR family of microcontrollers, simplified block diagram of AVR microcontroller, General idea of ROM, RAM, EEPROM, I/O pins and peripherals in microcontrollers. AVR architecture and Assembly level programming – General purpose registers, Data memory and instructions, status register and instructions, branch instructions, call and time delay loops; Assembler
directives, sample programs.

Text : (Relevant sections from chapters 1,2 and 3: Textbook 4)

Arithmetic and logical instructions – sample programs. (16 hrs)

Text : (Relevant sections from chapters 5: The Book 4)

5. AVR Programming :

I/O programming, I/O port pins and functions, features of ports A, B, C and D, dual role of Ports, sample programs. I/O ports and bit addressability.

Text : (Relevant sections from chapter 4: Book 4)

AVR programming in C: C language data types for AVR, C programs for arithmetic, logic time delay and I/O operations. (18 hrs)

Text : (Relevant sections from chapter 7: Book 4)

Textbooks:

1. Introduction to Microprocessors–A.P. Ma 6. thur (Tata-McGraw Hill).

2. Fundamentals of Microprocessors and Micro Computers"– B. Ram- Dhanapati Rai

3.Microprocessors – Architecture, Programming and Applications with 8085 - R.S.Gaonkar (Wiley Eastern)

4.The AVR microcontroller and embedded systems – using Assembly and C.
Muhammad Ali Mazidi, Sarmad Naimi, Sepehr Naimi, Prentice Hall - Pearson

Ref: 1. Programming and customizing the AVR microcontroller: Dhananjay V Gadre.

2. Embedded C programming and the Atmel AVR: Barnett, Cox, O'Cull.

Practical for Semesters III & IV

Course Plan

Unit/hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity Learning outcome(output)	Assessment
Unit I (12hours)	Microprocessor as CPU, Internal architecture of Intel 8085, Instruction set, Addressing modes, Examples of Assembly language programming, Addition and subtraction of 2 byte numbers, multiplication and division of 1 byte numbers, Sorting of 1 byte numbers	● Lecture ●Problem-Solving	• Study the Organization and internal architecture of the Intel 8085 • learn assembly language programming and arithmetic	Evaluation of problems ● Q and A
Unit II (10hours)	Instruction cycles, machine cycles and timing diagram, address space partitioning, generation of control signals for memory and I/O device interfacing, memory interfacing, I/O device interfacing, Address decoding using 74LS138.	● Lecture ●Problem-Solving	• Aware of Memory interfacing, and different Data transfer schemes, CO4 • Learn interfacing with peripheral I/O devices	● problem solving ● Q and A
Unit III(16hours)	Programmable Peripheral Interface- Intel 8255, Programmable Interval Timer- Intel 8253, Programmable DMA controller- Intel 8257, Programmable Interrupt controller- Intel 8259. ADC interfacing - General idea with block diagram, 7 segment LED display interfacing – General idea of display and drivers.	●Lecture ●Problem-Solving ● Powerpoint presentation	• Learn common applications of microprocessors like E Analog to Digital convert,7 segment LED displays,; Temperature measurement and control using a microprocessor	• Q & A • Evaluation problem solving skill

Unit IV (16 hours)	Microcontroller vs microprocessor, microcontrollers in embedded systems. Overview of AVR family of microcontrollers, simplified block diagram of AVR microcontroller, General idea of ROM, RAM, EEPROM, I/O pins and peripherals in microcontrollers. AVR architecture and Assembly level programming – General purpose registers, Data memory and instructions, status register and instructions, branch instructions, call and time delay loops; Assembler directives, sample programs.	● Lecture ●Problem-Solving	• To learn differences between microcontrollers and microprocessors • To extent the idea of AVR microcontroller	• Q & A • Evaluation problem solving skill
Unit V (18hours)	I/O programming, I/O port pins and functions, features of ports A, B, C and D, dual role of Ports, sample programs. I/O ports and bit addressability. AVR programming in C: C language data types for AVR, C programs for arithmetic, logic time delay and I/O operations. .	●Lecture ●Problem-Solving	• To understand the I/O port in an AVR microcontroller • To learn about AVR programming in C:	• Q & A • Evaluation problem solving skill

Faculty in charge
Shyama I

PRACTICALS SEMESTER III & IV

a) PHY3L05 & PHY4L06 (MODERN PHYSICS)

Contact Hours per Week: 8L
Number of Credits:3
Course Evaluation: Internal & External: 1:4

Objectives of the Course:

- Learn various experimental and computational tools thereby developing analytical abilities to address real world problems.
- Adopt the skills related to research, education, and industry- academia

Prerequisites: Background of the practical knowledge at degree level.

Course Outline:

External Practical Exam for PHY3L05 & PHY4L06 together will be conducted at the end of 4th semester.
At least 10 experiments are to be done from Part A and 2 each from the elective paper as listed in Part B. If no practicals have been given for a particular elective papers, two more experiments from Part A should be done. It may be noted that some experiments are given both in Part A and B – of course such experiments can be done only once: either as included in part A or in part B. Internal evaluation to be done in each semester and final grades to be intimated to the controller at the end of 2nd and 4th semesters. One mark is to be deducted from internal marks for each experiment not done by the student if the required total number experiments are not done in the semesters. The PHOENIX/EXPEYES Experimental Kit developed at the Inter University Accelerator Centre, New Delhi, may be used for experiments wherever possible.

PART A

1. G.M. Counter plateau and statistics of counting - To obtain the plateau, operating voltage and to verify the distribution law satisfied by the radioactive decay
2. Absorption coefficient for beta & gamma rays -To determine the absorption coefficient of the given materials using a G. M. Counter
3. Feather analysis – End point energy - To determine the end point energy of the beta particles from a given source using Feather analysis
4. Scintillation counter - To calibrate the given gamma ray (scintillation) spectrometer using standard gamma sources and to determine the energy of an unknown gamma ray source
5. Compton scattering - To verify the theoretical expression for the energy of the Compton scattered gamma rays at a given angle using a Scintillation gamma spectrometer / determine the rest mass energy of the electron

6. Half life of Indium – thermal neutron absorption - To determine the half life of In-116 by irradiation of In foil and beta counting using a GM counter
7. Photoelectric effect in lead - To get the spectrum of X rays emitted form lead target by photo electric effect using Cs-137 gammas
8. Conductivity, Reflectivity, sheet resistance and refractive index of thin films
9. Hall effect in semiconductors-To determine the carrier concentration in the given specimen of semiconducting material
10. ESR spectrometer – Determination of g factor
11. Rydberg constant determination
12. Absorption spectrum of KMnO4 and Iodine. To determine the wavelength of the absorption bands of KMnO4 and to determine the dissociation energy of iodine molecules from its absorption spectrum.
13. Ionic conductivity of KCl/NaCl crystals
14. Curie Weiss law -To determine the Curie temperature
15. To study the Thermoluminescence of F-centres of Alkali halides
16. Variation of dielectric constant with temperature of a ferroelectric material (Barium Titanate)
17. Polarization of light and verification of Malu‟s law.
18. Refractive index measurement of a transparent material by measuring Brewster‟s angle
19. Measurement of the thermal relaxation time constant of a serial light bulb.
20. Dielectric constant of a non polar liquid
21. Vacuum pump – pumping speed
22. Pirani gauge – characteristics
23. Ultrasonic interferometer. To determine the velocity and compressibility of sound in liquids.
24. Study of LED characteristics - Determination of wavelength of emission, I-V characteristics and variation with temperature, variation of output power vs. applied voltage
25. Optical fibre characteristics - To determine the numerical aperture, attenuation and bandwidth of the given optical fibre specimen
26. Band gap energy of Ge by four probe method.-To study bulk resistance and to determine band gap energy.
27. Thomson‟s e/m measurement.-To determine charge to mass ratio of the electron by Thomson‟s method.
28. Determination of Band gap energy of Ge and Si using diodes.
29. Millikan‟s oil drop experiment .To measure the charge on the electron.
30. Zener voltage characteristic at low and ambient temperatures – To study the variation of the Zener voltage of the given Zener diode with temperature
31. Thermionic work function – To determine the thermionic work function of the material of the cathode of the given vacuum diode/triode from the characteristic at different filament currents

PART B

I . ADVANCED ELECTRONICS

1. Simple temperature control circuit
2. Binary rate multiplier
3. Optical feedback amplifier
4. Frequency modulation and pulse modulation
5. Binary multiplier
6. Write ALP and execute using 8085 kit for generating a square wave of desired frequency using PPI 8255 interfacing. observe the output on CRO and measure frequency.

7. Write ALP to alternately switch on/off a green and a red LED within a given small time interval. Execute using 8085 kit.
8. Write ALP to convert a given d.c voltage (between 0 and 5 V) using ADC 0800/0808 interfaced to 8085 microprocessor. Execute using the given kit and check the result.

II MATERIAL SCIENCE / CONDENSED MATTER PHYSICS

1. Curie-Weiss law – (To determine the Curie temperature)
2. Solid-liquid phase transitions – measurement of resistivity of metals
3. Growth of a single crystal from solution and determination of structural, electrical and optical properties
4. Study of colour centres – Thermoluminescence glow curves
5. Ionic conductivity in KCl/NaCl crystals
6. Thermoluminescence spectra of alkali halides
7. Thermo emf of bulk samples (Al/Cu)
8. Electron spin resonance
9. Strain gauge – Y of a metal beam
10. Variation of dielectric constant with temperature of a ferroelectric material (Barium titanate)
11. Ferrite specimen – variation of magnetic properties with composition

III COMMUNICATION ELECTRONICS
1. Amplitude modulation and demodulation
2. Frequency modulation and demodulation
3. Pulse amplitude modulation and demodulation
4. Pulse code modulation and demodulation
5. Pulse position modulation and demodulation
6. Study of crystal detector
7. L-C transmission line characteristic
8. Tuned RF amplifier
9. Seely discriminators
10. AM transmitter
11. Radiation from dipole antenna
12. Optical fibre characteristics (Numerical aperture, attenuation and bandwidth)
13. Optical feedback circuit (Feedback factor, gain and frequency response)

IV. ADVANCED NUCLEAR PHYSICS and RADIATION PHYSICS

1. Half-life of Indium – thermal neutron absorption - To determine the half-life of In-116 by irradiation of In foil and beta counting using a GM counter
2. Alpha spectrometer - To calibrate the given alpha spectrometer and determine the resolution
3. Photoelectric effect in lead - To get the spectrum of X rays emitted from lead target by photo electric effect using Cs-137 gammas
4. Inner bremsstrahlung - To study the intensity spectrum of inner bremsstrahlung from given gamma source
5. Coincidence circuits - To construct and study the performance of series and parallel coincidence circuits using transistors and to determine the resolving time
6. Single channel analyzer - Study of characteristics of a SCA using precision pulser
7. Ionization chamber - Study of variation of pulse height with applied voltage and to obtaing the pulse height

spectrum of X-rays
8. Proportional counter - Study of variation of pulse height with applied voltage and to obtaining the pulse height spectrum of X-rays
9. Track detector – track diameter distribution - To measure the diameters of the alpha tracks in CR-39 track detector
10. Beta ray spectrometer - To plot the momentum distribution of beta particles from given beta sources
11. Range of alpha particles in air and mylar - To determine the range of alpha particles from Am-241 source in air and in mylar using either a surface barrier detector or a GM counter

V EXPERIMENTAL TECHNIQUES

1. Rydberg constant – hydrogen spectrum
2. ESR – Lande g factor
3. IR spectrum of few samples
4. Vacuum pump – pumping speed
5. Vacuum pump – Effect of connecting pipes
6. Absorption bands of Iodine
7. Vibrational bands of AlO
8. Pirani gauge – characteristics
9. Thin films – electrical properties (sheet resistance)
10. Thin films – optical properties (Reflectivity, transmission, attenuation, refractive index)

VI. ELECTRONIC INSTRUMENTATION

1. Strain gauge
2. Simple servomechanism
3. Temperature control
4. Coincidence circuits
5. Multiplexer
6. IEEE 488 Electrical interface
7. Single channel analyzer
8. Differential voltmeter
9. Frequency synthesizer – Signal generator
10. Silicon controlled rectifier – characteristics
11. Silicon controlled rectifier – power control

VII. DIGITAL SIGNAL PROCESSING

1 (a) Compute and plot the cross and auto correlation coefficients of one dimensional signal
(b)Estimate the pitch period of a periodic signal using correlation method. (3 hours).
2 (a) Compute and plot the convolution coefficients of one dimensional signal .
(b)Estimate the pitch period of a periodic signal using the convolution method. (3 hours).
3 Write a program for determining the Linear and circular Convolution of a finite sequence x(n) and h(n).Accept the sequences x(n) and h(n) from the user. Display the output sequence y(n).Plot all three sequences. (3 hours).
4 Compute the N-point DFT of the following. Vary the value of N and visualize the effect with N=8, 16, 24,

64,128,256. (3 hours).
5 Design an N point FIR low pass filter with cutoff frequency 0.2* pi using i) Rectangular ii) Hamming iii) Kaiser windows. Plot for N=16,32,64,128,256.Compare with N=1024 and record your observations. (3 hours).
(The programs are to be executed in Python/MATLAB)

VIII. LASER SYSTEMS, OPTICAL FIBRES AND APPLICATIONS

1. Optical fibre characteristics (Numerical aperture, attenuation and bandwidth)
2. Optical feedback circuit (Feedback factor, gain and frequency response
3. Determination of size of lycopodium particles by Laser diffraction

Reference Books for PHY 305 & PHY 405 :
1. B.L. Worsnop and H.T. Flint – Advanced Practical Physics for students – Methuen & Co (1950)
2. E.V. Smith – Manual of experiments in applied Physics – Butterworth (1970)
3. R.A. Dunlap – Experimental Physics – Modern methods – Oxford University Press (1988)
4. D. Malacara (ed) – Methods of experimental Physics – series of volumes – Academic Press Inc (1988)
5. A.C.Melissinos, J.Napolitano - Experiments in Modern Physics -Academic Press 2003.

Course Plan

Sl. No	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity Learning outcome(output)	Assessment
1 2	G.M. Counter plateau and statistics of counting - To obtain the plateau, operating voltage and to verify the distribution law satisfied by the radioactive decay Absorption coefficient for beta & gamma rays -To determine the absorption coefficient of	• Seminar • Peer Learning • Practicals	• This laboratory course focuses on the advanced physics experiments chosen from Atomic and Molecular Physics, Experimental techniques, Nuclear Physics	• Model Exam • Record Verification • Daily Test

	the given materials using a G. M. Counter Hall effect in semiconductors-To determine the carrier concentration in the given specimen of semiconducting material ESR spectrometer – Determination of g factor Rydberg constant determination Absorption spectrum of KMnO4 and Iodine. To determine the wavelength of the absorption bands of KMnO4 and to determine the dissociation energy of iodine molecules from its absorption spectrum. Band gap energy of Ge by four probe method.-To study bulk resistance and to determine band gap energy. Thomson‟s e/m measurement.-To determine charge to mass ratio of the electron by Thomson‟s method. Determination of Band gap energy of Ge and Si using diodes. Write ALP and execute using 8085 kit for generating a square wave of desired frequency using PPI 8255 interfacing. observe the output on CRO and measure frequency.		andCommunication Electronics. • It provides an insight to students about experimental techniques, data analysis, error analysis while investigating physical phenomena. • This course provides practical knowledge to students as they perform experiments and correlate it to theory.	
3				
4				
5				
6				
7				
8				
9				
10				

11	Write ALP to convert a given d.c voltage (between 0 and 5 V) using ADC 0800/0808 interfaced to 8085 microprocessor. Execute using the given kit and check the result.			
12	Amplitude modulation and demodulation			
13	Pulse amplitude modulation and demodulation			
14	Ultrasonic interferometer. To determine the velocity and compressibility of sound in liquids.			

Faculty in charge
Ancy Maria Varghese

b) PHY4L07: COMPUTATIONAL PHYSICS PRACTICAL

The programs are to be executed in Python. For visualization Pylab/matplotlib may be used.
At least 10 experiments are to be done, opting any 5 from Part A and another 5 from
Part B. The Practical examination is of 6 hours duration.

Part A

1. Interpolation : To interpolate the value of a function using Lagrange's interpolating polynomial
2. Least square fitting :To obtain the slope and intercept by linear and Non-linear fitting.
3. Evaluation of polynomials. Bessel and Legendre functions: Using the series expansion and recurrence relations.
4. Numerical integration : By using Trapezoidal method and Simpson's method
5. Solution of algebraic and transcendental equations .Newton Raphson method, minimum of a function
6. Solution of algebraic equation by Bisection method
7. Matrix addition, multiplication, trace, transpose and inverse
8. Solution of second order differential equation- Runge Kutta method
9. Monte Carlo method : Determination of the value of π by using random numbers
10. Numerical double integration
11. Solution of parabolic/elliptical partial differential equations
(e.g.: differential equations for heat and mass transfer in fluids and solids, unsteady behaviour of fluid flow past bodies, Laplace equation etc.,)

Part B

1. To plot the trajectory of a particle moving in a Coulomb field (Rutherford scattering) and to determine the deflection angle as a function of the impact parameter
2. Generate phase space plots - To plot the momentum v/s position plots for the following systems : (i) a conservative case (simple pendulum) (ii) a dissipative case (damped pendulum)
3. Simulation of the wave function for a particle in a box - To plot the wave function and probability density of a particle in a box; Schrödinger equation to be solved and eigen value must be calculated numerically.
4. Simulation of a two slit photon interference experiment : To plot the light intensity as a function of distance along the screen kept at a distance from the two slit arrangement.
5. Trajectory of motion of (a) projectile without air resistance (b) projectile with air resistance
6. Logistic map function – Solution and bifurcation diagram
7. Experiment with Phoenix/expEYES kit - Time constant of RC circuits by curve fitting. *
8. Experiment with Phoenix/expEYES kit - Fourier analysis of different waveforms captured using the instrument. *
(*If Phoenix is not available, data may be given in tabulated form)
9. Simulation of Kepler's orbit and verification of Kepler's laws.
10. Simulations of small oscillations in simple molecules:: Diatomic molecule/Triatomic molecule for various lengths(any one case)
11. Simulation of random walk in 1D/2D and determination of mean square distance.
12. Simulation of magnetic field - To plot the axial magnetic field v/s distance due to a current loop carrying current.
13. Simulation of the trajectory of a charged particle in a uniform magnetic field.
14. Simulation of polarisation of electromagnetic waves.
15. Simulation of coupled oscillators - Phase space portraits.

Textbooks :

1. Computational Physics -An introduction., R.C.Varma, P.K.Ahluwalia and K.C.Sharma, New Age International
Publishers
2. Numpy Reference guide, http://docs.scipy.org/doc/numpy/numpy-ref.pdf (also, free resources available on net)
3. Matplotlib , http://matplotlib.sf.net/Matplotlib.pdf (and other free resources available on net)
4. Numerical Methods in Engineering and Science, Dr. B S Grewal, Khanna Publishers, New Delhi (or any other
book)
5. Numerical Methods, E Balagurusamy, Tata McGraw-Hill
6. Numerical Methods , T Veerarajan, T Ramachandran, Tat MCGraw-Hill
7. Numerical Methods with Programs I BASIC, Fortran & Pascal, S Balachandra Rao, C K Shantha. Universities
Press
8. Numerical methods for scientists and engineers, K. Sankara Rao, PHI
9. Introductory methods of numerical analysis, S.S.Sastry , (Prentice Hall of India,1983)
10. Numerical Methods in Engineering with Python by Jaan Kiusalaas

Note: Experiments from Part A can be done with data from physical situations wherever possible. For example
consider the following cases.

a) The load W placed on a spring reduces its length L. A set of observations are given below. Calculate force constant and length of the spring before loading

W
(kg) 0.28 0.51 0.67 0.93 1.15 1.38 1.60 1.98
L (m) 6.62 5.93 4.46 4.25 3.3 3.15 2.43 1.46

b) The displacements of a particle at different instants are given below. What is the time instant at which the displacement is 70.2 m

t(s) 1.0 2.2 301 4.5 5.8 6.7 7.6 8.3 9.4
s(m) 3.0 10.56 19.07 37.12 59.16 77.38 98.04 115.78 146.6

Course Plan

Sl. No	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity Learning outcome(output)	Assessment
1 2 3 4 5 6	Interpolation : To interpolate the value of a function using Lagrange's interpolating polynomial Least square fitting :To obtain the slope and intercept by linear and Non-linear fitting. Numerical integration : By using Trapezoidal method and Simpson's method Solution of algebraic and transcendental equations .Newton Raphson method, minimum of a function Solution of algebraic equation by Bisection method Matrix addition, multiplication, trace, transpose and inverse	• Seminar • Peer Learning • Practicals	• For modern day technology students need to learn programming and Python is a very useful one for Physics students. • In this laboratory course students get the lessons in computer programming using Python.	• Model Exam • Record Verification • Daily Test

7	Solution of second order differential equation- Runge Kutta method			
8	Monte Carlo method : Determination of the value of π by using random numbers			
9	To plot the trajectory of a particle moving in a Coulomb field (Rutherford scattering) and to determine the deflection angle as a function of the impact parameter			
10	Simulation of the wave function for a particle in a box - To plot the wave function and probability density of a particle in a box; Schrödinger equation to be solved and eigen value must be calculated numerically.			
11	Simulation of a two slit photon interference experiment : To plot the light intensity as a function of distance along the screen kept at a distance from the two slit arrangement.			
12	Trajectory of motion of (a) projectile without air resistance (b) projectile with air resistance			
13	Logistic map function – Solution and bifurcation diagram			

Faculty in charge
Ancy Maria Varghese

Department of Chemistry

June 2021

I Sem BSc (M)	CHE1B01	Module I, II	Dr Santhosh Paul
III Sem BSc. (M)	CHE3B03	Module I	Dr. Laina A.L
V Sem BSc. (M)	CHE5B06	Module I, II	Ms. Shuin Michael
	CHE5B07	Module I, II	Dr Laina A.L
	CHE5B08	Module I, II	Dr. Santhosh Paul
I Sem BSc (Sub)	CHE1C01	Module I (half)	Ms. Shuin Michael
III Sem BSc (Sub)	CHE3C03	Module I, II	Dr. Laina. A.L
BSc. (M)	Practicals		Dr. Santhosh Paul
BSc. (Sub)	Practicals.		Dr. Laina A.L
I Sem MSc.	CHE1C01	Module I, II	Dr. Rosabella K.
	CHE1C02	Module I, II	Dr. Laisa C.P
	CHE1C03	Module I	Ms. Heana P
	CHE1C04	Module I	Dr. Laisa. C.P
III Sem MSc.	CHE3C09	Module I, II	Dr. Rosabella K.
	CHE3C10	Module I, II	Ms. Heana. P
	CHE3C11	Module I, II	Dr. Laisa. C.P
	CHE3E03	Module I	Ms. Shuin Michael
I Sem MSc.	Inorganic Practicals		Ms. Heana P
	Organic Practicals		Dr. Laisa C.P
	Physical Practicals		Dr. Rosabella K.
III Sem MSc.	Inorganic Practicals		Ms. Heana P
	Organic Practicals		Dr. Laisa P
	Physical Practicals.		Dr. Rosabella K.

Head of the Department
Department of Chemistry
Sacred Heart College Chalakudy

Dr. Santhosh Paul

July 2021

I Sem BSc(M)	CHE1B01	Module III	Ms. Shirin Michael
III Sem BSc(M)	CHE3B03	Module II	Dr. Santhosh Paul.
V Sem BSc(M)	CHE5B06	Module III, IV (half)	Dr. Laina A.L
	CHE5B07	Module III, IV	Dr. Laina A. L
	CHE5B08	Module III	Ms. Shirin Michael
I Sem BSc. (Sub)	CHE1C01	Module I (contd.)	Dr. Santhosh Paul
III Sem BSc (Sub)	CHE3C03	Module III, IV	Ms. Shirin Michael.
BSc. (M)	Practicals		Dr Santhosh Paul
BSc. (Sub)	Practicals		Dr. Laina A.L
I MSc. I Sem	CHE1C01	Module II, IV	Dr. Rosabella. K.
	CHE1C02	Module III	Dr. Laisa C.P
	CHE1C03	Module II, III	Ms. Heena P
	CHE1C04	Module II, III	Dr. Laisa C.P
III Sem MSc.	CHE3C09	Module III	Dr. Rosabella K.
	CHE3C10	Module III	Ms. Heena. P
	CHE3C11	Module II	Ms. Heena. P
	CHE3E03	Module II, III	Dr. Laisa C.P
I Sem MSc.	Inorganic Practicals		Ms. Heena P
	Organic Practicals		Dr. Laisa P.
	Physical Practicals		Dr. Rosabella K.
III Sem MSc.	Inorganic Practicals		Ms. Heena P
	Organic Practicals		Dr. Laisa C.P
	Physical Practicals		Dr. Rosabella K

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Department of Chemistry
Sacred Heart College Chalakudy

Dr. Santhosh Paul.

August 2021

I Sem BSc (M)	CHE1B01	Module IV	Dr. Santhosh Paul
III Sem BSc. (M)	CHE3B03	Module III	Ms. Sherin Michael
V Sem BSc. (M)	CHE5B06	Module IV contd..	Dr Laiva A.L
	CHE5B07	Module V	Ms. Sherin Michael
	CHEB08	Module IV	Dr Laiva A.L
I Sem BSc (Sub)	CHE1C01	Module II	Dr. Laiva A.L
III Sem BSc. (Sub)	CHE3C03	Module V	Dr. Santhosh Paul
BSc (M)	Practicals		Dr. Santhosh Paul
BSc (Sub)	Practicals		Dr Laiva A.L
I Sem MSc	CHE1C01	Module V, VI	Dr. Rosabella K.
	CHE1C02	Module IV	Dr. Laisa C.P
	CHE1C03	Module VI	Ms. Heena P
	CHE1C04	Module IV	Dr. Laisa C.P
III Sem MSc.	CHE3C09	Module IV, V	Dr. Rosabella. K
	CHE3C10	Module III	Ms. Heena. P
	CHE3C11	Module IV	Ms. Heena P
	CHE3E03	Module IV	Dr. Laisa C.P
I Sem MSc.	Inorganic Practicals		Ms. Heena P
	Organic Practicals		Dr. Laisa C.P
	Physical Practicals		Dr. Rosabella. K
III Sem MSc.	Inorganic Practicals		Ms. Heena P.
	Organic Practicals		Dr Laisa C.P
	Physical Practicals.		Dr. Rosabella K.

Head of the Department
Department of Chemistry
Sacred Heart College Chalakudy

JULY
Dr. Santhosh

September 2021

I Sem BSc. CM	CHE1B01	Module V	Ms. Shein Michael
III Sem BSc. CM	CHE3B03	Module IV	Dr. Laina A. L
V Sem BSc. CM	CHE5B06	Module V, VI	Dr. Santhosh Paul
	CHE5B07	Module VI	Dr. Laina A. L
	CHE5B08	Module V	Ms. Shein Michael
I Sem BSc. (Sub)	CHE1C01	Module III	Ms. Shein Michael
III Sem BSc. (Sub)	CHE3C03	Module VI	Dr. Laina A. L
BSc. (CM)	Practicals		Dr. Santhosh Paul
BSc. (Sub)	Practicals		Dr. Laina A.L
I Sem MSc.	CHE1C01	Module VII	Dr. Rosabella. K
	CHE1C02	Module V	Ms. Heena P
	CHE1C03	Module VI	Dr. Laisa C.P
	CHE1C04	Module V	Ms. Shein Michael
III Sem MSc.	CHE3C09	Module VI, VII	Dr. Rosabella. K.
	CHE3C10	Module V	Ms. Shein Michael
	CHE3C11	Module V	Dr. Laisa C.P
	CHE3E03	Module VI	Ms. Heena. P.
I Sem MSc.	Inorganic Practicals		Ms. Heena P
	Organic Practicals		Dr. Laisa C.P
	Physical Practicals		Dr. Rosabella. K
III Sem MSc.	Inorganic Practicals		Ms. Heena P
	Organic Practicals		Dr. Laisa C.P
	Physical Practicals		Dr. Rosabella. K

Head of the Department
Department of Chemistry
Sacred Heart College, Chalakudy

Dr. Santhosh Paul.

October 2021

I Sem BSc (M)	CHE1B01	Module VI	Dr. Santhosh Paul
III Sem BSc (M)	CHE3B03	Module V	Dr Laiva A.L
V Sem BSc (M)	CHE5B06	Module VII	Dr. Laiva A.L
	CHE5B07	Module VIII	Ms. Shrein Michael
	CHE5B08	Module VI	Dr. Santhosh Paul
I Sem BSc (Sub)	CHE1C01	Module IV	Dr. Laiva A.L
III Sem BSc (Sub)	CHE3C03	Module VII	Ms. Shrein Michael
BSc (M)	Practicals		Dr. Santhosh Paul
BSc (Sub)	Practicals		Dr. Laiva A.L
I Sem MSc	CHE1C01	Module VIII	Dr. Rosabella K.
	CHE1C02	Module VII	Dr. Laisa C.P
	CHE1C03	Module VI	Dr. Santhosh Paul
	CHE1C04	Module VI	Ms. Heena. P
III Sem MSc	CHE3C09	Module VIII	Dr. Rosabella. K
	CHE3C10	Module VI	Ms. Heena. P
	CHE3C11	Module VI	Ms. Shrein Michael
	CHE3E03	Module. VI	Dr. Laisa. C.P
I Sem MSc.	Inorganic Practicals		Ms. Heena P
	Organic Practicals		Dr. Laisa C.P
	Physical Practicals		Dr. Rosabella. K.
III Sem MSc.	Inorganic Practicals		Ms. Heena. P
	Organic Practicals		Dr. Laisa. C.P
	Physical Practicals		Dr. Rosabella. K.

Head of the Department
Department of Chemistry
Sacred Heart College Chalakudy

Dr. Santhosh Paul

November 2021

II Sem BSc. CM	CHE2B02	Module I	Dr. Santhosh Paul
IV Sem BSc. (M)	CHE4B04	Module I	Dr Santhosh Paul
VI Sem BSc (M)	CHE6B09	Module I	Ms. Sheein Michael
	CHE6B10	Module I, II	Dr. Santhosh Paul.
	CHE6B11	Module I, II	Dr. Laina A.L
	CHE6B12	Module I, II	Dr. Laina A.L
	CHE6B12(E2)	Module I	Ms. Shein Michael
II Sem BSc. (Sub)	CHE2C02	Module I half	Ms. Shein Michael
IV Sem BSc. (Sub	CHE4C04	Module I, II	Dr. Laina A.L
BSc. (Main)	Practicals		Dr. Santhosh Paul
BSc (Sub)	Practicals.		Dr. Laina. A.L
II Sem MSc.	CHE2C05	Module I	Dr. Rosabella
	CHE2C06	Module I	Ms. Heena. P.
	CHE2C07	Module I, II	Dr. Laisa C.P
	CHE2C08	Module I	Ms. Heena. P
IV Sem MSc.	CHE4C12	Module I, II	Ms. Heena. P
	CHE4E05	Module I	Dr. Laisa C.P
	CHE4E08	Module I, II	Ms. Shein Michael.
II MSc.	Inorganic Practicals		Ms. Heena P
	Organic Practicals		Dr. Laisa C.P
	Physical Practicals		Dr. Rosabella K.
IV Sem MSc.	Inorganic Practicals		Ms. Heena P
	Organic Practicals		Dr. Laisa C.P
	Physical Practicals		Dr. Rosabella K.

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Government College Chalakudy

Dr. Santhosh Paul

December 2021.

II Sem BSc (M)	CHE2B02	Module II half	Dr. Santhosh Paul
IV Sem BSc. (M)	CHE4B04	Module II	Dr. Laima A. L
VI Sem BSc (M)	CHE6B09	Module II	Ms. Shalin Michael
	CHE6B10	Module III	Ms. Shalin Michael
	CHE6B11	Module IV	Dr. Santhosh Paul
	CHE6B12	Module III, IV &	Dr. Laima A.L
	CHE6B12(EB2)	Module II, III	Dr. Santhosh Paul
II Sem BSc. (Sub)	CHE2C02	Module I and	Ms. Shalin Michael
IV Sem BSc. (Sub)	CHE4C04	Module III, IV	Dr. Laima. A.L
BSc. (M)	Practicals		Dr. Santhosh Paul
BSc. (Sub)	Practicals,		Dr. Laima. A.L
II Sem MSc.	CHE2C05	Module II	Dr. Rosabella. K
	CHE2C06	Module II	Ms. Aeena P
	CHE2C07	Module III	Dr. Laisa C.P
	CHE2C08	Module II	Dr Laisa C.P
IV Sem MSc.	CHE4C12	Module III, IV	Dr. Rosabella. K
	CHE4E05	Module II, III	Dr. Laisa. C.P
	CHE4E08	Module III, IV	Ms. Aeena. P
II Sem MSc.	Inorganic Practicals		Ms. Aeena. P
	Organic Practicals		Dr. Laisa C.P
	Physical Practicals		Dr Rosabella. K.
II Sem MSc.	Inorganic Practicals		Ms. Aeena. P
	Organic Practicals		Dr. Laisa. C.P
	Physical Practicals		Dr. Rosabella. K.

Head of the Department
Department of Chemistry

Dr. Santhosh Paul

January 2022

III Sem BSc (M)	CHE2B02	Module II contd.	Ms. Sharin Michael
IV Sem BSc (M)	CHE4B04	Module III	Dr. Laiva. A. L
V Sem BSc (M)	CHE6B09	Module III	Dr. Santhosh Paul.
	CHE6B10	Module IV	Dr. Laiva A. L
	CHE6B11	Module IV	Dr. Laiva A. L
	CHE6B12	Module V	Dr. Santhosh Paul
	CHE6B12(E2)	Module V	Ms. Sharin Michael
II Sem BSc (Sub)	CHE2C02	Module	Dr. Laiva A. L
IV Sem BSc (Sub)	CHE4C04	Module	Ms. Sharin Michael
BSc (M)	Practicals		Dr. Santhosh Paul
BSc. (Sub)	Practicals		Dr. Laiva. A. L
II Sem MSc.	CHE2C05	Module IV, V	Dr. Rosabella K.
	CHE2C06	Module III	Ms Heena P
	CHE2C07	Module IV	Ms. Heena P
	CHE2C08	Module III, IV	Dr. Laisa C. P
IV Sem MSc.	CHE4C12	Module V, VI	Dr. Rosabella. K
	CHE4E05	Module IV, V	Ms. Heena P
	CHE4E08	Module V	Dr. Laisa. C. P
II Sem MSc	Inorganic Practical		Ms. Heena. P
	Organic Practicals		Dr. Laisa C. P
	Physical Practicals		Dr. Rosabella. K
IV Sem MSc.	Inorganic Practicals		Ms. Heena P
	Organic Practicals		Dr. Laisa C. P
	Physical Practicals.		Dr. Rosabella. K

Head of the Dept. of Chem.

Dr. Santhosh Paul

February 2022

II Sem B.Sc (M)	CHE2B02	Module III	Dr. Santhosh Paul
IV Sem B.Sc (M)	CHE4B04	Module IV	Dr. Laina. A.L
VI Sem B.Sc (M)	CHE6B09	Module IV	Ms. Sherin Micheal.
	CHE6B10	Module V	Dr. Laina. A.L
	CHE6B11	Module V	Dr. Santhosh Paul
	CHE6B12	Module VI	Dr. Laina. A.L
	CHE6B13 (E_2)	Module V	Ms. Sherin Micheal.
II Sem B.Sc (Sub)	CHE2C02	Module III	Dr. Santhosh Paul
IV Sem B.Sc (Sub)	CHE4C04	Module VI	Ms. Sherin Micheal.
B.Sc (M)	Practicals		Dr. Santhosh Paul
B.Sc (Sub)	Practicals.		Ms. Sherin Micheal
II Sem M.Sc	CHE2C05	Module V	Dr. Rosabella. K
	CHE2C06	Module IV, V	Dr. Rosabella. K.
	CHE2C07	Module V	Ms. Heena. P
	CHE2C08	Module V	Dr. Laisa. C.P
IV Sem M.Sc	CHE4C12	Module VII	Dr. Rosabella. K
	CHE4E05	Module VI, VII	Ms. Heena. P
	CHE4E08	Module VI, VII	Ms. Laisa. C P
II Sem M.Sc.	Inorganic practicals		Ms. Heena. P
	organic practicals		Ms. Laisa. C P
	Physical practical		Dr. Rosabella. K
IV Sem. M.Sc	Inorganic practicals		Ms. Heena. P
	organic practicals.		Ms. Laisa. C P
	Physical practicals.		Dr. Rosabella. K.

Dr. Santhosh Paul
HoD

Head of the Depar...
Department of Che...

March 2022

II sem B.Sc (M)	CHE2B02	Module IV	Ms. Shenin Michael
IV sem B.Sc (M)	CHE4B04	Module II	Dr. Santhosh Paul
VI sem B.Sc (M)	CHE6B09	Module V	Dr. Laisa. A.L
	CHE6B10	Module VI	Ms. Anjana. E.S
	CHE6B11	Module VI	Dr. Santhosh Paul
	CHE6B12	Module VII	Dr. Laisa. A.L
	CHE6B13 (E2)	Module VII	Ms. Shenin Michael
II sem B.Sc (Sub)	CHE2C02	Module IV	Dr. Santhosh Paul
IV sem B.Sc Sub	CHE4C04	Module VI	Ms. Anjana. E.S
B.Sc (M)	Practicals		Dr. Santhosh Paul
B.Sc Sub	Practicals		Ms. Shenin Michael
II sem M.Sc	CHE2C05	Module VI	Dr. Rosabella. K.
	CHE2C06	Module VI	Ms. Heena. P
	CHE2C07	Module VI	Ms. Laisa. C. P
	CHE2C08	Module VI	Ms. Heena. P
IV sem M.Sc	CHE4C12	Module VII	Dr. Rosabella. K
	CHE4E05	Module VII	Ms. Laisa. CP
	CHE4E06	Module VII	Ms. Heena. P
II sem M.Sc	Inorganic practicals		Ms. Heena. P
	Organic practicals		Ms. Laisa. C. P
	Physical practicals		Dr. Rosabella. K
IV sem M.Sc	Inorganic practicals		Ms. Heena. P
	Organic practicals		Ms. Laisa. C. P
	Physical practicals		Dr. Rosabella. K

LUC
Dr. Santhosh Paul
HoD

Head of the Department
Department of Chemistry
Sacred Heart College

June 2022

I B.Sc (M)	CHE1B01	Module I, II	Dr. Santhosh Paul
III Sem B.Sc (M)	CHE3B03	Module I	Dr. Laina. A.L
V Sem B.Sc (M)	CHE5B06	Module 1, II	Dr. Anjali Jacob
	CHE5B07	Module I, II	Dr. Laina. A.L
	CHE5B08	Module I, II	Dr. Santhosh Paul
I Sem B.Sc (Sub)	CHE1C01	Module 1 (half)	Dr. Anjali Jacob
III Sem B.Sc (Sub)	CHE3C03	Module I, II	Dr. Laina. A.L
B.Sc (M) Practicals	Practicals.		Dr. Santhosh Paul
B.Sc (Sub)	Practicals		Dr. Laina. A.L
II Sem M.Sc	CHE3C09	Module 1, II	Dr. Rosabella. K
	CHE3C10	Module I, II	Ms. Megha. CB
	CHE3C11	Module 1, II	Ms. Anjana. E.S
	CHE3ED3	Module I	Ms. Anjana. E.S
I SEM MSc	CHE1C01	Module I, II	Dr. Rosabella. K
	CHE1C02	Module I, II	Ms. Anjana. E.S
	CHE1C03	Module I	Ms. Megha. C.B
	CHE1C04	Module 1	Ms. Megha. CB
II Sem M.Sc	Inorganic practicals		Ms. Anjana. E.S
	organic practicals		Ms. Megha. C B
	physical practicals		Dr. Rosabella. K
I Sem M.Sc..	Inorganic practicals		Ms. Anjana. E.S
	Organic practicals		Ms. Megha. C B
	physical practicals		Dr. Rosabella. K

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Department of Chemistry
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July 2022

I Sem B.Sc (M)	CHE1B01	Module III	Dr. Anjali Jacob
III Sem B.Sc (M)	CHE3B03	Module II	Dr. Santhosh Paul
V Sem B.Sc (M)	CHE5B06	Module III, IV(half)	Dr. Laina. A.L
	CHE5B07	Module III, IV	Dr. Laina. A.L
	CHE5B08	Module III	Dr. Anjali Jacob.
I Sem B.Sc (Sub)	CHE1C01	Module I	Dr. Santhosh Paul
III Sem B.Sc (Sub)	CHE3C03	Module III, IV	Dr. Anjali Jacob.
B.Sc (M)	Practicals.		Dr. Santhosh Paul
B.Sc (Sub)	Practicals.		Dr. Laina. A.L
I Sem M.Sc.	CHE1C01	Module III, IV	Dr. Rosabella. K
	CHE1C02	Module III	Ms. Megha. C.B Dr. Laina. C.P
	CHE1C03	Module II, III	Ms. Anjana. E.S
	CHE1C04	Module II, III	Ms. Megha. C.B
III Sem M.Sc.	CHE3C09	Module III	Dr. Rosabella. K
	CHE3C10	Module III	Ms. Anjana. E.S
	CHE3C11	Module III	Ms. Megha. C.B
	CHE3E03	Module II, III	Ms. Anjana. E.S
I Sem M.Sc	Inorganic practicals		Ms. Anjana. E.S
	Organic practicals		Ms. Megha. C.B
	physical practicals		Dr. Rosabella. K
II Sem M.Sc	Inorganic practicals		Ms. Anjana. E.S
	organic practicals		Ms. Megha. C.B
	physical practicals		Dr. Rosabella. K

Head of the Department

August 2022

I Sem B.Sc (Mo)	CHE1B01	Module IV	Dr. Santhosh Paul
III Sem B.Sc (Mo)	CHE3B03	Module III	Dr. Anjali Jacob
V Sem B.Sc (Mo)	CHE5B06	Module IV (Contd)	Dr. Laiva. A.L
	CHE5B07	Module V	Dr. Anjali Jacob
	CHE5B08	Module IV	Dr. Laiva. A.L
I Sem B.Sc (Sub)	CHE1C01	Module II	Dr. Laiva. A.L
III Sem B.Sc (Sub)	CHE3C03	Module V	Dr. Santhosh Paul.
B.Sc (Mo)	Practicals		Dr. Santhosh Paul
B.Sc (Sub)	Practicals		Dr. Laiva. A.L
I Sem M.Sc	CHE1C01	Module V, VI	Dr. Rosabella. K
	CHE1C02	Module IV	Ms. Anjana. E.S
	CHE1C03	Module IV	Ms. Anjana. E.S
	CHE1C04	Module IV	Ms. Megha. C.B
III Sem M.Sc	CHE3C09	Module IV, V	Dr. Rosabella K
	CHE3C10	Module IV	Ms. Anjana. E.S
	CHE3C11	Module IV	Ms. Megha. C.B
	CHE3C12	Module IV	Ms. Megha C.B
I Sem M.Sc	Inorganic practicals		Ms. Anjana. E.S
	organic practicals		Ms Megha. C.B
	physical practicals		Dr. Rosabella. K
III Sem M.Sc	Inorganic practicals		Ms. Anjana. E.S
	organic practicals		Ms. Megha. C.B
	physical practicals		Dr. Rosabella. K

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Department of Chem...
Sacred Heart College (A...

Department of Economics

Core 1

ECO1 B01 MICRO ECONOMICS

NO. OF HOURS OF LECTUERS PER WEEK: 6

NUMBER OF CREDIT: 5

MICRO ECONOMICS

Preamble: This course is designed to expose first semester students, who may be new to Economics, the basic principles of microeconomic theory. The emphasis will be on thinking like an economist and the course will illustrate how microeconomic concepts can be applied to analyze real-life situations.

Module I: Exploring the Subject Matter of Economics

Why study economics? Micro Versus Macro- Concepts of wealth, welfare, scarcity and growth -The scope and method of economics- Induction and deduction-Positive and normative economics-Value judgments- scarcity and choice- the basic problems of an economy- Production Possibility curve- basic competitive model- economic systems.

Module II: Demand and Supply Analysis

Concept of Demand- Law of Demand- Determinants of demand – Types of Demand – Demand Function – Market Demand Curve - Elasticity of Demand – Price, Income and Cross elasticity of demand Measures of Elasticity of Demand. Demand Forecast Meaning- Factors influencing demand forecast. Concept of Supply – Law of Supply – Determinants of Supply – Supply Function – Elasticity of Supply – Market Supply Curve -Market Equilibrium.

Module III: Theory of Consumer Behaviour

Utility Analysis – Cardinal and Ordinal approaches – Law of Diminishing Marginal Utility –Law of Equi-marginal utility, indifference curve, properties of indifference curves – Price (Budget) line – Equilibrium of the Consumer with the help of indifference curves – Price, Income and Substitution effect- Derivation of individual demand curve for normal good – Decomposition of Price effect into income effect and substitution effect – Hicksian and Slutsky‘s methods – Normal, inferior and Giffen goods – Application of Indifference Curves - Theory of Revealed Preference – Revealed Preference axioms - Consumer surplus - Marshall and Hicks.

Module IV: Theory of Production and Costs

Concept of Production – Production Function – Scale of production- short run versus long run production function- Law of Variable Proportions – Law of Returns to Scale – the Isoquant- Isocost Approach-producers equilibrium-expansion path- Internal and External Economies- Cobb-Douglas production function -Cost function and Cost concepts- Traditional theory of costs- Modern theory of costs.

References:

1. Dominick Salvatore (2003): Microeconomics: Theory and Applications- 4thEdition, Oxford University Press.
2. Robert S Pindyck and Daniel L Rubinfeld (2009): Microeconomics- 8th Edition, Pearson India.
3. Watson and Getz (2004): Price Theory and its Uses- 5thEdition, AITBS Publishers and Distributors.
4. A Koutsoyiannis (1979): Modern Microeconomics- 2ndEdition, Macmillan.
5. G S Madalla and Ellen Miller (1989): Microeconomics: Theory and Applications- Tata McGraw-Hill.
6. Robert Y Awh (1976): Microeconomics: Theory and Applications- John Wiley & Sons.
7. H.R Varian (2009) , Intermediate Microeconomics- A Modern Approach., W W Norton & Co Inc; 8 edition
8. Gregory Mankiw (2006) Principles of Microeconomics,(Paperback) South Western Educational Publishing
9. Jhingan,.M.L., (2017)., Micro Economic Theory, Vrinda Publications (P) Ltd, Delhi

OBJECTIVES

- To identify the difference between Micro and Macro Economics
- To understand the basic principles of the economy
- To analyze different concept of demand and supply in Economics
- To understand the theory of consumer behaviour using ordinal and cardinal approach.
- To identify the theory of production and costs in Economics

COURSE PLAN

Unit/Session / Hours (Time Required)	Topics to be Taught	Procedure Student Centric Methods of Teaching	Activity	Learning Outcome	Assessment
Module I	Why study economics?, Micro Versus Macro, Concepts of wealth, welfare, scarcity and growth, The scope and method of economics, Induction and deduction, Positive and normative economics, Value judgments, scarcity and choice, the basic problems of an economy, Production Possibility curve, basic competitive model, economic systems.	o Lecture o Group Discussion o Power Point Presentation	Peer Group Discussion on the basis of basic problems in economy	• To identify the concept micro vs macro economics • To understand the basic problems of economy.	Evaluation through debate
Module II	Concept of Demand-,Law of Demand,	o Lecture	Peer Group	❖ To analyze	Evaluation

	Determinants of demand ,Types of Demand , Demand Function , Market Demand Curve ,Elasticity of Demand ,Price, Income and Cross elasticity of demand ,Measures of Elasticity of Demand. Demand Forecast Meaning, Factors influencingdemand forecast. Concept of Supply ,Law of Supply , Determinants of Supply – ,SupplyFunction ,Elasticity of Supply ,Market Supply Curve ,Market Equilibrium	o Problem solving o Power Point Presentation o Participatory learning o Videos	Discussion on the basis of determinants of demands	different concept of demand and supply in Economics ❖ To identify basic principles of the economy	through MCQ questions.
Module III	Utility Analysis ,Cardinal and Ordinal approaches – Law of Diminishing Marginal Utility – Law of Equi-marginal utility ,indifference curve, properties of indifference curves – Price(Budget) line – Equilibrium of the Consumer with the help of indifference curves – Price, Income and Substitution effect- Derivation of individual demand curve for normal good – Decomposition of Price effect into income effect and substitution effect – Hicksian and Slutsky‘s methods –	o Lecture o Problem Solving o Diagrammatic Representation o Peer Discussion	o Find out the consumer surplus o Peer discussion on the basis of Slutsky’s and Hicksian methods	❖ To understand the theory of consumer behaviour using ordinal and cardinal approach	Evaluation through test paper

	Normal, inferior and Giffen goods – Application of Indifference Curves - Theory of Revealed Preference – Revealed Preference axioms - Consumer surplus - Marshall and Hicks				
Module IV	Concept of Production – Production Function – Scale of production- short run versus long run production function- Law of Variable Proportions – Law of Returns to Scale – the Isoquant-Isocost Approach- producers equilibrium- expansion path- Internal and External Economies- Cobb-Douglas production function -Cost function and Cost concepts- Traditional theory of costs- Modern theory of costs.	o Power Point Presentation o Lecture o Problem Solving	o Find out different costs o Compare Short run versus Long run	To identify the theory of production and costs in Economics	Evaluation through quiz

Course Outcomes

CO1	**To identify the difference between Micro and Macro Economics**
CO2	**To analyze different concept of demand and supply in Economics**
CO3	**To understand the theory of consumer behaviour using ordinal and cardinal approach.**
CO4	**To identify the theory of production and costs in Economics**

Faculty in charge
Dr. Shirley Jose K

Semester II

Course Category	**Core Course 2**
Course Title and Code	**Macroeconomics I ECO2 B02**
No. of Credits	**5**
No. of Contact Hours	**6 Hours per week**

MACROECONOMICS I

Preamble: Macroeconomics emerged as a separate discipline following the failure of classical economics to diagnose the reasons of the Great Depression in the 1930s. 'The General Theory of Employment, Interest and Money' published by John Maynard Keynes in 1936 was the influential book which laid the foundation of Macroeconomics. Today, principles of macroeconomics help us understand the trends in aggregate variables like national income, employment, price level and investment. It also helps us explore and understand the determinants of short run fluctuations and long run movements in these variables. The course is designed to give a rigorous overview of macroeconomics to the undergraduate students. It will give the necessary ideas and tools to understand the working of an economy at the aggregate level. The course is also expected to give an idea about the need for and the way in which government intervention is required in a modern economy. After completing this course, the student will be able to appreciate the context in which Macroeconomics emerged as a separate discipline. The student will be able to explain how output and employment are determined in classical and Keynesian systems. Student should also be able to explain why actual output will fall short of the productive capacity of the economy.

Module I: Introduction to Macroeconomics Nature, scope and limitations of macroeconomics – Macroeconomic model – Types of variables: Stock and flow, endogenous and exogenous, ex-ante and ex-post – static, comparative static and dynamic – equilibrium and disequilibrium - Circular flow of income and outputnational income and its measurement-Production approach, Expenditure approach, Income approach--Real and Nominal GDP.

Module II: Classical macroeconomics Classical Economy – Say's Law of Market – Wage-price flexibility – Classical model of output and employment – Classical theory of price level determination – Quantity theory of Money – Fisher's Equation of Exchange – Cash Balance Approach - Neutrality of Money – Money illusion-Classical dichotomy-Classicalresponse to the Great Depression-Crisis in the discipline of Economics

Module III: Keynesian macroeconomics Effective demand - Aggregate demand and aggregate supply – Consumption, Investment and Government Expenditure (C+I+G)- -Autonomous Consumption and Induced ConsumptionKeynesian Consumption function-investment function-MEC and MEI- Sticky prices and wagesAssumption of fix price-Keynesian Cross model and determination of equilibrium outputMultiplier-Inflationary and Deflationary gaps-Fiscal Policy-Understanding fiscal policy using Keynesian Cross model-tax multiplier-government expenditure multiplier-balanced budget multiplier.

Module IV: Money Nature of money-types-functions-time preference-interest rate: real and nominal-bondrelationship between bond price and interest rate-Theories of Demand for money-Liquidity Preference theory and Keynesian Liquidity Trap-Friedman's re-statement of Quantity Theory of Money. Theories of Supply of money-Measuring supply of money-High powered money-money multiplier.

References:

1. 1.Edward Shapiro – 'Macro economics' Oxford University press.
2. 2.GregoryMankiw – 'Macro economics' – 6th Edn. Tata McGraw Hill.
3. Richard T. Froyen – 'Macro economics', Pearson education.
4. Eugene Diulio – Macro economic Theory, Shaum's Outline series. Tata McGraw Hill
5. Errol D'Souza – 'Macro Economics' – Pearson Education 2008. 6.AbhijitKundu (2009): Methodology and Perspectives of Social Science – Pearson Education 8 7. Dornbusch, Fischer and Startz-Macroeconomics-Tata McGraw –Hill

OBJECTIVES

- To understand the trends in aggregate variables like national income, employment, price level and investment
- To analyze the working of an economy at the aggregate level
- To identify the need for and the way in which government intervention is required in a modern economy.
- To compare how output and employment are determined in classical and Keynesian systems.
- To explain why actual output will fall short of the productive capacity of the economy.
- To understand the importance of money in the economy
- To explain the liquidity preference theory and Keynesian Liquidity Trap

COURSE PLAN

Unit/Session/ Hours (Time Required)	Topics to be Taught	Procedure Student Centric Methods of Teaching	Activity	Learning Outcome	Assessment
Module I	Nature, scope and limitations of macroeconomics – Macroeconomic model – Types of variables: Stock and flow, endogenous and exogenous, ex-ante and ex-post – static, comparative static and dynamic – equilibrium and	• Lecture • Group Discussion • Diagrammatic presentation • Problem solving	• Distinguish between different types of variable • Find out National income	To understand the trends in aggregate variables like national income, employment, price level and investment	Evaluation through test paper

	disequilibrium - Circular flow of income and output national income and its measurement- Production approach, Expenditure approach, Income approach-- Real and Nominal GDP.				
Module II	Classical Economy – Say's Law of Market – Wage-price flexibility – Classical model of output and employment – Classical theory of price level determination – Quantity theory of Money – Fisher's Equation of Exchange – Cash Balance Approach - Neutrality of Money – Money illusion-	• Lecture • Illustrations • Group Discussion	• Peer discussion about Great Depression • Complete above illustrations	To identify the need for and the way in which government intervention is required in a modern economy	Evaluation through quiz

	Classical dichotomy- Classical response to the Great Depression- Crisis in the discipline of Economics				
Module III	Effective demand - Aggregate demand and aggregate supply – Consumption, Investment and Government Expenditure (C+I+G)- - Autonomous Consumption and Induced Consumption Keynesian Consumption function- investment function- MEC and MEI- Sticky prices and wagesAssumption of fix price- Keynesian Cross model and determination of equilibrium output Multiplier-	• Lecture • Group Discussion • Diagrammatic presentation • Problem solving	• Compare the classical and Keynesian model of output and employment • Find out Multiplier	To analyze the working of an economy at the aggregate level To compare how output and employment are determined in classical and Keynesian systems To explain why actual output will fall short of the productive capacity of the economy	Evaluation through test paper

	Inflationary and Deflationary gaps-Fiscal Policy-Understanding fiscal policy using Keynesian Cross model-tax multiplier-government expenditure multiplier-balanced budget multiplier				
Module IV	Nature of money-types-functions-time preference-interest rate: real and nominal-bond relationship between bond price and interest rate-Theories of Demand for money-Liquidity Preference theory and Keynesian Liquidity Trap-Friedman's re-statement of Quantity Theory of	• Lecture • Participatory Learning • Assignment • Group Discussion	• Compare barter system and Money system • Peer discussion based on liquidity preference among individuals.	To understand the importance of money in the economy To explain the liquidity preference theory and Keynesian Liquidity Trap	Evaluation through Assignment and Group Discussion

	Money. Theories of Supply of money- Measuring supply of money-High powered money- money multiplier.				

Course Outcomes

CO1	**To understand the trends in aggregate variables like national income, employment, price level and investment**
CO2	**To analyze the working of an economy at the aggregate level .**
CO3	**To identify the need for and the way in which government intervention is required in a modern economy.**
CO4	**To compare how output and employment are determined in classical and Keynesian systems**
CO5	**To explain why actual output will fall short of the productive capacity of the economy.**
CO6	**To understand the importance of money in the economy**
CO7	**To explain the liquidity preference theory and Keynesian Liquidity Trap**

Faculty in charge,
Mr. Nijil Jacobi

SEMESTER III

Course Category	**Core Course 3**
Course Title and Code	**Quantitative Methods for Economic Analysis - I ECO3 B03**
No. of Credits	**4**
No. of Contact Hours	**5 Hours per week**

QUANTITATIVE METHODS FOR ECONOMIC ANALYSIS – I

Preamble: Students of economics should have sound quantitative skills to collect, analyse and interpret empirical data. They also require these skills for advanced studies in quantitative economics. Quantitative skills have become an essential toolkit for most branches of economics. This course is intended to provide students an introduction to quantities methods and tools that are used in the study of economics at the undergraduate level. The aim of this course is to develop skill in statistical and mathematical techniques that are required for a meaningful study of applied economics and for carrying out empirical their further study in most branches of economics.

Module I –Basic Concepts

Exponents and logarithms-Equations –Linear, quadratic and simultaneous equations up to three un knows- Functions –types and their applications in economics –Introduction to co-ordinate geometry, Graphs, Slope and Intercepts, Equations of Straight Lines.

Module II- Basic Matrix Algebra:

Matrix -Meaning and types, Matrix operations, Addition, Subtraction and Multiplication Properties of Matrix multiplication, Transpose of matrix, Determinant and their properties (Up to 3 x 3) – Minor and Cofactors – Rank of a Matrix- Solving linear equations using Matrix Inverse- - Cramer's rule

Module III– Univariate Analysis

Univariate Analysis: -Frequency Tables, Representation of data-Frequency Polygon, Ogives and Pie diagram. Measures of Central tendency - Arithmetic Mean, Median, Mode, Geometric Mean and Harmonic Mean -. Measures of Dispersion: Absolute and Relative measures of Dispersion – Range, Quartile Deviation, Mean Deviation and Standard Deviation, Coefficient of variation - Lorenz Curve - Gini Coefficient - Skewness and Kurtosis.

Data management using Spread Sheet : Mean, Median, Mode, Dispersion, Coefficient of Variation -Graphical Presentation of Data: Line, bar, pie diagrams.

Module IV: **Correlation and Regression Analysis**

Correlation-Meaning, Types- Methods of Measuring Correlation-Graphical: Scatter Diagram and correlation Graph; Algebraic Methods: Karl Pearson‘s Coefficient of Correlation and Rank Correlation Coefficient -Simple linear regression - Meaning, Principle of Ordinary Least Squares and Regression Lines-Correlation and Regression using spread sheet. 28 BA Economics Curriculum: CBCSS 2019

References:

1. Allen , R.J.D. Mathematical Analysis for Economics ,Macmillan Press, London

2. Dowling Edward T, Mathematical Methods for Business and Economics, SchaumsOutlineSeries, McGraw Hill, 1993

3. Dowling Edaward.T, Introduction to Mathematical Economics, 2nd/3rd Edition, Schaum‘s Outline Series, McGraw-Hill, New York, 2003

4. Taro Yamane, Mathematics for Economists: An Elementary Survey, Prentice Hall of India

5. Sydsaeter K and Hammond P, Essential Mathematics for Economic Analysis, Prentice Hall

6. Haeussler Earnest F, Paul Richard S and Wood Richard, Introductory Mathematical Analysis PearsonEducation ISBN 0131276298

7. Bressler Barry, A Unified Introduction to Mathematical Economics, harper and Row Publishers, ISBN0060409525

8. Anderson, Sweeney and Williams, Statistics for Business and Economics, Thomson Education
9. Lind D.A., W.G. Marchal and S.A Wathen., Statistical Techniques in Business and Economics, Tata McGraw Hill, New Delhi

10. Gupta S. P, Statistical Methods, Sultan Chand and Sons, New Delhi

11. Aczel D Amir and Sounderpandian Jayavel, Complete Business Statistics, Tata McGraw Hill Publishers, Newdelhi ISBN 0070620164

12. Richard I Levin et.al. Statistics for management. India: Pearson Education.

OBJECTIVES

- To inculcate quantitative skills to collect, analyse and interpret empirical data.
- To develop skill in statistical and mathematical techniques that are required for a meaningful study of applied economics
- To understood basic concepts related to quantitative methods in economics
- To create the capability of data management using spread sheet

COURSE PLAN

Unit/Session/ Hours (Time Required	Topics to be Taught	Procedure Student Centric Methods of Teaching	Activity	Learning Outcome	Assessment
Module 1	Basic Concepts Exponents and logarithms-Equations – Linear, quadratic and simultaneous equations up to three un knows-Functions –types and their applications in economics – Introduction to co-ordinate geometry, Graphs, Slope and Intercepts, Equations of Straight Lines.	• Lecture • Participative Learning • Problem Solving • Discussion	Peer group discussion on functions, types and their application in economics	To understood basic concepts related to quantitative methods in economics	Evaluation through MCQ
Module 2	Basic Matrix Algebra: Matrix -Meaning and types, Matrix operations, Addition, Subtraction and MultiplicationProperties of Matrix multiplication, Transpose of matrix, Determinant and their properties (Up to 3 x 3) – Minor and Cofactors – Rank of a Matrix- Solving linear equations using Matrix Inverse- - Cramer's rule	• Lecture • Participative Learning • Problem Solving • Discussion • Assignment	Assignment on the properties of determinent	To inculcate quantitative skills to collect, analyse and interpret empirical data	Evaluation though Test paper
Module 3	Univariate Analysis: - Frequency Tables,	• Lecture • Participativ	Assignment on	To create	Evaluation

	Representation of data- Frequency Polygon, Ogives and Pie diagram. Measures of Central tendency - Arithmetic Mean, Median, Mode, Geometric Mean and Harmonic Mean -. Measures of Dispersion: Absolute and Relative measures of Dispersion – Range, Quartile Deviation, Mean Deviation and Standard Deviation, Coefficient of variation - Lorenz Curve - Gini Coefficient - Skewness and Kurtosis. Data management using Spread Sheet : Mean, Median, Mode, Dispersion, Coefficient of Variation - Graphical Presentation of Data: Line, bar, pie diagram	e Learning • Problem Solving • Discussion	measures of central tendency	the capability of data managemen t using spread sheet To inculcate quantitative skills to collect, analyse and interpret empirical data	through Practical exam
Module 4	Correlation-Meaning, Types- Methods of Measuring Correlation- Graphical: Scatter Diagram and correlation Graph; Algebraic Methods: Karl Pearson‘s Coefficient of Correlation and Rank Correlation Coefficient - Simple linear regression - Meaning, Principle of Ordinary Least Squares and Regression Lines- Correlation and Regression using spread sheet.	• Lecture • Power Point Presentation • Group Discussion • Assignment	Assignme nt on correlation meaning and types	To develop skill in statistical and mathematic al techniques that are required for a meaningful study of applied economics	Evaluation though Test paper

COURSE OUTCOME

CO1	**To understood basic concepts related to quantitative methods in economics**
CO2	**To inculcate quantitative skills to collect, analyse and interpret empirical data**
CO3	**To create the capability of data management using spread sheet**
CO4	**To develop skill in statistical and mathematical techniques that are required for a meaningful study of applied economics**

Faculty in Charge,

Dr. Chacko Jose P

Semester III

Course Category	**Core Course 4**
Course Title and Code	**Microeconomics II ECO3 B04**
No. of Credits	**4**
No. of Contact Hours	**4 Hours per week**

MICROECONOMICS II

Preamble: This course is designed to introduce fundamental market concepts and structures. The emphasis of the course is to give conceptual clarity to the student coupled with the use of the principles Micro economic analysis to the decision making of firms and market. After completing this course, the student will be able to apply the principles of micro economics, to the decision making of firms and the functioning of the market.

Module I: Market Structure: Perfect Competition

Market-Functions-Market structure-Types of markets-Perfect competition-Characteristics-Demand AR and MR curves-Price determination in the market period- Short run equilibrium of the firm and industryShut down point-Long run equilibrium of the firm and industry-Constant, increasing and decreasing cost industries- Welfare effects of government intervention- Impact of a tax and subsidy.

Module II: Monopoly

Monopoly- Sources of monopoly-Types of monopoly-AR and MR curve of a monopolist - Short run and long run equilibrium- Supply curve of a monopolist- The multiplant firm- Monopoly power-Measurement of monopoly power-Social cost of monopoly- Regulation of monopoly - Price discrimination-First degree, second-degree and third degree- International price discrimination (Dumping- types)-Two part tariff, tying and bundling-Peak load pricing-Monopsony- Bilateral monopoly.

Module III: Monopolistic Competition and Oligopoly

Monopolistic competition- Features of monopolistic competition-Short run and long run equilibrium Excess capacity-Product differentiation and selling costs-Oligopoly-Characteristics-Collusive versus non-collusive oligopoly-Cournot model- Kinked demand curve model - Cartel and price leadership.

Module IV: Pricing and Employment of Inputs

Competitive factor markets -Demand curve of the firm for one variable input-Demand curve of the firm for several variable inputs- Market demand curve for an input - Supply of inputs to a firm- The market supply of inputs- Equilibrium in a competitive factor market- Factor market with monopoly power- Factor market with monopsony power-Marginal Productivity theory of input demand.

References:

1. Dominick Salvatore (2003): Microeconomics: Theory and Applications- 4th Edition, Oxford University Press.

2. Robert S Pindyck and Daniel L Rubinfeld (2009): Microeconomics- 8th Edition, Pearson India.

3. Watson and Getz (2004): Price Theory and its Uses- 5th Edition, AITBS Publishers and Distributors.

4. A Koutsoyiannis (1979): Modern Microeconomics- 2nd Edition, Macmillan.

5 .G S Madalla and Ellen Miller (1989): Microeconomics: Theory and Applications- Tata McGraw-Hill.

OBJECTIVES

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- To introduce fundamental market concepts and structures
- To apply the principles of micro economics to the decision making of firms and the functioning of the market.
- To understood the concept of Price Discrimination in Monopoly
- To understood the concept of Product Differentiation in Monopolistic Competition
- To identify the pricing and employment of outputs.

COURSE PLAN

Unit/Session/ Hours (Time Required	Topics to be Taught	Procedure Student Centric Methods of Teaching	Activity	Learning Outcome	Assessment
Module I	Market-Functions-Market structure-Types of markets-Perfect competition-Characteristics-Demand AR and MR curves-Price determination in the market period-Short run equilibrium of the firm and industry Shut down point-Long run equilibrium of the firm and industry-Constant, increasing and decreasing cost industries-Welfare effects of government intervention-Impact of a tax and subsidy	• Lecture • Discussion • Participatory Learning	To find out short run and long run equilibrium in Perfect competition	To introduce fundamental market concepts and structures	Evaluation through quiz

Module II	Monopoly-Sources of monopoly-Types of monopoly-AR and MR curve of a monopolist - Short run and long run equilibrium-Supply curve of a monopolist- The multiplant firm-Monopoly power-Measurement of monopoly power-Social cost of monopoly-Regulation of monopoly -Price discrimination-First degree, second-degree and third degree-International price discrimination (Dumping-types)-Two part tariff, tying and bundling-Peak load pricing-Monopsony-Bilateral monopoly.	• Lecture • Discussion • Participatory Learning	To find out short run and long run equilibrium inMonopoly	To apply the principles of micro economics to the decision making of firms and the functioning of the market To understood the concept of Price Discrimination in Monopoly	Evaluation through Test paper
Module III	Monopolistic competition-Features of monopolistic competition-Short run and long run equilibriumExcess capacity-Product differentiation and selling costs-	• Lecture • Discussion • Participatory Learning	To find out short run and long run equilibrium in Monopolistic competition	To understood the concept of Product Differentiation in Monopolistic Competition	Evaluation through Test paper

	Oligopoly- Characteristics- Collusive versus non-collusive oligopoly- Cournotmodel- Kinked demand curve model - Cartel and price leadership				
Module IV	Competitive factor markets - Demand curve of the firm for one variable input- Demand curve of the firm for several variable inputs- Market demand curve for an input - Supply of inputs to a firm- The market supply of inputs- Equilibrium in a competitive factor market- Factor market with monopoly power- Factor market with monopsony power-Marginal Productivity theory of input demand.	• Lecture • Discussion • Participatory Learning	To find out Pricing and employment in outputs	To identify the pricing and employment of outputs	Evaluation through Test paper

COURSE OUTCOME

CO1	**To introduce fundamental market concepts and structures .**
CO2	**To apply the principles of micro economics to the decision making of firms and the functioning of the market**
CO3	**To understood the concept of Price Discrimination in Monopoly**
CO4	**To understood the concept of Product Differentiation in Monopolistic Competition**
CO5	**To identify the pricing and employment of outputs**

Faculty in Charge
Mr. Nijil Jacobi

Semester IV

Course Category	Core Course 5
Course Title and Code	Quantitative Methods for Economic Analysis II ECO4 B05
No. of Credits	4
No. of Contact Hours	5 Hours per week

QUANTITATIVE METHODS FOR ECONOMIC ANALYSIS – II

Preamble: This course is designed to transmit the body of basic statistics and mathematics that enables the study of economic theory at the undergraduate level. The aim of this course is to equip the students to quantify economic variables and to enable them to apply statistical techniques in Economics. After completing this course, the student will be able to apply statistical and mathematical techniques in Economics.

Module I: Differential Calculus

Limits and Continuity – Differentiation - Rules, Derivative of single variable and multi variable Functions (except Trigonometric and logarithmic Function), Higher Order Derivatives –Partial differentiation- Optimization - Maxima and Minima of Functions. – Economic Application of Derivatives – Marginal Concepts (MU, MR,MP, Elasticity etc)

Module II: Index Numbers and Time Series

Analysis Index Numbers: Meaning and Uses- Unweighted and Weighted Index Numbers: Laspeyre‘s, Paasche‘s, Fisher‘s, Dorbish-Bowley, Marshall-Edgeworth and Kelley‘s Methods - Tests of IndexNumbers: Time Reversal and Factor Reversal tests - Base Shifting, Splicing and Deflating -CPI and WPI - Stock Price Indices: BSE-SENSEX and NSE-NIFTY.Time Series Analysis - Components of Time Series - Measurement of Trend by Moving Average and the Method of Least Squares.

Module III: Vital Statistics

Vital Statistics: Meaning and Uses- Fertility Rates: Crude Birth Rate, General Fertility Rate, Specific Fertility Rate, Gross Reproduction Rate and Net Reproduction Rate - Mortality Rates: Crude Death Rate, Specific Death Rate, Infant Mortality Rate andMaternal Mortality Rate - Sex Ratio and Couple Protection Ratio.

Module IV- Fundamentals of probability

Basic probability concepts: – Mutually exclusive and collectively exhaustive events – statistically independent events, sample space, events. Types of probability –A Priori Classical probability – Empirical Classical Probability – Subjective Probability.

References

1. Allen , R.J.D. Mathematical Analysis for Economics ,Macmillan Press, London
2. Dowling Edward T, Mathematical Methods for Business and Economics, Schaums Outline Series, McGraw Hill, 1993

3. Bressler Barry, A Unified Introduction to Mathematical Economics, harper and Row Publishers, ISBN0060409525
4. Sydsaeter K and Hammond P, Essential Mathematics for Economic Analysis, Prentice Hal
l 5. Dowling Edaward.T, Introduction to Mathematical Economics, 2nd/3rd Edition, Schaum‘s
6. Outline Series, McGraw-Hill, New York, 2003
7. Anderson, Sweeney and Williams, Statistics for Business and Economics, Thomson Education
8. Lind D.A., W.G. Marchal and S.A Wathen., Statistical Techniques in Business and Economics, Tata McGraw Hill, New Delhi
9. Gupta S. P, Statistical Methods, Sultan Chand and Sons, New Delhi
10. Richard I Levin et.al. Statistics for management. India: Pearson Education

OBJECTIVES

- To equip the students to quantify economic variables
- To apply the index numbers in economic analysis
- To enable them to apply statistical techniques in Economics.
- To apply statistical and mathematical techniques in Economics.

COURSE PLAN

Unit/Session/ Hours (Time Required	Topics to be Taught	Procedure Student Centric Methods of Teaching	Activity	Learning Outcome	Assessment
Module I	Limits and Continuity – Differentiation - Rules, Derivative of single variable and multi variable Functions (except Trigonometric and logarithmic Function), Higher Order Derivatives –Partial differentiation- Optimization - Maxima and Minima of Functions. – Economic Application of Derivatives – Marginal Concepts (MU, MR,MP, Elasticity etc)	• Lecture • Participative Learning • Problem Solving • Discussion	Write a Assignment on the rules of differentiation.	To equip the students to quantify economic variables	Evaluation through assignments
Module II	Analysis Index Numbers: Meaning and Uses- Unweighted and	• Lecture • Participative Learning • Problem	Identifying different types of Index	To apply the index numbers in economic	Evaluation through quizzes

	Weighted Index Numbers:Laspeyre ‘s, Paasche‘s, Fisher‘s, Dorbish-Bowley, Marshall-Edgeworth and Kelley‘s Methods - Tests of IndexNumbers: Time Reversal and Factor Reversal tests - Base Shifting, Splicing and Deflating -CPI and WPI - Stock Price Indices: BSE-SENSEX and NSE-NIFTY.Time Series Analysis - Components of Time Series - Measurement of Trend by Moving Average and the Method of Least Squares	Solving	numbers	analysis	
Module III	Vital Statistics: Meaning and Uses-Fertility Rates: Crude Birth Rate, General Fertility Rate, Specific Fertility Rate, Gross Reproduction Rate and Net Reproduction Rate - Mortality Rates: Crude Death Rate, Specific Death Rate, Infant Mortality Rate andMaternal Mortality Rate -	• Lecture • Participative Learning • Problem Solving • Group discussion	Peer discussion about the Importance of vital statistics in Economics	To enable them to apply statistical techniques in Economics	Evaluation through Test Paper

	Sex Ratio and Couple Protection Ratio.				
Module IV	Basic probability concepts: – Mutually exclusive and collectivelyexhaustive events – statistically independent events, sample space, events. Types of probability –A Priori Classical probability - Empirical Classical ProbabilitySubjective Probability	• Lecture • Participative Learning • Problem Solving • Assignment	To write an assignment on what is probability and different types of probability	To apply statistical and mathematical techniques in Economics	Evaluation through MCQ

COURSE OUTCOME

CO1	To equip the students to quantify economic variables
CO2	To apply the index numbers in economic analysis
CO3	To enable them to apply statistical techniques in Economics.
CO4	To apply statistical and mathematical techniques in Economics.

Faculty in Charge,

Dr Chacko Jose P

Semester IV

Course Category	**Core Course 6**
Course Title and Code	**Macroeconomics II ECO4 B06**
No. of Credits	**4**
No. of Contact Hours	**4 Hours per week**

MACROECONOMICS – II

Preamble: I S-LM framework is a versatile tool used in understanding the working of modern economies. Hence it is widely used in policy formulation too. Phillips curve also was used widely for policy formulation, until it collapsed following the stagflation of 1970s. New concepts like NAIRU developed afterwards. Market economies have always experienced cyclical fluctuations in economic activity. Fiscal and monetary policies have been effectively employed by governments to fight such fluctuations. The objective of this course is to give a rigorous overview of macroeconomics to the undergraduate students. The course is designed to give the necessary ideas and tools to understand the working of an economy at the aggregate level. The course is also expected to give an idea about the need for and way in which government intervention is required in a modern economy. After completing this course a student should be able to derive IS-LM curves and use the framework to explain the working of an economy. A student should also be able to explain the way fiscal and monetary policy works, using the ISLM framework. Student should also be able to explain the concept and measurement of inflation and unemployment. Similarly, a student should also be able to explain the trade-off between inflation and unemployment as predicted by the Phillips curve and its collapse after the stagflation of 1970s.

Module I :ISLM Model

Goods market equilibrium using IS curve-derivation and shifts-Money market equilibrium using LM curve-derivation and shifts-equilibrium using IS and LM.

Module II:Theories of Inflation and Unemployment Inflation–

Types of Inflation –Headline and core inflation-Measurement of inflation in IndiaWPI-CPI-PPI-GDP deflator.Effects of inflation- Sacrifice ratio-Theories of inflation- Demandpull versus cost-push inflation-Measures to control inflation.Unemployment – Types of unemployment- Measurement of unemployment-Cost of unemployment and Okun'slaw.Phillips curve –Short Run and Long run Phillips curve – Stagflation of 1970s-reasons-NAIRU.

Module III:Short Run Analysis

Business Cycles-Phases-Theories of trade cycles- Hawtrey's theory- Hayek's theory- Keynesian theory-Monetarist interpretation of trade cycles-Contra-cyclical policy measures-Monetary, fiscal, and incomes policy - Meaning and Instruments.

Module IV:Fiscal and Monetary Policy

Fiscal policy-tools-effectiveness-Monetary policy-tools-effectiveness-Interaction between fiscal and monetary policy.Unconventional Monetary Policy-Quantitative easing-Transmission mechanism.Great recession of 2008 and use of monetary and fiscal policy.

References

1.Edward Shapiro – 'Macro economics' Oxford University press.

2.GregoryMankiw – 'Macro economics' – 6th Edn. Tata McGraw Hill.

3. Richard T. Froyen – 'Macro economics', Pearson education.

4. Eugene Diulio – Macro economic Theory, Shaum's Outline series. Tata McGraw Hill

5.Errol D'Souza – 'Macro Economics' – Pearson Education 2008

. 6.AbhijitKundu (2009) : Methodology and Perspectives of Social Science – Pearson Education

OBJECTIVES

- To identify the necessary ideas and tools to understand the working of an economy at the aggregate level.
- To give an idea about the need for and way in which government intervention is required in a modern economy
- To explain the way fiscal and monetary policy works, using the ISLM framework
- To explain the concept and measurement of inflation and unemployment.

COURSE PLAN

Unit/Session/ Hours (Time Required	Topics to be Taught	Procedure Student Centric Methods of Teaching	Activity	Learning Outcome	Assessment
Module I	Goods market equilibrium using IS curve-derivation and shifts-Money market equilibrium using LM curve-derivation and shifts-equilibrium using IS and LM.	• Lecture • Participative Learning • Problem Solving • Group discussion	To identifying the ISLM framework	To explain the way fiscal and monetary policy works, using the ISLM framework	Evaluation through Test Paper
Module II	Types of Inflation – Headline and core inflation- Measurement of inflation in IndiaWPI-CPI-PPI-GDP deflator.Effects of inflation- Sacrifice ratio-Theories of inflation- Demandpull versus cost-push inflation-Measures to control inflation.Unemployment – Types of	• Lecture • Participative Learning • Problem Solving • Group discussion	To identifying the different types of inflation	To explain the concept and measurement of inflation and unemployment.	Evaluation through Quiz

	unemployment-Measurement of unemployment-Cost of unemployment and Okun'slaw.Phillips curve –Short Run and Long run Phillips curve – Stagflation of 1970s-reasons-NAIRU.				
Module III	Business Cycles-Phases-Theories of trade cycles-Hawtrey's theory-Hayek's theory-Keynesian theory-Monetarist interpretation of trade cycles-Contra-cyclical policy measures-Monetary, fiscal, and incomes policy - Meaning and Instruments	• Lecture • Participative Learning • Group discussion	To understand the different types of businues s cycle	To identify the necessary ideas and tools to understand the working of an economy at the aggregate level.	Evaluation through Test Paper
Module IV	Fiscal policy-tools-effectiveness-Monetary policy-tools-effectiveness-Interaction between fiscal and monetary policy.Unconventional Monetary Policy-Quantitative easing-Transmission mechanism.Great recession of 2008 and use of monetary and fiscal policy.	• Lecture • Participative Learning • Group discussion	Peer discussion about the need of fiscal and monetary policy in India	To give an idea about the need for and way in which government intervention is required in a modern economy	Evaluation through Test Paper

COURSE OUTCOME

CO1	To explain the way fiscal and monetary policy works, using the ISLM framework
CO2	To explain the concept and measurement of inflation and unemployment.
CO3	To identify the necessary ideas and tools to understand the working of an economy at the aggregate level.
CO4	To give an idea about the need for and way in which government intervention is required in a modern economy

Faculty in Charge,

Shirley Joe K

Semester V

Course Category	**Core Course 7**
Course Title and Code	**Fiscal Economics ECO5 B07**
No. of Credits	**4**
No. of Contact Hours	**6 Hours per week**

FISCAL ECONOMICS

Preamble:Fiscal economics deals with the fisc (treasury) of the country. It is related to decision making in the public sector or finance of the government. The basic aim of this course is to introduce students to the application of the techniques, methods and principles of Economics for decision making in fiscal economics. After completing this course students are expected to learn how the principles of economics can be applied to sound decision making in public finance. They are expected to learn to analyse the financial activities of a government and to understand the important economic issues that government agents face. Training in fiscal economics will help students in higher studies.

Module I:Meaning and scope of fiscal economics

Origin, growth, meaning and scope of public finance- Public and private finance- Principle of MSA- Public goods and private goods-mixed goods and merit goods (concepts only with examples)

Module II: Public expenditure and cost benefit analysis

Meaning and importance of public expenditure with special reference to India-Wagner‘s, Peacock-Wiseman Hypothesis-Canons of Public expenditure-effects of public expenditure on the economy of India-investment evaluation, project evaluation and cost benefit analysis with suitable examples.

Module III: Public revenue and Income tax calculation

Sources of Public revenue-tax and non-tax- classification of taxes-canons and principles of taxation- Ability to pay- cost of service and Benefit- impact, incidence and shifting of tax burden- effects of taxation- major taxes in India like income tax, GST- calculation of personal and corporation income tax(with suitable examples).

Module IV: Public Debt and Budget in India

Public Debt and Debt management in India- Debt redemption- Budgeting in India- importancetypes- Principles- procedures of budgeting- revenue and capital budgets- zero base budgetingperformance

budgeting- primary deficit- revenue and capital deficit- budget deficit- fiscal policy with reference to India- contra cyclical fiscal policy- deficit financing and black money in India.

Module V:Federal and local finance in India

Meaning and importance of federal finance - function of finance commissions- jurisdictions of finance commission – Centre, State financial relations- NITI Aayog -Local finances- functions and revenues.

Assignments and Seminars

1. Discuss recent central, state and local governments' budget.
2. Calculate income tax of an employee.
3. Prepare and calculate corporation tax of a company.
4. Visit any project in the locality and calculate cost benefit analysis.
5. Discuss about local finance and project.
6. Study about war finance.
7. Consider parallel economy of India.
8. Impact of revenue and expenditure of immigrants and emigrants on the economy of Kerala.
9. Fiscal and monetary policy of India.
10. Discuss Railway Budget.
11. Changes in the financial system of post reform in India.
12. Social Audit system
13. Computation of Net price of a commodity or service by using GST

References:

1. Earl R.Rolph, (1954) "The theory of Fiscal Economics University of California Press.
2. Musgrave and Musgrave(1989),"PublicFinance in Theory and Practice",McGraw Hill International Edition.
3. Tyagi B.P. (1992-93) "Public Finance", Jai Prakash,Nath Co.,Meerat, U.P
4. .UmaKapila(2018) "Indian Economy: Performance and Policies", by Academic Foundation
5. H. Rosen, T. Gayer. (2009) "Public Finance", 9th ed., McGraw-Hill/Irwin,
6. Datta / Sundaram, (2009) "Indian Economy",S.Chand and Co. Ltd., New Delhi.
7. Bhatia H.L(1984). "Public Finance", Vikas Publishing House Pvt.Ltd.,New Delhi
8. R.K Lekhi,Jogindersingh, (2015) "Public Finance"– Kalyani publications
9. Jha R, (1998) "Modern Public Economics", Routledge London.
10. Good sand Service Tax (GST) (2019)-Concept& Status.-Central Boardof Indirect Taxesand Customs (CBIC)India.

OBJECTIVES

- To understand the meaning and scope of fiscal economies
- To apply the techniques, methods and principles of Economics for decision making in fiscal economics.
- To learn how the principles of economics can be applied to sound decision making in public finance
- To analyse the financial activities of a government
- To understand the important economic issues that government agents face

COURSE PLAN

Unit/Session/ Hours (Time Required	Topics to be Taught	Procedure Student Centric Methods of Teaching	Activity	Learning Outcome	Assessment
Module I	Origin, growth, meaning and scope of public finance-Public and private finance-Principle of MSA-Public goods and private goods-mixed goods and merit goods (concepts only with examples)	• Lecture • Group Discussion	To identify the meaning and scope of public Finance	To understand the meaning and scope of fiscal economies	Evaluation through Test Paper
Module II	Meaning and importance of public	• Lecture • Assignments	To identify the theories of Public	To apply the techniques, methods and	Evaluation through Test Paper

	expenditure with special reference to India- Wagner's, Peacock-Wiseman Hypothesis- Canons of Public expenditure- effects of public expenditure on the economy of India- investment evaluation, project evaluation and cost benefit analysis with suitable examples.	• Group Discussion	Expenditure	principles of Economics for decision making in fiscal economics.	
Module III	Sources of Public revenue-tax and non-tax- classification of taxes- canons and principles of taxation- Ability to pay- cost of service and Benefit- impact, incidence and shifting of tax burden-	• Lecture • Assignments • Group Discussion • Problem solving	To understood the calculation of GST and income tax in India	To learn how the principles of economics can be applied to sound decision making in public finance	Evaluation through Test Paper

	effects of taxation- major taxes in India like income tax, GST- calculation of personal and corporation income tax(with suitable examples).				
Module IV	Public Debt and Debt management in India- Debt redemption- Budgeting in India- importance types- Principles- procedures of budgeting- revenue and capital budgets- zero base budgeting performance budgeting- primary deficit- revenue and capital deficit- budget deficit- fiscal policy with reference to India- contra cyclical fiscal policy-	• Lecture • Assignments • Group Discussion	To classify different budgeting in India	To analyse the financial activities of a government	Evaluation through Assignments

	deficit financing and black money in India.				
Module V	Meaning and importance of federal finance - function of finance commissions- jurisdictions of finance commission – Centre, State financial relations- NITI Aayog - Local finances- functions and revenues.	• Lecture • Assignments • Group Discussion	Assignment on Financial sector Reforms in India	To understand the important economic issues that government agents face	Evaluation through Assignments

COURSE OUTCOME

CO1	To understand the meaning and scope of fiscal economies
CO2	To apply the techniques, methods and principles of Economics for decision making in fiscal economics.
CO3	To understand the meaning and scope of fiscal economies
CO4	To learn how the principles of economics can be applied to sound decision making in public finance
CO5	To understand the important economic issues that government agents face

Faculty In Charge,
Dr. Shirley Jose K

Semester V

Course Category	**Core Course 8**
Course Title and Code	**Indian Economic Development ECO5 B08**
No. of Credits	**4**
No. of Contact Hours	**6 Hours per week**

INDIAN ECONOMIC DEVELOPMENT

Preamble:. The course is designed to expose the learners to some of the key issues facing the Indian economy both at national and regional levels. In this process, as young adults, students are expected to be sensitised about these issues, appreciate and learn to critically assess the role of the government in various economic spheres. The learners are also exposed to numerical information relating to various aspects of Indian economy and India's economic policies. They are expected to develop analytical skills, interpret the economic events and visualise the economic future of India. For all these to happen, teachers are requested to take special care to instruct the students to read the suggested reference books, collect clippings and articles from newspapers and magazines and also develop the habit of following economic survey, economic review and RBI Bulletin. Besides, as against the conventional assignments, each module has **'Suggested Additional Activities**' at the end. Teachers need to encourage the learners to explore beyond the texts while attempting these activities.

Report Based on Study Tour: A study tour is recommended because it may add direct experience to learners about different economic culture of the country. All the final year students need to prepare a report of the tour that includes the places they visited, its importance etc and submit it to the Head of the Department soon after the completion of the tour.

Module I : Development Policies And Experience(1947-1990).

Low Level of Economic Development under the Colonial Rule- Development and Structural Change of Indian Economy Since Independence: Economic policies Perused between 1950's and 1980's: Mixed Economic framework; Market intervention policy and import substitution; Objectives and strategy of planning: Failures and achievements of plans – Performance of 11th plan – Current plan.

Suggested Additional Activities

1. Find out and prepare a list of items that India used to import and export during 1950-51 and 1990-91

a. Observe the difference

b. Do you see the impact of self-reliance? Discuss. Details can be collected from latest Economic Survey.

2. Find out the Deputy Chairman and members of the first Planning Commission of India

3. Find out the commodities which India Government permitted to import till1980.

4. Explain how import substitution can protect domestic industry?

Module II : Economic Reforms since 1991

Background for the introduction of New Economic Reforms of 1991; Liberalisation, Privatisation and Globalisation: An Appraisal- Indian Economy during Reforms with Special focus on trends in FDI, FII and Disinvestment- Centre-State Financial Relations: Finance Commission, its structure and Functioning (with emphasis on Latest Finance Commission).Role of NITI Aayog

Suggested Additional Activities

1. Prepare arguments for and against subsidies. Explain your view
2. Do you think only loss making companies should be privatised? Why?
3. Construct a pie chart for the sectoral contribution of GDP for the period1950-51 and 2012-
4. What would you observe? Is there a structural change? Explain in your own words
5. Prepare a list showing the latest data on the number of banks- nationalized,private,foreign and New Generation Banks.
6. Discuss the different formulae used for Finance Commission awards.
7. Find out who all are there in the First Finance Commission of India

Module III: Gross Domestic Product and Sectors.

a.Indian Agriculture: The place of Agriculture in the National Economy; Recent Trends in Investment, Credit and Agricultural Subsidy Policy, Agricultural Marketing and Price- New Agricultural Strategy of 1960s (Green Revolution)- Food Security, PDS and TPDS in India; The Need, Scope and Appraisal of Land Reforms in a Developing Country like India.

b.Indian Industries: Review of Industrial Growth under Planning- Industrial Structure: Traditional, SSI, Village, Cottage and Modern Industries- Industrial Sickness-Industrial Policy Resolutions: 1956, 1977, 1980, 1991; an Analysis of Current Industrial Policy- Infrastructure Development in India.

Suggested Additional Activities.

1. Why, despite the implementation of green revolution, 65% of our population continued tobe engaged in the agricultural sector till 1990?
2. Why was public sector given a leading role in industrial development during the plan period?
3. Lossesincurredbypublicsectorundertakingsaretobemetoutofthepublicbudget -Do ‟ you agrees with this statement? Discuss.
4. Find out the method of estimating inflation in India. Compare it with other countries.

Module IV: Current Challenges Facing the Indian Economy

. a.Poverty: Who are Poor?, Causes and Measurement of Poverty, Number of Poor in India; Policies and Programmes Towards Poverty Alleviation with Special Emphasis on Recent Policies like- Food as a Right: The Food Security Act of 2013 &MGNREGS.
b.Unemployment: Nature, Trends and Estimates of Unemployment in India, Informalisation of Indian Work Force; Employment Prospective of the latest Five Year Plan; Recent Schemes to Reduce Unemployment and Underemployment.

Suggested AdditionalActivities.

1. Find out from your parents and teachers types of tax payments they are making. Classify the taxes and observe the differences.
2. On the basis of the definition of poverty line, analyse whether categorization of people into BPL/APL is done in the correct way. Explain in your own words.
3. Analyse whether the dream programme of MGNREGP is carrying out in the right way.If.No ,suggest ways to make the programme more effective. ‟
4. In some communities, you might have noticed that even if the males do not earn high income, they do not send women to work. Why?
5. Prepare a list of recent schemes and objectives to strengthen the rural areas from the government website http://www.rural.nic.in

Module V: Kerala's Economic Development Growth and Structure

Primary, Secondary and Tertiary Sectors-Economic Development Vs Social Development-Poverty Profile of Kerala- Indicators of Human Development: PQLI and HDI- Demographic Transition of Kerala- Trends in Employment and Unemployment in KeralaSustainability of ―Kerala Model of Development with a Special Mention on Recent Sen- ǁ Bhagawati Debate- Decentralised Planning and Development of Kerala- Land Reforms in Kerala- Migration: Concepts in Migration- Emigration to the Gulf- Remittance and its Impact on the Economy of Kerala- Return Migration: Causes, Problems and Policies.

Suggested Additional Activities.

1. Find out the history of emigration from Kerala.
2. Foreign remittance is the backbone of Kerala s socio-economic development .Discuss. ‟ ‟
3. What is Nitaqat and Saudization? In what ways it is harmful to the economy ofKerala.
4. Find out the reasons for the existing controversy in poverty estimation.
5. Observe the functioning of „ayalkoottams (SHGs) in your locality and write how far it ‟ is successful in empowering women.

References:

1.Economic development in India-Problems and Prospects,N.P.Abdul(Ed), Regal Publications, NewDelhi

2.Indian Economy, Gopalji Gupta, PEARSON, NewDelhi.

3. Ahulwalia, I.J. and I.M.D. Little (Eds) (1999), India's Economic Reformsand

5. Development, (Essays in honour of Manmohan Singh), Oxford University Press, New Delhi.

6. Bardhan, P .K. (1999), The Political Economy of Development in India, Oxford University Press, NewDelhi

7. Chakravarty S, (1987), Development Planning: The Indian Experience, Oxford University Press, and New Delhi

OBJECTIVES

- To understand the key issues facing the Indian economy both at national and regional levels
- To critically assess the role of the government in various economic spheres.
- To classify various aspects of Indian economy and India‘s economic policies.
- To develop analytical skills, interpret the economic events and visualise the economic future of India.
- To critically evaluate Kerala Model Of Development

COURSE PLAN

Unit/Session/ Hours (Time Required	Topics to be Taught	Procedure Student Centric Methods of Teaching	Activity	Learning Outcome	Assessment
Module I	Low Level of Economic Development under the Colonial Rule-Development and Structural Change of Indian Economy Since Independence: Economic policies Perused between 1950‘s and 1980‘s: Mixed Economic framework; Market intervention policy and import substitution; Objectives and strategy of planning: Failures and achievements of plans – Performance of 11th plan – Current plan.	➢ Lecture ➢ Peer Discussion ➢ Power point Presentation	To critically evaluate Indian economy since Independence	To understand the key issues facing the Indian economy both at national and regional levels .	Evaluation through Peer Discussion

Module II	Background for the introduction of New Economic Reforms of 1991; Liberalisation, Privatisation and Globalisation: An Appraisal- Indian Economy during Reforms with Special focus on trends in FDI, FII and Disinvestment-Centre-State Financial Relations: Finance Commission, its structure and Functioning (with emphasis on Latest Finance Commission).Role of NITI Aayog	➢ Lecture ➢ Peer Discussion Power point Presentation	To analyse economic REFORMS OF 1991 in India	To develop analytical skills, interpret the economic events and visualise the economic future of India	Evaluation through Test Paper
Module III	a. Indian Agriculture b. Indian Industries	➢ Lecture ➢ Peer Discussion ➢ Power point Presentation	To compare growth of Indian agriculture and industries	To classify various aspects of Indian economy and India‘s economic policies	Evaluation through Test Paper
Module IV	a. Poverty: b. Unemployment	➢ Lecture ➢ Peer Discussion ➢ Power point Presentation	To understand the concept of poverty and employment through	To critically assess the role of the government in various economic spheres	Evaluation through Peer Discussion

			Discussion		
Module V	Growth and Structure- Primary, Secondary and Tertiary Sectors- Economic Development Vs Social Development- Poverty Profile of Kerala- Indicators of Human Development: PQLI and HDI- Demographic Transition of Kerala- Trends in Employment and Unemployment in KeralaSustainability of ―Kerala Model of Development with a Special Mention on Recent Sen- ǁ Bhagawati Debate- Decentralised Planning and Development of Kerala- Land Reforms in Kerala- Migration: Concepts in Migration- Emigration to the Gulf- Remittance and its Impact on the Economy of Kerala- Return Migration: Causes, Problems and Policies.	➢ Lecture ➢ Peer Discussion ➢ Power point Presentation ➢ Debate ➢ Assignments	To write assignment on Human Development Index in Kerala	To critically evaluate Kerala Model Of Development	Evaluation through Debate

COURSE OUTCOME

CO1	To understand the key issues facing the Indian economy both at national and regional levels
CO2	To develop analytical skills, interpret the economic events and visualise the economic future of India
CO3	To classify various aspects of Indian economy and India‘s economic policies
CO4	To critically assess the role of the government in various economic spheres
CO5	To critically evaluate Kerala Model Of Development

Faculty In Charge,
Dr. Shirley Jose K

Semester V

Course Category	Core Course 9
Title and Code	Economics of Capital Market ECO5 B09
No. of Credits	4
No. of Contact Hours	5 Hours per week

ECONOMICS OF CAPITAL MARKET

Preamble: In the present Globalised world financial institutions and markets play a significant role. The financial sector liberalization across the world including India has led to unprecedented growth in the financial sector, especially in the capital market, leading to the introduction of new and diversified financial instruments and financial practices, providing ample career opportunities to the students of economics. This course is designed to give an exposure to the students of economics to the changing world of financial markets and to give them an opportunity to familiarize with the basic concepts related to capital market which they read in newspapers and hear and see through electronic media in their daily walks of life. This course also aims at providing a platform to the students of economics in developing the skills required to take up a career in financial sector and to provide them an opportunity to think of higherstudies in finance which may open them vast career opportunities in the field of finance.

Module I:Financial Assets

Financial Assets –Tangible and Intangible Assets – Debt Vs Equity – Properties of Financial assets-Financial markets – Classification of Financial Markets – Financial System and Economic Development – Weakness of Indian Financial System.

References:

1. .FrankJ. Fabozziand Franco Midiglian, ―Capital Markets – Institutions and Instruments , ‖ Pearson Prentice Hall, New Delhi (LatestEdition).
2. GordanK.Natarajan,―FinancialMarketsandServices‖,HimalayaPublishingHouse, Mumbai (LatestEdition).

Module II : Capital Market Capital market –

Meaning, Characteristics and Functions – Importance of Capital Markets in an economy – The structure of Indian capital market – Capital market instruments – Equity shares (rights shares, bonus shares, bluechip shares), Debentures or Bonds (Convertible, nonconvertible, partly convertible, fully convertible, redeemable and irredeemable), Government securities, Euro Issues – GDRs, ADRs, Foreign Currency Convertible Bonds (FCCB) – Capital Market Institutions-DIIs, FIIs, Mutual Funds – Securities and Exchange Board of India (SEBI) – Objectives, Functions andPowers

References:

1. S. Gurusamy, _Capital Markets‘, Vijay Nicole Imprints Private Limited, Chennai(Latest edition)

2. Shashi K Gupta,Nisha Aggarwal and Neeti Gupta,_Financial Marketsand Institutions, Kalyani publishers, New Delhi (Latest edition)

3. M.Y. Khan, _Indian Financial System‘, Tata McGraw Hill Education Private Limited, New Delhi (Recentedition)

4. Online Resource : www.sebi.gov.com

Activities/Assignments:

1. Students may be asked to note down the important mutual funds operating in India and different schemes offered by some of them and their descriptions. (eg: Growth Funds, Open end Funds etc.)

Module III : The Primary Market (New Issues Market)

Meaning and Functions of Primary Market – Methods of Floating New Issues – Pure Prospectus method, Private Placement Method, IPO Method, Rights Issue Method, Bonus Issue Method, Book Building Method, Employee Stock Option (ESOP) – Intermediaries in New Issues Market – Merchant Bankers/Lead Managers, Registrars to an Issus, Underwriters, Bankers to an Issue, Brokers to an Issue, Debenture Trustees – Causes for Poor performance of New Issues Market.

References:

1. S. Gurusamy, _Capital Markets‘, Vijay Nicole Imprints Private Limited, Chennai(Latest edition)

2. Shashi KGupta,Nisha Aggarwal and NeetiGupta,_Financial Markets and Institutions, _Kalyani publishers, New Delhi (Latest edition)

3. S. Gurusamy, _Financial Markets and Institutions‘, Vijay Nicole Imprints Private Limited, Chennai (Latestedition)

4. S.N. Sasidharan and S. Aiyappan Pillai, _An Introduciton to Capital Market‘, Right Publishers, Kudavechoor (Latest edition)

5. L.M. Bhole, _Financial Institutions and Markets-Structure, Growth and Innovations‘, Tata McGraw Hill Publishing Company Limited, New Delhi (Latest edition)

Activities/Assignments:

1. Show specimen of share application form (IPO) and ask the students to note down the important terms mentioned in the form. Tell them to write down the meaning of all such terms (eg: QIB, Retail Investor, Cap Price etc) and institutions related to IPO.

2. Ask the students to fill up the share application form so as to acquire some practical skills in the subject.

3. Students may be introduced to a specimen of Demat Account opening Form. (Available with DPs like Geojith Securities, JRG Securities, Stock Holding Corporation of India or other Stock Brokingfirms)

Module IV:The Secondary Market – Stock Exchanges

The Secondary Market – Difference between Primary market and Secondary Market – Listing of Securities – Physical Shares and Demat Shares – Depository Participant (DP) – NSDL and CSDL – Meaning and Definition of Stock Exchanges – Functions of Stock Exchanges – Origi and Development of Stock Exchanges in India – Bombay Stock Exchange (BSE) - National Stock Exchange (NSE) – Over the Counter Exchange of India (OTCEI) – Stock Market Index in India and Abroad: SENSEX and Nifty – NASDAQ, DOWJONES, FTSE, Nikkei.

References:

1. S. Gurusamy, _Capital Markets‘, Vijay Nicole Imprints Private Limited, Chennai(Latest edition)

2. ShashiKGupta,NishaAggarwalandNeetiGupta,_FinancialMarketsandInstitutions, _Kalyani publishers, New Delhi (Latest edition)

3. S. Gurusamy, _Financial Markets and Institutions‘, Vijay Nicole Imprints Private Limited, Chennai (Latestedition)

4. S.N. Sasidharan and S. AiyappanPillai, _An Introduciton to Capital Market‘, Right Publishers, Kudavechoor (Latest edition)

5. L.M. Bhole, _Financial Institutions and Markets-Structure, Growth and Innovations‘, Tata McGraw Hill Publishing Company Limited, New Delhi (Latestedition)

6. Online resources:i)www.nseindia.com.ii)www.bseindia.com

Activities/Assignments:

1. Ask students to visit SEBI website and collect data on purchase, sale and net investment in equity and debt instruments by FIIs in Indian Stock Market (Also available in financial dailies like Economic Times, Businessline etc.)

2. Ask students to visit the BSE website and note down the shares of companies included in SENSEX and their relative weightage in the index

. 3. Ask students to visit the NSE website and note down the shares of companies included in NSE Nifty and their relative weightage in the index.

4. Students may be asked to find out other different indices published by BSE and make a short note of these indices from BSE website (eg: BSE PSU Index, BSE TECH Index etc.

5. Students may be directed to study the share holding pattern of some of the shares of companies listed at BSE or NSE. (Available also at www.moneycontrol.com)

Note: 1. Students may be motivated to read financial dailies like Economic Times, Business Line, Business Standard, Dhanam etc regularly in order to get a proper understanding of the terms and concepts and the working of capital markets. 2. Students may be encouraged to watch exclusive financial channels like CNBC TV 18, NDTV PROFIT etc, to get an idea of stock trading and capital market activities. 3. If

possible students may be taken to a stock trading terminal so as to get an idea of the online buying and selling of shares.

Additional Reading:

1. M. Y. Khan, _Indian Financial System‘, Tata McGraw Hill Education Private Limited, New Delhi (LatestEdition)

2. L.M. Bhole and JitendraMahakud, _Financial Institutions and Markets – Structure, Growth and Innovations‘, Tata McGraw Hill Educaiton Private Limited, New Delhi (LatestEdition)

3. Bharathi V. Pathak, _The Indian Financial System – Markets, Institutions and Services, Pearson, New Delhi (latest edition)

4. K.L. Garg, _Stock Exchanges in India‘, Bookland Limited,Calcutta.

5. V.A. Avadhani, _Investment and Securities Market in India‘, Himalaya Publishing House, Bombay (Latest edition)

OBJECTIVES

- To understand different finacial assets in the economy
- To introduce new and diversified financial instruments and financial practices
- To providing a platform to the students of economics in developing the skills required to take up a career in financial sector
- To understand the functioning stock market in India

COURSE PLAN

Unit/Session/ Hours (Time Required	Topics to be Taught	Procedure Student Centric Methods of Teaching	Activity	Learning Outcome	Assessment
Module I	Tangible and Intangible Assets – Debt Vs Equity – Properties of Financial assets- Financial markets – Classification of Financial Markets – Financial System and Economic Development – Weakness of Indian Financial System.	➢ Lecture ➢ Peer Discussion ➢ Power point Presentation	To compare tangible and intangible assets	To understand different finacial assets in the economy	Evaluation through Test Paper
Module II	Meaning, Characteristics and Functions – Importance of Capital	➢ Lecture ➢ Peer Discussion	The students to fill up the share application form so as to acquire some practical skills in the subject.	To introduce new and diversified financial instruments and	Evaluation Through Test Paper

	Markets in an economy – The structure of Indian capital market – Capital market instruments – Equity shares (rights shares, bonus shares, bluechip shares), Debentures or Bonds (Convertible, nonconvertible, partly convertible, fully convertible, redeemable and irredeemable), Government securities, Euro Issues – GDRs, ADRs, Foreign Currency Convertible Bonds (FCCB) – Capital Market Institutions- DIIs, FIIs, Mutual Funds – Securities and Exchange Board of India (SEBI) – Objectives, Functions			financial practices	

	andPowers				
Module III	Meaning and Functions of Primary Market – Methods of Floating New Issues – Pure Prospectus method, Private Placement Method, IPO Method, Rights Issue Method, Bonus Issue Method, Book Building Method, Employee Stock Option (ESOP) – Intermediaries in New Issues Market – Merchant Bankers/Lead Managers, Registrars to an Issus, Underwriters, Bankers to an Issue, Brokers to an Issue, Debenture Trustees – Causes for Poor performance of New Issues Market.	➢ Lecture ➢ Peer Discussion ➢ Assignments	to note down the important mutual funds operating in India and different schemes offered by some of them and their descriptions.(eg: Growth Funds, Open end Funds etc.)	To providing a platform to the students of economics in developing the skills required to take up a career in financial sector	Evaluation through Test Paper

Module IV	The Secondary Market – Difference between Primary market and Secondary Market – Listing of Securities – Physical Shares and Demat Shares – Depository Participant (DP) – NSDL and CSDL – Meaning and Definition of Stock Exchanges – Functions of Stock Exchanges – Origi and Development of Stock Exchanges in India – Bombay Stock Exchange (BSE) - National Stock Exchange (NSE) – Over the Counter Exchange of India (OTCEI) – Stock Market Index in India	➢ Lecture ➢ Peer Discussion ➢ Power point Presentation	To find out other different indices published by BSE and make a short note of these indices from BSE website (eg: BSE PSU Index, BSE TECH Index etc.	To understand the functioning stock market in India	Evaluation through Test Paper

	and Abroad: SENSEX and Nifty – NASDAQ, DOWJONES, FTSE, Nikkei.				

COURSE OUTCOME

CO1	To understand different finacial assets in the economy
CO2	To introduce new and diversified financial instruments and financial practices
CO3	To providing a platform to the students of economics in developing the skills required to take up a career in financial sector
CO4	To understand the functioning stock market in India

Faculty In Charge,

Dr. Chacko Jose P

Semester V

Course Category	Core Course 10
Course Title and Code	Mathematical Economics ECO5 B10
No. of Credits	4
No. of Contact Hours	5 Hours per week

MATHEMATICAL ECONOMICS

Preamble: Mathematical economics is an approach where mathematical symbols and theorems are used for economic analysis. Modern economics is analytical and mathematical in structure. Thus the language of mathematics has deeply influenced the whole body of the science of economics. Every student of economics must possess a good proficiency in the fundamental methods of mathematical economics. One of the significant developments in Economics is the increased application of quantitative methods and econometrics. A reasonable understanding of econometric principles is indispensable for further studies in economics. This course is aimed at introducing students to the most fundamental aspects of mathematical economics and econometrics. The objective is to develop skills in these. It also aims at developing critical thinking, and problem-solving, empirical research and model building capabilities of the student which will help them to build and test models in economics and related fields. The course will also assist them in higher studies in economics.

Module I: Introduction to Mathematical Economics

Mathematical Economics: Meaning and Importance- Mathematical Representation of Economic Models- Economic functions: Demand function, Supply function, Utility function, Consumption function, Production function, Cost function, Revenue function, Profit function, saving function, Investment function

Module II: Marginal Concepts

Marginal utility, Marginal propensity to Consume, Marginal propensity to Save, Marginal product, Marginal Cost, Marginal Revenue, Marginal Rate of Substitution, Marginal Rate of Technical Substitution. Relationship between Average Revenue and Marginal Revenue Relationship between Average Cost and Marginal Cost - Elasticity: Price elasticity, Income elasticity, Cross elasticity.

Module III: Optimisation

Optimisation of single / multi variable functions - Constrained optimisation with Lagrange Multiplier – significance of Lagrange Multiplier. Economic applications: Utility Maximisation, Cost Minimisation, Profit Maximisation.

Module IV: Production Function

Linear Programming and Input Output analysis Production function- homogeneous and non-homogeneous. Degree of homogeneity and returns to scale - Properties of Cobb-Douglas production function. Production possibility curve. Linear programming: – Basic concept, Nature of feasible, basic and optimal solution; Graphic solution.Input-output analysis –Matrix of technical coefficients – the Leontief matrix – computation of total demand for a two/ three sector economy.

Module V: Market Equilibrium

Market Equilibrium: Perfect Competition- Monopoly- Discriminating Monopoly

Note to faculty / question paper setter: 1. This course is for B.A. Economics course. The students of this course may not have studied mathematics at higher secondary level. Hence questions may be confined to intermediary level. 2. Kindly give due consideration and adhere to the weightages indicated in the syllabus while setting question paper also.

References:

1. Dowling E.T, Introduction to Mathematical Economics, 2nd Edition, Schaum‘sOutline Series, McGraw-Hill, New York,2003(ETD)

2. Chiang A.C. and K. Wainwright, Fundamental Methods of MathematicalEconomics, Tata McGraw-Hill Education; Fourth edition(2013)

3. Henderson, J. M. and R.E. Quandt (1980), Microeconomic Theory: A MathematicalApproach, McGraw Hill, New Delhi.

4. James Bradfield , Jeffrey Baldani, An Introduction to Mathematical Economics, Cengage Learning India Pvt Ltd (2008)

5.A. Koutsoyiannis, Modern Microeconomics, Palgrave Macmillan; 2nd Revised edition (2003)(– see mathematical appendices for each topic.

OBJECTIVES

- To develop a good proficiency in the fundamental methods of mathematical economics
- To introduce the most fundamental aspects of mathematical economics and econometrics
- To inculcate critical thinking, and problem-solving, empirical research and model building capabilities of the student.
- To understand the marginal concepts in economics

COURSE PLAN

Unit/Session/ Hours (Time Required	Topics to be Taught	Procedure Student Centric Methods of Teaching	Activity	Learning Outcome	Assessment
Module I	Mathematical Economics: Meaning and Importance- Mathematical Representation of Economic Models- Economic functions: Demand function, Supply function, Utility function, Consumption function, Production function, Cost function, Revenue function, Profit function, saving function, Investment function	➢ Lecture ➢ Group Discussion ➢ Problem Solving	To understand fundamental methods of mathematical economics	To develop a good proficiency in the fundamental methods of mathematical economics	Evaluation through Test Paper

Module II	Marginal utility, Marginal propensity to Consume, Marginal propensity to Save, Marginal product, Marginal Cost, Marginal Revenue, Marginal Rate of Substitution, Marginal Rate of Technical Substitution. Relationship between Average Revenue and Marginal Revenue Relationship between Average Cost and Marginal Cost - Elasticity: Price elasticity, Income elasticity, Cross elasticity	➢ Lecture ➢ Group Discussion ➢ Problem Solving	To understand marginal concepts in economics	To understand marginal concepts in economics	Evaluation through Test Paper
Module III	Optimisation of single / multi variable functions - Constrained optimisation with Lagrange Multiplier – significance of Lagrange Multiplier. Economic applications: Utility	➢ Lecture ➢ Group Discussion ➢ Problem Solving	To identify optimization of single / multi variable functions	To inculcate critical thinking, and problem-solving, empirical research and model building capabilities of the student	Evaluation through Test Paper

	Maximisation, Cost Minimisation, Profit Maximisation.				
Module IV	Linear Programming and Input Output analysis Production function- homogeneous and non-homogeneous. Degree of homogeneity and returns to scale - Properties of Cobb-Douglas production function. Production possibility curve. Linear programming: – Basic concept, Nature of feasible, basic and optimal solution; Graphic solution.Input-output analysis –Matrix of technical coefficients – the Leontief matrix – computation of total demand for a two/ three sector economy.	➢ Lecture ➢ Group Discussion ➢ Problem Solving	To find out linear programming in economics	To inculcate critical thinking, and problem-solving, empirical research and model building capabilities of the student	Evaluation through Test Paper

Module V	Market Equilibrium: Perfect Competition-Monopoly-Discriminating Monopoly	➢ Lecture ➢ Peer Discussion ➢ Problem Solving	To find out market equilibrium in different markets	To critically evaluate Market Equilibrium in different marets	Evaluation through Test Paper

COURSE OUTCOME

CO1	To develop a good proficiency in the fundamental methods of mathematical economics
CO2	To understand marginal concepts in economics
CO3	To inculcate critical thinking, and problem-solving, empirical research and model building capabilities of the student
CO4	To critically evaluate Market Equilibrium in different markets

Faculty In Charge,

Dr. Chacko Jose P

Semester VI

Course Category	Core Course 11
Course Title and Code	Financial Economics ECO6 B11
No. of Credits	4
No. of Contact Hours	5 Hours per week

FINANCIAL ECONOMICS

Preamble: This course intends to familiarize the students with the basic concepts in financial economics along with some of the basic models which are used to benchmark valuation of assets and derivatives. These include the CAPM, and the Binomial Option Pricing models. After completing this course, the student will be able to develop comprehensive knowledge on the role of finance in the operation of an economy. It also enables them to know the operation of the Indian Financial System and activities in the financial markets.

Module I: Investment Theory and Structure of Interest rates

Introduction to financial economics, Time Value of Money: Future Value, Present Value, Future value of an annuity, Present value of annuity, Present rate of perpetuity. Investment Criteria: Net Present Value, Benefit Cost Ratio, Internal Rate of Return, Modified Internal Rate of Return.

Module II: Valuation of Bonds and Securities

Fundamentals of Valuation of Securities: Valuation of Bonds and Stocks; Bond Yield, Yield to Maturity. Equity Valuation: Dividend Discount Model, The P/E Ratio Approach; Irrelevance of Dividends: Modigliani and Miller Hypothesis.

Module III: Risk and Return Types of risk

, Historical returns and Risk, computing historical returns, average annual returns, variance of returns, Measurement of Risk and Return of an asset, Measurement of Risk and Return of a Portfolio, Determinants of Beta, Risk-Return trade off.

Module IV: Cost of Capital and Capital Asset Pricing Model

The Cost of Capital: Debt and equity; Cost of Debt, Cost of Preference Capital and Equity Capital. The capital market line; the capital asset pricing model; the beta of an asset and of a portfolio; security market line; use of the CAPM model in investment analysis and as a pricing formula.

Module V:Derivative Markets

An introduction to financial derivatives: Types and uses of derivatives; Forward Contracts: determination of forward prices, Futures Contract: theories of future prices- the cost of carry model, the expectation model, capital asset pricing model. Relation between Spot and Future Prices, forward vs future contract, Hedging in Futures; Options: types, value of an option, the Pay-Offs from Buying and Selling of Options;

the Put Call Parity Theorem; Binomial option pricing model (BOPM) and Black-Scholes option pricing model.

References

1. L. M. Bhole and J. Mahukud, Financial Institutions and Markets, Tata McGraw Hill, 5th edition, 2011.
2. 2. Hull, John C., Options, Futures and Other Derivatives, Pearson Education, 6th edition, 2005.

Additional Reading List

1. David G. Luenberger, Investment Science, Oxford University Press, USA, 1997.

2. Thomas E. Copeland, J. Fred Weston and KuldeepShastri, Financial Theory and Corporate Policy, Prentice Hall, 4th edition, 2003.

3. Richard A. Brealey and Stewart C. Myers, Principles of Corporate Finance, McGrawHill, 7th edition, 2002.

4. Stephen A. Ross, Randolph W. Westerfield and Bradford D. Jordan, Fundamentals of Corporate Finance.McGraw-Hill, 7th edition, 2005.

OBJECTIVES

- To develop comprehensive knowledge on the role of finance in the operation of an economy.
- To critically evaluate Modigliani and Miller hypothesis
- To know the operation of the Indian Financial System and activities in the financial markets.
- To know the operation of the capital market in India
- To understand concept of financial derivatives in India

COURSE PLAN

Unit/Session/ Hours (Time Required	Topics to be Taught	Procedure Student Centric Methods of Teaching	Activity	Learning Outcome	Assessment
Module I	Introduction to financial economics, Time Value of Money: Future Value, Present Value, Future value of an annuity, Present value of annuity, Present rate of perpetuity. Investment Criteria: Net Present Value, Benefit Cost Ratio, Internal Rate of Return, Modified Internal Rate of Return.	• Lecture • Peer Discussion	To understand the concept of financial economics	To develop comprehensive knowledge on the role of finance in the operation of an economy	Evaluation through Test Paper
Module II	Fundamentals of Valuation of Securities: Valuation of Bonds and Stocks; Bond	• Lecture • Peer Discussion	To identify the fundamentals of valuation of securities.	To critically evaluate Modigliani and Miller hypothesis	Evaluation through Test Paper

	Yield, Yield to Maturity. Equity Valuation: Dividend Discount Model, The P/E Ratio Approach; Irrelevance of Dividends: Modigliani and Miller Hypothesis				
Module III	Historical returns and Risk, computing historical returns, average annual returns, variance of returns, Measurement of Risk and Return of an asset, Measurement of Risk and Return of a Portfolio, Determinants of Beta, Risk-Return trade off.	• Lecture • Peer Discussion	To know measurement of risk and return of portfolio	To know the operation of the Indian Financial System and activities in the financial markets.	Evaluation through Test Paper
Module IV	The Cost of Capital: Debt and equity; Cost of Debt, Cost of Preference Capital and Equity Capital. The capital market line; the capital asset pricing model; the beta of an	• Lecture • Peer Discussion	To critically evaluate CPAM model in investment analysis and as a pricing formula	To know the operation of the capital market in India	Evaluation through Test Paper

	asset and of a portfolio; security market line; use of the CAPM model in investment analysis and as a pricing formula				
Module V	An introduction to financial derivatives: Types and uses of derivatives; Forward Contracts: determination of forward prices, Futures Contract: theories of future prices- the cost of carry model, the expectation model, capital asset pricing model. Relation between Spot and Future Prices, forward vs future contract, Hedging in Futures; Options: types, value of an option, the Pay-Offs from Buying and Selling of Options; the Put Call Parity Theorem; Binomial	• Lecture • Peer Discussion	To understand financial derivatives in India	To understand concept of financial derivatives in India	Evaluation through Test Paper

	option pricing model (BOPM) and Black-Scholes option pricing model.				

COURSE OUTCOME

CO1	To develop comprehensive knowledge on the role of finance in the operation of an economy.
CO2	To critically evaluate the Modigliani and Miller hypothesis.
CO3	To know the operation of the Indian Financial System and activities in the financial markets
CO4	To know the operation of the capital market in India
CO5	To understand concept of financial derivatives in India

Faculty In Charge,

Mr. Nijil Jacobi

Semester VI

Course Category	Core Course 12
Course Title and Code	International Economics ECO6 B12
No. of Credits	4
No. of Contact Hours	5 Hours per week

INTERNATIONAL ECONOMICS

Preamble: International economics deals with the economic relations among nations --- both trade and financial relations—A good understanding in international economics is necessary for a student of economics and those who wish to work in these areas or governmental organizations. The basic aim of this introductory course on international economics is to present before the students the questions, and answers, related to international economic relations. The students are expected to acquire skill that will help them to take rational decisions in issues related to international economics.

Module I: Introduction to International Economics

Subject matter and importance of International Economics - Internal trade and International trade - Importance of International trade – International trade and economic development – Basicconcepts- Terms of trade.

Module II :Theories of International Trade:

Mercantilist approach to trade -ClassicalTheory: Absolute and Comparative Cost Advantage theories - Hecksher – Ohlin Theory and LeontiefParadox.

Module III: Theory of Commercial Policy:

Free trade - Arguments for and against free trade – Protection - Arguments for and against protection - Methods of Trade Restriction : Tariff and non-tariff trade barriers - Types of tariffs – New protectionism - export subsidy and countervailing duties - Dumping and anti-dumping duties – Economic Integration – WTO, EU, NAFTA, ASEAN, SAARC.

Module IV: Foreign Exchange

Foreign exchange market – functions - Defining foreign exchange and exchange rate – Exchange rate concepts – exchange rate changes (devaluation, revaluation, depreciation, appreciation- over valuation and undervaluation) – Different systems of exchange rate determination - fixed and flexible exchange rate – Hybrid exchange rate systems – Managed floating – Theories of exchange rate – Mint Parity theory – Purchasing Power Parity Theory – Balance of Payments Theory - Components of Foreign exchange .

Module V: Balance of Payments

Defining Balance of Trade and Balance of Payments - Structure of balance of payments – Equilibrium and disequilibrium in BOP – Measures to correct BOP disequilibrium – India‘s BOP since 1991 – International financial flows – Foreign Direct Investment and Porfolio Investment – Currency Convertibility – IMF-Role and Functions.

References

1. Salvatore, Dominick, _International Economics‘, Weily India, NewDelhi.

2. C.P. Kindle Berger, _International Economics‘

3. Bo Soderstein and Geoffrey Reed, _International Economics‘,Macmillan 4. Carbaugh, _International Economics‘, CengageLearning

4. Francis Cherumilam - _International Economics‘

5. Mannur, H.G. _International Economics‘

6. Errol D‘Souza, _Macro Economics‘, Pearson Education 2008 (For BOP in India)

7. RBI Bulletin, Various issues. 49

OBJECTIVES

- To understand the different terms related to international economics
- To explain the theories of international trade
- To analyze the different theories of commercial policies.
- To acquire skills related to interpret functioning of foriegn exchange
- To distinguish between BOT and BOP

COURSE PLAN

Unit/Session/ Hours (Time Required	Topics to be Taught	Procedure Student Centric Methods of Teaching	Activity	Learning Outcome	Assessment
Module I	Subject matter and importance of International Economics - Internal trade and International trade - Importance of International trade – International trade and economic development – Basicconcepts- Terms of trade	• Lecture • Peer Discussion	To know the differnt terms in international economics especially Terms of Trade	To understand the different terms related to international economics	Evaluation through Test Paper
Module II	Mercantilist approach to trade - ClassicalTheory : Absolute and Comparative Cost Advantage theories - Hecksher – Ohlin Theory and LeontiefParadox.	• Lecture • Peer Discussion	To diffrentiate the differnt theories in international trade	To explain the theories of international trade	Evaluation through Test Paper
Module III	Free trade - Arguments for and against free	• Lecture • Peer Discussio	To critically evaluate	To analyze the different	Evaluation through Test Paper

	trade – Protection - Arguments for and against protection - Methods of Trade Restriction : Tariff and non-tariff trade barriers - Types of tariffs – New protectionism - export subsidy and countervailing duties - Dumping and anti-dumping duties – Economic Integration – WTO, EU, NAFTA, ASEAN, SAARC	n	the theories of commercial policies	theories of commercial policies.	
Module IV	Foreign exchange market – functions - Defining foreign exchange and exchange rate – Exchange rate concepts – exchange rate changes (devaluation, revaluation, depreciation, appreciation- over valuation and undervaluation) – Different systems of exchange rate determination - fixed and flexible	• Lecture • Peer Discussio n	To identify the functioning of foriegn exchange markets	To acquire skills related to interpret functioning of foriegn exchange	Evaluation through Quizz

	exchange rate – Hybrid exchange rate systems – Managed floating – Theories of exchange rate – Mint Parity theory – Purchasing Power Parity Theory – Balance of Payments Theory - Components of Foreign exchange .				
Module V	Defining Balance of Trade and Balance of Payments - Structure of balance of payments – Equilibrium and disequilibrium in BOP – Measures to correct BOP disequilibrium – India‘s BOP since 1991 – International financial flows – Foreign Direct Investment and Porfolio Investment – Currency Convertibility – IMF-Role and Functions	• Lecture • Peer Discussio n	To compare BOT and BOP	To distinguish between BOT and BOP	Evaluation through Test Paper

COURSE OUTCOME

CO1	To understand the different terms related to international economics
CO2	To explain the theories of international trade
CO3	To analyze the different theories of commercial policies.
CO4	To acquire skills related to interpret functioning of foriegn exchange
CO5	To distinguish between BOT and BOP

Faculty In Charge,

Mr. Nijil Jacobi

Semester VI

Course Category	Core Course 13
Course Title and Code	Development of Economic Thought ECO6 B13
No. of Credits	4
No. of Contact Hours	5 Hours per week

DEVELOPMENT OF ECONOMIC THOUGHT

Preamble: This course presents review of the history of economic thinking and economic analysis.: The main goal of this course is to provide students with understanding of historical evolution of economic thought. In addition students are also led to familiarize with i) Developments in major field of economics, ii) Schools of thought in economics iii) Works of some great economist from antiquity to contemporary times. By the end of this course student will be able to identify the major ideas associated with each group or thinker studied, and thereby the origins of contemporary theory are better comprehended. They are expected to place the theories and ideas studied within the context of the times in which they developed, evaluate different streams of economic thinking as well some personalities who had a major impact on the history of economic thought. Students are also expected to identify theories that radically differ from modern mainstream theory, and thereby recognize that the theoretical basis of economics has been, and continues to be, contested.

Module I: Mercantilism &Physiocrats Mercantilism-

Main characteristics - Limitations of national resources. Importance of Foreign Conquest, Colonization and Trade, Role of State in Foreign Trade, Definition of Wealth and the ways in which to augment it, Importance of the Balance of Trade, Works of Francis Bacon, Thomas Mum, Josiah Child, John Cary, Charles Davenant, John Stuart Mill Age of Enlightenment – France, Italy, Scotland. The Physiocratic school.Definition of surplus.The organization of economic activities and transactions.The Tableau Economique Works of Jacques Turgot, Francois Quesnay, Richard Cantillon.

Module II:British Political Economy

Nature of the Surplus, Source of Value, Measure of Value, Market Prices and Natural Prices, Profits and Wages, Gross and Net Revenue (national income), Income Distribution, Works of Adam Smith, David Ricardo, Robert Malthus, Objections raised by J. B. Say, Charles Dupuit, W Stanley Jevons, and Leon Walras, J.M. Keynes

Module III:Socialism

Rise of Socialist ideas, Political background, Ricardian Theory of Rent, Nationalization of Land, French Socialists, Marxism, Marx's writings in theoretical economics. The Marxian twist, Marxism post – 1991 - Schumpeter's Critique

Module IV:Indian Economic Thought

Early Indian economic thought - Chanakya'sArthashastra - Colonial Economic policies, Unfair treatment of the colonies, Nationalist response, Swadeshi Movement. Economic ideas of M. G. Ranade, DadabhayNaorojee, Gopal Krishna Gokhale, Dr. B. R. Ambedkar, M.K. Gandhi

References:

1. Loganathan. V A, A History of Economic Thought, S Chand & Company,New Delhi(1987)

2. Srivastava S K - History of Economic Thought S Chand & Company,New Delhi(2002)

3. Ganguly B.N - Indian Economic Thought,A Nineteenth Century Perspective,McGraw Hill(1977)

4. Grid and Rist , A History of Economic Doctrines,George Harrop,London (1956)

5. Louis Haney - History of Economic Thought,Surjit Publications,New Delhi(1977)

6. Ernesto Screpanti and Stefano Zamagni,An Outline of History of Economic Thought, Oxford University Press,Second Edition (2005)

7. Grey and Thomson, The Development of Economic Doctrine, Longman Group, London(1980)

OBJECTIVES

- To understand historical evolution of economic thought.
- To critically evaluate the contribution of british political economist
- To critically evaluate the concept of socialism
- To critically evaluate the contribution of Indian economic thought

COURSE PLAN

Unit/Session/ Hours (Time Required	Topics to be Taught	Procedure Student Centric Methods of Teaching	Activity	Learning Outcome	Assessment
Module I	Main characteristics - Limitations of national resources. Importance of Foreign Conquest, Colonization and Trade, Role of State in Foreign Trade, Definition of Wealth and the ways in which to augment it, Importance of the Balance of Trade, Works of Francis Bacon, Thomas Mum, Josiah Child, John Cary, Charles Davenant, John Stuart Mill Age of Enlightenment – France, Italy, Scotland. The Physiocratic school.Definition of surplus.The organization of economic activities and transactions.The Tableau Economique Works	• Lecture • Peer Discussion	To know the contribution of different economist	To understand historical evolution of economic thought.	Evaluation through Test Paper

	of Jacques Turgot, Francois Quesnay, Richard Cantillon.				
Module II	Nature of the Surplus, Source of Value, Measure of Value, Market Prices and Natural Prices, Profits and Wages, Gross and Net Revenue (national income), Income Distribution, Works of Adam Smith, David Ricardo, Robert Malthus, Objections raised by J. B. Say, Charles Dupuit, W Stanley Jevons, and Leon Walras, J.M. Keynes	• Lecture • Peer Discussion	To know the contribution of different british economist	To critically evaluate the contribution of british political economist	Evaluation through Test Paper
Module III	Rise of Socialist ideas, Political background, Ricardian Theory of Rent, Nationalization of Land, French Socialists, Marxism, Marx's writings in theoretical economics. The Marxian twist, Marxism post – 1991 - Schumpeter's Critique	• Lecture • Peer Discussion	To know the concept of socialism	To critically evaluate the concept of socialism	Evaluation through Test Paper
Module IV	Early Indian economic thought - Chanakya'sArthashastra - Colonial Economic policies, Unfair treatment of the colonies, Nationalist response, Swadeshi Movement. Economic ideas of	• Lecture • Peer Discussion	To know the contribution of different Indian economist	To critically evaluate the contribution of Indian economic thought	Evaluation through Test Paper

	M. G. Ranade, DadabhayNaorojee, Gopal Krishna Gokhale, Dr. B. R. Ambedkar, M.K. Gandhi				

COURSE OUTCOME

CO1	To understand historical evolution of economic thought.
CO2	To critically evaluate the contribution of british political economist
CO3	To critically evaluate the concept of socialism
CO4	To critically evaluate the contribution of Indian economic thought

Faculty In Charge,
Dr. Shirley Jose K

Semester VI

Course Category	Core Course 14
Course Title and Code	Economics of Growth and Development ECO6 B14
No. of Credits	4
No. of Contact Hours	5 Hours per week

ECONOMICS OF GROWTH AND DEVELOPMENT

Preamble: This course is designed to introduce students to the exciting and challenging subject of economics of growth and development, which draws from several branches of economics. It intends to provide the theoretical framework for growth and development discourses under different schools of economic thoughts and also into better insights and knowledge on issues and challenges on economic development. It also aims to equip students with the ability to analyze the factors affecting the long run economic growth, both from a positive and negative sense.. After completing this course the student should also be able use theories of growth and development to analyze the problems of the developing world. The students are expected to develop an interrelated to approach to resource use.

Module I: Development and Underdevelopment-

An Overview Background and beginning of 'Development Economics' in the post-world war era, its elements Defining economic development - Alternative measures of development –PQLI, HDI and its extensions, Development and growth- income as a measure of growth - Human development-Sens capability approach, development as freedom, Structural features of underdeveloped economies-International variations – development gap- Underdevelopment as a low level equilibrium in a multiple equilibrium situation – low level equilibrium trap

Module II: Perceptions about Development and Underdevelopment

Vicious circle of poverty- Rostow's stages of growth-big push, balanced and unbalanced growth, Low level equilibrium models, Critical Minimum effort thesis- Dual economy models- Lewis model and its extensions, Harris- Todaro migration model - Poverty and Inequality: Definitions, Measures and Mechanisms - Concept of poverty and its measures - Inequality meaning – axioms - commonly used inequality measures, Kuznets curve - Impact of poverty and inequality on process of development.

Module III: Facts about economic growth

Neoclassical growth model- Solow model of growth- Production function, investment function, capital accumulation and steady state.Dynamics of the model-change in saving rate, population growth, Technological progress.Convergence in the Solow model. Endogenous growth theoryAK model.

Module IV: Development and environment.

Sustainable development. The environmental Kuznets curve. Global warming.Limits to growthEarth summit.

References:

1) Charles I Jones & Dietrich Vollreth (2013) – Introduction to economic growth, 3rd edition. W W Norton &Co

2) David N Weil (2012) – Economic growth, 3rdedition , Pearson.

3) A P Thirlwall (2011) – Economics of Development, 9th edition, Palgrave.

4) Todaro & Smith (2017) – Economic Development, 12th edition. Pearson.

5) Subrata Ghatak (2003) – Introduction to development economics,4th edition, Routledge.

6) Debraj Ray (1999) – Development economics,1st edition, OUP.

7) Hendrik Van Den Berg (2016) - Economic growth and development,3rd edition. World scientific publishing Co.

8) .E Wayne Nafziger (2005) – Economic Development, 4th edition, Cambridge University Press.

OBJECTIVES

- To undestand the concept of development and underdevelopment
- To provide the theoretical framework for growth and development
- To analyze the factors affecting the long run economic growth, both from a positive and negative sense.
- To use theories of growth and development to analyze the problems of the developing world.
- To critically evaluate the development and environment

COURSE PLAN

Unit/Session/ Hours (Time Required	Topics to be Taught	Procedure Student Centric Methods of Teaching	Activity	Learning Outcome	Assessment
Module I	An Overview Background and beginning of 'Development Economics' in the post-world war era, its elements Defining economic development - Alternative measures of development – PQLI, HDI and its extensions, Development and growth- income as a measure of growth - Human development-Sens capability approach, development as freedom, Structural	• Lecture • Peer Discussion	to identify different development indices	To undestand the concept of development and underdevelopment	Evaluation through Test Paper

	features of underdeveloped economies- International variations – development gap- Underdevelopment as a low level equilibrium in a multiple equilibrium situation – low level equilibrium trap				
Module II	Vicious circle of poverty- Rostow's stages of growth- big push, balanced and unbalanced growth, Low level equilibrium models, Critical Minimum effort thesis- Dual economy models- Lewis model and its extensions, Harris- Todaro migration model - Poverty and Inequality: Definitions, Measures and Mechanisms - Concept of poverty and its measures - Inequality meaning – axioms - commonly used inequality measures, Kuznets curve - Impact of poverty and inequality on process of	• Lecture • Peer Discussion	To distinguish different growth and development theories	To provide the theoretical framework for growth and development	Evaluation through Test Paper

	development.				
Module III	Neoclassical growth model-Solow model of growth-Production function, investment function, capital accumulation and steady state.Dynamics of the model-change in saving rate, population growth, Technological progress.Convergence in the Solow model. Endogenous growth theoryAK model.	• Lecture • Peer Discussion	To explain neoclassical growth model	To use theories of growth and development to analyze the problems of the developing world. To analyze the factors affecting the long run economic growth, both from a positive and negative sense.	Evaluation through Test Paper
Module IV	Sustainable development. The environmental Kuznets curve. Global warming.Limits to growthEarth summit.	• Lecture • Peer Discussion	To know the importance of sustainable development in economics	To critically evaluate the development and environment	Evaluation through Test Paper

Course outcome

CO1	To undestand the concept of development and underdevelopment
CO2	To provide the theoretical framework for growth and development
CO3	To analyze the factors affecting the long run economic growth, both from a positive and negative sense
CO4	To use theories of growth and development to analyze the problems of the developing world
CO5	To critically evaluate the development and environment

Faculty In Charge,
Mr. Nijil Jacobi

COMPLEMENTARY COURSES

Introductory Economics SEMESTER I

Course Category	Complementary Course
Course Title and Code	Introductory Economics I ECO1(2) C01
No. of Credits	4
No. of Contact Hours	6 Hours per week

INTRODUCTORY ECONOMICS I

Module I: Basics of Economics

Economics-Definitions- Importance of economics-relation with other social sciences-Basic Problems of an economy - Micro versus Macro

Module II: Demand and supply

Utility,utility function, marginal utility, law of diminishing marginal utility- demand, law of demand. Elasticity of demand-Cost, cost function, opportunity cost, variable cost, fixed cost, total cost, marginal cost, average cost, supply, supply function, supply curve, Elasticity of supply- Equilibrium price, market and its classification

Module III: Production and distribution

Factors of Production-Production function, types of production function (short run and long run), economies of scale- Distribution-Marginal productivity theory.

Module IV: National Income Concepts and Meaning

National Income-Meaning and Significance- Concepts of National Income- Importance of the estimation of national income-difficulties in estimation of national income.

Module V: Classical Vs Keynesian economics

Assumptions of Classical economists-Say‘s Law of Market, Full employment, wage-price flexibility -Keynesian revolution-major concepts of Keynes, Post-Keynesian developments (Brief introduction only).

References

1. Diwedi DN - Macroeconomics Theory and Policy, Tata McGraw Hill Education Pvt. Ltd, New Delhi,

2. Salvetor D and EA Diulio – Principals of Economics Schuam’s Outline Series

3. Salvetor D – International Economics, Schuam’s Outline Series

4. Gregory Mankiw, Principles of Macroeconomics

5. Sangita VaishaliKapoor, (2017) Introductory Macro Economics,

6. Gregory Mankiw, Principles of Microeconomics

7.Pradeepkumar Mehta and Meena Singh (2017) , Introductory Microeconomics, Taxmann’s Paperback. Paul Samuelson and William D Nordhaus(2010), Economics, Tata McGraw Hill Education

OBJECTIVES

- To understand the basic problems in an economy
- To understand the concept of demand and supply
- To know the production function in an economy
- To undestand the ntional income concepts and meaning
- To distiguish between Classicals and Keynesian economics

COURSE PLAN

Unit/Session / Hours (Time Required	Topics to be Taught	Procedure Student Centric Methods of Teaching	Activity	Learning Outcome	Assessment
Module I	Economics-Definitions-Importance of economics-relation with other social sciences-Basic Problems of an economy - Micro versus Macro	• Lecture • Group Discussion	To distinguish between Micro and Macro economics	To understand the basic problems in an economy	Evaluation through Test Paper
Module II	Utility,utility function, marginal utility, law of diminishing marginal utility-demand, law of demand. Elasticity of demand-	• Lecture • Group Discussion	To differentiate different types of Elasticity of demand	To understand the concept of demand and supply	Evaluation through Test Paper

	Cost, cost function, opportunity cost, variable cost, fixed cost, total cost, marginal cost, average cost, supply, supply function, supply curve, Elasticity of supply- Equilibrium price, market and its classification				
Module III	Factors of Production- Production function, types of production function (short run and long run), economies of scale- Distribution- Marginal productivity theory.	• Lecture • Group Discussio n	To identify different types of factors of production	To know the productio n function in an economy	Evaluation through Test Paper
Module IV	National Income- Meaning and Significance- Concepts of National Income- Importance	• Lecture • Group Discussio n	To f know the different methods of national income calculation	To undestand the ntional income concepts and meaning	Evaluation through Test Paper

	of the estimation of national income-difficulties in estimation of national income.				
Module v	Assumptions of Classical economists-Say's Law of Market, Full employment, wage-price flexibility - Keynesian revolution-major concepts of Keynes, Post-Keynesian developments (Brief introduction only).	• Lecture • Group Discussion	To compare the classical and keynesian economics.	To distiguish between Classicals and Keynesian economics	Evaluation through Test Paper

COURSE OUTCOME

CO1	To understand the basic problems in an economy
CO2	To understand the concept of demand and supply
CO3	To know the production function in an economy
CO4	To undestand the ntional income concepts and meaning
CO5	To distiguish between Classicals and Keynesian economics

Faculty In Charge,

Mr. Nijil Jacobi

SEMESTER IV

Course Category	Complementary
Course Course Title and Code	Introductory Economics II ECO4(3) C01
No. of Credits	4
No. of Contact Hours	6 Hours per week

INTRODUCTORY ECONOMICS II

Module I: Money and Banking

Definitions and functions of money- demand for and supply of money- Fischer's quantity theory of money- inflation and deflation (Only concepts, Types and Causes)- Role and functions of commercial banks and Central Bank-monetary policy and its instruments.

Module II: Public Finance Meaning and Significance

- Public and private finance-Principle of Maximum Social AdvantagePublic revenue- public expenditure-public debt- budget- Fiscal Policy-FRBM Act- Finance Commission- Terms of References and Recommendations of 14th and 15th Finance Commission.

Module III: Trade Internal and External Trade

-balance of trade and balance of payments-foreign exchange rate, devaluation- revaluation-depreciation-appreciation.

Module IV: India as a Developing Economy

Indian economy- growth and development under different policy regimes-Demographic trends and issues-education- health and malnutrition - Trends and policies on poverty; inequality and unemployment - Role of NITI Aayog.

References

1. Diwedi DN - Macroeconomics Theory and Policy Tata Magrawhill ‖

2. Salvetor D and EA Diulio – Principals of Economics Schuam's Outline Series

3. Salvetor D – International Economics, Schuam's Outline Series

4. Gregory Mankiw, Principles of Macroeconomics

5. Sangita VaishaliKapoor, (2017) Introductory Macro Economics,

6. Datt and AshwaniMahajan (2018), Indian Economy, S. Chand, New Delhi

7. Uma Kapila, (2017), Indian Economy-Performance and Policies,

8. Manoranjan Sharma (2017), Leading Issues in Indian Economy

9. R. K. Lekhi and Joginder Singh, (2016) Public Finance, Kalyani Publishers

10. H.L. Bhatia, Public Finance (29th Edition), Vikas Publishing House, New Delhi

OBJECTIVES

- To understand demand for and supply of money
- To critically evaluate the functions of finance commission
- To distinguish between BOP and BOT
- To critically evaluate the India as a developing economy

COURSE PLAN

Unit/Session/ Hours (Time Required	Topics to be Taught	Procedure Student Centric Methods of Teaching	Activity	Learning Outcome	Assessment
Module I	Definitions and functions of money- demand for and supply of money- Fischer's quantity theory of money- inflation and deflation (Only concepts, Types and Causes)- Role and functions of commercial banks and Central Bank- monetary policy and its instruments.	• Lecture • Group Discussion	To explain the importance of money supply n an economy	To understand demand for and supply of money	Evaluation through Test Paper
Module II	Public and private finance- Principle of Maximum Social AdvantagePublic revenue- public expenditure-	• Lecture • Group Discussion	To write an essay on topic Evaluate the functions of finance commission in india	To critically evaluate the functions of finance commission	Evaluation through Test Paper

	public debt-budget- Fiscal Policy-FRBM Act- Finance Commission- Terms of References and Recommendations of 14th and 15th Finance Commission.				
Module III	-balance of trade and balance of payments- foreign exchange rate, devaluation- revaluation- depreciation- appreciation.	• Lecture • Group Discussion	To undestand the importance of internal and external trade	To distinguish between BOP and BOT	Evaluation through Test Paper
Module IV	Indian economy- growth and development under different policy regimes- Demographic trends and issues- education- health and malnutrition - Trends and policies on poverty; inequality and unemployment - Role of NITI Aayog.	• Lecture • Group Discussion	To critically evaluate the position of India as a developing economy	To critically evaluate the India as a developing economy	Evaluation through Test Paper

COURSE OUTCOME

CO1	To understand demand for and supply of money
CO2	To critically evaluate the functions of finance commission
CO3	To distinguish between BOP and BOT
CO4	To critically evaluate the India as a developing economy

Faculty In Charge,
Mr. Nijil Jacobi

Department of English

SEM	Course - Code	Title	Name of the Teacher
I	BA ENGLISH		
I	A01	Communication Skills in English	
I	A02	Critical Reasoning Writing & Presentation	
I	EN1B1	Reading Poetry	Bindu Jose Noble A Pakkath
II	A03	Reading Literature in English	
II	A04	Zeitgeist	
II	EN2B1	Reading Prose	Bindu Jose Noble A Pakkath
III	A05	Signatures	
III	EN3B1	Reading Drama	Bindu Jose Daisy Mathew
III	EN3B2	Reading Fiction	Sr Princy Noble A Pakkath
IV	A06	Spectrum	
IV	EN4B1	Modern English Literature	Bindu Jose
IV	EN4B2	Methodology of Humanities	Sr Princy Noble A Pakkath

SEM	Paper - Code	Title	Name of the Teacher
V	EN5B1	Indian Writing in English	Bindu Jose, Sr. Privacy
V	EN5B2	Language & Linguistics	Sr. Privacy, Sandra Juliet Jose
V	EN5B3	Methodology of Literature	Daisy Mathew
V	EN5B4	Informatics	Sandra Juliet Jose, Dhanisha KS
V	EN5B5	Project	Daisy Mathew, Sandra Juliet
VI	EN6B1	Literary Criticism & Theory	Daisy Mathew P
VI	EN6B2	Literature in English American & Postcolonial	Bindu Jose, Sr. Privacy
VI	EN6B3	Women's Writing	Sr. Privacy, Noble A. Palath
VI	EN6B4	Writing for Media	Sandra Juliet Jose, Dhanisha KS
VI	EN6B5	Project	Daisy Mathew, Sandra Juliet
VI	EN6B5E1	(Elective) World Classics in Translation	Sandra Juliet, Dhanisha KS
V	EN5D03	(Open Course) Applied Language Skills	Sandra Juliet, Dhanisha KS
I	JCC101	Introduction to Communication & Journalism	Daisy Mathew, Dhanisha KS
II	JCC102	History of Mass Media	Sandra Juliet, Dhanisha KS
III	JCC103	Corporate Communications & Advertising	Daisy Mathew, Dhanisha KS
IV	JCC104	News Reporting & Editing	Sandra Juliet, Dhanisha KS

Work schedule of the year 2018-19 ~~2012-2013~~

Name of the teacher :- BINDU JOSE

June

Class	Subject	Portion/Lesson
III BA	American & Postcolonial	Introduction, Walt Whitman, Stevens
II BA	Modern English Literature	Introduction to modern English Literature, George Bernard Shaw
~~I~~		

July

Class	Subject	Portion/Lesson
III BA	American & Post Colonial	Plath, Hughes, Introdn to Postcolonialism
II BA	Modern English Literature	Yeats, Journey of the magi, Literary movements

August

Class	Subject	Portion/Lesson
III BA	American & Post Colonial	Arthur Miller, Atwood Brathwaite, Meena Alexander
II BA	Modern English Literature	
I BA	Reading poetry	Elements of Poetry
I DC	Ways with words	

September

Class	Subject	Portion/Lesson
III BA	American & Post Colonial	Edgar Allen Poe, Killing time, Scarf
II BA	Modern English Literature	The unknown citizen, A constable calls
I BA	Reading Poetry	Shakespeare, Browning, Auden
I DC	Ways with words	

October

Class	Subject	Portion/Lesson
III BA	American & Post Colonial	Faulkner, Harvest
II BA	Modern English Literature	Arebs, How should one read a book
I BA	Reading Poetry	Donne, Wordsworth, Gray, Lawrence
I DC	Ways with words	

Work schedule of the year . 2018-19

Name of the teacher :- BINDU JOSE

November

Class	Subject	Portion/Lesson
III BA	American & Post Colonial	Okara, Diop, Revisions for exams.
II BA	Reading Drama	Drama & Theatre
I BA	Reading Poetry	Maya Angelou, Chinua Achebe
I DC	Zeitgeist	

December

Class	Subject	Portion/Lesson
III BA	Introduction Indian Writing	Introduction, Naidu, Tagore,
II BA	Reading Drama	Macbeth
I BA	Reading Fiction/Prose	Bacon, Hussain
I DC	Zeitgeist	

January

Class	Subject	Portion/Lesson
III BA	Indian Writing	Ezekiel, AK Ramanujan, Tagore with Desiring. Nagamandala
II BA	Reading Drama	Macbeth
I BA	Reading Fiction/Prose	Kongwan, Martin Luther King
I DC	Zeitgeist	

February

Class	Subject	Portion/Lesson
III BA	Indian Writing	Revision and Previous Year Ques discussion
II BA	Reading Drama	Ibsen
I BA	Reading Prose	Hasan, Our Pocket, Valmiki,
I DC	Zeitgeist	

March

Class	Subject	Portion/Lesson
III BA	Study Leave & Revision	
II BA	Reading Drama	Ibsen, Synge
I BA	Reading Prose	James Baldwin, Mourad Sea
I DC	Zeitgeist	

Work schedule of the year 2018-2019

Name of the teacher :- DR SR PRINCY ANTO

June

Class	Subject	Portion/Lesson
III Main	American & Post Colonial	Introduction to American Literature
II Main	Methodology of Humanities	Language and Culture.
I BA/BSc	Transactions.	Phonemic Symbols: Vowels - Diphthongs - Triphthongs.

July

Class	Subject	Portion/Lesson
III BA	American & Post Colonial	I Hear America Singing by W. Whitman.
II Main	Methodology of Humanities	Edge by Sylvia Plath
		→ Culture.
I BA/BSc	Transactions.	Words Clicks. Sentence Stress

August

Class	Subject	Portion/Lesson
III BA	American & Post Colonial	Anecdote of a Jar: Wallace Stevens.
II Main	Methodology of Humanities	Langue, Parole, Genderlect.
I BA/BSc	Transactions.	Intonation: Falling & Rising.

September

Class	Subject	Portion/Lesson
III BA	American & Post Colonial	Mother to Son by Langston Hughes.
II Main	Methodology of Humanities	The Fall of the House of Usher by Poe.
		Pidgin and Creole, nativism.
I BA/BSc	Transactions	Barriers to Listening.

October

Class	Subject	Portion/Lesson
III BA	American & Post Colonial	Barn Burning by Faulkner.
II Main	Methodology of Humanities	Discourse and culture.
I BA/BSc	Transactions	Weak forms and Strong Forms.

Work schedule of the year .

Name of the teacher :-

November

Class	Subject	Portion/Lesson
III BA	American & Post Colonial	Death of a Salesman by Arthur Miller.
II Hons	Methodology of Humanities	Concept of Identities.
I BA/Bsc	Translations.	Influence of Mother Tongue.

December

Class	Subject	Portion/Lesson
III BA	Indian Writing.	Tryst with Destiny by Jawaharlal Nehru.
II BA	Modern English Literature	The weed by Amrita Pritam
I BA/Bsc	Reading Lit. in English	Rocking Horse Winner by D H Lawrence.
		Abraham Lincoln's letter to his son's teacher.

January

Class	Subject	Portion/Lesson
III BA	Indian Writing	Roots and Shadows by Shashi Desh Pande
II BA	Modern English Literature	How should one Read a Book by V Woolf
I BA/Bsc	Reading Lit in English	A Ring to Me is a Bondage by Rina Desai

February

Class	Subject	Portion/Lesson
III BA	Indian writing.	Roots and Shadows by Shashi Desh Pande
II BA	Modern English Literature	How should one Read a Book by V Woolf.
I BA/Bsc	Reading Lit in English	The Walrus and the Carpenter by Lewis Carroll.

March

Class	Subject	Portion/Lesson
III BA	Study Holidays & Exam.	
II BA	Modern English Literature	The French Lieutenant's woman.
I BA/Bsc	Reading Lit in Eng Lit	Refund - Fritz Kaiser Thy

Work schedule of the year 2018-19 ~~2012-2013~~

Name of the teacher :- DARLY MATHEW

June

Class	Subject	Portion/Lesson
III B.A	Methodology of Literature	Traits of literature - Forms of Literature Canon formation
I Gen	A01 - Transactions	Communication, English as Global Language,
I Gen	A02 - Ways with words	Old Folks Laugh, Boxes
II Main	ENG3B02 - Reading Fiction	Miss Brill

July

Class	Subject	Portion/Lesson
III Main	Methodology of Literature	British Literature, American, African, Indian, Canadian, Australian
I Gen	A01 - Transactions	Listening (conversation, speech, lecture)
I Gen	A02 - Ways with words	Once upon a Time, A Shocking Accident
II Main	ENG3B02 - Fiction	The Diamond Necklace

August

Class	Subject	Portion/Lesson
III Main	Methodology of Literature	New criticism, Formalism, Deconstruction, Psychoanalytic literary criticism, Structuralism,
I Gen	A01 - Transactions	Greeting, thanking, requesting, enquiring
I Gen	A02 - Ways with words	The Times They Are A-changing
II Main	ENG3B02 - Fiction	Mirzya - Chakhor

September

Class	Subject	Portion/Lesson
III Main	Methodology of Literature	Marginalized genders, ethnicity Postcolonial literary criticism, cultural Studies (India & Africa), Cultural materialism
I Gen	A01 - Transactions	Explaining, Reporting, permission, reading
I Gen	A02 - Ways with words	Lamb to Slaughter, Appointment in Samara
II Main	ENG3B02 - Fiction	Eliot - Journey to Magi

October

Class	Subject	Portion/Lesson
III Main	Methodology of Literature	New Historicism, Marxism, post-modernism, Eco-criticism, Eco-feminism.
I Gen	A01 - Transactions	Reading charts, tables, graphs, advertisements
I Gen	A02 - Ways with words	Letters, documents, profiles, online content.
II Main	ENG3B02 - Fiction	Night walkers & mystery manors

Work schedule of the year. 2018-19

Name of the teacher :- DAPLY MATHEH

November

Class	Subject	Portion/Lesson
III Main	Literary Criticism & Theory	Aristotle, Plato, Rasa Theory
I Gen	A04 - Zeitgeist	Should Gandhi's assassin be killed
II Gen	A05 - Signatures - the self	I stand with you Against Disorder
II Main	EN614B02 - Humanities	Language, culture and Identity

December

Class	Subject	Portion/Lesson
III Main	Literary Criticism & Theory	Alankara, Wordsworth, Sanskaara
I Gen	A04 - Zeitgeist	Toba Tek Singh
II Gen	A05 - Signatures - the self	I sto was growing up, Art, truth & Politics
II Main	EN614B02 - Humanities	Narration and representation

January

Class	Subject	Portion/Lesson
III Main	Literary Criticism & Theory	Eliot, Elaine Showalter
I Gen	A04 - Zeitgeist	The End of Living and Beginning of Survival
II Gen	A05 - Signatures - the self	The Great Dictator, Voices from Chernobyl
II Main	EN614B02 - Humanities	Indian theories of knowledge - knowledge systems

February

Class	Subject	Portion/Lesson
III Main	Literary Criticism & Theory	Simile, metaphor, synecdoche, metonymy,
I Gen	A04 - Zeitgeist	symbol, irony, paradox.
II Gen	A05 - Signatures - the self	Splatch the goal, The story of an hour
II Main	EN614B02 - Humanities	Breaking Silence, Voices from Chernobyl
		Origin and Development of Indian philosophical systems

March

Class	Subject	Portion/Lesson
III Main	A04 - Zeitgeist	Refugee Blues, Amnesty
I General	A05 - Signatures - the self	The Secret Diary of Adrian Mole,
II Main	EN614B02 - Humanities	Nariyanpaamba Letter.
		Textuality and Reading

2018-19

Work schedule of the year ~~2012-2013~~

Name of the teacher :- NOBLE A. PALIATH

June

Class	Subject	Portion/Lesson
I BA	Reading Poetry	"The Man with the Hoe"
II BA	Reading Prose	"Filming India"
III BA	Reading Fiction	"The History of Fiction"
I BA/ BSc	Transactions	"Module II: Vocabulary"

July

Class	Subject	Portion/Lesson
I BA	Reading Poetry	"Birches"
II BA	Reading Prose	"Filming India"
III BA	Reading Fiction	"The History of Fiction"
I BA/ BSc	Transactions	"Module II: Vocabulary"

August

Class	Subject	Portion/Lesson
I BA	Reading Poetry	"Tonight I Can Write the Saddest Lines"
II BA	Reading Prose	"Filming India"
III BA	Reading Fiction	"The History of Fiction"
I BA/BSc	Transactions	"Module II: Vocabulary"

September

Class	Subject	Portion/Lesson
I BA	Reading Poetry	"Refugee Mother and Child"
II BA	Reading Prose	"Good Resolutions"
III BA	Reading Fiction	"The History of Fiction"
I BA/BSc	Transactions	"Grammar"

October

Class	Subject	Portion/Lesson
I BA	Reading Poetry	"General, Your Tank"
II BA	Reading Prose	"Good Resolutions"
III BA	Reading Fiction	"The History of Fiction"
I BA/BSc	Transactions	"Grammar"

Work schedule of the year . 2018 – 19

Name of the teacher :- NOBLE A. PALIATH

November

Class	Subject	Portion/Lesson
I BA	Reading Prose	"Good Resolutions"
II BA	Reading Fiction	"The Old Man and the Sea"
III BA/ BSc	Writing for Academic & Professional Success	"Genres and Types of Academic Writing"

December

Class	Subject	Portion/Lesson
I BA	Reading Prose	"My Dungeon Shook"
II BA	Reading Fiction	"The Old Man and the Sea"
III BA/ BSc	Writing for Academic & Professional Success	"The Process of Writing"

January

Class	Subject	Portion/Lesson
I BA	Reading Prose	"My Dungeon Shook"
I BA	Reading Fiction	"The Old Man and the Sea"
III BA/ BSc	Writing for Academic & Professional Success	"Writing for Professional Purposes I"

February

Class	Subject	Portion/Lesson
I BA	Reading Prose	"My Dungeon Shook"
I BA	Reading Fiction	"The Old Man and the Sea"
III BA/ BSc	Writing for Academic & Professional Success	"Writing for Professional Purposes II"

March

Class	Subject	Portion/Lesson
I BA	Reading Prose	Revision of Textual Exercises"
II BA	Reading Fiction	"Revision of Textual Exercises"
I BA/BSc	Writing for Academic & Professional Success	"Revision of Textual Exercises"

Work schedule of the year ~~2012-2013~~ 2018-19

Name of the teacher :- SANDRA JULIET JOSE

June

Class	Subject	Portion/Lesson
III BA	Language & Linguistics	Introduction to Communication
	Informatics	Dictionaries
	Open Course	Introduction to four modules
II BA	Journalism	History of Press in India
II DC	Signatures	Neruda, Annie Dillard

July

Class	Subject	Portion/Lesson
III BA	Language & Linguistics	Theories of Language
	Informatics	Knowledge Resources on Net
	Open Course	Conventional Resources
II BA	Journalism	Introduction to Advertising
II DC	Signatures	When I was growing up

August

Class	Subject	Portion/Lesson
III BA	Language & Linguistics	Linguistic analysis, Levels
	Informatics	Computer Localisation
II BA	Open Course	Electronic Resources and Practicals
II DC	Journalism	Copywriting Practices
~~I BA~~	Signatures	I stand with you against the disorder
~~I DC~~	Ways with words	Maya Angelou, Robert Frost

September

Class	Subject	Portion/Lesson
III BA	Language & Linguistics	Types of linguistics
II BA	Informatics	Computer localisation and extensions
II DC	Open Course	Career Skills
~~I BA~~	Journalism	Effects of Advertising and Communication
I DC	Signatures	Art, Truth and Politics
	Ways with words	Bob Dylan, Tennessee Williams, Lucas

October

Class	Subject	Portion/Lesson
III BA	Language & Linguistics	Linguistics as an inter disciplinary study
II BA	Informatics	Networking and Resources
II DC	Open Course	Career skills and Practical assignments
I BA	Journalism	Corporate Communication
I DC	Signatures	Art, Truth & Politics
	Ways with words	Dylan Thomas, Keats, Okara

Work schedule of the year . 2018-19

Name of the teacher :- Sandra Jubel Jose

November

Class	Subject	Portion/Lesson
III BA	Writing for Media	Print Media
	Project	Introduction to Dissertation writing
II BA	World Classics in Trans	Introduction to Drama
II DC	Journalism	Evolution of Indian Press
I BA	Spectrum	Amandprchalor, Tagore
I DC	Journalism	Organisational Structure of newspaper
	Zeitgeist	Tagore

December

Class	Subject	Portion/Lesson
III BA	Writing for Media	Print Media
	Project	MLA
II BA	World Classics in Trans	Sophocles : Oedipus Rex, Bhasa - Karnabharam
II DC	Journalism	Evolution of Indian Press
I BA	Spectrum	Death Fugue, Paul Celan
I DC	Journalism	Contents of a newspaper
	Zeitgeist	Preamble, Greve Patel

January

Class	Subject	Portion/Lesson
III BA	Writing for Media	Digital Media
	Project	Outline of the project
II BA	World Classics in Trans	The dependent Sonata
II DC	Journalism	Legends of Journalism
I BA	Spectrum	Philip Levine (What work is)
I DC	Journalism	Reporting practices
	Zeitgeist	Lee Makobe

February

Class	Subject	Portion/Lesson
III BA	Writing for Media	Stylistics
	Project	Submission
II BA	World Classics in Trans	Goethe The Remmar & Faustlin
II DC	Journalism	History of Broadcasting
I BA	Spectrum	Big Fish
I DC	Journalism	Reporting practices
	Zeitgeist	Amnesty, Refugee Blues.

March

Class	Subject	Portion/Lesson
III BA	Writing for Media	Revision
	Project	Evaluation
II BA	World Classics in Trans	Revision
II DC	Journalism	Films
I BA	Spectrum	Turnaround
I DC	Journalism	Process of editing
	Zeitgeist	Chemical Happiness and the meaning of life

2018-19

Work schedule of the year ~~2012-2013~~

Name of the teacher :- DHANISHA K.S.

June

Class	Subject	Portion/Lesson
III BA	Informatics	"Encyclopaedias, Libraries, Book Sites, Journals, Content Repositories"
III BA	World Classics	"The Reunion"
I BA	Introduction to Communication	"Types of Communicatio

July

Class	Subject	Portion/Lesson
III BA	Informatics	"Online Education, Internet Directories, Websites of Universities"
III BA	World Classics	"I Loved You"
I BA	Introduction to Communication	"Elements of Communicatio

August

Class	Subject	Portion/Lesson
III BA	Informatics	"Online Courses & Virtual Universities"
III BA	World Classics	"The Divine Comedy"
I BA	Introduction to Communication	"Functions of Communicatio

September

Class	Subject	Portion/Lesson
III BA	Informatics	"What is Localization?, Using Computers in the Local Languages"
III BA	World Classics	"Notes from Underground"
I BA	Introduction to Communication	"Dysfunctions of Communica

October

Class	Subject	Portion/Lesson
III BA	Informatics	"Language Packs for Operati Systems & Programmes"
III BA	World Classics	"Siddhartha"
I BA	Introduction to Communication	"Models of Communicatio

Work schedule of the year . 2018-19

Name of the teacher :- Dhanisha K. S.

November

Class	Subject	Portion/Lesson
III BA	Writing for the Media	"Advertisement in Different Media: An Overview, Promotional
III BA	Open Course	Literature, Copywriting for Leaflet
II BA	News Reporting & Editing	"Group Discussion" "What is News Reporting"

December

Class	Subject	Portion/Lesson
III BA	Writing for the Media	"Pamphlets, Brochures, Classified Text, Captions, Logo, Storyboard
III BA	Open Course	"Debate"
II BA	News Reporting & Editing	"Inverted Pyramid Style"

January

Class	Subject	Portion/Lesson
III BA	Writing for the Media	"Differences in Writing Styles, Basic Principles of AP style"
III BA	Open Course	"Presentation Skills"
II BA	News Reporting & Editing	"Hourglass Style"

February

Class	Subject	Portion/Lesson
III BA	Writing for the Media	"Use of the Stylebooks, Style as a Manner of Writing"
III BA	Open Course	"Curriculum Vitae"
II BA	News Reporting & Editing	"Types of Leads"

March

Class	Subject	Portion/Lesson
III BA	Writing for the Media	"Clarity in Writing, Readability Five W's and 1H in Writing
III BA	Open Course	"Cover Letter"
II BA	News Reporting & Editing	"Principles of Editing"

Course/ Lesson Plan

B. A. English

Semester V 2020-2021, 2021-2022

Course category: Core Paper VII

Paper name: Appreciating Drama and Theatre

Code: ENG5B07

Contact Hours: 90 (5 hrs per week) **Credits : 4**

Course Outcome:

- **To introduce the students to the basic elements of drama, including the historical progress of drama in different continents.**
- **To foster an ability in the students for appreciating drama as an art form.**
- **To familiarize the students with the different genres and masters of drama.**
- **To facilitate the learners to critically go beyond the theatrical performances to the texts and approach them critically from various standpoints.**

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I : Drama - Some Key Concepts	Basic Elements of Drama: Tragedy, Comedy, Tragicomedy; The Constituent Parts of Drama – Plot, Character, Thought, Song, Spectacle, Diction, Three Unities, Tragic Hero, Chorus, Simple plot and Complex plot; The basic structure of tragedy	5	Lecture	Evaluation through question-answer sessions

	History of Drama: Greek Theatre and Drama, Miracle Plays and Morality Plays, University Wits, Shakespearean Theatre, Restoration Drama, Sentimental Drama, Anti-sentimental Drama, Comedy of Manners, Drama of the Romantic Period, Decadence, Problem Play, Realism, Ibsen and Bernard Shaw.	5	Lecture Seminar Presentation on 'History of Drama'	Write-ups of students are to be evaluated. Seminar evaluation
	Avant-garde: Expressionism & Epic Theatre, Angry Young Man, The Theatre of the Absurd, Comedy of Menace	5	Lecture Debate on the different types of theatres	Reference reading and notes are evaluated.
	The Theatre of Cruelty, Feminist theatre, Street theatre, Ritualistic Theatre, The Poor theatre, Radio Drama.	1	Presentation and Lecture	Class test including all the topics of Module I.
Module II : Classical Drama	William Shakespeare: Othello	5	Lecture Student seminar	Question-answer sessions Seminar evaluation
		5	Lecture Debate	Presentation on 'Shakespeare: Life and Works'
		5	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
		5	Lecture Student seminar	Question answer sessions Seminar evaluation
		5	Lecture Discussion	Discussion on 'Shakespearean tragedies'
		5	Lecture Debate on 'Iago as a Villain'	Question-answer sessions Debate evaluation
Module III : World Plays	Anton Chekov: The Bear/ The Boor	5	Lecture Debate Presentations	Question-answer sessions Seminar evaluation
	Edward Albee: Zoo Story	5	Lecture Student seminar	Question-answer sessions

		5	Student Seminar	Presentation on the theme of 'Zoo Story' Seminar evaluation
	Kobo Abe: The Man who turned into a Stick – trans. Donald Keene	5	Lecture Discussion Critical analysis of the play.	Evaluation through question-answer session.
Module IV : Drama Adaptation	Roman Polanski: Macbeth (1971)	5	Lecture Debate Presentations	Question-answer sessions
		2	Debate	Debate on the significance of Drama Adaptations Evaluation of the debate.
	Syamaprasad: Akale (2004)	5	Lecture Discussion	Discussion on the various aspects of 'Akale'. Evaluation through question-answer session.
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic		All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedback is given. CIE Internal marks are awarded on the basis of assignments as well.
Seminars	Any topic	7	All students are required to present a topic with the help of a powerpoint presentation, preferably.	Feedback is provided and marks are considered for CIE
		90 hours		

Reference Materials :

- Catherine Belsey. The Subject of Tragedy- Identity and Difference in Renaissance Drama. London: Methuen, 1985.
- Jean Chothia. English Drama of the Early Modern Period, 1890-1940. London: Longman, 1996.
- A C Bradley, Shakespearean Tragedy. London: Elibron, 1904.
- H. Granville-Barker, Study of Drama. London: Sedgwick, 1931.

- Peter Womack and Simon Shepherd. English Drama: A Cultural History. Cambridge: Blackwell, 1996.

Teacher/s –in Charge:

- Ms. Bindu Jose
- Ms. Sandra Juliet Jose

Module Division:

Module	Month	Teacher/s-in--charge
Module 1	June	Bindu Jose
Module 2	July - August	Bindu Jose
Module 3	September	Sandra Juliet Jose
Module 4	October	Sandra Juliet Jose

Course/ Lesson Plan

Semester III

Course category: Core Paper III

Paper name: Appreciating Prose

Code: ENG3B03

Contact Hours: 72 (4 hrs per week) **Credits : 4**

Course Outcome:

- **To familiarize the students with different types of prose writing.**
- **To introduce to them the basic concepts of style and literary devices in prose.**
- **To acquaint them with cultural diversity and divergence in perspectives.**
- **To develop their critical thinking abilities and write creatively and critically.**

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I : Introduction to Prose	Etymology - Functions of prose.	4	Lecture	Evaluation through question-answer session
	Prose varieties – Fiction/Short Story/Tales - Autobiography/Biography- Newspaper/Journal Articles	4	Lecture Debate	Debate on the topic "Prose as a Literary Genre"
	-Philosophical/Scientific Essays –Travelogues – Speech.	2	Presentation on different prose varieties	Reference reading and notes are evaluated.
	Evolution of Prose - Early translations- King Alfred- the Anglo Saxon Chronicle- homilies	4	Presentation and Lecture	Class test including all the topics related to 'evolution of prose'.
	Essay – formal/impersonal essay and informal/personal essay •Types of formal essays: periodical essay, critical essay 16	4	Lecture Presentation on types of essays	Reference reading and notes are evaluated.
	•Personal essays /Life Writing: biography, autobiography, memoir and diaries	4	Lecture Seminar	Question-answer sessions Seminar evaluation
	- bible translations-secular prose-Morte D'arthur- Elizabethan prose-tracts, pamphlets and treatises-	4	Lecture Debate	Presentation on Elizabethan prose
	eighteenth century prose – Victorian and modern prose.	4	Lecture Student seminar	Class test of all the topics of Module I Seminar evaluation

Module II : Reflections and speeches	1. Francis Bacon : Of Studies Speech	4	Lecture Student seminar	Question-answer sessions Seminar evaluation
	2. Charles Lamb : Dream Children :A Reverie.	2	Lecture Debate	Question-answer session
	3. G. K Chesterton : On Running After One's Hat	4	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	4. Albert Camus : Nobel Acceptance	4	Lecture Student seminar	Class test of topics 1- 4 Seminar evaluation
	5. Arundhati Roy : Come September	4	Presentation and Lecture	Reference reading and notes are evaluated.
	6. Pico Iyer : In Praise of the Humble Comma (Biography/Autobiography/Memoir)	4	Lecture Student seminar	Seminar evaluation
	7. Chinua Achebe : The Education of a British Protected Child(extract from the text.)	4	Lecture Debate	Reference reading and notes are evaluated.
	8. Marcel Junod : The First Atom Bomb. (extract from Warrior Without Weapons, translated by Edward Fitzgerald.) 9. Usha Jesudasan : Justice vs Mercy	4	Lecture Student seminar	Class test of all the topics of Module II Seminar evaluation
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic		All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedback is given. Also, CIE Internal mark is awarded on the basis of assignments.

Seminars	Any topic	7	All students are required to present a topic with the help of a powerpoint presentation, preferably.	Feedback is provided and marks are considered for CIE
		72 hours		

Reference Materials :

- A Concise Companion to Literary Forms. Emerald, 2013.(Chapter IV)
- Dr. Takashi Nagai : Letter from Nagasaki & Dr. Tamiki Hara : Letter from Hiroshima
- Doris Lessing: On not winning the Nobel Prize (Nobel Lecture, December 7,2007)
- Bertrand Russell: Ideas that have helped mankind.
- Marilynne Robinson : When I Was a Child
- Thomas de Quincey : The Literature of Knowledge and The Literature of Power
- J.B Priestley : On Doing Nothing
- Robert Lynd : On Forgetting
- AG. Gardiner : On Living Again

Teacher –in Charge:

- Ms. Bindu Jose

Module Division:

Module	Month	Teacher-in--charge
Module 1	June-August	Ms. Bindu Jose
Module 2	August - October	

Course/ Lesson Plan

Semester IV

Course category: Core Paper V

Paper name: Appreciating Fiction

Code: ENG4B05

Contact Hours: 90 hrs (5 hrs per week) **Credits : 4**

Course Outcome:

- **To help students discover the pleasures in reading fiction.**
- **To aid students gain an insight into the human condition and the complexities of life.**
- **To acquaint the students with different types of fiction and analyze them.**

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I : Understanding Fiction	What is fiction?	5	Lecture	Evaluation through question-answer session
	- Plot- Character- Atmosphere- Narrative Techniques	5	Lecture Debate	Debate on the topic "Narrative Techniques"
	Points of view- Difference between long and short fiction	5	Presentation on long and short fiction	Reference reading and notes are evaluated.
	Different types of fiction	5	Presentation and Lecture	Class test including all the topics related to types of fiction
Module II : Short Fiction	O Henry- The Cactus	5	Lecture Student seminar	Question-answer sessions Seminar evaluation
	Maxim Gorky- Her Lover	5	Lecture Debate	Presentation on 'Gorky: Life and Works'
	James Joyce- Eveline	5	Lecture Student seminar	Write-ups of students are to be evaluated.
	Ray Bradbury- Sound of Thunder	5	Lecture Student seminar	Seminar evaluation
	Sally Morgan- The Letter	5	Lecture	Evaluation through question-answer session
	Arun Joshi- The Homecoming	5	Lecture	Evaluation through question-answer session
	Ken Liu- The Paper Menagerie	5	Lecture Presentation	Class test including of all Module II topics
Module III : Long Fiction	George Orwell- Animal Farm	5	Lecture Debate Presentations	Question-answer sessions Seminar evaluation

		5	Lecture Student seminar	Question-answer sessions
		5	Student Seminar	Presentation
			Discussion	Discussion on the different aspects of 'Animal Farm'
Module IV : Film	Moby Dick: dir John Huston	5	Lecture Debate Presentations	Question-answer sessions
		3	Debate	Debate on the various themes of 'Moby Dick'
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic		All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedback is given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	7	All students are required to present a topic with the help of a powerpoint presentation, preferably.	Feedback is provided and marks are considered for CIE
		90 hours		

Reference Materials :

- Craft, Stephen and Helen D Cross. Literature, Criticism and Style: A Practical Guide to Advanced Level English Language. Oxford: OUP,2000.
- Watt, Ian. The Rise of the Novel. University of California Press, 2001.
- Booth, Wayne C. Rhetoric and Fiction. University of Chicago Press, 1983
- Lubbock, Percy. Craft of Fiction. Penguin 2017.
- Lazar ,Gillian. Literature and Language Teaching: A Guide for Teachers and Learners. Cambridge University Press, 2008.

Teacher –in Charge:

- Ms. Bindu Jose

Module Division:

Module	Month	Teacher-in--charge

Module 1	November	Ms. Bindu Jose
Module 2	December - January	
Module 3	February	
Module 4	March	

Course/ Lesson Plan

Semester II

Course category: Core Paper II

Paper name: Appreciating Poetry

Code: ENG2B02

Contact Hours: 108 (6 hrs per week) **Credits : 5**

Course Outcome:

- **To introduce the students to the basic elements of poetry, including the stylistic and rhetorical devices employed in poetry, and to various genres of poetry.**
- **To facilitate students to attain various perspectives in reading poetry like gender, race, caste, ethnicity, religion, region, environment and nation.**
- **To familiarize the learners with different forms of poetry written in British and American literature.**
- **To create an awareness among the learners about different forms and themes of poetry produced across the globe in the history of literature.**

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I : Poetry- Some Key Concepts	Basic Elements of Poetry: Prosody: Rhythm, Meter – Rhyme - hard rhyme, soft rhyme, internal rhyme - Alliteration, Assonance – Diction.	6	Lecture	Evaluation through question-answer session
	Figures of Speech: Metaphor, Simile, Personification, Oxymoron, Metonymy, Synecdoche, Transferred Epithet.	6	Lecture Seminar presentation	Presentation on the topic “Figures of Speech”
	Poetic Forms: Lyric, Ode, Sonnet, Haiku, Ballad, Couplet, Villanelle, Dramatic Monologue, Elegy, Satire, Mock Epic, Free Verse, Tanka, Jintishi, Ghazal, Rubai, Prose poetry, Narrative poetry, Performance Poetry.	4	Presentation on Poetic Forms	Reference reading and notes are evaluated.

Module II : Poetic Forms	Sonnet: William Shakespeare: Shall I Compare thee to a Summer's Day (Sonnet XVIII), John Milton: On His Blindness. Ballad: John Keats: La Belle Dame sans Merci.	6	Lecture Student seminar	Question-answer sessions Seminar evaluation
	Ode: P B Shelley: Ode to a Skylark	6	Lecture Debate	Presentation on 'P B Shelley: Life and Works'
	Elegy: W H Auden: In Memory of W. B. Yeats	6	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	Villanelle: Dylan Thomas: Do not go Gentle into that Good Night	6	Lecture Student seminar	Class test of topics 1-5 Seminar evaluation
	(Dramatic) Monologue: Robert Browning: My Last Duchess	6	Lecture Debate on Dramatic Monologue	Debate evaluation
	Heroic Couplet: Alexander Pope: Extract from Essay on Man (Epistle I, Section II), "Presumptous man! The reason wouldst thou find…"	6	Discussion on 'Essay on Man'	Question-answer sessions
	Free Verse: Stanley Kunitz: The Layers. Song: Leonard Cohen: I'm your Man	4	Lecture Seminar	Question-answer sessions Write-ups of students are to be evaluated.
Module III : World Poetry	Childhood: Rainer Maria Rilke: Childhood. Love and Loss: Pablo Neruda: Tonight I Can Write the Saddest Lines.	6	Lecture Debate Presentations	Question-answer sessions Seminar evaluation
	Protest: Nazim Hikmet: Some Advice to those who will Serve Time in Prison. Family: Langston Hughes: Mother to Son.	6	Lecture Student seminar	Question-answer sessions
	Survival: Namdeo Dhasal: Stoneman, My Father & Me. Alienation: Diane Glancy: Without Title.	6	Student Seminar	Presentation

	War: Yehuda Amichai: Anniversaries of War. Environment: Joao Cabral de Melo Neto: Landscape of the Capibaribe River.	6	Discussion	Discussion on the different aspects of War
	Commitment and Passion: Charles Baudelaire: Be Drunk. Cultural Difference: Bassey Ikpi: Homeward.	6	Lecture Debate	Discussions, question-answer sessions Debate evaluation
Module IV : Appreciation of Poetry	Poem Analysis, practical analysis of poems, critical appreciation	6	Lecture Debate Presentations	Evaluation through question-answer session
		4	Debate	Discussion on the aspects of critical appreciation of poems
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic		All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedback is given. Also, CIE Internal marks are awarded on the basis of assignments as well.
Seminars	Any topic	7	All students are required to present a topic with the help of a powerpoint presentation, preferably.	Feedback is provided and marks are considered for CIE
		108 hours		

Reference Materials :

- A Concise Companion to Literary Forms. Emerald, 2013.
- Bernard Blackstone. Practical English Prosody: A Handbook for Students. Longman, 2009.
- C. T. Thomas Ed. Chaucer to Housman Vol I .New Delhi: B.I. Publications 1990.
- Katherine Washburn and John S. Major Ed. World Poetry: An anthology of Verse from Antiquity to Our Time. New York: W. W. Norton, 1998.

- Margaret Ferguson, Mary Jo Salter and Jon Stallworthy. The Noeton Anthology of Poetry. 5th Ed. New York: W. W. Norton, 2005.
- Neil Corcoran. English Poetry since 1940. London: Longman, 1993.

Teacher/s –in Charge:

- Ms. Darly Mathew
- Ms. Ms Bindu Jose

Module Division:

Module	Month	Teacher/s-in--charge
Module 1	November	Darly Mathew
Module 2	December - January	Bindu Jose
Module 3	February	Darly Mathew
Module 4	March	Darly Mathew

Course/ Lesson Plan

Semester II

Course category: Common Course

Paper name: Writing for Academic & Professional Success

Code: A03

Contact Hours: 72(4 hrs/wk) **Credits: 3**

Course Outcome:

- **To develop writing skills, to learn to integrate writing and thought and to apply the conventions of academic writing correctly**
- **To acquire the correct sense of format, syntax, grammar, punctuation and spelling**
- **To acquire concepts, principles and vocabulary of resoning and argumentation and use analysis, synthesis and evaluation to advance arguments**
- **To gain an understanding of discourse conventions ranging from structure and paragraphing to tone and mechanics**

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I The Process of Writing	Introduction to Academic Writing: What is Academic Writing – Purpose of Academic Writing- types of academic writing – Features of academic writing	5	Lecture	Evaluation through question-answer session
	Structuring the essay: planning an essay – brain storming- organizing and outlining- writing a thesis statement- nature of supporting sentences- writing paragraphs- structure of an essay	4	Lecture/ Writing	Practice on Writing Paragraphs
	Vocabulary for writing: selection of vocabulary- Abbreviations_ choice of nouns and- adjectives- Appropriate verbs and adverbs- conjunctions	4	Presentation of new vocabulary	Reference reading and notes are evaluated.

	andprepositions Prefixes and suffixes- Synonyms- Common errors			
	Composing the content: writing introductions and conclusions- ordering the paragraphs - Proof-reading and editing_ Finalising the final draft.	5	Presentation and Lecture	Class test
Module II Elements of Writing	shaping strategies: Discussions, persuasions and arguments Mechanics and conventions of writing:	4	Lecture Student seminar	Question-answer sessions Seminar evaluation
	- comparison and contrast cause and effect-	4	Lecture	Presentation
	Defining and classifying problems and solutions	2	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	Punctuation, Use of articles, Relevance of examples, Generalizations, Academic style.	2	Lecture Student seminar	Class test of all the topics of Module II Seminar evaluation
Module III Writing for Professional Purpose 1	writing Reviews: Reviewing books - Reviewing movies - writing product reviews Writing Case Studies	5	Lecture Presentations	Question-answer sessions Seminar evaluation
	Writing Reports: Feasibility report, progress reports, Evaluative reports	5	Lecture Student seminar	Question-answer sessions
	Surveys::Conducting surveys- Designing questionnaires,	4	Student Seminar	Presentation
	Collecting data _ Writing descriptive reports	4	Discussion	Discussion on the different aspects
Module IV Writing for Professional Purpose II	Writing CVs Letter Writing:	3	Lecture	Question-answer sessions
	Transmittal and cover letters	3	Presentations	Discussion
	Emails, Writing summaries	3	Discussion	Discussion on various aspects

	Writing memos, On writing blogs, Etiquette in writing	3	Lecture	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic		All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	7	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		72hours		

Core Text: Author PublisherENG2 A03 WRITING FOR ACADEMIC AND PROFESSIONAL SUCCESS

Dr. Jacob George &Dr. Anwar Sadath University ofCalicut

Teacher/s –in Charge: Dr. Sr. A. Princy Anto

Ms. Darly Mathew

Module Division:

Module	Month	Teacher/s-in--charge
Module 1	June-July	Dr. Sr. A. Princy Anto
Module 2	June, July	Ms. Darly Mathew
Module 3	August	Dr. Sr. A. Princy Anto
Module 4	September	Ms. Darly Mathew
Module 5	August, September	Dr. Sr. A. Princy Anto
Module 6	October	Ms. Darly Mathew

Course/ Lesson Plan

Semester III

Course category: Core Course

Paper name: English Grammar and Usage

Code: ENG3BO4

Contact Hours: 90(5hrs/wk) **Credits: 4**

Course Outcome:

- To familiarize the students with the key concepts of English grammar and to use them more sensitively in their day-to-day communication needs.
- To help students towards a better language use through the understanding of the sentence patterns in English.
- To help the students develop a sense of English grammar, idioms, syntax, semantics and their usage.
- To develop the logical and analytical skills in the use of language for communication. e. To familiarize students with contemporary English usage

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I Basic Grammatical Units	Form class and Function words 6. English Morphology – Compounding, Affixation, Inflexion, Derivation 7. Phrasal verbs and idioms	3	Lecture	Evaluation through question-answer session
	Identifying the Grammatical labels and Functional labels of words	3	Lecture/ Writing	Practice on Writing
	Verb in Function—Gerund , Infinitives, Participles—their uses	3		
	Synonyms, Antonyms, Precise Use	3		
	Mood and Modality	3		

	English Morphology – Compounding, Affixation, Inflexion, Derivation Phrasal verbs and idioms	3		
Module II The Sentence	Word order and Sentence Pattern	5	Lecture Student seminar	Question-answer sessions Seminar evaluation
	Coordination and Subordination	5	Lecture	Presentation
Module III Sentence Transformations: A Relook at Traditional Categories	Tag questions	3	Lecture Presentations	Question-answer sessions Seminar evaluation
	Active passive	3	Lecture Student seminar	Question-answer sessions
	Direct and indirect	3		
	Simple, complex, Compound	3		
	Movement – Collocation	3		
Module IV Important Grammatical Concepts:	Time, Tenses and Aspects	3	Lecture	Question-answer sessions
	Lexical Verbs and Auxiliary verbs: Their uses	3		
	Anomalous Finites	3		
	Subject—Verb agreement in sentences	3		
	Degrees of Comparison	3		
Module V	Reorder jumbled sentences	5		
	Correct the given sentences according to accepted Modern usage and justify the changes made	5		
	Paragraph Editing	5		

	(with more focus on grammatical corrections)			
	Translate a passage from Mother Tongue to English	5		
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic		All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	7	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials

Gleason, H. A. Linguistics and English Grammar. Holt, Rinehart & Winston, Inc. 1965.

Leach, Geoffrey & Ian Savaitvik. A Communicative Grammar of English. ELBS.

Murphy, Raymond. English Grammar. Cambridge University Press, 2005

Quirk R. & Sidney Greenbaum. A University Grammar of English. ELBS.

Swan, Michael. Practical English Usage. Oxford University Press, 2005.

Thomson, A. J. and Martinet. A Practical English Grammar Combined Exercises Vol. 1 & 2. . Oxford University Press.

Quirk, Randolph. The Use of English. Longman, 1968. 19

Sailaja, Pingali. Indian English. Edinburgh University Press, 2009

Teacher/s –in Charge:DrSr A PrincyAnto

MsDarly Mathew

Module Division:

Module	Month	Teacher/s-in--charge
Module 1	June	DrSr A PrincyAnto
Module 2	July	DrSr A PrincyAnto
Module 3	August - October	DrSr A PrincyAnto
Module 4	June - August	MsDarly Mathew
Module 5	September - October	MsDarly Mathew

Course/ Lesson Plan

Semester V

Course category: Core Course

Paper name: Indian Writing

Code: ENG5B10

Contact Hours: 90(5hrs/wk) **Credits: 4**

Course Outcome:

- To provide an overview of the various phases of the evolution of Indian writing in English
- To introduce students to the thematic concerns, genres and trends of Indian writing in English
- To expose students to the pluralistic aspects of Indian culture and identity

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I Poetry	Rabindranath Tagore: Two verses - one each from The Gitanjali and The Gardener.	5	Lecture	Evaluation through question-answer session
	Sarojini Naidu: The Coromandel Fishers	5	Lecture/ Writing	Discussion
	Kamala Das: Introduction. ArunKolatkar: Old Woman	5	Lecture/ Writing	Reference reading and notes are evaluated.
	Agha Shahid Ali: Country without a Postcard	5	Presentation and Lecture	Class test
Module II Prose	B R Ambedkar: Speech at Mahad	7	Lecture Student seminar	Question-answer sessions Seminar evaluation
	Salman Rushdie: Imaginary Homelands.	8	Lecture	Presentation
Module III Fiction	R K Narayan: The Fortune Teller	7	Lecture Presentations	Question-answer sessions Seminar evaluation
	2. TemsulaAo: Laburnum for my Head.	9	Lecture Student seminar	Question-answer sessions
	3. JhumpaLahiri: The Interpreter of Maladies	9	Lecture Discussion	Presentation
Module IV	GirishKarnad: Fire	13	Lecture	Question-answer

Drama & Film	and Rain		Role Play Discussion	sessions
	Charulatha: dir. SatyajitRay	5	Film Screening Discussion	Discussion
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic		All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	7	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials

Iyengar, Sreenivasa. Indian Writing in English. Delhi: Sterling, 1984.

Naik, M.K. A History of Indian English Literature. Delhi: Sahitya Academy, 1982.

Mehrotra, A.K. A Concise History of Indian Literature in English. Delhi: Permanent Black, 2008

Naik, M.K. Perspectives on Indian Poetry in English. Delhi: Abhinav Publication, 1984

N.V. Bhairava and V. Sarang ed. Indian English Fiction 1980-1990:An Assessment. Delhi: Permanent Black, 1994.

Naik, M.K. and S.M. Panekar ed. Perspectives on Indian Drama in English. Delhi: Permanent Black, 1977.

Amga, H.I., Indo-English Poetry. Jaipur: Surabhi Publication, 2000.

Roy, Nelson, F.S., Reworlding: The Literature of Indian Diaspora. New York: Permanent Black, 1992.

Williams, H.M. Indo Anglian Literature, 1800-1970. Bombay: Orient Longman, 1976.

Anuradha. Patterns of Feminist Consciousness in Indian Women Writers: Some Feminist Issues. Delhi: Prestige Books, 1999

Teacher/s –in Charge:

MsBindu Jose

DrSr A PrincyAnto

Module Division:

Module	Month	Teacher/s-in—charge
Module 1	June - July	MsBindu Jose
Module 2	August - October	MsBindu Jose
Module 3	June - July	DrSr A PrincyAnto
Module 4	August - October	DrSr A PrincyAnto

Course/ Lesson Plan

Semester V

Course category: Core Course

Paper name: Language and Linguistics

Code: ENG5BO2

Contact Hours: 90(5hrs/wk) **Credits: 5**

Course Outcome:

- To lead lo a better understanding 0fthehumanmindofhuman communicative action and relations through an objective study of language.
- Tofamiliarisestudents with keyconcepts oflinguisticsanddevelopawareness of latest trends in languageStudy.
- To help students towards better pronunciation and to improvethegeneral standard of pronunciation in everyday conversation and in reading.
- To help the students developa sense of English grammar, idioms. syntaxand usage
- To improve writing and speech skills.

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I Language &Linguistics	Language - definitions - Theories related to the origin of language - Properties of human language as opposed to animal communication - Speech & Writing	4	Lecture	Evaluation through question-answer session
	Linguistics - definition - levels of linguistic analysis- Phonetics, phonology, morphology, syntax, semantics, semiology, discourse	5	Lecture/ Writing	Practice on Writing
	Branches of linguistics - psycho-linguistics, ethno-linguistics, socio-linguistics Language Varieties - Idiolect – Dialect - Isogloss- Register – Pidgin, Creole - Bilingualism	5		

	- Diglossia. (Concepts of linguist & polyglot)			
	Approaches to the study of linguistics - synchronic & diachronic - descriptive& prescriptive - traditional & modern Concepts of langue, parole, competence. performance	4		
Module II	Airstream mechanism -Organs of speech Classification & description of speech sounds - vowels - monophthongs, diphthongs, triphthongs - cardinal vowels - consonants	8	Lecture Student seminar	Question-answer sessions Seminar evaluation
	Phonology - phoneme - allophones- - transcription- IPA symbols, diacritics Phonemes in English - vowels, consonants, some important allophonic variants Homophones, homonyms	8	Lecture	Presentation
	Syllable- definition/description - structure - syllabic consonant - consonant clusters, abutting consonants Word accent Accent & rhythm in connected speech - weak forms Intonation	7	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	Juncture- Assimilation & Elision Transcription	7	Lecture Student seminar	Class test of all the topics of Module II Seminar evaluation

	Need for uniformity - RP & GIE.			
Module III	Morpheme, allomorph & morph	7	Lecture Presentations	Question-answer sessions Seminar evaluation
	Free & bound morphemes - content/lexical & functional/structural words - root, stem, affixes - derivational & inflectional affixes -Word-formation Semantics - Synonymy, antonymy, hyponymy, polysemy, ambiguity Semantic changes	8	Lecture Student seminar	Question-answer sessions
Module IV Writing for Professional Purpose II	Types of phrases, clauses & sentences	6	Lecture	Question-answer sessions
	Syntactic models - IC Analysis, labelled IC Analysis - PS Grammar - TG Grammar - kernel sentences & transforms - deep structure & surface structure - Some transformations - obligatory & optional - Interrogative - Do support - Negation - Passivisation - Co-ordination & subordination	9	Presentations	Discussion
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic		All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	7	All students are	Feedbacks are provided

			required to present a topic with the help of power point presentation, preferably.	and marks are considered for CIE
		90 hours		

Refernce Materials

Lyon, John. Language and Linguistics: An Introduction

Gimson, A.C. An Introduction to the Pronunciation of English

Murphy, Raymond. English Grammar

Trask, R. I. Key Concepts in Language and Linguistics

Martinet, Andre. Elements of General Linguistics

Swan, Michael. Practical English Usage.

Gleason, H.A. Linguistics and English Grammar Lyons,

John. Ed. New Horizon in Language

Hencock, Mark. English Pronunciation in Use

Hall, Christopher J. An Introduction to Language and Linguistics

Odden, David. Introducing Phonology

Matthews, P.H. Linguistics: A Very Short Introduction

Yule, George: The Study of Language.

Teacher/s –in Charge:DrSr A PrincyAnto

Ms Noble A Paliath

Module Division:

Module	Month	Teacher/s-in--charge
Module 1	June-July	DrSr A PrincyAnto
Module 2	June, July	Ms Noble A Paliath
Module 3	August - October	DrSr A PrincyAnto
Module 4	August - October	Ms Noble A Paliath

Course/ Lesson Plan

Semester I

Course category: Common Course

Paper name: Transactions:Essential English language Skills

Code: ENG1A01

Contact Hours: 72 **Credits: 3**

Course Outcome:

- **Students become able to pronounce the words correctly**
- **The speech of the students sound more natural and fluent with the use of phrasal verbs and idioms**
- **The vocabulary of the students become rich with synonymous expressions**
- **Students become capable to comprehend the reading materials.**

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I	Pronounciation-Introduction--speech sounds-vowels-consonants-	3	Presentation,Language lab,Drilling session,videos	Evaluation through test pacers,question-answer session
	basics of word/sentence	3	Lecture videos,presentation	Group activity games,test paper, question-answer session
	stress-	3	Language lab,presentation,lecture	Oral tests conducted individually
	resolving issues of L1 interference-e/m-learning corner.	3	Presentation and Lecture	Test Paper-question-answer session
Module II	Module 2: Vocabulary Introduction-synonyms-collocations-phrasal verbs-idiomatic expressions-vocabulary in everyday social contexts- e/m-learning corner.	3	Lecture Role plays,Dictionary,word games	Question-answer sessions ,Test papers
	synonyms-collocations-	3	Role plays, seminars,lecture'Dictionary	Oral test,Question-answer sessions

	phrasal verbs- idiomatic expressions- vocabulary in everyday social contexts- e/m-learning corner.	3	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	vocabulary in everyday social contexts- e/m-learning corner.	3	Lecture Student seminar,Role plays	Class test of all the topics of Module II Seminar evaluation
Module III	Introduction- major tenses-	3	Lecture Exerxises	Test papers,Question-answer sessions
	present-past-	3	Tense exercises,lecture, interactive sessions	Students must prepare sentences indicating the specified tenses and is to be evaluated.
	future-questions and negatives-	3	Tense exercises,lecture, interactive sessions	Students must prepare sentences indicating the specified tenses and is to be evaluated.
	modals-conditionals-e/m-learning corner	3	Tense exercises,lecture, interactive sessions	Students must prepare sample sentences based on the modals/conditionals and is to be evaluated.
Module IV	Social Communication: Introduction –	3	Lecture Discussion	Discussion on decorum to be kept in social communication
	sounding very polite-making a point/persuading-	3	Lecture ,Role plays, interactive sessions,	Oral tests,Students must prepare sentences expressing persuasion,request etc and is to be valuated
	opinions/preferences-encouraging/comforting- making suggestions/regrets.-complimenting-guessing telephoning in English.	3	Lecture ,Role plays, interactive sessions,	Oral tests,Students must prepare sentences expressing opinion preference,suggestions,regrets,complimenting,comforting etc and is to be valuated.Students must be divided into groups regarding the role play for telephonic conversation and is to be vealuated
	Academic Communication: discussion skills – presentation skills-debating skills- e/m-learning corner.	3	Lecture Discussion,presentation,	Seminars must be evaluated

Module V	Reading Skills Introduction-implicationst.	3	Lecture,discussion	Vocabulary tests to be conducted and evaluated
	/Tone/attitude/ viewpoint-	3	Loud reading&silent reading,Discussion,lecture	Students must prepare summary of the given paragraph and is to be evaluated
	effective reading comprehension skills-understanding generic/specific ideas /factual information--	3	Loud reading&silent reading,Discussion,lecture	Students must answer the comprehension questions and is to be evaluated
	vocabulary in context	3		
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 60 marks and 2 hours duration	7	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic		All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		72hours		

Reference Materials :

- English Pronounciation in Use Elementary by Jonathan M
- Better English Pronounciation by J. D O'Connor

Teacher/s –in Charge:

- Ms.Darly Mathew
- Dr.Sr.A Princy anto

Module Division:

Module	Month	Teacher/s-in--charge

Module 1	June-July	Darly Mathew
Module 2	August	Dr.Sr.Princy Anto
Module 3	September	Ms.Darly
Module 4	October	Dr.Sr.Princy anto

Course/ Lesson Plan

Semester :4

Course category: Core Course I

Paper name:Literary Criticism

Code: ENG4BO6

Contact Hours: 72 **Credits: 4**

Course Outcome:

- **The students identify the difference between literary criticism and theory**
- **They read literature keeping in mind the traditional principles of criticism**
- **The students write literature from the perspective of the theory**
- **The students produce critique of literature**

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I	Classical Literary Criticism 1. Plato: Concept of Art - Mimesis, His attack on poetry, Moral Concerns of literature, Views on Drama. 22	5	Lecture ,seminar presentation	Evaluation through question-answer session
	2. Aristotle: Poetics - Mimesis, Catharsis, Hamartia - Defence of Poetry - Definition of Tragedy-Parts of Tragedy, Plot, Tragic Hero, Three Unities, Comedy, Epic, Poetic style.	4	Lecture Discussion	Seminar presentations by students to be evaluated
	3. Horace: Ars Poetica - Definition of art, Views on Poetry and Drama.	3	Lecture and Discussion	Reference reading and notes are to be evaluated.
	4. Longinus: Romanticism, Sublimity in literature – Its sources.	3	Lecture.Discussion,Seminar	Class test including all the topics of module 1

Module II	English Literary Criticism – The Sixteenth to the Nineteenth Century 1. Philip Sidney: Apology for Poetry – Reply to Stephen Gosson, The Argumentative Method .2.John Dryden: Neoclassicism – The function of Poetry, Dramatic Poesy, Observations on tragedy, comedy, satire, epic	5	Lecture Student seminar	Question-answer sessions Seminar evaluation
	3.Dr. Samuel Johnson: Neoclassicism, Biographical Criticism, Historical approach, Observations on Poetry, Drama, Shakespeare, Tragicomedy, Three unities.–	3	Lecture Discussion	Evaluation through question-answer sessions
	The Nineteenth Century 1.William Wordsworth: "Preface to Lyrical Ballads" – The Romantic Creed - Difference between Neoclassicism and Romanticism - definition of poetry – poetic diction and language.2.S. T. Coleridge: Theory of Imagination, Fancy and Imagination, Primary Imagination and Secondary imagination, Poetic Genius.	4	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation

	3.P. B. Shelley: The Defence of Poetry – Concept of Poetry. 4.Mathew Arnold: Classicism - Concept of Culture – the use and function of poetry - Touchstone method – Moralistic criticism – Function of criticism – High seriousness and Grand Stylefcc	3	Lecture Student seminar	Class test of all the topics of Module II Seminar evaluation
Module III	The Twentieth Century 1.T.S. Eliot: "Tradition and Individual Talent" – Historical Sense – Impersonality – Poetic Emotion – Objective Correlative – Dissociation of Sensibility.	3	Lecture Discussion	Question-answer sessions
	2.I. A. Richards: Poetry and Communication, Practical Criticism - The Four Kinds of Meaning – Scientific and Emotive uses of Language. 3.F.R. Leavis: Concept of Literature and Criticism	5	Lecture Discussion	Student seminar presentations to be evaluated
	4.Formalism: Key Features of Formalism - Its Origin, Focus on language, Form, Literariness, Defamiliarization, Fabula/Syuzet, Motivation.	3	Lecture,Discussion	Question-answer sessions,seminar presentations

	5.New Criticism: The origin - Close reading and explication - Ambiguity, Paradox, Irony, Tension, Intentional Fallacy and Affective fallacy. 6.Archetypal Criticism: Myth, Archetype, Collective Unconscious, Northrop Frye	4	Lecture,presentation,discussion	Evaluation through question-answer session
Module IV	Glossary 1. Indian Aesthetics: Rasa, Dhwani,	6	Presentation,Discussion	Seminar presentations by students are to be evaluated
	Vyanjana, Alamkara, Thinai. 2. Literary Movements: Classicism, Neoclassicism,	4	Presentation,lecture	Seminar evaluation
	Romanticism, Humanism, Realism, Naturalism, symbolism.	2	Lecture Presentation	Seminar evaluation
	3. Literary Concepts: Catharsis, Mimesis, Objective Correlative, Ambiguity, Negative Capability	3	Lecture Discussion	Class test
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic		All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	7	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		72 hours		

Reference Materials :

- B Prasad, An Introduction to English Criticism.
- Lois Tyson, Critical Theory Today.
- David Daiches, Critical Approaches to Literature.
- Harry Blamires. A History of Literary Criticism.
- Ramaswamy S & Sethuraman V.S. The English Critical Tradition.
- Das B. B., Literary Criticism: A Reading

Teacher/s –in Charge:

- Ms.Darly Mathew
- Ms.Bindu Jose

Module Division:

Module	Month	Teacher/s-in--charge
Module 1	June-July	Ms.Darly Mathew
Module 2	August	Ms.Darly Mathew
Module 3	September	Ms.Bindu Jose
Module 4	October	Ms. bindu Jose

Course/ Lesson Plan

Semester I

Course category: Core Course I

Paper name:Introducing Literature

Code: ENG1BO1

Contact Hours: 108 **Credits:5**

Course Outcome:

- **The students read and enjoy theory**
- **The students theorise social issues**
- **The students become able to identify the constituents of language**
- **The students analyse events systematically**
- **The students acquire vocabulary**

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I	The Syntax: Verb Phrases, Adjuncts, Collocations, Linkers, Sense Groups	6	Lecture Presentation	Evaluation through question-answer session
	The Poetic: Comparisons, Exaggerations, Images, Symbols, Iamb, Trochee, Caesura, Enjambment	6	Lecture Presentation	Seminar presentations by students are to be evaluated
	Texts: 1. Ruskin Bond “Eyes of the Cat” 2. Anton Chekhov “The Death of a Clerk” 3.	6	Lecture Discussion	Reference reading and notes are evaluated.
	Alfred Lord Tennyson “The Oak” 4. Langston Hughes “Dreams” 5. Emily Dickinson “Because I could not Stop for Death”	6	Lecture Discussion	Class test including all the topics of module 1
Module II	Point of view (diegesis),	6	Lecture Student seminar	Question-answer sessions Seminar evaluation
	polyphony and its rationale, single perspective and its dangers Texts:	6	Lecture Presentation	Evaluation through question-answer sessions

	1. Freya Stark Winter in Arabia (excerpts)	6	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	2. Laura Bohannan "Shakespeare in the Bush" 3. Akira Kurosawa dir. Rashomon	6	Lecture Student seminar	Class test of all the topics of Module II Seminar evaluation
Module III	: Literature and Ideology The workings of power structures in literature; explication of the terms - ideology, hegemony, interpellation,	6	Lecture Debate Presentations	Question-answer sessions
	discourse, grand narratives, little narratives – using literary texts;	6	Lecture Discussion	Seminar Presentations
	literary devices like irony and paradox and their role in reinforcing ideology. Texts: 1. Arundhati Roy "The God of Small Things"	6	Lecture,presentation	Seminar presentations by students to be evaluated
	Charlotte Bronte "Jane Eyre" 3. George Orwell "A Hanging" 4. Hansda Sowvendra Shekhars "The Adivasi will not Dance"	6	Lecture Discussion	Evaluation of write-ups by students
Module IV	Perspective of the Subaltern Dominant voices, marginalized voices, Kingston "No Name Woman"	6	Lecture Debate	Evaluation of write ups by studentsc
	subaltern identities, resisting the norm/authority Texts: 1. RK Narayan Swami and Friends (Excerpt from Chapter XI "In Father's Presence")	6	Lecture Student Seminar	Seminar evaluation
	2. Arun Kamble "Which language should I Speak?" and FM Shinde "Habit" 3. The	6	Lecture Student Seminar	Seminar evaluation

	Letter Q: Ely Shipley 4. Maxine Hong	6	Lecture Discussion	Class test
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic		All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	7	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		108 hours		

Reference Materials :

- Achebe, Chinua. Things Fall Apart. Penguin, 1994.
- Angelou, Maya. I know Why the Caged Bird Sings. Bantam, 1971.\
- Austen, Jane. Pride and Prejudice. Penguin, 2003.
- Bond, Ruskin. "The Night the Roof Blew Off" Tigers Forever: Poems and Stories. RatnaSagar, Delhi, 1996

Teacher/s –in Charge:

- Ms.Bindu Jose
- Ms.Darly Mathew
- Ms.Keerthana Kannan

Module Division:

Module	Month	Teacher/s-in--charge
Module 1	June-July	Ms Darly Mathew
Module 2	August	Ms. Bindu Jose
Module 3	September	Ms.Keerthana Kannan
Module 4	October	Ms.Darly Mathew

Course/ Lesson Plan

Semester V & VI

Course category: Core Course I

Paper name: Project

Code: ENG6B21

Contact Hours: Nil **Credits:2**

Course Outcome:

- **The students prepare the bibliography of the project as per the MLA format**
- **The students present the ideas in a logical and coherent manner**
- **The students do the in-text citation as per the MLA format**
- **The students practice academic writing**

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I	Methodology of Research-The Principles of MLA style-The core elements		Lecture	Evaluation through question-answer session
	'The Mechanics of scholarly prose-formatting and ordering of the works cited list,in-text citation		Lecture Debate	Test paper
	Plagiarism		Presentation on Greco-Roman traditions and writers	Reference reading and notes are evaluated.
	Principles of Academic Writing-Difference between academic and non-academic writing,Characteristics of academic writing-Vocabulary		Presentation and Lecture	Class test including all the topics of the module
Module II	Library Work and data collection-Author&Primary Sources		Lecture Student seminar	Question-answer sessions Seminar evaluation
	Review of Litrerature		Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation

	Synopsis Preparation		Lecture Student seminar	Class test of all the topics of Module II Seminar evaluation
Module III	Data analysis-Collection of Secondary Materials		Lecture Debate Presentations	Seminars are to be evaluated
	Note taking		Lecture and materials on note-taking	Notes are to be evaluated
	Organisation of the data		Discussion	Arranged data is to be evaluated
	Analysis of the data		Discussion	Seminars are to be evaluated
Module IV	Project presentation and submission-Outline Preparation		Discussion	Outline is to be evaluated
	Rough Draft		Discussion	Rough draft is to be evaluated
	Fair Copy presentation and submission		Discussion	Seminar evaluation
	Viva-voce		Discussion	viva-voce
Evaluation: (12 hrs)				
Internal Examinations	Viva voce of 15 marks is to be conducted	20mts.	Viva Voce	Performance during the viva as well as organization, originality and methodology are evaluated
Assignments	Topics regarding the project		All students are required to prepare assignments regarding the project topic	Assignments are corrected and feedbacks are given.
Seminars	Topics regarding the project	7	All students are required to present topics with the help of power point preferably.	Feedbacks are provided
		Nil		

Reference Materials :

- MLA Handbook Eighth Edition
- Primary Sources of the respective project
- Secondary sources regarding the respective project

Teacher/s –in Charge:

- Ms.Darly Mathew
- Ms.Sandra Juliet Jose

Module Division:

Module	Month	Teacher/s-in--charge
Module 1	June-July ,August	Ms.Darly&Ms.Sandra
Module 2	September,October	Ms.Darly &Ms.Sandra
Module 3	October,November,Decembr	Ms.Darly&Ms.Sandra
Module 4	January,February,March	Ms.Darly &Ms.Sandra

Course/ Lesson Plan

Semester :V

Course category: Core Course

Paper name: Literary Theory

Code: ENG5B08

Contact Hours: 90 **Credits: 4**

Course Outcome:

- **Students read on the important texts and movements of literary theory.**
- **Students prepare critique of literature and culture in the context of literary theory.**
- **Students analyse the various arguments presented in literary theory**
- **Students look into the various literary texts and**

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I	Liberal Humanism versus Theory- Introduction	3	Lecture	Evaluation through question-answer session
	1. Liberal Humanism: Dominant aspects of Liberal humanism with examples	3	Lecture Discussion	Evaluation through question-answer sessionn
	2. Literary Theory: Dominant aspects of literary theory with examples.	4	Lecture,discussion,Presentation on literary theory	Evaluation through question-answer sessioReference reading and notes are evaluated.
	Linguistic Turn – Critical turn – Paradigm shif	5	Lecture and discussion	Class test including all thetopics of Module 1
Module II	1. Structuralism: Saussure - Sign, Signifier, Signified – Claude Levi-Strauss and Roland Barthes – Structuralist narratology	4	Lecture,Discussion Student seminar	Question-answer sessions Seminar evaluation
	2. Poststructuralism: Derrrida, Logocentrism, Aporia, Decentering	4	Lecture,Discussion Student seminars	Student Seminars are to be evaluated

	3. Psychoanalytic Theory: Unconscious. Fre ud – Id, Ego, Superego, Oedipus Complex.	3	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	Lacan – Imaginary, Symbolic, Real, Mirror Stage	4	Lecture Student seminar	Class test of all the topics of Module II Seminar evaluation
Module III	1.Marxism: Base, Superstructure, Materialism, ideology. The Frankfurt School – Culture industry.	4	Lecture Discussion Presentations	Question-answer sessions
	Antonio Gramsci – The formation of the intellectuals, Subaltern. Louis Althusser – Ideological State apparatus and Interpellation. 2.Cultural Studies: Culturalism, New Left, CCCS,	3	Lecture Discussion	Seminar evaluation
	Raymond Williams' definition of Culture, Structure of feeling, Stuart Hall and the 'popular', and the two paradigms of Cultural Studies.3.Cultural Materialism	4	Lecture Discussion	Seminar evaluation
	New Historicism: Marxist framework of Culture and History, Historiography, Foucauldian notion of Power, Difference with Old Historicism, Stephen Greenblatt, Louis Montrose	4	Lecture,Discuss ion , Seminars	Evaluation through question-answer session
Module IV	. Feminism: The three waves in feminism, Gynocriticism,,	3	Lecture Debate	Debate on the various perspectives of feminism

	French Feminism - Ecriture feminine, Sexual Politics, Marxist Feminism, Lesbian Feminism	4	Lecture,Discussion Student Seminar	Seminar evaluation
	Backlash, Black Feminism, Dalit Feminism, Postfeminism, Womanism.	4	Lecture,Discussion Student Seminar	Seminar evaluation
	Queer Theory: Social constructionism of gender and sexuality, LGBTIQ, Transgender identity	4	Lecture, Discussion	Debate on 'gender as performative'
Module V	Postcolonialism: Eurocentrism, Orientalism, Alterity,	5	Lecture,Discussion	Seminar evaluation
	Diaspora, Hybridity, Uncanny, Strategic Essentialism, Subaltern Studies, Postcolonial Critique of Nationalism.	4	Lecture,Discussion	Seminar evaluation
	. Postmodernism: Critique of Enlightenment and Universalism, Habermas's notion of Modernity as an Incomplete Project, Lyotard's concept of incredulity towards metanarratives, Baudrillard's ideas of Simulation, Simulacra and hyperreality, Brian McHale's concept of Postmodernist literatures.	5	Lecture,Discussion,Discussion	Seminar evaluation
	. Ecocriticism: Anthropocentrism, Shallow Ecology vs Deep Ecology, Environmental Imagination, Ecofeminism	4	Lecture,Discussion,Discussion	Debate on 'How to maintain the balance between nature and culture'
Evaluation: (12 hrs)				

Internal Examinations	Two internals of 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic		All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	7	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials :

- Hans Bertons. Literary Theory.
- Terry Eagleton. Literary Theory: An Introduction.
- Aijaz Ahmad. In Theory: Classes, Nations, Literatures.
- Jonathan Culler. Literary Theory: A Very Short Introduction.
- Terry Eagleton. After Theory. 27 Peter Barry. Beginning Theory.

Teacher/s –in Charge:

- Ms.Darly Mathew.
- Ms.Sandra Juliet Jose

Module Division:

Module	Month	Teacher/s-in--charge
Module 1	June-July	Ms.Sandra Juliet Jose
Module 2	August	Ms.Darly Mathew
Module 3	September	Ms.Darly Mathew
Module 4	October	Ms.Sandra Juliet Jose

Course Plan

Semester **:** III

Course Category **:** Complementary Course II

Paper Name : Introduction to TV and Cinema

Code **:** JOU3C02

Contact Hours **:** 108 (6 hrs per week)

Credits **:** 4

Course Outcomes

- Introduce the TV Broadcast journalism to the students
- Introduce the students the medium cinema and its characteristics

Modules	Contents	Hours	Procedure/ Activity/ plans	Assessment
Module I: Evolution of Television	Television: Characteristics, Scope and Limitations - Origin and Development of Television	5	Lecture	Evaluation through question-answer session
	DD Cable TV, Satellite TV, DTH; News Channels with Special Reference to Malayalam	4	Lecture Debate	Debate on the topic "Advantages of Cable TV"
	Organisational Structure of News Wing of a TV Channel	4	Presentation on Organisational Structure of News Wing of a TV Channel	Reference reading and notes are evaluated.
	TV on Web, TV on Mobile	5	Presentation and Lecture	Class test including all the topics related to Evolution of Television
Module II: Television News Programmes	Structure and Types of TV News – TV News Gathering - News Writing – Voice Over, News Production, Anchoring, PCR,	5	Lecture Student Seminar	Question-answer sessions Seminar evaluation

	Teleprompter			
	Scripting for Television Programmes -	4	Lecture Debate	Presentation on "Scripting for Television"
	TV Interviewing, Discussion, TV Magazines, Live Programmes	3	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	Special Audience Programmes, Sting Operation	3	Lecture Student seminar	Class test of all the topics of Module II Seminar evaluation
Module III: An Overview of Cinema	Cinema; Characteristics and Types Cinema: A Brief History. - Lumiere Brothers and Early Experiments Major Film Movements – An Overview	4	Lecture Debate Presentations	Question-answer sessions Seminar evaluation
	German Expressionism- Cabinet of Dr. Caligary by Robert Wiene. Soviet Montage - Battleship Potemkin by Sergie Eisentein	5	Lecture Student seminar	Question-answer sessions
	Italian Neo Realism - Bicycle Thieves by Vittorio Desseca	1	Student Seminar	Presentation
	A Few Great Masters: Charles Spencer Chaplin - Akira Kurosawa, Kim Ki Duk and Mohsen Makmalbaf	2	Discussion	Discussion on the filmic aspects of eminent film makers
Module IV: Indian Cinema	Indian Cinema: Early Experiments, New Wave and Commercial Cinema, FTII – Indian Masters	6	Lecture Presentations	Question-answer sessions
	H.S. Bhatwadekar, DG Phalke, Satyajith Ray	3	Presentations	Topics related to the module
	Ritwik Ghatak, Mrinal Sen	3	Discussion	Discussion on the topics taught
	Girish Kasaravalli, K Balachandar	6	Lecture	Evaluation through question-answer session
	Malayalam Cinema – A dDecade-wise Overview	4	Lecture	Evaluation through question-answer session

Module V: Malayalam Cinema	Masters: - Adoor Gopalakrishnan - G Aravindan	4	Debate	Debate on "Adoor Gopalakrishnan Films: Merits and Demerits"
	John Abraham, P.N. Menon	3	Discussion and Student Seminar	Evaluation through question-answer session
	K.G. George; Contemporary Malayalam Cinema	3	Lecture and Discussion	Class test
Module VI: Basics of Film Making	Steps in Film Making	4	Lecture	Evaluation through question-answer session
	Pre Production	4	Lecture Student Seminar	Seminar evaluation
	Production	5	Lecture Student Seminar	Seminar evaluation
	Post Production	6	Lecture Discussion	Class test
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic		All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	7	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		108 hours		

Reference Materials :

- Herbert Zettl. Television Production Handbook, 7th Edition.
- Arthur Asa Berger. Scripts, Writing for Radio and Television. SAGE Publications.
- Virginia Wright Wexman. A history of Film. 6 th edition.
- Jarek KUPSC. The History of Cinema for beginners.

- Keval J. Kumar, Mass Communication in India‘, Jaico Publishing House, New Delhi.

Teacher/s –in Charge:

- Ms. Sandra Juliet Jose
- Ms. Noble A. Paliath

Module Division

Module	Month	Teacher/s-in--charge
Module 1	June-July	Noble A. Paliath
Module 2	June-July	Sandra Juliet Jose
Module 3	August	Sandra Juliet Jose
Module 4	September	Sandra Juliet Jose
Module 5	August-September	Noble A. Paliath
Module 6	October	Sandra Juliet Jose

Course Plan

Semester **: II**

Course Category **: Common Course**

Paper Name **: Zeitgeist: Readings on Society and Culture**

Course Code **: ENG2A04**

Contact Hours **: 90 (5 hrs/wk)**

Credits **: 4**

Course Outcomes:

- To inculcate the values enshrined in the constitution of India and to provide an insight on the secular framework of the country.
- To familiarize the learners with concepts such as conservation, sustainability and the life of the marginalized and their interconnectedness.
- To foster among learners an awareness of the diverse problems faced by women and the sexual minorities and to promote a culture of inclusion.
- To understand the "human" as articulated among the various cultures and promote a multicultural and plural understanding of rights.

Modules	**Contents**	**Hours**	**Procedure/ Activity/ Plans**	**Assessment**
Module I: **Indian Constitution and Secularism**	Preamble to the Constitution of lndia	5	Lecture	Evaluation through question-answer session
	Should Gandhi's Assassin be Killed?	4	Lecture Debate	Debate on the topic "Should Gandhi's assassin be killed?"
	Toba Tek Singh	6	Presentation and lecture	Reference reading and notes are evaluated.
	Freedom	5	Presentation and lecture	Evaluation through question-answer session
Module II: **Sustainable Environment**	The End of Living and the Beginning of Survival	5	Lecture Listen To The Original Speech As Made By Chief Seattle	Question-answer sessions Seminar evaluation
	The End of Living and the Beginning of Survival	7	Lecture Debate	Debate on the topic "Is there an immediate need to protect nature?"
	Zlateh the Goat	3	Lecture Student Seminar	Write-ups of students are to be evaluated. Seminar evaluation
	On Killing a Tree	3	Lecture Explore More Poems By Gieve Patel	Class test of all the topics of module ii Seminar evaluation
		8	Lecture	Question-answer

			Debate Presentations	sessions
Module III: **Gender**	The Story of an Hour	3	Debate	Debate on the "Marriageable age of boys as 21?"
	Refugee Blues	4	Discussion	Discussion on the application
	What it Means to be a Transgender?	6	Lecture	Evaluation through question-answer session
Module IV: **Human Rights**	Refugee Blues	4	Lecture Debate	Debate on "Are human rights completely violated?"
	Amnesty	4	Lecture Student Seminar	Seminar evaluation
	Akkarmashi	5	Lecture Student Seminar	Seminar evaluation
	Chemical Happiness and the Meaning of Life	6	Lecture Discussion	Class test
Evaluation: (12 hrs)				
Internal Examinations	Two Internals of 80 Marks and 2.5 Hours Duration	5	Written exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any Topic		All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE internal mark is awarded on the basis of assignments too.
Seminars	Any Topic	7	All students are required to present the assigned topics	Feedbacks are provided and marks are considered for CIE.
		90 hours		

Reference Materials:

- Wagner G., T. Kåberger, S. Olai, M. Oppenheimer, K. Rittenhouse and T. Sterner, "Push Renewables to spur carbon pricing", *Nature*, 525:27-29 (3 September 2015) [DOI:10.1038/525027a]
- Jensen S., K. Mohlin, K. Pittel and T. Sterner (2015) "The green paradox: a brief introduction to Climate policy and intertemporal emissions leakage", *Review of Environmental Economics and Policy* (Summer 2015) 9 (2): 246-265

- Management, Gender, Race**,** by Margaret F. Karsten, with contributions from Joan E. Riedle (2005)
- Contemporary Women Novelists: New Voices for the New Millennium: A Selected List, by Helene Androski (2005).
- (Inter)disciplining Chinese Women: An Introduction to the English-Language Literature on Women's Studies in China, by Patricia Arend (October, 2000)

Teachers -in-Charge:

- Ms. Noble A. Paliath
- Ms. Sandra Juliet Jose

Module Division:

Module	**Month**	**Teachers-in-Charge**
Module 1	October, November, December	Ms. Noble A. Paliath
Module 2	January, February, March	Ms. Noble A. Paliath
Module 3	October, November, December	Ms. Sandra Juliet Jose
Module 4	January, February, March	Ms. Sandra Juliet Jose

Course Plan

Semester : III

Course Category : Common Course

Paper Name : Signatures: Expressing the Self

Code : ENG3 A05

Contact Hours : 90 (5hrs/wk)

Credits : 4

Course Outcomes:

- To enable the students to read and critically appreciate the different genres of expressing the self
- To appreciate the fluid and flexible narratives of self expression that transcend the conventions of genre
- To understand how personal narratives intersect with the larger social realities
- To read personal narratives that move beyond the individual self to express the collective self
- To understand how the distinctions between fact and fiction blur in personal narratives

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I: Autobiographical Writings and Memo	Memoirs	5	Lecture	Evaluation through question-answer session
	Pilgrim at Tinker Creek	4	Lecture	Evaluation through question-answer session
	I Stand With You Against the Disorder	6	To trace the history of Okanagan Community	Reference reading and notes are evaluated.
	When I was Growing Up	5	Presentation and Lecture	Class test including all the covered topics of module I
Module II: Speeches and Testimonies	Art, Truth and Politics	5	Lecture Student seminar	Question-answer sessions Seminar evaluation
	Charlie Chaplin's Final Speech in the Movie 'The Great Dictator'	7	Lecture Debate	Debate on the topic of "Is the concept of democracy fully enjoyed by the masses?"
	Voices from Chernobyl	3	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation

	Breaking Silence	3	Lecture Student seminar	Class test of all the topics of Module II Seminar evaluation
Module III: Diary Entries and Letters	A Diary of a Young Girl	8	Lecture Debate Presentations	Question-answer sessions
	The Secret Diary of Adrian Mole Aged 13 3/4	3	Reading based on the entire diary of Anne Frank	Question-answer sessions
	Letters from the Mothers of Nenjamparambu to the Supreme Court	4	Discussion on the impact of the use of Endosulphan	Recap of the discussion through question-answer sessions
	Letter to Adolf Hitler	6	Reading based on the two autobiographies, viz, Gandhi's and Hitler's	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 80 Marks and 2.5 hours duration	5	Written exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic		All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE internal mark is awarded on the basis of assignments too.
Seminars	Any topic	7	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE.
		90 hours		

Reference Materials:

- Harner, James L. Literary Research Guide: An Annotated Listing of Reference Sources in English Literary Studies. 5th ed
- Marcuse, Michael J. A Reference Guide for English Studies.
- Howard-Hill, T. H. Bibliography of British Literary Bibliographies. 2nd ed.

- Watson, George, ed. The Shorter New Cambridge Bibliography of English Literature
- Watson, George & I.R. Wilson, eds. The New Cambridge Bibliography of English Literature.

Teachers-in-Charge:

- Dr. Sr. A. Princy Anto
- Ms. Darly Mathew
- Ms. Noble A. Paliath

Module Division:

Module	**Month**	**Teachers-in-Charge**
Module 1	June - October	Ms. Darly Mathew
Module 2	June - October	Dr. Sr. A. Princy Anto
Module 3	June - October	Ms. Noble A. Paliath

Course Plan

Semester : V

Course Category : Open Course

Paper Name : English for Competitive Examinations

Code : ENG5D01

Contact Hours : 54 hrs (3 hrs per week)

Credits : 3

Course Outcomes:

- To prepare the students for competitive exams such as UPSC, Defence, SSC, Banking, KPSC, Insurance and other examinations.
- To help the students to approach and qualify competitive examinations by introducing the usually discussed areas in the exams.
- To enable the learners to acquire necessary professional skills in the usage of English.
- To provide opportunities for the students to improve their listening and reading comprehension skills.

Modules	Contents	Hours	Procedure/ Activity/ Plans	Assessment
Module I: Word Based Questions	Synonyms, Antonyms, One Word Substitution	4	Lectures/ Sample exercises/ references and practical activities based on previous years' question papers	Evaluation through question/answer sessions
	Analogy, Idiomatic Use of Verbs	4	Lectures/ Sample exercises/ references and practical activities based on previous years' question papers	Peer tutoring
	Test of Spellings	4	Lectures/ Sample exercises/ references and practical activities based on previous years' question papers	Periodical test papers
	Correct Use of Prepositions and Articles	4	Lectures/ Sample exercises/ references and	Timely submission of assignments and presentation of seminars

			practical activities based on previous years' question papers	based on the assigned topics
Module II: Sentence Based Questions	Error Identification	4	Lectures/ Sample exercises/ references and practical activities based on previous years' question papers	Evaluation through question/answer sessions
	Sentence Correction	4	Lectures/ Sample exercises/ references and practical activities based on previous years' question papers	Peer tutoring
	Jumbled Words in a Sentence	3	Lectures/ Sample exercises/ references and practical activities based on previous years' question papers	Periodical test papers
	Sentence Completion	3	Lectures/ Sample exercises/ references and practical activities based on previous years' question papers	Timely submission of assignments and presentation of seminars based on the assigned topics
Module III: Passage Based Questions	Jumbled Sentences in a Paragraph	4	Lecture/individual presentations	Periodical test papers
	Reading Comprehension	4	Reading exercises from the best-selling existing catalogue of secondary materials	Random passages are selected from the best-selling existing catalogue of secondary materials and are finally assessed through test papers
	Reading Comprehension	3	Reading exercises from the best-selling existing catalogue of secondary materials	Discussions on the application procedure
	English Comprehension	3	Lecture sessions followed by practical examples	Individual students are asked to work out on the assigned topic and the performances are

				evaluated and graded
Evaluation: (10 hrs)				
Internal Examinations	Two Internals of 60 Marks and 2 Hours Duration	4	Written exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any Topic		All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE internal mark is awarded on the basis of assignments too.
Seminars	Any Topic	6	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE.
		54 Hours		

Reference Materials:

- Edgar Thorpe and Showick Thorpe : Objective English for Competitive Exams.
- Michael Swan : Practical English Usage.
- Wren and Martin : High School English Grammar & Topic

Teachers–in- Charge:

- Ms. Darly Mathew
- Ms. Noble A. Paliath

Module Division:

Module	**Month**	**Teachers-in--charge**
Module 1	July - October	Ms. Noble A. Paliath
Module 2	July, August	Ms. Darly Mathew
Module 3	September, October	Ms. Darly Mathew

Course/ Lesson Plan

Semester **:I**

Course category **: Common Course I**

Paper name **: WAYS WITH WORDS:LITERATURES IN ENGLISH**

Code **: ENGlA02**

Contact Hours **: 90** **Credits: 3**

Course Outcome:

- **To help students develop the acumen to read, appreciate and discuss literature.**
- **To introduce students to the linguistic qualities of a literary text and to unravel the many meanings of the text**
- **To acquaint the students with different genres of literature and to analyse them**

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I	Shakespeare. Keats	5	Lecture	Evaluation through question-answer session
	Frost, Chitre	4	Lecture Debate	Discussion on Modernism in poetry
	Maya Angelou, Okara	6	Presentation on Greco-Roman traditions and writers	Reference reading and notes are evaluated.
	Bob Dylan	5	Presentation and Lecture	Class test including all the Module 1
Module II	Appointment in Samarra	5	Lecture Student seminar	Question-answer sessions Seminar evaluation
	A Shocking Accident: Graham Greene	7	Lecture Debate	Discussion on short stories
	Lamb to the Slaughter: Roald Dahl	3	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	1t Used to be Green Once	3	Lecture Student seminar	Class test of all the topics of Module II Seminar evaluation
Module III	Bores: E. V Lucas	8	Lecture Debate Presentations	Question-answer sessions
	Night- walkers and Mystery Mongers: sense and Nonsense at the Edge of science: Carl Sagan	3	Discussion	Discussion on the application
	Night- walkers and Mystery Mongers:	4	Discussion	Discussion on the application

	sense and Nonsense at the Edge of science: Carl Sagan			
	Night- walkers and Mystery Mongers: sense and Nonsense at the Edge of science: Carl Sagan	6	Lecture	Evaluation through question-answer session
Module IV	Something Unspoken: Tennesee Williams	4	Lecture Debate	Discussion on plays
	One Act play	4	Lecture Student Seminar	Seminar evaluation
	Different shades of the play	5	Lecture Student Seminar	Seminar evaluation
	Summarising the entire book	6	Lecture Discussion	Class test
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic		All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	7	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials :

- ENGl A02 WAYS WITH WORDS : LITERATURES IN ENGLISH, BoS, University of Calicut, University of Calicut

Teacher/s –in Charge:

- Ms. Bindu Jose, Ms. Noble A. Paliath, Ms. Sandra Juliet Jose

Module Division:

Module	Month	Teacher/s-in—charge
Module 1	June-September	Ms Bindu Jose
Module 2	June- August	Ms. Bindu and Ms Noble
Module 3	June- August	Ms. Sandra
Module 4	Sptember, October	Ms. Sandra and Ms. Noble

Course/ Lesson Plan

Semester II

Course category: Complementary Course II/ Complementary Course in Electronic Media

Paper name: Introduction to Electronic Media

Code: JOU2C02

Contact Hours: 108 **Credits : 4**

Course Outcome:

- **Make them aware of communication and radio**
- **Stress the importance of radio as a mass media**
- **Introduce them to the New Media and the writing practices**

Modules	Contents	Hours	Procedure/ Activity/ plans	Assessment
Module I	Definition, elements and types of communication, mass communication - nature, characteristics, functions and dysfunctions of mass	5	Lecture	Evaluation through question-answer session
	Mass media - types of media: print, radio, TV	4	Lecture Debate	Debate on the topic "Media and its influences"
	Film and new media	4	Presentation on Greco-Roman traditions and writers	Reference reading and notes are evaluated.
	News: types of news - news determinants – news story structure- print VS broadcast news.	5	Presentation and Lecture	Class test including all the topics related to News Media
Module II	Characteristics, scope and limitations of Radio	5	Lecture Student seminar	Question-answer sessions Seminar evaluation
	Brief history of radio and AIR; Organisational set up of AIR;	4	Lecture Debate	Presentation on AIR
	Types of radio stations: AM, FM, Community radio	3	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	Private F M Stations in Malayalam; Online Radio, Radio on Mobile.	3	Lecture Student seminar	Class test of all the topics of Module II Seminar evaluation
Module III	Basic elements of radio	4	Lecture	Question-answer sessions

	programme- sound, music and effects		Debate Presentations	Seminar evaluation
	Writing for the ear - radio news writing, news reading- script writing for different radio programmes – interview, talk, feature, commentary, magazine programmes, radio drama, documentary;	5	Lecture Student seminar	Question-answer sessions
	Radio Jockeying	1	Student Seminar	Presentation
	Outside Broadcasting- Cultural event and Sports event.	2	Discussion	Discussion on the different aspects
Module IV	Internet as a medium of communication: history and evolution of internet	6	Lecture Debate Presentations	Question-answer sessions
	characteristics of new media: immediacy,	3	Debate	Debate on the pros and cons of Internet
	interactivity, universality, hypertext, multimedia, media convergence	3	Discussion	Discussion on the aspects of Internet
	Cyber laws and IT Act	6	Lecture	Evaluation through question-answer session
Module V	Online reporting: language and style of online journalism,	4	Lecture	Evaluation through question-answer session
	tools for newsgathering, news determinants in cyberspace, dos and don‘ts of online reporting;	4	Debate	Debate on Online reporting and accuracy
	Online News writing: Types of Online news	3	Discussion and Student Seminar	Evaluation through question-answer session
	writing breaking news, writing features, editing – HL writing	3	Lecture and Discussion	Class test
Module VI	Social media: evolution, definition and types,	4	Lecture Debate	Debate on Social Media: Boon or Bane?
	social media as a tool for news gathering, social media activism: Jasmine Revolution, India Against Corruption movement,	4	Lecture Student Seminar	Seminar evaluation
	, Social media as a tool for Political Communication, social media as a tool for Public Relations,	5	Lecture Student Seminar	Seminar evaluation
	Political	6	Lecture	Class test

	Communication and Propaganda.		Discussion	
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic		All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	7	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		108 hours		

Reference Materials :

- Joseph A Devito : Communicology: An Introduction to the study of Communication, Harper and Row, New York, 1985.
- Joseph R. Dominick : The Dynamics of Mass Communication, McGraw Hill, New Delhi.
- Agee, Ault & Emery : Introduction to Mass Communications, Harper and Row, New York, 1985.
- Spencer Crump : Fundamentals of Journalism, McGraw Hill Book Company.
- Oxford : International Encyclopedia of Communications

Teacher/s –in Charge:

- Ms. Sandra Juliet Jose
- Ms. Noble A. Paliath

Module Division:

Module	Month	Teacher/s-in--charge
Module 1	June-July	Noble A. Paliath
Module 2	June, July	Sandra Juliet Jose
Module 3	August	Sandra Juliet Jose
Module 4	September	Sandra Juliet Jose
Module 5	August, September	Noble A. Paliath

Module 6	October	Sandra Juliet Jose

Course/ Lesson Plan

Semester : **IV**

Course category : **Common Course**

Paper name : **SPECTRUM: LITERATURE AND CONTEMPORARY ISSUES**

Code : **ENG4A06**

Contact Hours: 90 **Credits: 4**

Course Outcome:

- **The learner's are aware of the humanist dimensions of literature**
- **Learner's understand the concepts like globalisation, commercialisation and intellectual property rights**
- **The spirit of universal brotherhood is deeply engraved in students**
- **Students are aware of the rights of the minorities.**

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I Literature and Media	Divided Times	5	Lecture	Evaluation through question-answer session
	Concepts of othering and influence of Media	4	Lecture Debate	Debate on the topic Media and its effects
	Komala	6	Presentation on Greco-Roman traditions and writers	Reference reading and notes are evaluated.
	Komala	5	Presentation and Lecture	Class test including all the topics
Module II	Cheriya Meenukalum Valiya Malsyavum	5	Lecture Student seminar	Question-answer sessions Seminar evaluation
	Cheriya Meenukalum Valiya Malsyavum	7	Lecture Debate	Debate on the topic of globalization and its effects
	Turmeric	3	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	What Work Is	3	Lecture Student seminar	Class test of all the topics of Module II Seminar evaluation
Module III	Home	8	Lecture Debate Presentations	Question-answer sessions
	Love Across the Salt Desert	3	Debate	Debate on the Migrants and the attitude towards them
	No men are Foreign:	4	Discussion	Discussion on the

	James Kirkup, Death Fugue: Paul Celan			application
	Jamaican Fragment: A. L. Hendricks	6	Lecture	Evaluation through question-answer session
Module IV	UN Speech: Malala Yousufzai	4	Lecture Debate	Debate on women rights
	Caring for Animals: Jon Silkin	4	Lecture Student Seminar	Seminar evaluation
	The Cry of the Gull: Emmanuelle Labroire (Excerpts)	5	Lecture Student Seminar	Seminar evaluation
	Average Waves in Unprotected Waters: Anne Tyier'	6	Lecture Discussion	Class test
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	5	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	2	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials :

- ENG4 A06 Spectrum: Literature and Contemporary Issues, BoS, Calicut University published by Calicut University

Teacher/s –in Charge:

- Sr. A. Princy Anto
- Ms. Darly Mathew
- Ms. Noble A.Paliath
- Ms. Sandra Juliet Jose

Module Division:

Module	Month	Teacher/s-in—charge
Module 1	June-August	Ms. Darly, Ms. Sandra
Module 2	June- August	Sr. Princy, Ms. Noble
Module 3	September- October	Sr. Princy, Ms. Noble
Module 4	September- October	Ms. Darly, Ms. Sandra

Course/ Lesson Plan

Semester VI

Course category: Core Course

Paper name: Voices of Women

Code: ENG6B11

Contact Hours: 90

Credits: 4

Course Outcomes:

a. To equip students to steer clear of misconceptions regarding women and to evolve a human perspective about them.
b. To arouse a keen interest in analysing critically the diversity of women's experiences across the world and to marvel at their creative skills.
c. To perceive gender as a social construct

Modules	Contents	Hours	Procedure/Plan	Assessment
Module 1: Essays	1. Chimamanda Ngozi Adichie: We Should All Be Feminists	9	Lecture	Question-answer sessions
	2.Virginia Woolf: Shakespeare's Sister	9	Lecture	Extended reading exercises
Module II: Poetry	1. Eunice D Souza: Bequest 2. Amy Lowell: Vintage	5	Lecture Student seminars	Question-answer sessions Seminar evaluation
	3. Sappho: To Anactoria in Lydia	7	Lecture	Extended reading exercises
	4. Inez Hernandez Avila: To Other Women Who Were Ugly Once	3	Lecture Student seminars	Seminar evaluation
	5. Judith Wright: Eve to her Daughters	3	Lecture Student seminars	Assessment of learning progress of students through class test
Module III: Fiction	Novel: Kate Chopin : *The Awakening*	15	Lecture Assignments	Extended reading exercises
	Short stories 1. Clarice Lispector : Preciousness	8	Lecture and Discussion	Nuances of the short stories
	2. Alice Walker: The Flowers	7	Discussion	Extended reading exercises
Module IV: Drama and Film	Thozhilkendrathilekku Makhmalbuf	4	Lecture Debate Seminar	Seminar and discussion
	At Five in the Afternoon : dir.	4	Lecture Student Seminar	Seminar evaluation
	Samira Mustang : dir Denize Gamze	4	Lecture Student Seminar	Seminar evaluation

	Erguven			
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 80 marks and 2.5 hours duration		Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic relevant to the subject under discussion	5	All students are required to prepare an assignment from any of the topics relevant to the subject under discussion	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic relevant to the subject under discussion	7	All students are required to present a topic with the help of power point presentation, preferably	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials:

- Kamala Bhasin---What is Patriarchy?
- Nivedita Menon--Seeing like a Feminist
- Naomi Wolf--Beauty Myth
- Alice Walker ---Colour Purple
- Caryl Churchill---Vinegar
- Tom Deepa Mehta's films---Earth, Fire, Water
- Rina Das' Film---The Village Rockster

Teachers–in-charge:

- Dr. Sr. A. Princy Anto
- Ms. Noble A. Paliath

Module Division:

Module	**Month**	**Teachers-in-charge**
Module 1	Nov-Dec	Ms. Noble A. Paliath
Module 2	December	Ms. Noble A. Paliath
Module 3	January	Dr. Sr. A. Princy Anto
Module 4	February	Dr. Sr. A. Princy Anto

Course/ Lesson Plan

Semester VI

Course category: Core Course

Paper name: Classics of World Literature

Code: ENG6B12

Contact Hours: 90 (5hrs per week) **Credits: 4**

Course Outcome:

- **To help them to appreciate great Classics**
- **To introduce different cultural perspectives**
- **To enhance the literary sensibility of students**

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I Introduction to the ancient world	Introducing epics of the world and conventions: The Iliad, Odyssey, Aeneid, The Epic of Gilgamesh	5	Lecture	Evaluation through question-answer session
	Introduction to Mahabaratha and Ramayana	2	Lecture Debate	Debate on the topic "Mahabaratha and Ramayana"
	Introduction to Greek Theatre and Indian Theatre	3	Presentation	Reference reading and notes are evaluated.
Module II Poetry	Dante: Divine Comedy Canto IV	4	Lecture Student seminar	Question-answer sessions Seminar evaluation
	Goethe: The Violet	4	Lecture Debate	Question-answer sessions
	Alexander Pushkin: A Flower Shrivelled Bare of Fragrance	4	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	Rilke: Adam.	4	Lecture Student seminar	Seminar evaluation
	Omar Khayyam: The Rubaiyat: 68-72	5	Lecture Student seminar	Seminar evaluation
	Rumi: Let go of Your Worries, Look at Love, I died from Minerality	5	Lecture Student seminar	Seminar evaluation
	Matsuo Basho: In the Twilight Rain	4	Lecture Student seminar	Seminar evaluation

Module III Drama and Film	Sophocles: Oedipus Rex	6	Lecture Debate Presentations	Question-answer sessions Seminar evaluation
	Bhasa: Urubhangam	6	Lecture Student seminar	Question-answer sessions
	Les Miserables: dir. Bille August	6	Lecture Student Seminar	Presentation
Module IV Fiction	Maupassant: Mother Savage	4	Lecture Debate Presentations	Question-answer sessions
	Tolstoy: The Three Questions	4	Lecture Debate	Question-answer sessions
	Firdausi: Shahnamah: The Story of Sohrab and Rustum	4	Lecture Discussion	Discussion
	Ryunosuke Akutagawa: In a Grove	4	Lecture	Evaluation through question-answer session
	P U Songling: The Painted Wall	4	Lecture	Question-answer sessions
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic		All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	7	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials :

- Boccaccio Giovanni, The Decameron
- Virgil. Aenied. Trans. Edward McCrorie. USA: University of Michigan Press, 1996.
- Songling P U, Strange Stories From Chinese Studio. 1880
- www.rumi.org.uk and www.khamush.com
- Pushkin Alexander. The Complete works of Alexander Pushkin

Teacher/s –in Charge:

- Dr Sr A Princy Anto
- Ms. Noble A. Paliath

Module Division:

Module	Month	Teacher/s-in--charge
Module 1	June-July	Noble A. Paliath
Module 2	June, July	Dr Sr A Princy Anto
Module 3	August	Noble A. Paliath
Module 4	September	Dr Sr A Princy Anto
Module 5	August, September	Noble A. Paliath
Module 6	October	Dr Sr A Princy Anto

Signature/s of Teacher/s- in- charge Signature of Head of the Department

Course/ Lesson Plan

Semester VI

Course category: Core Course I

Paper name: FILM STUDIES

Code: ENG6B13

Contact Hours: 90 **Credits: 4**

Course Outcome:

- **To appreciate film as an art form and its aesthetics**
- **To understand how film connects with history, politics, technology, society and performance.**
- **To critically appraise the nature of representation on screen.**
- **To develop analytical skills for the close reading of films.**

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I	Basic terminology of film making	5	Lecture	Evaluation through question-answer session
	Editing, Sound in cinema, Colour in Cinema	4	Lecture Debate	Discussion on the various editing techniques
	Introduction to various film genres	6	Presentation on Greco-Roman traditions and writers	Reference reading and notes are evaluated.
	Major movements and theories in film studies	5	Presentation and Lecture	Class test including all the topics on Terminologies
Module II	Andre Bazin: Evolution of Language of Cinema	5	Lecture Student seminar	Question-answer sessions Seminar evaluation
	Gilbert Harman: Semiotics	7	Lecture Debate	Debate on the topic: Cinema and relevance of semiotic considferation
	Laura Mulvey: Visual Pleasure and Narrative Cinema	3	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	Bill Nichols: Voice of Documentary	3	Lecture Student seminar	Class test of all the topics of Module II Seminar evaluation
Module III	Charlie Chaplin: The Goldrush	8	Lecture Debate Presentations	Discussion on the political signification of the movie and its nuances.

	Francois Truffaut: 400 Blows	3	Presentation and Discussion	Nuances of the Cinema
	Federico Fellini: 8 1/2	4	Discussion	Discussion on the movie
	Andrei Tarkovsky: The Mirror	6	Lecture	Evaluation through question-answer session
Module IV	Milos Forman: One Flew Over Cukoos Nest	4	Lecture Debate Seminar	Seminar and Discussion
	Adoor Gopalakrishnan: Elippathayam	4	Lecture Student Seminar	Seminar evaluation
	Ousmane Sembene: Guelwar	5	Lecture Student Seminar	Seminar evaluation
	Kim Ki Duk: Spring, Summer, Winter, Autumn, Spring	6	Lecture Discussion	Class test
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic		All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	7	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials :

- Core Textbook
- Virginia Wright Wexman: A History of Film, Pearson, Delhi.
- Susan Heyward: Key Concepts in Cinema Studies, Routledge, London

Teacher –in Charge:

- Ms. Sandra Juliet Jose

Module Division:

Module	Month	Teacher/s-in--charge
Module 1	Nov- Dec	Ms. Sandra
Module 2	December	Ms. Sandra
Module 3	January	Ms. Sandra
Module 4	February	Ms. Sandra

Signature/s of Teacher/s- in- charge

Signature of Head of the Department

Course/ Lesson Plan

Semester 6

Course category: Core Course

Paper name: New Literatures in English

Code: BNG6B14

Contact Hours: 90 **Credits: 4**

Course Outcome:

- **The students produce critiques of prose, fiction, drama and film**
- **The students point out the trends of literary growth in the various national varieties of literature**
- **The literary appetite in the students gets enhanced and they turn to advanced reading of global literature**
- **The humanitarian side of the students get nourished and their concern for nations,races,sufferings, and genders empower the writers in them**

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I	Module 1: Introduction:A brief introduction to the canon of English literature, Commonwealth literature,	1	Lecture	Evaluation through question-answer session
	post Colonialism	1	Lecture Debate	Debate on the topic 'Postcolonialism-Merits and Drawbacks'.
	context of New Literatures	1	Presentation on various literatures	Reference reading and notes are evaluated.
	New Literatures	2	Presentation and Lecture	Class test including all the given categories of postcolonial literatures
Module II	Module 2: Poetry 1. Alice Walker: Remember Me? (U.S) 2. A D Hope: Australia (Australia)	5	Lecture Student seminar	Question-answer sessions Seminar evaluation
	3. Derek Walcott: A Far Cry from Africa (Caribbean) 4. Faiz Ahmed Faiz: When Autumn Came (Pakistan)	5	Lecture Presentation	Question-answer sessions Seminar evaluation

	5. Li Young Lee: I Ask my Mother to Sing (China) 6. Tenzin Tsundue : When it Rains in Dharamsala (Tibet)	5	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	7. David Diop: The White Man Killed my Father(West Africa)8. Margaret Atwood: Helen of Troy Does Countertop Dancing	5	Lecture Student seminar	Class test of all the topics of Module II Seminar evaluation
Module III	Module 3: Prose and Short Fiction :1. Gabriel Garcia Marquez: The Handsomest Drowned Man in the World	6	Lecture Presentations	Question-answer sessions
	2. Alice Munroe: Voices	6	Lecture Presentation	Evaluation of seminar presentations
	. Robyn Davidson: Tracks: One Woman's Journey across 1700 miles of Australian Outbreak	13	Lecture Presentation Discussion	Evaluation of the seminar presentations,question-answer sessions,Test papers
Module IV	Module 4: Drama 1. Wole Soyinka: Death and the King's Horseman	10	Lecture Presentation Role play	Seminar Presentations Test papers
	2. Eugene O'Neil: Long Day's Journey into Night	10	Lecture Role play Presentation	Evaluation of the seminar presentations,question-answer sessions,Test papers
Module V	Module 5: Film 1. Kite Runner: dir Marc Forster	4	Lecture Role play Discussion	Seminar evaluation
	2. Embrace of the Serpent: dir Ciro Guerra	4	Lecture Role play Discussion	Seminar evaluation
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 80 marks and 2.5 hours duration	6	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	2	All students are required to prepare an assignment from any of the topics they're interested, but should avoid	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.

			repetition	
Seminars	Any topic	4	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials :

- Gray, Richard. A Brief History of American Literature.London:Wiley-Blackwell,2011.
- Pierce, Peter. The Cambridge History of Australian Literature: Queensland: James Cook University,2017.
- Young, Robert C. Post Colonialism: A Very Short Introduction. London: Oxford,2003.
- Atwood, Margaret. Survival: A Thematic Guide to Canadian Literature. Toronto: Anansi, 2004

Teacher/s –in Charge:

- Ms.Bindu Jose
- Ms.Darly Mathew

Module Division:

Module	Month	Teacher/s-in--charge
Module 1	November -December	Ms.Bindu Jose
Module 2	January	Ms. Bindu Jose
Module 3	February	Ms.Darly Mathew
Module 4	March	Ms.Darly Mathew

Signature/s of Teacher/s- in- charge Signature of Head of the Department

Course/ Lesson Plan

Semester I

Course category: Core Course I

Paper name: Shakespeare

Code: ENG6B20

Contact Hours: 54 (3 hours per week) Credits: 3

Course Outcome: To initiate students to read and appreciate the master.

- To expose students to the universality of Shakespeare and his relevance for all times.
- To appreciate the polyphonic quality of Shakespeare's works and to learn the different modes of approaching Shakespeare.
- To develop the students' skill of formulating his/her own critical position.
-

Modules	Contents	Hours	Procedure/ Activity/ plans	Assessment
Module I	The influence of Shakespeare in the 21st century	3	Lecture	Evaluation through question-answer session
	Popular quotes	2	Lecture Debate	Debate on the topic --- Shakespeare's relevance
	How to do things with Shakespeare: New Approaches.	2	Presentation on Greco-Roman traditions and writers	Reference reading and notes are evaluated.
	New essays	3	Presentation and Lecture	Class test including all the relevant plays.
Module II	The four phases of Shakespeare's dramatic career	3	Lecture Student seminar	Question-answer sessions Seminar evaluation
	Shakespearean Tragedy	3	Lecture Debate	Debate on the topic of movie adaptations
	Shakespearean Comedy	2	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	Shakespeare's characters	2	Lecture Student seminar	Class test of all the topics of Module II Seminar evaluation
Module III	The Twelveth Night	5	Lecture Debate Presentations	Question-answer sessions
			Debate	Debate on the plays

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			Discussion	Discussion on the application of Shakespeare's philosophy
	The Tempest	5	Lecture	Evaluation through question-answer session
Module IV	The trial scene in 'The Merchant of Venice' Act IV Scene 1 lines 1-163	6	Lecture Debate	Debate on the male-female dichotomy in Shakespeare's plays
	Antony's speech in 'Julius Caesar' Act III Scene 2	6	Lecture Student Seminar	Seminar evaluation
				Class test
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic		All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	7	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		54 hours		

Reference Materials :

- Maguire, Laurie. Ed. How to do things with Shakespeare: New Approaches, New Essays. Wiley-Blackwell, 2007.

Teacher/s –in Charge:

- Ms. Bindu Jose

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Module Division:

Module	Month	Teacher/s-in--charge
Module 1	Nov-Dec	Ms Bindu Jose
Module 2	January	Ms Bindu Jose
Module 3	February	Ms Bindu Jose
Module 4	March	Ms Bindu Jose

Signature/s of Teacher/s- in- charge

Signature of Head of the Department

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Course/ Lesson Plan

Semester V & VI

Course category: Core Course I

Paper name: Project

Code: ENG6B21

Contact Hours: Nil **Credits:2**

Course Outcome:

- **The students prepare the bibliography of the project as per the MLA format**
- **The students present the ideas in a logical and coherent manner**
- **The students do the in-text citation as per the MLA format**
- **The students practice academic writing**

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I	Methodology of Research-The Principles of MLA style-The core elements		Lecture	Evaluation through question-answer session
	'The Mechanics of scholarly prose-formatting and ordering of the works cited list,in-text citation		Lecture Debate	Test paper
	Plagiarism		Presentation on Greco-Roman traditions and writers	Reference reading and notes are evaluated.
	Principles of Academic Writing-Difference between academic and non-academic writing,Characteristics of academic writing-Vocabulary		Presentation and Lecture	Class test including all the topics of the module
Module II	Library Work and data collection-Author&Primary Sources		Lecture Student seminar	Question-answer sessions Seminar evaluation
	Review of Litrerature		Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation

	Synopsis Preparation		Lecture Student seminar	Class test of all the topics of Module II Seminar evaluation
Module III	Data analysis-Collection of Secondary Materials		Lecture Debate Presentations	Seminars are to be evaluated
	Note taking		Lecture and materials on note-taking	Notes are to be evaluated
	Organisation of the data		Discussion	Arranged data is to be evaluated
	Analysis of the data		Discussion	Seminars are to be evaluated
Module IV	Project presentation and submission-Outline Preparation		Discussion	Outline is to be evaluated
	Rough Draft		Discussion	Rough draft is to be evaluated
	Fair Copy presentation and submission		Discussion	Seminar evaluation
	Viva-voce		Discussion	viva-voce
Evaluation: (12 hrs)				
Internal Examinations	Viva voce of 15 marks is to be conducted	20mts.	Viva Voce	Performance during the viva as well as organization, originality and methodology are evaluated
Assignments	Topics regarding the project		All students are required to prepare assignments regarding the project topic	Assignments are corrected and feedbacks are given.
Seminars	Topics regarding the project	7	All students are required to present topics with the help of power point preferably.	Feedbacks are provided
		Nil		

Reference Materials :

- MLA Handbook Eighth Edition
- Primary Sources of the respective project
- Secondary sources regarding the respective project

Teacher/s –in Charge:

- Ms.Darly Mathew
- Ms.Sandra Juliet Jose

Module Division:

Module	Month	Teacher/s-in--charge
Module 1	June-July ,August	Ms.Darly&Ms.Sandra
Module 2	September,October	Ms.Darly &Ms.Sandra
Module 3	October,November,Decembr	Ms.Darly&Ms.Sandra
Module 4	January,February,March	Ms.Darly &Ms.Sandra

Course Plan 2019-2020

Course/ Lesson Plan

Semester I

Course category: Core Course I

Paper name: British Literature from Chaucer to 18th Century

Code: ENG 1 C01

Contact Hours: 90 **Credits: 5**

Course Outcome:

- Familiarize the students with various trends in British literature from the 14th century to the 18th century.
- Introduce them to various movements in British literature

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Section A: Poetry	Geoffrey Chaucer : "The General Prologue to Canterbury Tales" (first 100 lines)	6	Lecture	Evaluation through question-answer session
	William Shakespeare : Sonnet 18. "Shall I Compare thee to a Summer's Day" John Donne : "The Canonization"	6	Lecture Debate	Debate on the topic – Compare and Contrast Shakespeare and John Donne.
	Andrew Marvell : "To His Coy Mistress" John Dryden : "Mac Flecknoe"	6	Presentation on Literary Qualities in Mac Flecknoe	Reference reading and notes are evaluated.
	John Milton : "Paradise Lost" Book 1 (lines up to 270) Thomas Gray : "Elegy written in a Country Churchyard"	8	Lecture	Evaluation through Annotation questions
Section B: Drama	Shakespeare : Hamlet	8	Lecture Student seminar	Question-answer sessions Seminar evaluation

	Shakespeare : Hamlet & Webster : The Duchess of Malfi	6	Lecture Debate	Debate on the topic Elucidate the soliloquies in the Hamlet.
	Webster : The Duchess of Malfi	6	Lecture	Write-ups of students are to be evaluated.
			Student seminar	Seminar evaluation
	Sheridan : The Rivals	6	Lecture Student seminar	Class test of all the topics of Section II Seminar evaluation
Section C : Prose And Fiction	Swift : Gulliver's Travels	6	Lecture Debate Presentations	Question-answer sessions
	Henry Fielding : Joseph Andrews	6	Debate	Debate on the how far the term "picaresque" applied to Joseph Andrews.
	Francis Bacon : "Of Marriage", Joseph Addison : Sir Roger at Church	8	Discussion	Discussion in group on the topic, "Is being married better than remaining single?
	Daniel Defoe : Robinson Crusoe	6	Lecture	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	2	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	5	All students are required to present a topic with the help of power point	Feedbacks are provided and marks are considered for CIE

			presentation, preferably.	
		90 hours		

Reference Materials:

- Carter, Ronald and John McRae. The Routledge History of Literature in English Britain and Ireland. Malcolm Bradbury, 2001.
- O' Neill, Michael. The Cambridge History of English Poetry. Cambridge University Press, 2010.

Teacher/s –in Charge:

- Arya James Module Division:

Module	Month	Teacher/s-in—charge
Module 1	June-July	Arya James
Module 2	August-September	Arya James
Module 3	October-November	Arya James

Course/ Lesson Plan

Semester I

Course category: Core Course II

Paper name: British Literature 19th century

Code: ENG1CO2

Contact Hours: 90 **Credits: 5**

Course Outcome:

- This course will train students to examine and interpret the long eighteenth century and its multiple revolutions through a transnational and cross-cultural perspective.
- Students will be trained to understand the continuities between the eighteenth century and high modernity.

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I	The Tiger, The Lamb Lines Composed a Few Miles above Tintern Abbey	6	Lecture	Evaluation through question-answer session
	Kubla Khan Ozymandias Ode to a Nightingale	6	Lecture Debate	Debate on the topic John Keats
	She Walks in Beauty Tithonus Fra Lippo Lippi	6	Presentation on Fra Lippo Lippi	Reference reading and notes are evaluated.
	A Musical Instrument Dover Beach The Blessed Damozel	8	Presentation and Lecture	Class test including all the poems
Module II	Oscar Wilde	8	Lecture Student seminar	Question-answer sessions Seminar evaluation
	The Importance of Being Earnest	6	Lecture Debate	Debate on the topic of Victorian tradtions and hypocrisy
	The Importance of Being Earnest	6	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	The Importance of Being Earnest	6	Lecture Student seminar	Class test of Module II Seminar evaluation

Module III	Charles Lamb : "Dream Children – A Reverie"	6	Lecture Debate Presentations	Question-answer sessions
	William Hazlitt : On Reading Old Books			
	Charles Dickens : A Tale of Two Cities	6	Lecture Debate	Debate on the Characterisation
	Emily Bronte : Wuthering Heights	8	Lecture Debate Discussion	Discussion on Heathcliff and Catherine
	Thomas Hardy : Tess of the D'Urbevilles	6	Lecture Debate Discussion	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 150 marks and 3 hours duration	6	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	1	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials :

- Elizabeth Gaskell : *North and South*
- George Eliot : *The Lifted Veil* OXFORD WORLD'S CLASSICS

- Thomas Hardy : *Tess of the D'Urbervilles*
- Raymond Williams : Introduction *In the English Novel from Dickens to Lawrence*

Teacher/s –in Charge:

- Mary Davis

Module Division:

Module	Month	Teacher/s-in--charge
Module 1	June-July	Mary Davis
Module 2	August-September	Mary Davis
Module 3	October-November	Mary Davis

Course/ Lesson Plan

Semester I

Course category: Core Course III

Paper name: History of English Language

Code: ENG1CO3

Contact Hours: 90 **Credits: 5**

Course Outcome:

- The course offers an overview of the History of English Language from its origin to the present.

Modules	Contents	Hours	Procedure/ Activity/ plans	Assessment
Module I	Language families - The Indo-European family of languages; Germanic Family of languages and the origin of English	6	Lecture	Evaluation through question-answer session
	The early history of English language; Old English Period - Scandinavian invasions - Middle English Period: The Impact of the Norman Conquest on the English Language; - Middle English Literature.	6	Lecture Debate	Debate on the topic Origin of Language
	Modern English Period – Latin and Greek influence – Loan words - The impact of the Renaissance- Bible Translations	6	Presentation on Latin and Greek influence	Reference reading and notes are evaluated.

	Sound changes in English – The Great Vowel Shift - Changes in Grammar,	8	Presentation and Lecture	Class test including all the Topics
	vocabulary, phonology and morphology – Semantics – word formation			
Module II	Foreign influences on English in the Seventeenth, Eighteenth and the Nineteenth Centuries	8	Lecture Student seminar	Question-answer sessions Seminar evaluation
	Colonialism and the English language	6	Lecture Debate	Debate on the topic of Colonialism and the English language
	Expansion of Vocabulary – Semantic change- Pidgins and Creoles.	6	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	Contributions of major writers to the growth of English vocabulary	6	Lecture Student seminar	Class test of Module II Seminar evaluation
Module III	The discrepancy between spelling and pronunciation - Attempts to reform English spelling	6	Lecture Debate Presentations	Question-answer sessions
	Evolution of Standard English - Dialects of English: British and American – English in India	6	Lecture Debate	Debate on Dialects of English

	English in the postcolonial world – English as a global language — The rise of 'englishes' – impact of Science and Technology –	8	Lecture Debate Discussion	Discussion on impact of Science and Technology
	English in the digital age.	6	Lecture Debate Discussion	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 150 marks and 3 hours duration	6	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	1	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials :

- F. T. Wood : An Outline History of the English language
- C. L. Wrenn : The English Language
- A. C. Baugh : A History of the English Language
- David Crystal : English as a Global Language
- David Crystal: The English Language: A guided Tour of the Language
- Bill Ashcroft, et al : The Empire Writes Back
- Christian Mair :The Politics of English as a World Language

- Andreas Sedlatschek : Contemporary Indian English: Variation and Change
- Pingali Sailaja : Indian English
- Michael Hanrahan& Deborah L Madsen (Ed.): Teaching, Technology, Textuality: Approaches to New Media

Teacher/s –in Charge:

- Keerthana P K Module Division:

Module	Month	Teacher/s-in--charge
Module 1	June-July	Keerthana P K
Module 2	August-September	Keerthana P K
Module 3	October-November	Keerthana P K

Course/ Lesson Plan

Semester I

Course category: Core Course IV

Paper name: Indian Literature in English

Code: ENG1 C04

Contact Hours: 90 **Credits: 5**

Course Outcome:

- Familiarize the students with the various trends and movements in Indian English literature from its inception to the present.

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Section A: Poetry	Toru Dutt : "Our Casuarina Tree" Rabindranath Tagore : "The Child"	5	Lecture	Evaluation through question-answer session
	Nizzim Ezekiel : "In the Country Cottage" Jayantha Mahapatra : "Hunger" A.K. Ramanujan : "Obituary"	4	Lecture Debate	Debate on the topic: Compare and Contrast the writers Ezekiel and Mahapatra.

	R. Parthasarathy : "River, Once" Kamala Das : "The Old Playhouse" Gieve Patel : "The Ambiguous fate of Gieve Patel.	6	Presentation on Kamala Das as a Confessional Poet of India	Reference reading and notes are evaluated.
	Meena Alexander : "Blue Lotus" Arundhathi Subramaniam : "Home" MeenaKandasamy :"Dead Woman Walking"		Presentation and Lecture	Class test including all the annotation portion of Section A.
Section B: Fiction	Mulk Raj Anand : Coolie		Lecture Student seminar	Question-answer sessions Seminar evaluation
	R.K. Narayanan : The Guide	7	Lecture Debate	Debate on the topic of literary techniques of a frame narrative in "The Guide"

	Salman Rushdie : Midnight's Children	3	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	AmitavGhosh : The Hungry Tide		Lecture Student seminar	Class test of all the topics of Section -B Seminar evaluation
Section: C Drama	GirishKarnad : Yayati (English Translation by the author)	8	Lecture Debate Presentations	Question-answer sessions
	GirishKarnad : Yayati		Debate	Debate on the GirishKarnad : Yayati
	Mahesh Dattani : Tara	4	Discussion	Discussion on the Characteristics of Tara
	Mahesh Dattani : Tara	6	Lecture	Evaluation through question-answer session
Section-D Prose	JawaharLal Nehru : "What is Culture?"		Lecture Debate	Debate on Nehru's Writing Style
	AmartyaSen : "Reason and Identity" (From: The Argumentative Indian, Part IV)		Lecture Student Seminar	Seminar evaluation

	AmartyaSen : "Reason and Identity" Section 1-4)	5	Lecture Student Seminar	Seminar evaluation
	AmartyaSen : "Reason and Identity" (Section 58)		Lecture Discussion	Class test
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 150 marks and 3 hours duration		Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	2	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic		All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials:

- Agrawal K.A. Indian Writing in English: A Critical Study. Atlantic Publishers, 2003.
- Tiwari, Shubha. Indian Fiction in English Translation. Atlantic Publishers, 2005.

Teacher/s –in Charge:

- Arya James Module Division:

Module	Month	Teacher/s-in--charge
Module 1	June-July	Arya James
Module 2	August-September	Arya James
Module 3	October-November	Arya James

Course/ Lesson Plan

Semester II

Course category: Core Course I

Paper name:: Twentieth Century British Literature up to 1940 Code:

ENG2C05

Contact Hours: 90 **Credits: 5**

Course Outcome:

- This course will train students to examine and interpret the Twentieth century and its multiple revolutions through a transnational and cross-cultural perspective.
- Students will be trained to understand the different perspectives of modernity.

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I	G.M. Hopkins - : "The Windhover"	6	Lecture	Evaluation through question-answer session
	W.B. Yeats - : The Second Coming, Byzantium	6	Lecture Debate	Debate on the topic W.B. Yeats
	TS Eliot - : The Waste Land	6	Presentation on The Wasteland	Reference reading and notes are evaluated.
	W.H.Auden - : Funeral Blues Wilfred Owen : A Strange Meeting	8	Presentation and Lecture	Class test including all the poems
Module II	GB Shaw : Caesar and Cleopatra	8	Lecture Student seminar	Question-answer sessions Seminar evaluation
	TS Eliot : Murder in the Cathedral	6	Lecture Debate	Debate on the topic of Theme of martyrdom
	TS Eliot : Murder in the Cathedral	6	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	JM Synge : Juno and The Paycock	6	Lecture Student seminar	Class test of Module II Seminar evaluation

Module III	Virginia Woolf - : "Modern Fiction"	6	Lecture Debate Presentations	Question-answer sessions
	Joseph Conrad -: Heart of Darkness	6	Lecture Debate	Debate on the Characterisation
	D.H. Lawrence : Sons and Lovers	8	Lecture Debate Discussion	Discussion on female characters
	James Joyce - : A Portrait of the Artist as a Young Man	6	Lecture Debate Discussion	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 150 marks and 3 hours duration	6	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	1	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials :

- Baum, Paull F. "Sprung Rhythm". PMLA, IX.XIV (1959),pp.418-25.
- Bender, Todd K. Gerard Manley Hopkins: The Classical Background and Critical Reception of his Work.
- Bergonzi, Bernard. Gerard Manley Hopkins. New York:Macmillan, 1977.

- Aiken, Conrad ‘An Anatomy of Melancholy’, T.S.Eliot:TheWasteLand(CaseBook), Ed. Dyson,Macmillan,London, 1968
- Bradbury,Malcolm.The Modern World Ten great Writers, KalyaPublishers,New Delhi,1989
- Brooks, Cleanth.Modern Poetry and Tradition, Oxford University Press, New York, 1939

Teacher/s –in Charge:

- Mary Davis

Module Division:

Module	Month	Teacher/s-in--charge
Module 1	December	Mary Davis
Module 2	January	Mary Davis
Module 3	February-March	Mary Davis

Course/ Lesson Plan

Semester II

Course category: Core Course II

Paper name:Literary Criticism and Theory – Part 1(Up to New Criticism)

Code: ENG1CO6

Contact Hours: 90 **Credits: 5**

Course Outcome:

- The course offers an overview of the History of English Language from its origin to the present.

Modules	Contents	Hours	Procedure/ Activity/ plans	Assessment
Module I	Plato : The Republic (Books 2 and 3)	6	Lecture	Evaluation through question-answer session
	Aristotle - : Poetics	6	Lecture Debate	Debate on the topic Poetics
	Aristotle - : Poetics	6	Presentation on Latin and Greek influence	Reference reading and notes are evaluated.
	Longinus - : On the sublime (Chapters 7 – 9)	8	Presentation and Lecture	Class test including all the Topics
Module II	Sir Philip Sydney - : An Apology for Poetry William Wordsworth : Preface to Lyrical Ballads	8	Lecture Student seminar	Question-answer sessions Seminar evaluation
	F. R Leavis : Hard Times: An Analytic note (From 'The Great Tradition')	6	Lecture Debate	Debate on the topic of Criticism on Dickens
	T.S. Eliot - : Tradition and Individual Talent	6	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation

	Cleanth Brooks - : The Language of Paradox			
	Northrop Frye - : The Archetypes of Literature	6	Lecture Student seminar	Class test of Module II Seminar evaluation
Module III	S.N. Das Gupta - : The Theory of Rasa	6	Lecture Debate Presentations	Question-answer sessions
	S.N. Das Gupta - : The Theory of Rasa	6	Lecture Debate	Debate on Rasa
	Kunjunni Raja - : Theory of Dhwani	8	Lecture Debate Discussion	Discussion on impact of Dhwani
	Kunjunni Raja - : Theory of Dhwani	6	Lecture Debate Discussion	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 150 marks and 3 hours duration	6	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	1	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials :

- Day, Gary. Literary Criticism: A New History. Edinburgh UP, 2008
- Allan, William. Classical Literature: A Very Short Introduction. Oxford UP, 2014.
- Habib, M. A. R. A History of Literary Criticism. Blackwell Press, 2005.
- Day, Gary. Literary Criticism: A New History. Edinburgh UP, 2008.
- Allan, William. Classical Literature: A Very Short Introduction. Oxford UP, 2014.
- Abercrombie, Lascellas. Principles of Literary Criticism. Greenwood P, 1979.

Teacher/s –in Charge:

- Keerthana P K Module Division:

Module	Month	Teacher/s-in--charge
Module 1	December	Keerthana P K
Module 2	January	Keerthana P K
Module 3	February-March	Keerthana P K

Course/ Lesson Plan

Semester II

Course category: Core Course III

Paper name: American Literature

Code: ENG2C07

Contact Hours: 90 **Credits: 5**

Course Outcome:

- Aimed at acquainting students with the dominant trends in American Literature from the early colonial period to the twentieth century.
  Gain in-deep knowledge of the subject.

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Section A: Poetry	Robert Frost - Home Burial Wallace Stevens - The Emperor of Ice Cream EE Cummings - Buffalo Bill	6	Lecture	Evaluation through question-answer session
	Langston Hughes - I Too Robert Lowell - For the Union Dead Allen Ginsberg - America		Lecture Debate	Debate on the topic – Compare and Contrast the writers Langston Hughes and Lowell.
	Sylvia Plath - Edge Gloria E. Anzaldua : To live in the Borderlands means you		Presentation on Sylvia Plath as a Confessional Poet.	Reference reading and notes are evaluated.
	Edgar Allan Poe - The Raven Walt Whitman - A passage to India Emily Dickinson - There is a certain slant of light	8	Lecture	Evaluation through Annotation questions
Section B: Prose and Fiction	Ralph Waldo Emerson - “Selfreliance” Herman Melville - Moby Dick		Lecture Student seminar	Question-answer sessions Seminar evaluation

	Mark Twain - Huckleberry Finn		Lecture Debate	Debate on the topic the role of religion in the novel.
	William Faulkner - The Sound and the Fury	6	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	Tony Morrison - Tar Baby	6	Lecture Student seminar	Class test of all the topics of Section-B Seminar evaluation
SECTION C: Drama	Eugene O'Neill- The Emperor Jones	6	Lecture Debate Presentations	Question-answer sessions
	The Emperor Jones (cont.) & Tennessee Williams - The Glass Menagerie	6	Debate	Debate on the Tennessee Williams' The Glass Menagerie as a Memory Play.
	Tennessee Williams - The Glass Menagerie	8	Discussion	Discussion on the Characteristics of Tara
	Amiri Baraka (LeRoi Jones) – Dutchman	6	Lecture	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 150 marks and 3 hours duration	5	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	2	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials:

- Belasco, Susan. A Companion to American Literature. Wiley Publishers, 2020.
- Rozakis E, Laurie. The Complete Idiot's Guide to American Literature. Alpha Publishers, 1999.

Teacher/s –in Charge:

- Arya James

Module Division:

Module	Month	Teacher/s-in--charge
Module 1	December	Arya James
Module 2	January	Arya James
Module 3	February-March	Arya James

Course/ Lesson Plan

Semester II

Course category: Core Course IV

Paper name:Postcolonial Writings

Code: ENG2C08

Contact Hours: 90 **Credits: 5**

Course Outcome:

- This course on Postcolonial literature will explore colonialism and its cultural impacts,throughwritings produced by people from countries with a history of colonialism,primarily those concernedwith the workings and legacy of colonialism and the postcolonial resistance to them.

Modules	Contents	Hours	Procedure/ Activity/ plans	Assessment
Module I	A. K. Ramanujan : "Self Portrait" Dom Moraes : "A Letter", "Sinbad" Leopold Senghor : "New York"	6	Lecture	Evaluation through question-answer session
	Gabriel Okara : "The Mystic Drum" David Diop : "Africa" Allen Curnow : "House and Land"	6	Lecture Debate	Debate on the topic Africa.
	A.D. Hope : "Australia" Jack Davis : "Aboriginal Australian" Margaret Atwood : "Journey to the Interior"	6	Presentation on Postcolonialism	Reference reading and notes are evaluated.

	Derek Walcott : "Ruins of a Great House" E. E. Tiang Hong : "Arrival" Almaghir Hashmi : "So What if I Live in a House Made by Idiots"	8	Presentation and Lecture	Class test including all the poems
	Kamau Brathwaite : "Negus"			
Module II	Wole Soyinka : *The Road*	8	Lecture Student seminar	Question-answer sessions Seminar evaluation
	GirishKarnad : *Hayavadana*	6	Lecture Debate	Debate on the topic of Importance of chorus
	GirishKarnad : *Hayavadana*	6	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	Timberlake Wertenbaker : *Our Country's Good*	6	Lecture Student seminar	Class test of Module II Seminar evaluation
Module III	Chinua Achebe : *Things Fall Apart*	6	Lecture Debate Presentations	Question-answer sessions
	V. S. Naipaul : *A House for Mr.Biswas*	6	Lecture Debate	Debate on the Characterisation
	Khaled Hosseini : *The Kite Runner*	8	Lecture Debate Discussion	Discussion on Afghan Politics
	Margaret Laurence : *Stone Angel*	6	Lecture Debate Discussion	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 150 marks and 3 hours duration	6	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.

Assignments	Any topic	1	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials :

- Ashcroft, Bill, Gareth Griffiths, and Helen Fiffin. The Empire Writes Back: Theory and Practice in Post-Colonial Literatures.
- Bhabha, Homi. "Postcolonial Criticism."
- Boehmer, Elleke. Colonial and Postcolonial Literature. Oxford University Press, 2005.
- Bové, Paul A. Intellectuals in Power: the Genealogy of Critical Humanism. New York: Columbia University Press, 1986.
- Brydon, Diana ed. And introduction. Postcolonialism: Critical Concepts in Literary and Cultural Studies. 5 vols. New York: Routledge, 2006

Teacher/s –in Charge:

- Mary Davis Module Division:

Module	Month	Teacher/s-in--charge
Module 1	December	Mary Davis
Module 2	January	Mary Davis
Module 3	February-March	Mary Davis

Course/ Lesson Plan

Semester III

Course category: Core Course I

Paper name: Twentieth Century British Literature Post 1940

Code: ENG3CO9

Contact Hours: 90 **Credits: 5**

Course Outcome:

- This course will train students to examine and interpret the long twentieth century and its multiple revolutions through a transnational and cross-cultural perspective.
- Students will be trained to understand the perspectives on post modernity.

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I	Dylan Thomas : "Fern Hill" Philip Larkin : "Church Going"	6	Lecture	Evaluation through question-answer session
	Thom Gunn : "On the Move" Ted Hughes : "View of a Pig", Seamus Heaney : "Punishment	6	Lecture Debate	Debate on the topic bog poetry
	Charles Tomlinson : "Swimming Chenango Lake" Geoffrey Hill : "In Memory of Jane Frazer	6	Presentation on Charles Tomlinson	Reference reading and notes are evaluated.
	Elizabeth Jennings : "One Flesh" Andrew Motion : "The Last Call"	8	Presentation and Lecture	Class test including all the poems
Module II	Samuel Beckett : *Waiting for Godot*	8	Lecture Student seminar	Question-answer sessions Seminar evaluation
	Caryl Churchill : *Top Girls*	6	Lecture Debate	Debate on the topic of female characters
	Harold Pinter : *The Birthday Party*	6	Lecture	Write-ups of students are to be evaluated.

			Student seminar	Seminar evaluation
	Edward Bond : *Lear*	6	Lecture Student seminar	Class test of Module II Seminar evaluation
Module III	John Fowles : *The French Lieutenant's woman*	6	Lecture Debate Presentations	Question-answer sessions
	Kingsley Amis *: Lucky Jim*	6	Lecture Debate	Debate on the Characterisation
	Alan Sillitoe : *Loneliness of the Long Distance Runner*	8	Lecture Debate Discussion	Discussion on the character Smith
	Kazuo Ishiguro : Remains of the Day	6	Lecture Debate Discussion	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 150 marks and 3 hours duration	6	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	1	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials :

- Book by Martin Esslin : The Theatre of the Absurd
- Michael Y. Bennett : Reassessing the Theatre of the Absurd: Camus, Beckett, Ionesco, Genet, and Pinter
- Michael Y. Bennett : The Cambridge Introduction to Theatre and Literature of the Absurd
- Perry Anderson : The Origins of Postmodernity
- Fredrick Jameson : Postmodernism, or, the Cultural Logic of Late Capitalism
- William Hutchings :Samuel Beckett's Waiting for Godot: A Reference Guide

Teacher/s –in Charge:

- Keerthana P K Module Division:

Module	Month	Teacher/s-in--charge
Module 1	June-July	Keerthana P K
Module 2	August-September	Keerthana P K
Module 3	October-November	Keerthana P K

Course/ Lesson Plan

Semester III

Course category: Core Course II

Paper name: Literary Criticism and Theory: Part 2

Code: ENG3C10

Contact Hours: 90 **Credits: 5**

Course Outcome:

- Familiarize the students with Literary Criticism and Theory
  Introduce them to various theories and help them to have in-depth knowledge of the major theorists and key concepts.

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Section A: 1.Structuralism 2. PostStructuralism/ Deconstruction 3.Psychoanalysis: An Overview	Major theorists, Key concepts. Structure, Sign, Signifier, Signified, Semiology, Semiotics, Langue and Parole, Mythemes, Structuralist Narratology.	6	Lecture	Evaluation through question-answer session
	Text for Detailed Study: Roland Barthes: "Structuralist Activity"		Lecture Debate	Debate on the topic – Major theorists of Structuralism Post-Structuralism.
	Major theorists, Key concepts. Text for Detailed Study: Jacques Derrida: "Structure, Sign and Play in the Discourse of Social Sciences"		Presentation on key concepts	Reference reading and notes are evaluated.

	Major theorists, Key concepts. Text for Detailed Study: Jacques Lacan: "The Mirror Stage as Formative of the Function of the I"	8	Lecture	Evaluation through quiz

Section B: 4. Feminism 5. Cultural Materialism/ New Historicism 6. Post colonialism: An Overview	Major theorist: : Virginia Woolf, Kate Millet, Elaine Showalter, Helene Cixous, Adrienne Rich. Key concepts.	8	Lecture Student seminar	Question-answer sessions Seminar evaluation
	Text for Detailed Study: Elaine Showalter: "Towards a Feminist Poetics"	6	Lecture Debate	Debate on the topic of phases of feminism.
	Major theorists. & Louis Montrose: "Professing the Renaissance: The Poetics and Politics of Culture"	6	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	Major theorists, Key concepts. Text for Detailed Study: Edward Said: "Jane Austen and Empire"	6	Lecture Student seminar	Class test of all the topics of Section-II Seminar evaluation
Section C: 7. Ecocriticism 8.Critiquing Theory: An Overview	Major theorists: Jonathan Bate, CheryllGlotfelty, Laurence Coupe, Patrick DMurphy, William Rueckert.	6	Lecture Debate Presentations	Question-answer sessions

	Key concepts: Anthropocentrism, Shallow Ecology vs Deep Ecology, The Crisis of Humanism, Nature/Culture, Green Studies, Environmental Imagination, Ecofeminism.	6	Debate	Debate on the key terms of Ecocriticism
	Text for Detailed Study: Cheryll Glotfelty: "Introduction: Literary Studies in an age of Environmental Crisis"	8	Discussion	Discussion on "Introduction: Literary Studies in an age of Environmental Crisis"
	Text for Detailed Study: Graham Good: "Presentism: Postmodernism, Poststructuralism, Postcolonialism"	6	Lecture	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 150 marks and 3 hours duration	5	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	2	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE

		90 hours		

Reference Materials :

- Habib, M.A.R. Modern Literary Criticism and Theory. Blackwell Publishing,2008.
- Bennett, Andrews. An Introduction to Literature Criticism and Theory. Routledge Publishers, 2016.

Teacher/s –in Charge:

- Arya James Module Division:

Module	Month	Teacher/s-in--charge
Module 1	June-July	Arya James
Module 2	August-September	Arya James
Module 3	October-November	Arya James

Course/ Lesson Plan

Semester III

Course category: Elective Course I

Paper name: EUROPEAN FICTION IN TRANSLATION Code: ENG3E02

Contact Hours: 90 **Credits: 5**

Course Outcome:

- This course will explore different trends in European fiction and its cultural impacts, through writings produced by people from different countries.

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I	Cervantes Don Quixote	6	Lecture	Evaluation through question-answer session
	Gustave Flaubert Madame Bovary	6	Lecture Debate	Debate on the topic morality
	Gustave Flaubert Madame Bovary	6	Presentation on Madame Bovary	Reference reading and notes are evaluated.

	Leo Tolstoy Anna Karenina	8	Presentation and Lecture	Class test including all the topics
Module II	Franz Kafka The Trial	8	Lecture Student seminar	Question-answer sessions Seminar evaluation
	Kazantzakis Zorba, the Greek	6	Lecture Debate	Debate on the topic of contrast between Zorba and Boss
	Kazantzakis Zorba, the Greek	6	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	Gunter Grass The Tin Drum	6	Lecture Student seminar	Class test of Module II Seminar evaluation
Module III	Milan Kundera The Joke	6	Lecture Debate Presentations	Question-answer sessions
	Jose Saramago Blindness	6	Lecture Debate	Debate on the Characterisation
	Orhan Pamuk Snow	8	Lecture Debate Discussion	Discussion on Pamuk
	Italo Calvino If on a winter's night a traveller	6	Lecture Debate Discussion	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 150 marks and 3 hours duration	6	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	1	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.

Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials :

- Walter Cohen : A History of European Literature: The West and the World from Antiquity to the Present
- Dr. Usha Jain : European Classics in Translation
- John Lucas : The Literature o f Change: Studies in the Nineteenth Century Provincial Novel
- John Galsworthy : The Creation o f Character in Literature
- Jonathan Culler : The Uses of Madame Bovary
- Stirling Haig : The Madame Bovary Blues: The Pursuit o f Illusion in Nineteenth Century French Fiction
- Ruth Crego Benson : Women in Tolstoy.
- Laura J Gorfkle : Discovering the Comic in Don Quixote

Teacher/s –in Charge:

- Mary Davis Module Division:

Module	Month	Teacher/s-in--charge
Module 1	June-July	Mary Davis
Module 2	August-September	Mary Davis
Module 3	October-November	Mary Davis

Course/ Lesson Plan

Semester III

Course category: Elective Course II

Paper name: Introduction to Linguistics Code: ENG 3 E04

Contact Hours: 90 **Credits: 5**

Course Outcome:

- The course is intended to familiarize learners with the nature and organization of language. The history of Linguistics and its key concepts are discussed.

Modules	Contents	Hours	Procedure/ Activity/ plans	Assessment
Module I	Unit 1 Origin of Language – Features of Language – language behavior and language system- – Language Families – Language Typology – Language Acquisition Introduction to Linguistics	6	Lecture	Evaluation through question-answer session
	Linguistics as a science - History of Linguistics: Ancient Greece and Rome	6	Lecture Debate	Debate on the topic History of Linguistics
	Ancient India – Medieval Arabic and Hebrew Traditions	6	Presentation on Arabic and Hebrew influence	Reference reading and notes are evaluated.
	Branches of Linguistics - Comparative Philology – Saussure's theories – Schools and	8	Presentation and Lecture	Class test including all the Topics

	movements – Historicism – Structuralism – Functionalism – Generativism .			
Module II	Sounds – Phonology and Phonetics - (The sound system, classification of sounds, phonological rules) – Articulatory Phonetics	8	Lecture Student seminar	Question-answer sessions Seminar evaluation
	Vocoids and Contoids – Allophones – Suprasegmental features – Auditory phonetics	6	Lecture Debate	Debate on the topic of suprasegmental features
	Morphology (Morphemes, Word formation, Morphological rules) – Morphophonemics – Semantics (Semantic properties, semantic fields, semantic change) - Syntax	6	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	- Transformational Generative Grammar – Chomsky's contributions to Linguistics – Derivation – Constituent Structure – Immediate Constituents - Tagmemics.	6	Lecture Student seminar	Class test of Module II Seminar evaluation
Module III	Language and the brain – Psycholinguistics	6	Lecture Debate Presentations	Question-answer sessions

	Sociolinguistics – Ethnolinguistics Neurolinguistics –	6	Lecture Debate	Debate on sociolinguistics
	Ecolinguistics – Forensic Linguistics	8	Lecture Debate Discussion	Discussion on the features of Forensic Linguistics
	Computational Linguistics. Cognitive Science and Artificial Intelligence	6	Lecture Debate Discussion	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 150 marks and 3 hours duration	6	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	1	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials :

- R H Robins :*A Short History of Linguistics*
- William O'Grady, Michael Dobrovsky& Mark Arnoff :*Contemporary Linguistics: An Introduction*
- Charles F. Hockett : A Course in Modern Linguistics • John Lyons : Language and Linguistics, An Introduction.
- Danny D Steinberg & Natalia V Sciarini :*An Introduction to Psycholinguistics*

- Malcolm Coulthard& Alison Johnson: *An Introduction to Forensic Linguistics*
- Peter Trudgill :*Sociolinguistics: An Introduction to Language and Society*
- Elizabeth Ahlsen :*Introduction to Neurolinguistics*
- Alvin Fill. : *Eco-linguistics*: *State of the Art 1998*
- PaninianLinguistics :https://web.stanford.edu/class/linguist289/encyclopaedia001.pdf
- Keith Allan :*The Routledge Handbook of Linguistics*
- E F K Koerner : "The Chomskyan Revolution," *Towards a History of American Linguistics*

Teacher/s –in Charge:

- Keerthana P K Module Division:

Module	Month	Teacher/s-in--charge
Module 1	June-July	Keerthana P K
Module 2	August-September	Keerthana P K
Module 3	October- November	Keerthana P K

Course/ Lesson Plan

Semester IV

Course category: Core Course I

Paper name: English Literature in the 21st Century

Code: ENG4C11

Contact Hours: 72 **Credits: 4**

Course Outcome:

- Familiarize the students with various trends in English Literature in the 21st Century. Introduce them to various movements.

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Section A: Poetry	Simon Armitage : "A Vision" Benjamin Zephaniah : "Rong Radio Station" Martin Espada : "Alabanza: In Praise of Local 100"	5	Lecture	Evaluation through question-answer session
	Evan Boland : "Atlantis - A lost Sonnet" DaljitNagra : "Look We Have Coming to Dover" Sean O'Brien : "Water- Gardens"		Lecture Debate	Debate on the topic – Evan Boland : "Atlantis - A lost Sonnet"
	Ocean Vuong : "DetoNation" Terrance Hayes : "I Lock You in an American Sonnet that is Part Prison" Sarah Howe : "Yangtze"		Presentation on Literary Qualities in Ocean Vuong : "DetoNation"	Reference reading and notes are evaluated.
	Jorie Graham : "Fast" Vijay Nambisan : These were my Homes		Lecture	Evaluation through Annotation questions
Section B: Drama	Tracy Letts : August: Osage County		Lecture Student seminar	Question-answer sessions Seminar evaluation

	Tracy Letts : August: Osage County Part-2		Lecture Debate	Debate on the topic of Tracy Letts : August: Osage County
	Lucy Kirkwood : Chimerica	5	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	AyadAkhtar : Disgraced	5	Lecture Student seminar	Class test of all the topics of Section-B Seminar evaluation
Section C: Fiction and Prose	Kazuo Ishiguo's Never Let Me Go. Mohsin Hamid : The Reluctant Fundamentalist	5	Lecture Debate Presentations	Question-answer sessions
	Richard Powers : The Echo Maker Viet Thanh Nguyen : The Sympathizer	5	Debate	Debate on the Nguyen : The Sympathizer
	Ali Smith : Autumn AmitavGhosh : Chapters 1-4	5	Discussion	Discussion on the Ali Smith : Autumn
	David Lodge : "Consciousness and the Two Cultures" Chimamanda Ngozi Adichie : Purple Hibiscus	5	Lecture	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 150 marks and 3 hours duration	5	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	2	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.

Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		72hours		

Reference Materials :

- Bryant N. Kendra. Engaging 21st century Writers with Social Media.IGI Global Publishers, 2017.
- Antakyalioglu, Zekiye English Studies in 21st Century, Cambridge Scholars Publishers, 2020

Teacher/s –in Charge:

- Arya James Module Division:

Module	Month	Teacher/s-in--charge
Module 1	December	Arya James
Module 2	January	Arya James
Module 3	February-March	Arya James

Course/ Lesson Plan

Semester IV

Course category: Elective Course I

Paper name: INDIAN ENGLISH FICTION

Code: ENG4E14

Contact Hours: 72 **Credits: 4**

Course Outcome:

- This course intends to familiarise students with the different trends in Indian English fiction

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I	Raja Rao Kanthapura	5	Lecture	Evaluation through question-answer session
	Mulk Raj Anand Coolie	5	Lecture Debate	Debate on the topic Indian English fiction
	Khushwant Singh *Train To Pakistan*	5	Presentation on narration	Reference reading and notes are evaluated.
	RohintonMistry *A Fine Balance*	5	Presentation and Lecture	Class test including all the topics
Module II	ArvindAdiga *The White Tiger*	5	Lecture Student seminar	Question-answer sessions Seminar evaluation
	Deepak Unnikrishnan *Temporary People*	5	Lecture Debate	Debate on *Temporary People*
	Chitra Banerjee Divakaruni The*Palace Of Illusions*	5	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	Chitra Banerjee Divakaruni The*Palace Of Illusions*	5	Lecture Student seminar	Class test of Module II Seminar evaluation

Module III	JhumpaLahiri *The Namesake*	5	Lecture Debate Presentations	Question-answer sessions
		5	Lecture Debate	Debate on the Characterisation
	Kiran Desai *The Inheritance Of Loss*	5	Lecture Debate Discussion	Discussion on Kiran Desai
	AneesSalim *The Blind Lady's Descendants*	5	Lecture Debate Discussion	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 120 marks and 3 hours duration	6	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	1	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		72 hours		

Reference Materials :

- Naik M K : History of Indian English Literature
- Ran Sharma : Critical Explorations in Indian English Literature
- Ajay Kumar Sharma : Critical Perspectives of Indian English Literature
- Shyamala A Narayan : Indian English Literature 2001- 2015 A Critical Survey

Teacher/s –in Charge:

- Keerthana P K

Module Division:

Module	Month	Teacher/s-in--charge
Module 1	December	Keerthana P K
Module 2	January	Keerthana P K
Module 3	February-March	Keerthana P K

Course/ Lesson Plan

Semester IV

Course category: Elective Course II

Paper name: Malayalam Literature in English Translation

Code: ENG4E18

Contact Hours: 72 **Credits: 4**

Course Outcome:

- This Course introduces the learners to movements and trends in Malayalam literature since the 1970s, offering representative texts for study.

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I	Kumaran Asan : "The Fallen Flower" Vallathol : "Akroon to Ambadi" Ulloor : "Music of Love"	5	Lecture	Evaluation through question-answer session
	Changampuzha : "Manaswini" G. Sankara Kurup : "The Master Carpenter"	5	Lecture Debate	Debate on the topic Romanticism
	Balamani Amma : "Mother's Heart" Vyloppilli : "The Mother Tigress in the Zoo"	5	Presentation on Poetic techniques	Reference reading and notes are evaluated.

	N.V. Krishna Variyar : "The Rats" Sugatha Kumari : "Colossus" O.N.V. Kurup : "Blue Fish"	5	Presentation and Lecture	Class test including all the topics
Module II	O. Chandu Menon : *Indulekha* Basheer : *My Granddad had an Elephant*	5	Lecture Student seminar	Question-answer sessions Seminar evaluation

	C.V. Raman Pillai : *Marthanda Varma* Thakazhi : *Chemmeen*	5	Lecture Debate	Debate on Chemmeen
	O.V. Vijayan : *The Legend of Kazak*	5	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	Kesava Dev : *From The Gutter* M.T. Vasudevan Nair : *Mist*	5	Lecture Student seminar	Class test of Module II Seminar evaluation
Module III	N. Krishna Pillai : *Investmen*t (Kerala Sahitya Akademi, Thrissur)	5	Lecture Debate Presentations	Question-answer sessions
	C.J. Thomas : *Behold, He Comes Again*	5	Lecture Debate	Debate on the Characterisation
	Thoppil Bhasi : *Capita*l G. Sankara Pillai : *Bharata Vakyam*	5	Lecture Debate Discussion	Discussion on Thoppil Bhasi
	K.J. Baby : *Nadugadhika*	5	Lecture Debate Discussion	Evaluation through question-answer session
Evaluation: (12 hrs)				

Internal Examinations	Two internals of 120 marks and 3 hours duration	6	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	1	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		72 hours		

Reference Materials :

- The Oxford India Anthology of Malayalam Dalit Writing(2011) • The Oxford India Anthology of Modern Malayalam Literature (2017).
- Mona Baker : Critical Readings in Translation Studies
- Silvia Kadiu : Reflexive Translation Studies : Silvia Kadiu
- Dr. N. Mukundan : Changamphuzha Krishnapillai
- Ulloor S Parameswara Aiyer : Kerala Sahithya Charithram (V Volumes, IV edition)

Teacher/s –in Charge:

- Mary Davis Module Division:

Module	Month	Teacher/s-in--charge
Module 1	December	Mary Davis
Module 2	January	Mary Davis
Module 3	February-March	Mary Davis

Course Plan 2020-2021

Course/ Lesson Plan

Semester I

Course category: Core Course I

Paper name: British Literature from Chaucer to 18th Century

Code: ENG 1 C01

Contact Hours: 90 **Credits: 5**

Course Outcome:

- Familiarize the students with various trends in British literature from the 14th century to the 18th century.
- Introduce them to various movements in British literature

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Section A: Poetry	Geoffrey Chaucer : "The General Prologue to Canterbury Tales" (first 100 lines)	6	Lecture	Evaluation through question-answer session
	William Shakespeare : Sonnet 18. "Shall I Compare thee to a Summer's Day" John Donne : "The Canonization"	6	Lecture Debate	Debate on the topic – Compare and Contrast Shakespeare and John Donne.
	Andrew Marvell : "To His Coy Mistress" John Dryden : "Mac Flecknoe"	6	Presentation on Literary Qualities in Mac Flecknoe	Reference reading and notes are evaluated.
	John Milton : "Paradise Lost" Book 1 (lines up to 270) Thomas Gray : "Elegy written in a Country Churchyard"	8	Lecture	Evaluation through Annotation questions
Section B: Drama	Shakespeare : Hamlet	8	Lecture Student seminar	Question-answer sessions Seminar evaluation

	Shakespeare : Hamlet & Webster : The Duchess of Malfi	6	Lecture Debate	Debate on the topic Elucidate the soliloquies in the Hamlet.
	Webster : The Duchess of Malfi	6	Lecture	Write-ups of students are to be evaluated.
			Student seminar	Seminar evaluation
	Sheridan : The Rivals	6	Lecture Student seminar	Class test of all the topics of Section II Seminar evaluation
Section C : Prose And Fiction	Swift : Gulliver's Travels	6	Lecture Debate Presentations	Question-answer sessions
	Henry Fielding : Joseph Andrews	6	Debate	Debate on the how far the term "picaresque" applied to Joseph Andrews.
	Francis Bacon : "Of Marriage", Joseph Addison : Sir Roger at Church	8	Discussion	Discussion in group on the topic, "Is being married better than remaining single?
	Daniel Defoe : Robinson Crusoe	6	Lecture	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	2	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	5	All students are required to present a topic with the help of power point	Feedbacks are provided and marks are considered for CIE

			presentation, preferably.	
		90 hours		

Reference Materials:

- Carter, Ronald and John McRae. The Routledge History of Literature in English Britain and Ireland. Malcolm Bradbury, 2001.
- O' Neill, Michael. The Cambridge History of English Poetry. Cambridge University Press, 2010.

Teacher/s –in Charge: Dhanisha K.S.

Module Division:

Module	Month	Teacher/s-in—charge
Module 1	June-July	Dhanisha K.S.
Module 2	August-September	Dhanisha K.S.
Module 3	October-November	Dhanisha K.S

Course/ Lesson Plan

Semester I

Course category: Core Course II

Paper name: British Literature 19th century

Code: ENG1CO2

Contact Hours: 90 **Credits: 5**

Course Outcome:

- This course will train students to examine and interpret the long eighteenth century and its multiple revolutions through a transnational and cross-cultural perspective.
- Students will be trained to understand the continuities between the eighteenth century and high modernity.

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I	The Tiger, The Lamb Lines Composed a Few Miles above Tintern Abbey	6	Lecture	Evaluation through question-answer session
	Kubla Khan Ozymandias Ode to a Nightingale	6	Lecture Debate	Debate on the topic John Keats
	She Walks in Beauty Tithonus Fra Lippo Lippi	6	Presentation on Fra Lippo Lippi	Reference reading and notes are evaluated.
	A Musical Instrument Dover Beach The Blessed Damozel	8	Presentation and Lecture	Class test including all the poems
Module II	Oscar Wilde	8	Lecture Student seminar	Question-answer sessions Seminar evaluation
	The Importance of Being Earnest	6	Lecture Debate	Debate on the topic of Victorian tradtions and hypocrisy
	The Importance of Being Earnest	6	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	The Importance of Being Earnest	6	Lecture Student seminar	Class test of Module II Seminar evaluation

Module III	Charles Lamb : "Dream Children – A Reverie"	6	Lecture Debate Presentations	Question-answer sessions
	William Hazlitt : On Reading Old Books			
	Charles Dickens : A Tale of Two Cities	6	Lecture Debate	Debate on the Characterisation
	Emily Bronte : Wuthering Heights	8	Lecture Debate Discussion	Discussion on Heathcliff and Catherine
	Thomas Hardy : Tess of the D'Urbevilles	6	Lecture Debate Discussion	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 150 marks and 3 hours duration	6	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	1	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials :

- Elizabeth Gaskell : *North and South*
- George Eliot : *The Lifted Veil* OXFORD WORLD'S CLASSICS
- Thomas Hardy : *Tess of the D'Urbervilles*
- Raymond Williams : Introduction *In the English Novel from Dickens to Lawrence*

Teacher/s –in Charge: Femin Sunny

Module Division:

Module	Month	Teacher/s-in--charge
Module 1	June-July	Femin Sunny
Module 2	August-September	Femin Sunny
Module 3	October-November	Femin Sunny

Course/ Lesson Plan

Semester I

Course category: Core Course III

Paper name: History of English Language

Code: ENG1CO3

Contact Hours: 90 **Credits: 5**

Course Outcome:

- The course offers an overview of the History of English Language from its origin to the present.

Modules	Contents	Hours	Procedure/ Activity/ plans	Assessment
Module I	Language families - The Indo-European family of languages; Germanic Family of languages and the origin of English	6	Lecture	Evaluation through question-answer session
	The early history of English language; Old English Period - Scandinavian invasions - Middle English Period: The Impact of the Norman Conquest on the English Language; - Middle English Literature.	6	Lecture Debate	Debate on the topic Origin of Language
	Modern English Period – Latin and Greek influence – Loan words - The impact of the Renaissance- Bible Translations	6	Presentation on Latin and Greek influence	Reference reading and notes are evaluated.

	Sound changes in English – The Great Vowel Shift - Changes in Grammar,	8	Presentation and Lecture	Class test including all the Topics
	vocabulary, phonology and morphology – Semantics – word formation			
Module II	Foreign influences on English in the Seventeenth, Eighteenth and the Nineteenth Centuries	8	Lecture Student seminar	Question-answer sessions Seminar evaluation
	Colonialism and the English language	6	Lecture Debate	Debate on the topic of Colonialism and the English language
	Expansion of Vocabulary – Semantic change- Pidgins and Creoles.	6	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	Contributions of major writers to the growth of English vocabulary	6	Lecture Student seminar	Class test of Module II Seminar evaluation
Module III	The discrepancy between spelling and pronunciation - Attempts to reform English spelling	6	Lecture Debate Presentations	Question-answer sessions
	Evolution of Standard English - Dialects of English: British and American – English in India	6	Lecture Debate	Debate on Dialects of English

	English in the postcolonial world – English as a global language — The rise of 'englishes' – impact of Science and Technology –	8	Lecture Debate Discussion	Discussion on impact of Science and Technology
	English in the digital age.	6	Lecture Debate Discussion	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 150 marks and 3 hours duration	6	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	1	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials :

- F. T. Wood : An Outline History of the English language
- C. L. Wrenn : The English Language
- A. C. Baugh : A History of the English Language
- David Crystal : English as a Global Language
- David Crystal: The English Language: A guided Tour of the Language
- Bill Ashcroft, et al : The Empire Writes Back
- Christian Mair :The Politics of English as a World Language

- Andreas Sedlatschek : Contemporary Indian English: Variation and Change
- Pingali Sailaja : Indian English
- Michael Hanrahan& Deborah L Madsen (Ed.): Teaching, Technology, Textuality: Approaches to New Media

Teacher/s –in Charge: Anju Rose Anto

Module Division:

Module	Month	Teacher/s-in--charge
Module 1	June-July	Anju Rose Anto
Module 2	August-September	Anju Rose Anto
Module 3	October-November	Anju Rose Anto

Course/ Lesson Plan

Semester I

Course category: Core Course IV

Paper name: Indian Literature in English

Code: ENG1 C04

Contact Hours: 90 **Credits: 5**

Course Outcome:

- Familiarize the students with the various trends and movements in Indian English literature from its inception to the present.

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Section A: Poetry	Toru Dutt : "Our Casuarina Tree" Rabindranath Tagore : "The Child"	5	Lecture	Evaluation through question-answer session
	Nizzim Ezekiel : "In the Country Cottage" Jayantha Mahapatra : "Hunger" A.K. Ramanujan : "Obituary"	4	Lecture Debate	Debate on the topic: Compare and Contrast the writers Ezekiel and Mahapatra.

	R. Parthasarathy : "River, Once" Kamala Das : "The Old Playhouse" Gieve Patel : "The Ambiguous fate of Gieve Patel.	6	Presentation on Kamala Das as a Confessional Poet of India	Reference reading and notes are evaluated.
	Meena Alexander : "Blue Lotus" Arundhathi Subramaniam : "Home" MeenaKandasamy :"Dead Woman Walking"		Presentation and Lecture	Class test including all the annotation portion of Section A.
Section B: Fiction	Mulk Raj Anand : Coolie		Lecture Student seminar	Question-answer sessions Seminar evaluation
	R.K. Narayanan : The Guide	7	Lecture Debate	Debate on the topic of literary techniques of a frame narrative in "The Guide"

	Salman Rushdie : Midnight's Children	3	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	AmitavGhosh : The Hungry Tide		Lecture Student seminar	Class test of all the topics of Section -B Seminar evaluation
Section: C Drama	GirishKarnad : Yayati (English Translation by the author)	8	Lecture Debate Presentations	Question-answer sessions
	GirishKarnad : Yayati		Debate	Debate on the GirishKarnad : Yayati
	Mahesh Dattani : Tara	4	Discussion	Discussion on the Characteristics of Tara
	Mahesh Dattani : Tara	6	Lecture	Evaluation through question-answer session
Section-D Prose	JawaharLal Nehru : "What is Culture?"		Lecture Debate	Debate on Nehru's Writing Style
	AmartyaSen : "Reason and Identity" (From: The Argumentative Indian, Part IV)		Lecture Student Seminar	Seminar evaluation

	AmartyaSen : "Reason and Identity" Section 1-4)	5	Lecture Student Seminar	Seminar evaluation
	AmartyaSen : "Reason and Identity" (Section 58)		Lecture Discussion	Class test
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 150 marks and 3 hours duration		Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	2	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic		All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials:

- Agrawal K.A. Indian Writing in English: A Critical Study. Atlantic Publishers, 2003.
- Tiwari, Shubha. Indian Fiction in English Translation. Atlantic Publishers, 2005.

Teacher/s –in Charge: Dhanisha K.S.

Module Division:

Module	Month	Teacher/s-in--charge
Module 1	June-July	Dhanisha K.S.
Module 2	August-September	Dhanisha K.S.
Module 3	October-November	Dhanisha K.S.

Course/ Lesson Plan

Semester II

Course category: Core Course I

Paper name:: Twentieth Century British Literature up to 1940 Code:

ENG2C05

Contact Hours: 90 **Credits: 5**

Course Outcome:

- This course will train students to examine and interpret the Twentieth century and its multiple revolutions through a transnational and cross-cultural perspective.
- Students will be trained to understand the different perspectives of modernity.

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I	G.M. Hopkins - : "The Windhover"	6	Lecture	Evaluation through question-answer session
	W.B. Yeats - : The Second Coming, Byzantium	6	Lecture Debate	Debate on the topic W.B. Yeats
	TS Eliot - : The Waste Land	6	Presentation on The Wasteland	Reference reading and notes are evaluated.
	W.H.Auden - : Funeral Blues Wilfred Owen : A Strange Meeting	8	Presentation and Lecture	Class test including all the poems
Module II	GB Shaw : Caesar and Cleopatra	8	Lecture Student seminar	Question-answer sessions Seminar evaluation
	TS Eliot : Murder in the Cathedral	6	Lecture Debate	Debate on the topic of Theme of martyrdom
	TS Eliot : Murder in the Cathedral	6	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	JM Synge : Juno and The Paycock	6	Lecture Student seminar	Class test of Module II Seminar evaluation

Module III	Virginia Woolf - : "Modern Fiction"	6	Lecture Debate Presentations	Question-answer sessions
	Joseph Conrad -: Heart of Darkness	6	Lecture Debate	Debate on the Characterisation
	D.H. Lawrence : Sons and Lovers	8	Lecture Debate Discussion	Discussion on female characters
	James Joyce - : A Portrait of the Artist as a Young Man	6	Lecture Debate Discussion	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 150 marks and 3 hours duration	6	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	1	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials :

- Baum, Paull F. "Sprung Rhythm". PMLA, IX.XIV (1959),pp.418-25.
- Bender, Todd K. Gerard Manley Hopkins: The Classical Background and Critical Reception of his Work.
- Bergonzi, Bernard. Gerard Manley Hopkins. New York:Macmillan, 1977.

- Aiken, Conrad ‘An Anatomy of Melancholy’, T.S.Eliot:TheWasteLand(CaseBook), Ed. Dyson,Macmillan,London, 1968
- Bradbury,Malcolm.The Modern World Ten great Writers, KalyaPublishers,New Delhi,1989
- Brooks, Cleanth.Modern Poetry and Tradition, Oxford University Press, New York, 1939

Teacher/s –in Charge: Sr. Alphonsa P.J.

Module Division:

Module	Month	Teacher/s-in--charge
Module 1	December	Sr. Alphonsa P.J.
Module 2	January	Sr. Alphonsa P.J.
Module 3	February-March	Sr. Alphonsa P.J.

Course/ Lesson Plan

Semester II

Course category: Core Course II

Paper name:Literary Criticism and Theory – Part 1(Up to New Criticism)

Code: ENG1CO6

Contact Hours: 90 **Credits: 5**

Course Outcome:

- The course offers an overview of the History of English Language from its origin to the present.

Modules	Contents	Hours	Procedure/ Activity/ plans	Assessment
Module I	Plato : The Republic (Books 2 and 3)	6	Lecture	Evaluation through question-answer session
	Aristotle - : Poetics	6	Lecture Debate	Debate on the topic Poetics
	Aristotle - : Poetics	6	Presentation on Latin and Greek influence	Reference reading and notes are evaluated.
	Longinus - : On the sublime (Chapters 7 – 9)	8	Presentation and Lecture	Class test including all the Topics
Module II	Sir Philip Sydney - : An Apology for Poetry William Wordsworth : Preface to Lyrical Ballads	8	Lecture Student seminar	Question-answer sessions Seminar evaluation
	F. R Leavis : Hard Times: An Analytic note (From 'The Great Tradition')	6	Lecture Debate	Debate on the topic of Criticism on Dickens
	T.S. Eliot - : Tradition and Individual Talent	6	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation

	Cleanth Brooks - : The Language of Paradox			
	Northrop Frye - : The Archetypes of Literature	6	Lecture Student seminar	Class test of Module II Seminar evaluation
Module III	S.N. Das Gupta - : The Theory of Rasa	6	Lecture Debate Presentations	Question-answer sessions
	S.N. Das Gupta - : The Theory of Rasa	6	Lecture Debate	Debate on Rasa
	Kunjunni Raja - : Theory of Dhwani	8	Lecture Debate Discussion	Discussion on impact of Dhwani
	Kunjunni Raja - : Theory of Dhwani	6	Lecture Debate Discussion	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 150 marks and 3 hours duration	6	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	1	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials :

- Day, Gary. Literary Criticism: A New History. Edinburgh UP, 2008
- Allan, William. Classical Literature: A Very Short Introduction. Oxford UP, 2014.
- Habib, M. A. R. A History of Literary Criticism. Blackwell Press, 2005.
- Day, Gary. Literary Criticism: A New History. Edinburgh UP, 2008.
- Allan, William. Classical Literature: A Very Short Introduction. Oxford UP, 2014.
- Abercrombie, Lascellas. Principles of Literary Criticism. Greenwood P, 1979.

Teacher/s –in Charge: Anju Rose Anto

Module Division:

Module	Month	Teacher/s-in--charge
Module 1	December	Anju Rose Anto
Module 2	January	Anju Rose Anto
Module 3	February-March	Anju Rose Anto

Course/ Lesson Plan

Semester II

Course category: Core Course III

Paper name: American Literature

Code: ENG2C07

Contact Hours: 90 **Credits: 5**

Course Outcome:

- Aimed at acquainting students with the dominant trends in American Literature from the early colonial period to the twentieth century.
  Gain in-deep knowledge of the subject.

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Section A: Poetry	Robert Frost - Home Burial Wallace Stevens - The Emperor of Ice Cream EE Cummings - Buffalo Bill	6	Lecture	Evaluation through question-answer session
	Langston Hughes - I Too Robert Lowell - For the Union Dead Allen Ginsberg - America		Lecture Debate	Debate on the topic – Compare and Contrast the writers Langston Hughes and Lowell.
	Sylvia Plath - Edge Gloria E. Anzaldua : To live in the Borderlands means you		Presentation on Sylvia Plath as a Confessional Poet.	Reference reading and notes are evaluated.
	Edgar Allan Poe - The Raven Walt Whitman - A passage to India Emily Dickinson - There is a certain slant of light	8	Lecture	Evaluation through Annotation questions
Section B: Prose and Fiction	Ralph Waldo Emerson - “Selfreliance” Herman Melville - Moby Dick		Lecture Student seminar	Question-answer sessions Seminar evaluation

	Mark Twain - Huckleberry Finn		Lecture Debate	Debate on the topic the role of religion in the novel.
	William Faulkner - The Sound and the Fury	6	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	Tony Morrison - Tar Baby	6	Lecture Student seminar	Class test of all the topics of Section-B Seminar evaluation
SECTION C: Drama	Eugene O'Neill- The Emperor Jones	6	Lecture Debate Presentations	Question-answer sessions
	The Emperor Jones (cont.) & Tennessee Williams - The Glass Menagerie	6	Debate	Debate on the Tennessee Williams' The Glass Menagerie as a Memory Play.
	Tennessee Williams - The Glass Menagerie	8	Discussion	Discussion on the Characteristics of Tara
	Amiri Baraka (LeRoi Jones) – Dutchman	6	Lecture	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 150 marks and 3 hours duration	5	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	2	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials:

- Belasco, Susan. A Companion to American Literature. Wiley Publishers, 2020.
- Rozakis E, Laurie. The Complete Idiot's Guide to American Literature. Alpha Publishers, 1999.

Teacher/s –in Charge: Femin Sunny

Module Division:

Module	Month	Teacher/s-in--charge
Module 1	December	Femin Sunny
Module 2	January	Femin Sunny
Module 3	February-March	Femin Sunny

Course/ Lesson Plan

Semester II

Course category: Core Course IV

Paper name:Postcolonial Writings

Code: ENG2C08

Contact Hours: 90 **Credits: 5**

Course Outcome:

- This course on Postcolonial literature will explore colonialism and its cultural impacts,throughwritings produced by people from countries with a history of colonialism,primarily those concernedwith the workings and legacy of colonialism and the postcolonial resistance to them.

Modules	Contents	Hours	Procedure/ Activity/ plans	Assessment
Module I	A. K. Ramanujan : "Self Portrait" Dom Moraes : "A Letter", "Sinbad" Leopold Senghor : "New York"	6	Lecture	Evaluation through question-answer session
	Gabriel Okara : "The Mystic Drum" David Diop : "Africa" Allen Curnow : "House and Land"	6	Lecture Debate	Debate on the topic Africa.
	A.D. Hope : "Australia" Jack Davis : "Aboriginal Australian" Margaret Atwood : "Journey to the Interior"	6	Presentation on Postcolonialism	Reference reading and notes are evaluated.

	Derek Walcott : "Ruins of a Great House" E. E. Tiang Hong : "Arrival" Almaghir Hashmi : "So What if I Live in a House Made by Idiots"	8	Presentation and Lecture	Class test including all the poems
	Kamau Brathwaite : "Negus"			
Module II	Wole Soyinka : *The Road*	8	Lecture Student seminar	Question-answer sessions Seminar evaluation
	GirishKarnad : *Hayavadana*	6	Lecture Debate	Debate on the topic of Importance of chorus
	GirishKarnad : *Hayavadana*	6	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	Timberlake Wertenbaker : *Our Country's Good*	6	Lecture Student seminar	Class test of Module II Seminar evaluation
Module III	Chinua Achebe : *Things Fall Apart*	6	Lecture Debate Presentations	Question-answer sessions
	V. S. Naipaul : *A House for Mr.Biswas*	6	Lecture Debate	Debate on the Characterisation
	Khaled Hosseini : *The Kite Runner*	8	Lecture Debate Discussion	Discussion on Afghan Politics
	Margaret Laurence : *Stone Angel*	6	Lecture Debate Discussion	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 150 marks and 3 hours duration	6	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.

Assignments	Any topic	1	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials :

- Ashcroft, Bill, Gareth Griffiths, and Helen Fiffin. The Empire Writes Back: Theory and Practice in Post-Colonial Literatures.
- Bhabha, Homi. "Postcolonial Criticism."
- Boehmer, Elleke. Colonial and Postcolonial Literature. Oxford University Press, 2005.
- Bové, Paul A. Intellectuals in Power: the Genealogy of Critical Humanism. New York: Columbia University Press, 1986.
- Brydon, Diana ed. And introduction. Postcolonialism: Critical Concepts in Literary and Cultural Studies. 5 vols. New York: Routledge, 2006

Teacher/s –in Charge: Sr. Alphonsa P.J.

Module Division:

Module	Month	Teacher/s-in--charge
Module 1	December	Sr. Alphonsa P.J.
Module 2	January	Sr. Alphonsa P.J.
Module 3	February-March	Sr. Alphonsa P.J.

Course/ Lesson Plan

Semester III

Course category: Core Course I

Paper name: Twentieth Century British Literature Post 1940

Code: ENG3CO9

Contact Hours: 90 **Credits: 5**

Course Outcome:

- This course will train students to examine and interpret the long twentieth century and its multiple revolutions through a transnational and cross-cultural perspective.
- Students will be trained to understand the perspectives on post modernity.

Modules	Contents	Hours	Procedure/ Activity/ plans	Assessment
Module I	Dylan Thomas : "Fern Hill" Philip Larkin : "Church Going"	6	Lecture	Evaluation through question-answer session
	Thom Gunn : "On the Move" Ted Hughes : "View of a Pig", Seamus Heaney : "Punishment	6	Lecture Debate	Debate on the topic bog poetry
	Charles Tomlinson : "Swimming Chenango Lake" Geoffrey Hill : "In Memory of Jane Frazer	6	Presentation on Charles Tomlinson	Reference reading and notes are evaluated.
	Elizabeth Jennings : "One Flesh" Andrew Motion : "The Last Call"	8	Presentation and Lecture	Class test including all the poems
Module II	Samuel Beckett : *Waiting for Godot*	8	Lecture Student seminar	Question-answer sessions Seminar evaluation

	Caryl Churchill : *Top Girls*	6	Lecture Debate	Debate on the topic of female characters
	Harold Pinter : *The Birthday Party*	6	Lecture	Write-ups of students are to be evaluated.
			Student seminar	Seminar evaluation
	Edward Bond : *Lear*	6	Lecture Student seminar	Class test of Module II Seminar evaluation
Module III	John Fowles : *The French Lieutenant's woman*	6	Lecture Debate Presentations	Question-answer sessions
	Kingsley Amis *: Lucky Jim*	6	Lecture Debate	Debate on the Characterisation
	Alan Sillitoe : *Loneliness of the Long Distance Runner*	8	Lecture Debate Discussion	Discussion on the character Smith
	Kazuo Ishiguro : Remains of the Day	6	Lecture Debate Discussion	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 150 marks and 3 hours duration	6	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	1	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE

		90 hours		

Reference Materials :

- Book by Martin Esslin : The Theatre of the Absurd
- Michael Y. Bennett : Reassessing the Theatre of the Absurd: Camus, Beckett, Ionesco, Genet, and Pinter
- Michael Y. Bennett : The Cambridge Introduction to Theatre and Literature of the Absurd
- Perry Anderson : The Origins of Postmodernity
- Fredrick Jameson : Postmodernism, or, the Cultural Logic of Late Capitalism
- William Hutchings :Samuel Beckett's Waiting for Godot: A Reference Guide

Teacher/s –in Charge: Dhanisha K.S.

Module Division:

Module	Month	Teacher/s-in--charge
Module 1	June-July	Dhanisha K.S.
Module 2	August-September	Dhanisha K.S.
Module 3	October-November	Dhanisha K.S.

Course/ Lesson Plan

Semester III

Course category: Core Course II

Paper name: Literary Criticism and Theory: Part 2

Code: ENG3C10

Contact Hours: 90 **Credits: 5**

Course Outcome:

- Familiarize the students with Literary Criticism and Theory
  Introduce them to various theories and help them to have in-depth knowledge of the major theorists and key concepts.

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Section A: 1.Structuralism 2. PostStructuralism/ Deconstruction 3.Psychoanalysis: An Overview	Major theorists, Key concepts. Structure, Sign, Signifier, Signified, Semiology, Semiotics, Langue and Parole, Mythemes, Structuralist Narratology.	6	Lecture	Evaluation through question-answer session
	Text for Detailed Study: Roland Barthes: "Structuralist Activity"		Lecture Debate	Debate on the topic – Major theorists of Structuralism Post-Structuralism.
	Major theorists, Key concepts. Text for Detailed Study: Jacques Derrida: "Structure, Sign and Play in the Discourse of Social Sciences"		Presentation on key concepts	Reference reading and notes are evaluated.

	Major theorists, Key concepts. Text for Detailed Study: Jacques Lacan: "The Mirror Stage as Formative of the Function of the I"	8	Lecture	Evaluation through quiz

Section B: 4. Feminism 5. Cultural Materialism/ New Historicism 6. Post colonialism: An Overview	Major theorist: : Virginia Woolf, Kate Millet, Elaine Showalter, Helene Cixous, Adrienne Rich. Key concepts.	8	Lecture Student seminar	Question-answer sessions Seminar evaluation
	Text for Detailed Study: Elaine Showalter: "Towards a Feminist Poetics"	6	Lecture Debate	Debate on the topic of phases of feminism.
	Major theorists. & Louis Montrose: "Professing the Renaissance: The Poetics and Politics of Culture"	6	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	Major theorists, Key concepts. Text for Detailed Study: Edward Said: "Jane Austen and Empire"	6	Lecture Student seminar	Class test of all the topics of Section-II Seminar evaluation
Section C: 7. Ecocriticism 8.Critiquing Theory: An Overview	Major theorists: Jonathan Bate, CheryllGlotfelty, Laurence Coupe, Patrick DMurphy, William Rueckert.	6	Lecture Debate Presentations	Question-answer sessions

	Key concepts: Anthropocentrism, Shallow Ecology vs Deep Ecology, The Crisis of Humanism, Nature/Culture, Green Studies, Environmental Imagination, Ecofeminism.	6	Debate	Debate on the key terms of Ecocriticism
	Text for Detailed Study: Cheryll Glotfelty: "Introduction: Literary Studies in an age of Environmental Crisis"	8	Discussion	Discussion on "Introduction: Literary Studies in an age of Environmental Crisis"
	Text for Detailed Study: Graham Good: "Presentism: Postmodernism, Poststructuralism, Postcolonialism"	6	Lecture	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 150 marks and 3 hours duration	5	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	2	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE

		90 hours		

Reference Materials :

- Habib, M.A.R. Modern Literary Criticism and Theory. Blackwell Publishing,2008.
- Bennett, Andrews. An Introduction to Literature Criticism and Theory. Routledge Publishers, 2016.

Teacher/s –in Charge: Anju Rose Anto

Module Division:

Module	Month	Teacher/s-in--charge
Module 1	June-July	Anju Rose Anto
Module 2	August-September	Anju Rose Anto
Module 3	October-November	Anju Rose Anto

Course/ Lesson Plan

Semester III

Course category: Elective Course I

Paper name: EUROPEAN FICTION IN TRANSLATION Code: ENG3E02

Contact Hours: 90 Credits: 5

Course Outcome:

- This course will explore different trends in European fiction and its cultural impacts, through writings produced by people from different countries.

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I	Cervantes Don Quixote	6	Lecture	Evaluation through question-answer session
	Gustave Flaubert Madame Bovary	6	Lecture Debate	Debate on the topic morality
	Gustave Flaubert Madame Bovary	6	Presentation on Madame Bovary	Reference reading and notes are evaluated.

	Leo Tolstoy Anna Karenina	8	Presentation and Lecture	Class test including all the topics
Module II	Franz Kafka The Trial	8	Lecture Student seminar	Question-answer sessions Seminar evaluation
	Kazantzakis Zorba, the Greek	6	Lecture Debate	Debate on the topic of contrast between Zorba and Boss
	Kazantzakis Zorba, the Greek	6	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	Gunter Grass The Tin Drum	6	Lecture Student seminar	Class test of Module II Seminar evaluation
Module III	Milan Kundera The Joke	6	Lecture Debate Presentations	Question-answer sessions
	Jose Saramago Blindness	6	Lecture Debate	Debate on the Characterisation
	Orhan Pamuk Snow	8	Lecture Debate Discussion	Discussion on Pamuk
	Italo Calvino If on a winter's night a traveller	6	Lecture Debate Discussion	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 150 marks and 3 hours duration	6	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	1	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.

Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials :

- Walter Cohen : A History of European Literature: The West and the World from Antiquity to the Present
- Dr. Usha Jain : European Classics in Translation
- John Lucas : The Literature o f Change: Studies in the Nineteenth Century Provincial Novel
- John Galsworthy : The Creation o f Character in Literature
- Jonathan Culler : The Uses of Madame Bovary
- Stirling Haig : The Madame Bovary Blues: The Pursuit o f Illusion in Nineteenth Century French Fiction
- Ruth Crego Benson : Women in Tolstoy.
- Laura J Gorfkle : Discovering the Comic in Don Quixote

Teacher/s –in Charge;
Femin Sunny
Module Division:

Module	Month	Teacher/s-in--charge
Module 1	June-July	Femin Sunny
Module 2	August-September	Femin Sunny
Module 3	October-November	Femin Sunny

Course/ Lesson Plan

Semester III

Course category: Elective Course II

Paper name: Introduction to Linguistics Code: ENG 3 E04

Contact Hours: 90 **Credits: 5**

Course Outcome:

- The course is intended to familiarize learners with the nature and organization of language. The history of Linguistics and its key concepts are discussed.

Modules	Contents	Hours	Procedure/ Activity/ plans	Assessment
Module I	Unit 1 Origin of Language – Features of Language – language behavior and language system- – Language Families – Language Typology – Language Acquisition Introduction to Linguistics	6	Lecture	Evaluation through question-answer session
	Linguistics as a science - History of Linguistics: Ancient Greece and Rome	6	Lecture Debate	Debate on the topic History of Linguistics
	Ancient India – Medieval Arabic and Hebrew Traditions	6	Presentation on Arabic and Hebrew influence	Reference reading and notes are evaluated.
	Branches of Linguistics - Comparative Philology – Saussure's theories – Schools and	8	Presentation and Lecture	Class test including all the Topics

	movements – Historicism – Structuralism – Functionalism – Generativism .			
Module II	Sounds – Phonology and Phonetics - (The sound system, classification of sounds, phonological rules) – Articulatory Phonetics	8	Lecture Student seminar	Question-answer sessions Seminar evaluation
	Vocoids and Contoids – Allophones – Suprasegmental features – Auditory phonetics	6	Lecture Debate	Debate on the topic of suprasegmental features
	Morphology (Morphemes, Word formation, Morphological rules) – Morphophonemics – Semantics (Semantic properties, semantic fields, semantic change) - Syntax	6	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	- Transformational Generative Grammar – Chomsky's contributions to Linguistics – Derivation – Constituent Structure – Immediate Constituents - Tagmemics.	6	Lecture Student seminar	Class test of Module II Seminar evaluation
Module III	Language and the brain – Psycholinguistics	6	Lecture Debate Presentations	Question-answer sessions

	Sociolinguistics – Ethnolinguistics Neurolinguistics –	6	Lecture Debate	Debate on sociolinguistics
	Ecolinguistics – Forensic Linguistics	8	Lecture Debate Discussion	Discussion on the features of Forensic Linguistics
	Computational Linguistics. Cognitive Science and Artificial Intelligence	6	Lecture Debate Discussion	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 150 marks and 3 hours duration	6	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	1	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials :

- R H Robins :*A Short History of Linguistics*
- William O'Grady, Michael Dobrovsky& Mark Arnoff :*Contemporary Linguistics: An Introduction*
- Charles F. Hockett : A Course in Modern Linguistics • John Lyons : Language and Linguistics, An Introduction.
- Danny D Steinberg & Natalia V Sciarini :*An Introduction to Psycholinguistics*

- Malcolm Coulthard& Alison Johnson: *An Introduction to Forensic Linguistics*
- Peter Trudgill :*Sociolinguistics: An Introduction to Language and Society*
- Elizabeth Ahlsen :*Introduction to Neurolinguistics*
- Alvin Fill. : *Eco-linguistics*: *State of the Art 1998*
- PaninianLinguistics :https://web.stanford.edu/class/linguist289/encyclopaedia001.pdf
- Keith Allan :*The Routledge Handbook of Linguistics*
- E F K Koerner : "The Chomskyan Revolution," *Towards a History of American Linguistics*

Teacher/s –in Charge: Dhanisha K.S.

Module Division:

Module	Month	Teacher/s-in--charge
Module 1	June-July	Dhanisha K.S.
Module 2	August-September	Dhanisha K.S.
Module 3	October- November	Dhanisha K.S.

Course/ Lesson Plan

Semester IV

Course category: Core Course I

Paper name: English Literature in the 21st Century

Code: ENG4C11

Contact Hours: 72 **Credits: 4**

Course Outcome:

- Familiarize the students with various trends in English Literature in the 21st Century. Introduce them to various movements.

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Section A: Poetry	Simon Armitage : "A Vision" Benjamin Zephaniah : "Rong Radio Station" Martin Espada : "Alabanza: In Praise of Local 100"	5	Lecture	Evaluation through question-answer session
	Evan Boland : "Atlantis - A lost Sonnet" DaljitNagra : "Look We Have Coming to Dover" Sean O'Brien : "Water- Gardens"		Lecture Debate	Debate on the topic – Evan Boland : "Atlantis - A lost Sonnet"
	Ocean Vuong : "DetoNation" Terrance Hayes : "I Lock You in an American Sonnet that is Part Prison" Sarah Howe : "Yangtze"		Presentation on Literary Qualities in Ocean Vuong : "DetoNation"	Reference reading and notes are evaluated.
	Jorie Graham : "Fast" Vijay Nambisan : These were my Homes		Lecture	Evaluation through Annotation questions
Section B: Drama	Tracy Letts : August: Osage County		Lecture Student seminar	Question-answer sessions Seminar evaluation

	Tracy Letts : August: Osage County Part-2		Lecture Debate	Debate on the topic of Tracy Letts : August: Osage County
	Lucy Kirkwood : Chimerica	5	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	AyadAkhtar : Disgraced	5	Lecture Student seminar	Class test of all the topics of Section-B Seminar evaluation
Section C: Fiction and Prose	Kazuo Ishiguo's Never Let Me Go. Mohsin Hamid : The Reluctant Fundamentalist	5	Lecture Debate Presentations	Question-answer sessions
	Richard Powers : The Echo Maker Viet Thanh Nguyen : The Sympathizer	5	Debate	Debate on the Nguyen : The Sympathizer
	Ali Smith : Autumn AmitavGhosh : Chapters 1-4	5	Discussion	Discussion on the Ali Smith : Autumn
	David Lodge : "Consciousness and the Two Cultures" Chimamanda Ngozi Adichie : Purple Hibiscus	5	Lecture	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 150 marks and 3 hours duration	5	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	2	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.

Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		72hours		

Reference Materials :

- Bryant N. Kendra. Engaging 21st century Writers with Social Media.IGI Global Publishers, 2017.
- Antakyalioglu, Zekiye English Studies in 21st Century, Cambridge Scholars Publishers, 2020

Teacher/s –in Charge: Sr. Alphonsa P.J.

Module Division:

Module	Month	Teacher/s-in--charge
Module 1	December	Sr. Alphonsa P.J.
Module 2	January	Sr. Alphonsa P.J.
Module 3	February-March	Sr. Alphonsa P.J.

Course/ Lesson Plan

Semester IV

Course category: Elective Course I

Paper name: INDIAN ENGLISH FICTION

Code: ENG4E14

Contact Hours: 72 **Credits: 4**

Course Outcome:

- This course intends to familiarise students with the different trends in Indian English fiction

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I	Raja Rao Kanthapura	5	Lecture	Evaluation through question-answer session
	Mulk Raj Anand Coolie	5	Lecture Debate	Debate on the topic Indian English fiction
	Khushwant Singh *Train To Pakistan*	5	Presentation on narration	Reference reading and notes are evaluated.
	RohintonMistry *A Fine Balance*	5	Presentation and Lecture	Class test including all the topics
Module II	ArvindAdiga *The White Tiger*	5	Lecture Student seminar	Question-answer sessions Seminar evaluation
	Deepak Unnikrishnan *Temporary People*	5	Lecture Debate	Debate on *Temporary People*
	Chitra Banerjee Divakaruni The*Palace Of Illusions*	5	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	Chitra Banerjee Divakaruni The*Palace Of Illusions*	5	Lecture Student seminar	Class test of Module II Seminar evaluation

Module III	JhumpaLahiri *The Namesake*	5	Lecture Debate Presentations	Question-answer sessions
		5	Lecture Debate	Debate on the Characterisation
	Kiran Desai *The Inheritance Of Loss*	5	Lecture Debate Discussion	Discussion on Kiran Desai
	AneesSalim *The Blind Lady's Descendants*	5	Lecture Debate Discussion	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 120 marks and 3 hours duration	6	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	1	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		72 hours		

Reference Materials :

- Naik M K : History of Indian English Literature
- Ran Sharma : Critical Explorations in Indian English Literature
- Ajay Kumar Sharma : Critical Perspectives of Indian English Literature
- Shyamala A Narayan : Indian English Literature 2001- 2015 A Critical Survey

Teacher/s –in Charge: Anju Rose Anto

Module Division:

Module	Month	Teacher/s-in--charge
Module 1	December	Anju Rose Anto
Module 2	January	Anju Rose Anto
Module 3	February-March	Anju Rose Anto

Course/ Lesson Plan

Semester IV

Course category: Elective Course II

Paper name: Malayalam Literature in English Translation

Code: ENG4E18

Contact Hours: 72 **Credits: 4**

Course Outcome:

- This Course introduces the learners to movements and trends in Malayalam literature since the 1970s, offering representative texts for study.

Modules	Contents	Hours	Procedure/ Activity/ plans	Assessment
Module I	Kumaran Asan : "The Fallen Flower" Vallathol : "Akroon to Ambadi" Ulloor : "Music of Love"	5	Lecture	Evaluation through question-answer session
	Changampuzha : "Manaswini" G. Sankara Kurup : "The Master Carpenter"	5	Lecture Debate	Debate on the topic Romanticism
	Balamani Amma : "Mother's Heart" Vyloppilli : "The Mother Tigress in the Zoo"	5	Presentation on Poetic techniques	Reference reading and notes are evaluated.

	N.V. Krishna Variyar : "The Rats" Sugatha Kumari : "Colossus" O.N.V. Kurup : "Blue Fish"	5	Presentation and Lecture	Class test including all the topics
Module II	O. Chandu Menon : *Indulekha* Basheer : *My Granddad had an Elephant*	5	Lecture Student seminar	Question-answer sessions Seminar evaluation

	C.V. Raman Pillai : *Marthanda Varma* Thakazhi : *Chemmeen*	5	Lecture Debate	Debate on Chemmeen
	O.V. Vijayan : *The Legend of Kazak*	5	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	Kesava Dev : *From The Gutter* M.T. Vasudevan Nair : *Mist*	5	Lecture Student seminar	Class test of Module II Seminar evaluation
Module III	N. Krishna Pillai : *Investmen*t (Kerala Sahitya Akademi, Thrissur)	5	Lecture Debate Presentations	Question-answer sessions
	C.J. Thomas : *Behold, He Comes Again*	5	Lecture Debate	Debate on the Characterisation
	Thoppil Bhasi : *Capita*l G. Sankara Pillai : *Bharata Vakyam*	5	Lecture Debate Discussion	Discussion on Thoppil Bhasi
	K.J. Baby : *Nadugadhika*	5	Lecture Debate Discussion	Evaluation through question-answer session
Evaluation: (12 hrs)				

Internal Examinations	Two internals of 120 marks and 3 hours duration	6	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	1	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		72 hours		

Reference Materials :

- The Oxford India Anthology of Malayalam Dalit Writing(2011) • The Oxford India Anthology of Modern Malayalam Literature (2017).
- Mona Baker : Critical Readings in Translation Studies
- Silvia Kadiu : Reflexive Translation Studies : Silvia Kadiu
- Dr. N. Mukundan : Changamphuzha Krishnapillai
- Ulloor S Parameswara Aiyer : Kerala Sahithya Charithram (V Volumes, IV edition)

Teacher/s –in Charge: Femin Sunny

Module Division:

Module	Month	Teacher/s-in--charge
Module 1	December	Femin Sunny
Module 2	January	Femin Sunny
Module 3	February-March	Femin Sunny

Course/ Lesson Plan 2021-2022

Semester I

Course category: Core Course I

Paper name: British Literature from Chaucer to 18th Century

Code: ENG 1 C01

Contact Hours: 90 **Credits: 5**

Course Outcome:

- Familiarize the students with various trends in British literature from the 14th century to the 18th century.
- Introduce them to various movements in British literature

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Section A: Poetry	Geoffrey Chaucer : "The General Prologue to Canterbury Tales" (first 100 lines)	6	Lecture	Evaluation through question-answer session
	William Shakespeare : Sonnet 18. "Shall I Compare thee to a Summer's Day" John Donne : "The Canonization"	6	Lecture Debate	Debate on the topic – Compare and Contrast Shakespeare and John Donne.
	Andrew Marvell : "To His Coy Mistress" John Dryden : "Mac Flecknoe"	6	Presentation on Literary Qualities in Mac Flecknoe	Reference reading and notes are evaluated.
	John Milton : "Paradise Lost" Book 1 (lines up to 270) Thomas Gray : "Elegy written in a Country Churchyard"	8	Lecture	Evaluation through Annotation questions
Section B: Drama	Shakespeare : Hamlet	8	Lecture Student seminar	Question-answer sessions Seminar evaluation

	Shakespeare : Hamlet & Webster : The Duchess of Malfi	6	Lecture Debate	Debate on the topic Elucidate the soliloquies in the Hamlet.
	Webster : The Duchess of Malfi	6	Lecture	Write-ups of students are to be evaluated.
			Student seminar	Seminar evaluation
	Sheridan : The Rivals	6	Lecture Student seminar	Class test of all the topics of Section II Seminar evaluation
Section C : Prose And Fiction	Swift : Gulliver's Travels	6	Lecture Debate Presentations	Question-answer sessions
	Henry Fielding : Joseph Andrews	6	Debate	Debate on the how far the term "picaresque" applied to Joseph Andrews.
	Francis Bacon : "Of Marriage", Joseph Addison : Sir Roger at Church	8	Discussion	Discussion in group on the topic, "Is being married better than remaining single?
	Daniel Defoe : Robinson Crusoe	6	Lecture	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	2	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	5	All students are required to present a topic with the help of power point	Feedbacks are provided and marks are considered for CIE

			presentation, preferably.	
		90 hours		

Reference Materials:

- Carter, Ronald and John McRae. The Routledge History of Literature in English Britain and Ireland. Malcolm Bradbury, 2001.
- O' Neill, Michael. The Cambridge History of English Poetry. Cambridge University Press, 2010.

Teacher/s –in Charge:

- Keerthana P.K
- Module Division:

Module	Month	Teacher/s-in—charge
Module 1	June-July	Keerthana P.K
Module 2	August-September	Keerthana P.K
Module 3	October-November	Keerthana P.K

Course/ Lesson Plan 2021-2022

Semester I

Course category: Core Course II

Paper name: British Literature 19th century

Code: ENG1CO2

Contact Hours: 90 **Credits: 5**

Course Outcome:

- This course will train students to examine and interpret the long eighteenth century and its multiple revolutions through a transnational and cross-cultural perspective.
- Students will be trained to understand the continuities between the eighteenth century and high modernity.

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I	The Tiger, The Lamb Lines Composed a Few Miles above Tintern Abbey	6	Lecture	Evaluation through question-answer session
	Kubla Khan Ozymandias Ode to a Nightingale	6	Lecture Debate	Debate on the topic John Keats
	She Walks in Beauty Tithonus Fra Lippo Lippi	6	Presentation on Fra Lippo Lippi	Reference reading and notes are evaluated.
	A Musical Instrument Dover Beach The Blessed Damozel	8	Presentation and Lecture	Class test including all the poems
Module II	Oscar Wilde	8	Lecture Student seminar	Question-answer sessions Seminar evaluation
	The Importance of Being Earnest	6	Lecture Debate	Debate on the topic of Victorian tradtions and hypocrisy
	The Importance of Being Earnest	6	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	The Importance of Being Earnest	6	Lecture Student seminar	Class test of Module II Seminar evaluation

Module III	Charles Lamb : "Dream Children – A Reverie"	6	Lecture Debate Presentations	Question-answer sessions
	William Hazlitt : On Reading Old Books			
	Charles Dickens : A Tale of Two Cities	6	Lecture Debate	Debate on the Characterisation
	Emily Bronte : Wuthering Heights	8	Lecture Debate Discussion	Discussion on Heathcliff and Catherine
	Thomas Hardy : Tess of the D'Urbevilles	6	Lecture Debate Discussion	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 150 marks and 3 hours duration	6	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	1	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials :

- Elizabeth Gaskell : *North and South*
- George Eliot : *The Lifted Veil* OXFORD WORLD'S CLASSICS

- Thomas Hardy : *Tess of the D'Urbervilles*
- Raymond Williams : Introduction *In the English Novel from Dickens to Lawrence*

Teacher/s –in Charge:

- Anju Rose Anto

Module Division:

Module	Month	Teacher/s-in--charge
Module 1	June-July	Anju Rose Anto
Module 2	August-September	Anju Rose Anto
Module 3	October-November	Anju Rose Anto

Course/ Lesson Plan 2021-2022

Semester I

Course category: Core Course III

Paper name: History of English Language

Code: ENG1CO3

Contact Hours: 90 **Credits: 5**

Course Outcome:

- The course offers an overview of the History of English Language from its origin to the present.

Modules	Contents	Hours	Procedure/ Activity/ plans	Assessment
Module I	Language families - The Indo-European family of languages; Germanic Family of languages and the origin of English	6	Lecture	Evaluation through question-answer session
	The early history of English language; Old English Period - Scandinavian invasions - Middle English Period: The Impact of the Norman Conquest on the English Language; - Middle English Literature.	6	Lecture Debate	Debate on the topic Origin of Language
	Modern English Period – Latin and Greek influence – Loan words - The impact of the Renaissance- Bible Translations	6	Presentation on Latin and Greek influence	Reference reading and notes are evaluated.

	Sound changes in English – The Great Vowel Shift - Changes in Grammar,	8	Presentation and Lecture	Class test including all the Topics
	vocabulary, phonology and morphology – Semantics – word formation			
Module II	Foreign influences on English in the Seventeenth, Eighteenth and the Nineteenth Centuries	8	Lecture Student seminar	Question-answer sessions Seminar evaluation
	Colonialism and the English language	6	Lecture Debate	Debate on the topic of Colonialism and the English language
	Expansion of Vocabulary – Semantic change- Pidgins and Creoles.	6	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	Contributions of major writers to the growth of English vocabulary	6	Lecture Student seminar	Class test of Module II Seminar evaluation
Module III	The discrepancy between spelling and pronunciation - Attempts to reform English spelling	6	Lecture Debate Presentations	Question-answer sessions
	Evolution of Standard English - Dialects of English: British and American – English in India	6	Lecture Debate	Debate on Dialects of English

	English in the postcolonial world – English as a global language — The rise of 'englishes' – impact of Science and Technology –	8	Lecture Debate Discussion	Discussion on impact of Science and Technology
	English in the digital age.	6	Lecture Debate Discussion	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 150 marks and 3 hours duration	6	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	1	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials :

- F. T. Wood : An Outline History of the English language
- C. L. Wrenn : The English Language
- A. C. Baugh : A History of the English Language
- David Crystal : English as a Global Language
- David Crystal: The English Language: A guided Tour of the Language
- Bill Ashcroft, et al : The Empire Writes Back
- Christian Mair :The Politics of English as a World Language

- Andreas Sedlatschek : Contemporary Indian English: Variation and Change
- Pingali Sailaja : Indian English
- Michael Hanrahan& Deborah L Madsen (Ed.): Teaching, Technology, Textuality: Approaches to New Media

Teacher/s –in Charge:

- Sr Alphonsa
- Module Division:

Module	Month	Teacher/s-in--charge
Module 1	June-July	Sr Alphonsa
Module 2	August-September	Sr Alphonsa
Module 3	October-November	Sr Alphonsa

Course/ Lesson Plan 2021-2022

Semester I

Course category: Core Course IV

Paper name: Indian Literature in English

Code: ENG1 C04

Contact Hours: 90 **Credits: 5**

Course Outcome:

- Familiarize the students with the various trends and movements in Indian English literature from its inception to the present.

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Section A: Poetry	Toru Dutt : "Our Casuarina Tree" Rabindranath Tagore : "The Child"	5	Lecture	Evaluation through question-answer session
	Nizzim Ezekiel : "In the Country Cottage" Jayantha Mahapatra : "Hunger" A.K. Ramanujan : "Obituary"	4	Lecture Debate	Debate on the topic: Compare and Contrast the writers Ezekiel and Mahapatra.

	R. Parthasarathy : "River, Once" Kamala Das : "The Old Playhouse" Gieve Patel : "The Ambiguous fate of Gieve Patel.	6	Presentation on Kamala Das as a Confessional Poet of India	Reference reading and notes are evaluated.
	Meena Alexander : "Blue Lotus" Arundhathi Subramaniam : "Home" MeenaKandasamy :"Dead Woman Walking"		Presentation and Lecture	Class test including all the annotation portion of Section A.
Section B: Fiction	Mulk Raj Anand : Coolie		Lecture Student seminar	Question-answer sessions Seminar evaluation
	R.K. Narayanan : The Guide	7	Lecture Debate	Debate on the topic of literary techniques of a frame narrative in "The Guide"

	Salman Rushdie : Midnight's Children	3	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	AmitavGhosh : The Hungry Tide		Lecture Student seminar	Class test of all the topics of Section -B Seminar evaluation
Section: C Drama	GirishKarnad : Yayati (English Translation by the author)	8	Lecture Debate Presentations	Question-answer sessions
	GirishKarnad : Yayati		Debate	Debate on the GirishKarnad : Yayati
	Mahesh Dattani : Tara	4	Discussion	Discussion on the Characteristics of Tara
	Mahesh Dattani : Tara	6	Lecture	Evaluation through question-answer session
Section-D Prose	JawaharLal Nehru : "What is Culture?"		Lecture Debate	Debate on Nehru's Writing Style
	AmartyaSen : "Reason and Identity" (From: The Argumentative Indian, Part IV)		Lecture Student Seminar	Seminar evaluation

	AmartyaSen : "Reason and Identity" Section 1-4)	5	Lecture Student Seminar	Seminar evaluation
	AmartyaSen : "Reason and Identity" (Section 58)		Lecture Discussion	Class test
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 150 marks and 3 hours duration		Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	2	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic		All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials:

- Agrawal K.A. Indian Writing in English: A Critical Study. Atlantic Publishers, 2003.
- Tiwari, Shubha. Indian Fiction in English Translation. Atlantic Publishers, 2005.

Teacher/s –in Charge:

- Keerthana P.K
- Module Division:

Module	Month	Teacher/s-in--charge
Module 1	June-July	Keerthana P.K
Module 2	August-September	Keerthana P.K

Module 3	October-November	Keerthana P.K

Course/ Lesson Plan 2021-2022

Semester III

Course category: Core Course I

Paper name: Twentieth Century British Literature Post 1940

Code: ENG3CO9

Contact Hours: 90 **Credits: 5**

Course Outcome:

- This course will train students to examine and interpret the long twentieth century and its multiple revolutions through a transnational and cross-cultural perspective.
- Students will be trained to understand the perspectives on post modernity.

Modules	Contents	Hours	Procedure/ Activity/ plans	Assessment
Module I	Dylan Thomas : "Fern Hill" Philip Larkin : "Church Going"	6	Lecture	Evaluation through question-answer session
	Thom Gunn : "On the Move" Ted Hughes : "View of a Pig", Seamus Heaney : "Punishment	6	Lecture Debate	Debate on the topic bog poetry
	Charles Tomlinson : "Swimming Chenango Lake" Geoffrey Hill : "In Memory of Jane Frazer	6	Presentation on Charles Tomlinson	Reference reading and notes are evaluated.

	Elizabeth Jennings : "One Flesh" Andrew Motion : "The Last Call"	8	Presentation and Lecture	Class test including all the poems
Module II	Samuel Beckett : *Waiting for Godot*	8	Lecture Student seminar	Question-answer sessions Seminar evaluation
	Caryl Churchill : *Top Girls*	6	Lecture Debate	Debate on the topic of female characters
	Harold Pinter : *The Birthday Party*	6	Lecture	Write-ups of students are to be evaluated.
			Student seminar	Seminar evaluation
	Edward Bond : *Lear*	6	Lecture Student seminar	Class test of Module II Seminar evaluation
Module III	John Fowles : *The French Lieutenant's woman*	6	Lecture Debate Presentations	Question-answer sessions
	Kingsley Amis *: Lucky Jim*	6	Lecture Debate	Debate on the Characterisation
	Alan Sillitoe : *Loneliness of the Long Distance Runner*	8	Lecture Debate Discussion	Discussion on the character Smith
	Kazuo Ishiguro : Remains of the Day	6	Lecture Debate Discussion	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 150 marks and 3 hours duration	6	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.

Assignments	Any topic	1	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials :

- Book by Martin Esslin : The Theatre of the Absurd
- Michael Y. Bennett : Reassessing the Theatre of the Absurd: Camus, Beckett, Ionesco, Genet, and Pinter
- Michael Y. Bennett : The Cambridge Introduction to Theatre and Literature of the Absurd
- Perry Anderson : The Origins of Postmodernity
- Fredrick Jameson : Postmodernism, or, the Cultural Logic of Late Capitalism
- William Hutchings :Samuel Beckett's Waiting for Godot: A Reference Guide

Teacher/s –in Charge:

- Sr Alphonsa
- Module Division:

Module	Month	Teacher/s-in--charge
Module 1	June-July	Sr Alphonsa
Module 2	August-September	Sr Alphonsa
Module 3	October-November	Sr Alphonsa

Course/ Lesson Plan 2021-2022

Semester III

Course category: Core Course II

Paper name: Literary Criticism and Theory: Part 2

Code: ENG3C10

Contact Hours: 90 **Credits: 5**

Course Outcome:

- Familiarize the students with Literary Criticism and Theory
  Introduce them to various theories and help them to have in-depth knowledge of the major theorists and key concepts.

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Section A: 1.Structuralism 2. PostStructuralism/ Deconstruction 3.Psychoanalysis: An Overview	Major theorists, Key concepts. Structure, Sign, Signifier, Signified, Semiology, Semiotics, Langue and Parole, Mythemes, Structuralist Narratology.	6	Lecture	Evaluation through question-answer session
	Text for Detailed Study: Roland Barthes: "Structuralist Activity"		Lecture Debate	Debate on the topic – Major theorists of Structuralism Post-Structuralism.
	Major theorists, Key concepts. Text for Detailed Study: Jacques Derrida: "Structure, Sign and Play in the Discourse of Social Sciences"		Presentation on key concepts	Reference reading and notes are evaluated.

	Major theorists, Key concepts. Text for Detailed Study: Jacques Lacan: "The Mirror Stage as Formative of the Function of the I"	8	Lecture	Evaluation through quiz

Section B: 4. Feminism 5. Cultural Materialism/ New Historicism 6. Post colonialism: An Overview	Major theorist: : Virginia Woolf, Kate Millet, Elaine Showalter, Helene Cixous, Adrienne Rich. Key concepts.	8	Lecture Student seminar	Question-answer sessions Seminar evaluation
	Text for Detailed Study: Elaine Showalter: "Towards a Feminist Poetics"	6	Lecture Debate	Debate on the topic of phases of feminism.
	Major theorists. & Louis Montrose: "Professing the Renaissance: The Poetics and Politics of Culture"	6	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	Major theorists, Key concepts. Text for Detailed Study: Edward Said: "Jane Austen and Empire"	6	Lecture Student seminar	Class test of all the topics of Section-II Seminar evaluation
Section C: 7. Ecocriticism 8.Critiquing Theory: An Overview	Major theorists: Jonathan Bate, CheryllGlotfelty, Laurence Coupe, Patrick DMurphy, William Rueckert.	6	Lecture Debate Presentations	Question-answer sessions

	Key concepts: Anthropocentrism, Shallow Ecology vs Deep Ecology, The Crisis of Humanism, Nature/Culture, Green Studies, Environmental Imagination, Ecofeminism.	6	Debate	Debate on the key terms of Ecocriticism
	Text for Detailed Study: Cheryll Glotfelty: "Introduction: Literary Studies in an age of Environmental Crisis"	8	Discussion	Discussion on "Introduction: Literary Studies in an age of Environmental Crisis"
	Text for Detailed Study: Graham Good: "Presentism: Postmodernism, Poststructuralism, Postcolonialism"	6	Lecture	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 150 marks and 3 hours duration	5	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	2	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE

		90 hours		

Reference Materials :

- Habib, M.A.R. Modern Literary Criticism and Theory. Blackwell Publishing,2008.
- Bennett, Andrews. An Introduction to Literature Criticism and Theory. Routledge Publishers, 2016.

Teacher/s –in Charge:

- Keerthana P.K
- Module Division:

Module	Month	Teacher/s-in--charge
Module 1	June-July	Keerthana P.K
Module 2	August-September	Keerthana P.K
Module 3	October-November	Keerthana P.K

Course/ Lesson Plan 2021-2022

Semester III

Course category: Elective Course I

Paper name: EUROPEAN FICTION IN TRANSLATION Code: ENG3E02

Contact Hours: 90 Credits: 5

Course Outcome:

- This course will explore different trends in European fiction and its cultural impacts, through writings produced by people from different countries.

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I	Cervantes Don Quixote	6	Lecture	Evaluation through question-answer session
	Gustave Flaubert Madame Bovary	6	Lecture Debate	Debate on the topic morality

	Gustave Flaubert Madame Bovary	6	Presentation on Madame Bovary	Reference reading and notes are evaluated.
	Leo Tolstoy Anna Karenina	8	Presentation and Lecture	Class test including all the topics
Module II	Franz Kafka The Trial	8	Lecture Student seminar	Question-answer sessions Seminar evaluation
	Kazantzakis Zorba, the Greek	6	Lecture Debate	Debate on the topic of contrast between Zorba and Boss
	Kazantzakis Zorba, the Greek	6	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	Gunter Grass The Tin Drum	6	Lecture Student seminar	Class test of Module II Seminar evaluation
Module III	Milan Kundera The Joke	6	Lecture Debate Presentations	Question-answer sessions
	Jose Saramago Blindness	6	Lecture Debate	Debate on the Characterisation
	Orhan Pamuk Snow	8	Lecture Debate Discussion	Discussion on Pamuk
	Italo Calvino If on a winter's night a traveller	6	Lecture Debate Discussion	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 150 marks and 3 hours duration	6	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	1	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.

Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials :

- Walter Cohen : A History of European Literature: The West and the World from Antiquity to the Present
- Dr. Usha Jain : European Classics in Translation
- John Lucas : The Literature o f Change: Studies in the Nineteenth Century Provincial Novel
- John Galsworthy : The Creation o f Character in Literature
- Jonathan Culler : The Uses of Madame Bovary
- Stirling Haig : The Madame Bovary Blues: The Pursuit o f Illusion in Nineteenth Century French Fiction
- Ruth Crego Benson : Women in Tolstoy.
- Laura J Gorfkle : Discovering the Comic in Don Quixote

Teacher/s –in Charge:

- Anju Rose Anto
- Module Division:

Module	Month	Teacher/s-in--charge
Module 1	June-July	Anju Rose Anto
Module 2	August-September	Anju Rose Anto
Module 3	October-November	Anju Rose Anto

Course/ Lesson Plan

Semester III

Course category: Elective Course II

Paper name: Introduction to Linguistics Code: ENG 3 E04

Contact Hours: 90 **Credits: 5**

Course Outcome:

- The course is intended to familiarize learners with the nature and organization of language. The history of Linguistics and its key concepts are discussed.

Modules	Contents	Hours	Procedure/ Activity/ plans	Assessment
Module I	Unit 1 Origin of Language – Features of Language – language behavior and language system- – Language Families – Language Typology – Language Acquisition Introduction to Linguistics	6	Lecture	Evaluation through question-answer session
	Linguistics as a science - History of Linguistics: Ancient Greece and Rome	6	Lecture Debate	Debate on the topic History of Linguistics
	Ancient India – Medieval Arabic and Hebrew Traditions	6	Presentation on Arabic and Hebrew influence	Reference reading and notes are evaluated.
	Branches of Linguistics - Comparative Philology – Saussure's theories – Schools and	8	Presentation and Lecture	Class test including all the Topics

	movements – Historicism – Structuralism – Functionalism – Generativism .			
Module II	Sounds – Phonology and Phonetics - (The sound system, classification of sounds, phonological rules) – Articulatory Phonetics	8	Lecture Student seminar	Question-answer sessions Seminar evaluation
	Vocoids and Contoids – Allophones – Suprasegmental features – Auditory phonetics	6	Lecture Debate	Debate on the topic of suprasegmental features
	Morphology (Morphemes, Word formation, Morphological rules) – Morphophonemics – Semantics (Semantic properties, semantic fields, semantic change) - Syntax	6	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	- Transformational Generative Grammar – Chomsky's contributions to Linguistics – Derivation – Constituent Structure – Immediate Constituents - Tagmemics.	6	Lecture Student seminar	Class test of Module II Seminar evaluation
Module III	Language and the brain – Psycholinguistics	6	Lecture Debate Presentations	Question-answer sessions

	Sociolinguistics – Ethnolinguistics Neurolinguistics –	6	Lecture Debate	Debate on sociolinguistics
	Ecolinguistics – Forensic Linguistics	8	Lecture Debate Discussion	Discussion on the features of Forensic Linguistics
	Computational Linguistics. Cognitive Science and Artificial Intelligence	6	Lecture Debate Discussion	Evaluation through question-answer session
Evaluation: (12 hrs)				
Internal Examinations	Two internals of 150 marks and 3 hours duration	6	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic	1	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	5	All students are required to present a topic with the help of power point presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials :

- R H Robins :*A Short History of Linguistics*
- William O'Grady, Michael Dobrovsky& Mark Arnoff :*Contemporary Linguistics: An Introduction*
- Charles F. Hockett : A Course in Modern Linguistics • John Lyons : Language and Linguistics, An Introduction.
- Danny D Steinberg & Natalia V Sciarini :*An Introduction to Psycholinguistics*

- Malcolm Coulthard& Alison Johnson: *An Introduction to Forensic Linguistics*
- Peter Trudgill :*Sociolinguistics: An Introduction to Language and Society*
- Elizabeth Ahlsen :*Introduction to Neurolinguistics*
- Alvin Fill. : *Eco-linguistics*: *State of the Art 1998*
- PaninianLinguistics :https://web.stanford.edu/class/linguist289/encyclopaedia001.pdf
- Keith Allan :*The Routledge Handbook of Linguistics*
- E F K Koerner : "The Chomskyan Revolution," *Towards a History of American Linguistics*

Teacher/s –in Charge:

- Sr Alphonsa
- Module Division:

Module	Month	Teacher/s-in--charge
Module 1	June-July	Sr Alphonsa
Module 2	August-September	Sr Alphonsa
Module 3	October- November	Sr Alphonsa

Department of History

Lesson plan

Semester I

Course category: Core Course I

Paper name: TRENDS IN HISTORIOGRAPHY

Code: HIS1B01

Course Outcome:

- Expose the basic understanding regarding the development of History as a discipline.
- The emphasis will be on the major trends in the arena of Historical Writing and Thought.
- Illustrate how the methodological and philosophical shifts have contributed for the development of History as a discipline.

Modules	Contents	Hours	Procedure/ Activity/ plans	Assessment
Module I	Meaning of Historiography – Quasi History	5	Lecture	Evaluation through question-answer session
	Past and History- Differentiation and Conceptualization	4	Lecture Debate	Debate on the topic 'Does history represents past accurately?'
	Nature and Character of Greek Historical Writings- Herodotus	6	Presentation on Greco-Roman traditions and writers	Reference reading and notes are evaluated.
	Nature of Medieval Historical Writings- St: Augustine – Ibn Khaldun	5	Presentation and Lecture	Class test including all the traditions of pre -modern historiographical writings.
Module II	Vico and New science – Positivism- Auguste Comte and Ranke	5	Lecture Student seminar	Question-answer sessions Seminar evaluation
	Marx and Historical Materialism	7	Lecture Debate	Debate on the topic of 'relevance of Marxist ideologies'
	Cultural History- Jacob Burckhardt	3	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	A J Toynbee and the Study of Civilizations	3	Lecture Student seminar	Class test of all the topics of Module II Seminar evaluation
Module III	The Annales – Marc Bloch, Fernand Braudal	8	Lecture Debate Presentations	Question-answer sessions
	History of Mentalities- Philippe Aries	3	Debate	Debate on the 'relevance of mentalities in history'

	History from Below- E P Thompson	4	Discussion	Discussion on the application of the approach in sub-altern approach
	Post Modernism – Keith Jenkins	6	Lecture	Evaluation through question-answer session
Module IV	Gender History– Gerda Lerner	4	Lecture Debate	Debate on the role of Gender in history
	Food History – Felipe Fernandez- Armesto	4	Lecture Student Seminar	Seminar evaluation
	Environmental History – Alfred W Crosby	5	Lecture Student Seminar	Seminar evaluation
	Oral Tradition and Oral History – Jan Vansina and Allan Nevins	6	Lecture Discussion	Class test
Internal Examinations	Two internals of 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic		All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	10	All students are required to present a topic with the help of presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		95 hours		

Reference Materials

1. Shashi Bhushan Upadhyay, Historiography in the Modern World: Western and Indian Perspectives, OUP, 2016.
2. Gerda Lerner, The Creation of Patriarchy, OUP, 1987.
3. Felipe Fernandez- Armesto, Near A Thousand Tables: A History of Food, The Free Press, 2002
4. Alfred W Crosby, Ecological Imperialism: The Biological Expansion of Europe, 900-1900, Cambridge University Press, 2004.
5. Jan Vansina, Oral Tradition as History, The University of Wisconsin Press, 1985.
6. Gerald L Fetner, Immersed in Great Affairs: Allan Nevins and the Heroic Age of American History, State University of New York Press, 2004.

Semester II

Course Category: Core Course II

Paper name: Trends in Indian Historiography

Code: HIS2 B02

Course Outcome:

- Get the basic understanding regarding the development of Historical consciousness in India.
- Provide a basic understanding regarding the major trends in the arena of Historical Writing and Thought in India.
- Expose the students to the major paradigms associated with the study of Indian History, which will help them to understand the Indian History Courses in the following semesters.

Modules	Contents	Hours	Procedure/ Activity/ plans	Assessment
Module I - Historical Consciousness in Pre- British India	Concept of time in early India	3	Lecture	Evaluation through question-answer session
	Jain and Buddhist Tradition	3	Discussion Student seminar	Seminar evaluation
	Ithihasa – Purana Tradition	2	Discussion Student seminar	Seminar evaluation
	Charithas and Kavyas- Harshacharitha – Mooshakavamsa- Rajatharangani	3	Student Seminar Lecture	Evaluation through question-answer session
	Kitab-al- Hind- Al- Biruni	3	Lecture	Evaluation through question-answer session
	Historical Writings of Sultanate Period- Barani- Amir Khusrau	3	Lecture	Evaluation through question-answer session
	Historiography of Mughal period -AbulFazal	3	Lecture Discussion	Discussion on the merits of Mughal historical traditions.
	Historical consciousness in other parts of India - Ferishta- Sheikh Zainuddeen- Mangalkabya	3	Lecture	Evaluation through question-answer session
	Indology- William Jones- Max Muller	3	Lecture Reference	Students' reference notes are evaluated

Module II Colonial and Nationalist Historiography	James Mill and the Division of Indian History- The History of British India	3	Lecture Reference	Students' reference notes are evaluated
	Vincent A Smith- Great Men History	2	Lecture	Evaluation through question-answer session
	Nationalist Historiography- K.P Jayswal- R.C Majumdar- R.C Dutt- K.A.N Sastri- Elamkulam P N Kunjan Pillai	5	Lecture Debate	Debate on the topic ' Colonialist vs Nationalist historiography: representation of truth'
Module III Critique of Paradigms	Oriental Despotism	3	Lecture	Evaluation through question-answer session
	Asiatic Mode of Production	5	Lecture Student Seminar	Seminar evaluation
	Hydraulic Society	2	Lecture	Evaluation through question-answer session
	Aryan Racial Supremacy Theory	2	Lecture	Evaluation through question-answer session
	Romila Thapar's Critique on Colonial and Nationalist Historiography	5	Debate Lecture	Debate on the topic ' Reactions towards colonialist historiography from Indians'
Module IV Historiographical Trends in Independent India	Marxist approach to Indian history writing	6	Debate Lecture	Debate on the topic or 'merits of applying Marxist methodology into Indian history writing'
	Subaltern Studies- Ranajith Guha- Dipesh Chakraborthy	4	Lecture	Evaluation through question-answer session
	Cambridge and new Cambridge school- Anil Seal- C A Bayly	4	Lecture	Evaluation through question-answer session
	Gender History- Uma Chakravarti	4	Debate	Debate on the topic 'women representation in history'
	Environmental History- Ramachandra Guha	3	Lecture Discussion	Discussion on the topic 'Emergence of environmental history as a new discipline'
Internal Examinations	Two internals of 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.

Assignments	Any topic		All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	10	All students are required to present a topic with the help of presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference books

Dr. S P Sen, Historians and Historiography in Modern India, Institute of Historical Studies, 1973

Elliot and Dowson, History of India as told by its own Historians

Romila Thapar, The Past and Prejudice NBT 1975

Romila Thapar, Time as a Metaphor of History: Ancient India, OUP 1997

James Mill, The History of British India

Ranajit Guha (ed), Subaltern Studies, Vol. 1, OUP 1996

Shashi BhushanUpadhyay, Historiography in the Modern World: Western and Indian Perspectives, OUP, 2016.

Henry Schwarz, Writing Cultural History in Colonial and Postcolonial India, University of Pennsylvania Press, 1997

Semester III

Course category: Core Course III

Paper name: WORLD HISTORY – 1, State, Society and Civilisation in the Ancient World

Code: HIS3B03

Course Outcome:

- To know a general time line and outline of ancient civilisations, including key events and cultural achievements of different ancient civilisatiojs
- The course provides an overview of early cultures and meetings between cultures and similar trends across cultures
- Compares and contrasts past with current events, issues and problems
- Ability to recognise the multiple spatial and temporal contexts and to look at one's own society and civilisation in contrast to other societies and civilisations
- Ability to recognise the influence of global forces and identify their connections to local and national developments

Modules	Contents	Hours	Procedure/ Activity/ plans	Assessment
Module I	Geological time and the phases of human evolution	5	Lecture	Evaluation through question-answer session
	Stone age	4	Lecture, seminar presentation	Evaluation through question-answer session
	Neolithic revolution	4	Presentation	Reference reading and notes are evaluated.
	Metal Age	3	Lecture	Class test
Module II	Mesopotamian Civilisation	6	Lecture Student seminar	Question-answer sessions Seminar evaluation
	Babylonian Civilisation-Code of Hammurabi	7	Presentation	Evaluation of the notes prepared by the students
	Egyptian Civilisation	6	Lecture Student seminar	Evaluation through question-answer session
	Chinese Civilisation	6	Lecture Student seminar	Evaluation through question-answer session
Module III	Homeric age – Greek city state	9	Lecture Presentations	Question-answer sessions
	Roman Empire	9	Lecture	Evaluation through question-answer session
Module IV	Decline of Roman Empire	6	Lecture	Evaluation through question-answer session
	Impact of Christianity	4	Lecture	Evaluation through question-answer session
	Gothic invasion	3	Lecture	Evaluation through question-answer session

Internal Examinations	Two internals of 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated Feedbacks are given individually.
Assignments	Any topic	10	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given.
Seminars	Any topic	10	All students are required to present a topic with the help of presentation, preferably.	Feedbacks are provided
		97hours		

Reference Materials

1. Edward Gibbon, Decline of Roman Empire
2. Gordon Childe, Man Makes himself
3. Felipe Fernandez- Armesto, Near A Thousand Tables: A History of Food, The Free Press, 2002

Semester III

Course Category: Core Course IV

Paper name: INDIAN HISTORY-1

Code: HIS3 B04

Course Outcome:

- Provide a broad historic outline about the process of socio-political formations in the north and south India up to 1300 CE.
- Explain the emergence of the first urbanization in the north western part of early India during bronze age
- Understanding on the socio-political formations of Indo-Gangetic plains in the Iron Age.
- Understand the emergence of an empire under Mauryas in the north and Muvendars in the South and the formation of feudal cultures in the north and south.

Modules	Contents	Hours	Procedure/ Activity/ plans	Assessment
Module- I Towards Civilization	Pre-Harappan cultures; - extension of the Harappan culture- features of the Harappan sites; Harappa, Mohenjodaro, Lothal, Dholavira, Kalibangan	6	Lecture Map reading Discussion Presentation of Harappan artefacts album	Question-Answer session is organized. Students have to submit the filled in maps.
	Debates on the nature of society and polity: Dravidian and Indo Aryan	5	Lecture Discussion Student seminar	Seminar evaluation
	Debate on the decline of Indus civilization	4	Lecture Discussion	Discussion on the various theories on the decline of Harappan civilisation
	Debate on Harappan script: Airavatham Mahadevan –Asko Parpola	5	Lecture Discussion Presentation of Harapan scripts	Student discussion on the 'Problems of reading Harappan scripts'.
Module-II Socio-Political Formations in the Indo-Gangetic Plains	Vedic literatures and Archaeological evidences - PGW, NBPW- early tribal pastoral and agrarian society in the Gangetic plains	5	Lecture Map reading	Question-Answer session is organized. Students have to submit the filled in maps.
	Aryan debate: Central Asian/indigenous theory	4	Lecture Debate	Debate on the topic ' origin of migration of Aryans'

	Early and later Vedic polity- formation of urban centers- Mahajanapadas	3	Lecture Discussion Student seminar	Question-answer sessions
	Nature of state; oligarchies, Monarchies and republics	4	Lecture	Students are evaluated through class tests
	Material setting of the formation of Jainism and Buddhism	4	Lecture Discussion	Question-Answer session is organized.
Module-III Mauryan and Muvendar	From Mahajanapadas to the empire- domination of Magadha- foundation of Mauryan polity	3	Lecture	Class test
	Asokan Edicts and Megasthenees's Indica	2	Discussion	Discussion on the contents written on Asokhan eddicts.
	Extension of the empire	2	Map reading	Students have to mark the important sites and routes.
	Arthasasthra and early Indian treatise on the theory of state; Sapthanga – nature of Asoka dharma	3	Debate Seminars	Debate on the 'application of Arthasastra in polity
	Debates on Mauryan polity	3	Lecture	Class test
	Tamizhakam – Tinai based production and exchange–Indo-Roman trade- nature of Muvendar polity- Chera, Chola and Pandya	4	Lecture Discussion	Question-answer session
Module-IV Into a Feudal Society	Land grants under Satavahanas and Gupta- revival of Vedic traditions- art- literature and architecture as the symbols of feudalism	5	Lecture	Question-answer session
	Debates on Indian feudalism; R.S Sharma, Herbans Mukhia	8	Discussion	Discussion on the topic 'characteristics of Indian feudalism in comparison with European'.
	South Indian feudalism- Temple based Bhakti traditions of Alwars and Nayanars in South India.	5	Lecture Student seminars	Class test. Seminar evaluation
Internal Examinations	Two internals of 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic		All students are required to prepare an assignment	Assignments are corrected and feedbacks are given. CIE Internal mark is

			from any of the topics they're interested, but should avoid repetition	awarded on the basis of assignments too.
Seminars	Any topic	10	All students are required to present a topic with the help of presentation , preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference materials.

R.S. Sharma. Material Culture and Social formations in Ancient India

……..India's Ancient Past

RomilaThappar. From Lineage to State

……Early India

Upinder Singh. A History of Ancient and Early Medieval India

Semester IV

Course Category: Core Course V

Paper name:World History -2, Medieval World: State and Society

Code: HIS4 B05

Course Outcome:

- To create knowledge on medieval world through which students could able to understand different state system
- Focuses on the socio political and economic currents of medieval central Asia, West Asia and East Asia
- Understand the scientific and intellectual interactionsthat taken place between East and West

Course Outcome: Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I -	Europe after the fall of Rome	**6**	Lecture	Evaluation through question-answer session
	Byzantine Empire	**5**	Presentation	Evaluation of the notes prepared by the students
	Carolingian dynasty	**7**	Lecture	Evaluation through question-answer session
Module I I	Rise of Islam	**6**	Presentation	Evaluation of the notes prepared by the students
	Arab Empire	**9**	Presentation	Evaluation of the notes prepared by the students
Module III	Unification of China	**7**	Lecture	Evaluation through question-answer session
	Trade routes	**7**	Lecture	Evaluation through question-answer session
	Peasant revolts	**9**	Lecture	Evaluation through question-answer session
Module IV	Decline of Feudalism	**10**	Lecture	Evaluation through question-answer session
	Crusades	**9**	Lecture	Evaluation through question-answer session
Internal Examinations	Two internals of 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated Feedbacks are given individually.
Assignments	Any topic	10	All students are required to prepare an assignment from any of the topics they're	Assignments are corrected and feedbacks are given.

			interested, but should avoid repetition	
Seminars	Any topic	10	All students are required to present a topic with the help of presentation, preferably.	Feedbacks are provided
		100		

Reference Materials

1. Perry Anderson, Passage from Antiquity to Feudalism
2. Edward MC Nalls burn, Western Civilisation
3. Marc Bloch,Feudal Society

Semester IV

Course Category: Core Course IV

Paper Name:INDIAN HISTORY-2

Code : HIS4B06

Course Outcome

- It is framed to explicate the nature of state and society in Medieval India.
- It familiarizes the students with process of state formation; economic pattern of medieval India along with the social and cultural developments of the period.
- It explains the process of medieval trade related to Arabian Sea and Indian Ocean.
- Students could able to understand changing pattern of agrarian system in medieval India.
- Understanding of Delhi Sultanate
- Analyse Mughal rule administrations, art, and architecture
- Identify cultural synthesis
- . Analyse Medieval South India

Modules	Contents	Hours	Procedure/ Activity/ plans	Assessment
Module 1	*Concept of early medieval*	5	**Lecture Discussion**	Evaluation through question answer session
	□ *Indian Feudal model and its critics*	5	**Lecture Debate**	Debate on the topic '□ *Indian Feudal model*
Module II-	Arab conquest of Sind- the Sultanate ascendancy in India- Battle of Tarain- Political consolidation under early Turkish Sultans- Reforms under Iltumish and Balban	6	**Lecture**	Evaluation through question answer session
	Delhi Sultanate under Khaljis and Thuglaqs; Alauddin Khalji- military measures and economic reforms – Administrative reforms and military experiments of Muhammadbin	6	Lecture Debate	. Evaluation through question answer session

	Thuglaq- Firozshah Thuglaq and welfare measures			
	Administrative system and institutions under Delhi sultanate- kingship- Administrationnobility – slavery-land revenue and forms of distribution- Iqta system	**6**	Lecture Student seminar	Question-answer sessions Seminar evaluation
	The Vijaya nagara Empire- Bahmani Kingdom : nature of Polity and cultural contributions	**5**	Lecture	Debate on the topic of ‘ The Vijaya nagara Empire- Bahmani Kingdom :
Module III	Babur- war fare- military technology- Afghan conflicts and formation of Surr dynasty	**5**	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
	Consolidation of the Mughal Empire under Akbar- expansion of the empire-economic reforms-Mansabdari system - Jagir and land revenue system- zabti – Akbar’s religious policy- Rajput policy- Aurengazeb and Decan policy	**6**	Lecture Student seminar	Question-answer sessions
	Rise of The Marathas- Shivaji and his administration- Land revenue policy	**5**	Lecture Discussion	Question-answer sessions
	Ahom Kingdom of North-east India	**5**	Lecture	Question-answer sessions
Module IV	Bhakthi movement in North and South India Sufism : general trend	**5**	Lecture Discussion	Discussion on Sufism : general trend
	Rural economy- agrarian system- trade, urbanization, Indian Ocean trade	**5**	Lecture	Evaluation through question-answer session

	□ Nature of medieval architecture	**5**	Lecture	Discussion on □ Nature of medieval architecture
	□ Science and technology in Mugal India: basic feature	**6**	Lecture Debate	Discussion on Science and technology in Mugal India: basic feature
Internal Examinations	Two internals of 80 marks and 2.5 hours duration	5	Written Exam	Feedbacks are provided and marks are considered for CIE
Assignments	Any topic		All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	10	All students are required to present a topic with the help of presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		90 hours		

Reference Materials:

Brain M Fagan. *Ancient Lives: An Introduction to Archaeology and Pre-History*
Gordon Childe. *Man Makes Himself*
M.C. Burkkit. *The Old Stone Age*
Hendrik Willem Van Loon. *The Story of Mankind*
Rev.JamesBaikie. *Wonder Tales of the Ancient World*
G. Dalton (ed.). *Tribal and Peasant Economies: Readings in Economic Anthropology*
L. De Blois and R. J. Van Der Spek. *An Introduction to the Ancient World*
Barbara Bender. Farming in Prehistory
Amar Farooqi. *Early Social Formations*
D. Rindos. *The Origins of Agriculture*, Academic Press, New York, 1984

Semester IV

Course Category: Core Course VI

Paper name: Gender Studies

Code: HIS4 B20

Course Outcome:

- Explain conventional social norms about male – female dichotomy and can device policies and strategies to foster gender equality and gender justice
- Contribute to creative interventions that may result in a world with less inequality
- Critically interrogate and actively engage in social processes related to the construction of gender
- Analyse social and cultural phenomena through the lens of gender in a way that appreciates a range of disciplinary perspectives

Course Outcome: Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I -	Conceptualising Gender:	6	Lecture	Evaluation through question-answer session
	Patriarchy and Matriarchy	5	Lecture	Evaluation through question-answer session
	Concept of feminism	7	Lecture	Evaluation through question-answer session
Module II	Division of labour:	4	Lecture	Evaluation through question-answer session
	Brahmanical patriarchy	8	Lecture	Evaluation through question-answer session
	Gayatri Spivak	7	Presentation	Evaluation of the notes prepared by the students
Module III	Changing Concept of family and marriage	4	Presentation	Evaluation of the notes prepared by the students
	Law Relating to Crimes against women and transgender	10	Presentation	Evaluation of the notes prepared by the students
Module IV	Contemporary issues	9	Lecture	Evaluation through question-answer session
	Gender identity	8	Lecture	Evaluation through question-answer session

	Third Gender	7	Lecture	Evaluation through question-answer session
Internal Examinations	Two internals of 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated Feedbacks are given individually.
Assignments	Any topic	10	All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given.
Seminars	Any topic	10	All students are required to present a topic with the help of presentation, preferably.	Feedbacks are provided
		100		

Reference Materials

1. Leela Dube, Anthropological explorations in gender
2. Vandana Shiva, the Violence of Green Revolution
3. Gayatri Spivak, Can Subaltern Speak
4. Nivedita Menon, Gender and politics in India

Semester V

Course Category: Core Course 7

Paper name: World History – 3, Emergence of Modern World

Code: HIS5 B07

Course Outcome:

- Students acquaint with transition in history by looking at social, political, economic and technological changes from medieval to modern
- Develop new perspective on American War of Independence, English and French revolution
- Create a fresh look at Industrial revolution and consequent development in all walks of modern world
- Appreciate the mass mobilisation in third world countries and appreciate the democratic ideologies tagged along with it

Course Outcome: Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I	Renaissance- medieval origin – nature and characteristics	8	Lecture	Evaluation through question-answer session
	Reformation- Martin Luther	6	Presentation	Evaluation of the notes prepared by the students
	Geographical explorations	5	Presentation	Evaluation of the notes prepared by the students
	Nation states in Europe	4	Lecture	Evaluation through question-answer session
Module II	Scientific revolution	2	Lecture	Evaluation through question-answer session
	Enlightenment	6	Lecture	Evaluation through question-answer session
	Industrial revolution	6	Presentation	Evaluation of the notes prepared by the students
	Colonialism and Imperialism	5	Presentation	Evaluation of the notes prepared by the students
	Socialism	3	Lecture	Evaluation through question-answer session
Module III	English Revolution	4	Lecture	Evaluation through question-answer session

	American Revolution	4	Lecture	Evaluation through question-answer session
	French Revolution	4	Lecture	Evaluation through question-answer session
	Unification of Italy and Germany	5	Lecture	Evaluation through question-answer session
Module IV	First and Second World war	7	Lecture	Evaluation through question-answer session
	Russian Revolution	3	Lecture	Evaluation through question-answer session
	League of nation,Depression	2	Lecture	Evaluation through question-answer session
	Fascism and Nazism	4	Lecture	Evaluation through question-answer session
	Cold war and Globalisation	6	Lecture	Evaluation through question-answer session
Internal Examinations	Two internals of 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated Feedbacks are given individually.
Assignments	Any topic	10	All students are required to prepare an assignment from any of the topics they're interested	Assignments are corrected and feedbacks are given.
Seminars	Any topic	10	All students are required to present a topic with the help of presentation, preferably.	Feedbacks are provided
		109		

Reference Materials

1. Edward mCNall Burns, World Civilisation, Vol -3
2. David S Mason, A Concise history of Modern Europe
3. Arjun Dev and Indira Arjun Dev, History of the world

Semester V

Course Category: Core Course 10

Paper name: Methodology of the writing of History

Code: HIS5 B10

Course Outcome:

- Enable the student to understand the techniques of writing history and evolution of such a technique
- Students will learn the theory and practice of historical research as practiced by professionals in the field including traditional and current research methodologies
- It enables the students to develop a thesis, evaluate its historical probability, and place that argument in a historical context
- Distinguish between various forms of presentation of history and basic elements of research in history
- Prepare students for writing the local history projects

Course Outcome: Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I	Identification of a historical problem	4	Lecture	Evaluation through question-answer session
	Hypothesis and preliminary bibliography	5	Lecture	Evaluation through question-answer session
Module II	Primary and secondary sources	7	Lecture	Evaluation through question-answer session
	E sources – inflibnet, shodhganga	7	Presentation	Evaluation of the notes prepared by the students
	Internal and external criticism	9	Presentation	Evaluation of the notes prepared by the students
Module III	Style of footnoting	8	Lecture	Evaluation through question-answer session
	Appendices	8	Lecture	Evaluation through question-answer session
Module IV	Research paper, Project	10	Lecture	Evaluation through question-answer session
	Oral history, local history	10	Lecture	Evaluation through question-answer session
Internal Examinations	Two internals of 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated

				Feedbacks are given individually.
Assignments	Any topic	10	All students are required to prepare an assignment from any of the topics they're interested	Assignments are corrected and feedbacks are given.
Seminars	Any topic	10	All students are required to present a topic with the help of presentation, preferably.	Feedbacks are provided
		93		

Reference Materials

1. G R Elton, Practice of History
2. Joseph Gibaldy, MLA handbook for the writers of research paper
3. E H Carr, What is History

Lesson plan

Semester I

Course category: Complementary Course I (for 4th Sem Economics and 3rd Sem History)

Paper name: Indian Constitution and Politics: Federalism, Decentralisation and Political Dynamics.

Code: ICP 4(3) CO2

Course Outcome:

- **At the end of the course the students will be able to evaluate the main features of Indian federal system.**
- **This course also help students to develop good idea about party system, regionalism etc..**

Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I Indian Federalism	Union-State Relations	5	Lecture	Evaluation through question-answer session
	Challenges to Indian Federalism	4	Lecture Debate	Debate on the topic ' is India a true federal state'?
	Finance Commission	6	Lecture	Reference reading and notes are evaluated.
	NITI Ayog	5	Presentation and Lecture	Class test on Centre-State administrative relations
Module II Panchayati Raj	73 and 74 Constitutional Amendments	5	Lecture Student seminar	Question-answer sessions Seminar evaluation
	Peoples Planning Programme	7	Lecture Debate	Debate on the topic 'Peoples Planning in Kerala'
	Impact of Reservation in PRIs	3	Lecture Student seminar	Write-ups of students are to be evaluated. Seminar evaluation
Module III Procedure to amend Indian Constitution	1,42,44 CAA	8	Lecture Debate Presentations	Question-answer sessions
	52,86,101 CAA	3	Debate	Debate on 'Rigidity and Flexibility of Indian Constitution'
Module IV Indian Party System				
	National parties in India	4	Lecture Student Seminar	Seminar evaluation

	Regional Parties in India	5	Lecture Student Seminar	Seminar evaluation
	Regionalism	6	Lecture Discussion	Class test
Module V Human Rights	Constitutional provisions to protect Human Rights	6	Lecture Debate	Debate on Human Rights of Dalits in India.
Internal Examinations	Two internals of 60 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated and marks are taken for CIE. Feedbacks are given individually.
Assignments	Any topic		All students are required to prepare an assignment from any of the topics they're interested, but should avoid repetition	Assignments are corrected and feedbacks are given. CIE Internal mark is awarded on the basis of assignments too.
Seminars	Any topic	10	All students are required to present a topic with the help of presentation, preferably.	Feedbacks are provided and marks are considered for CIE
		82 Hours		

Reference Materials

1. D.D.Basu, Introduction to the Constitution of India, Prentice Hall, 2010
2. Dr.M.V.Pylee, India's Constitution, Vikas, New Delhi 2010
3. J.C.Johari, Indian Political System, Anmol Publications,2008.

Semester II

Course Category: Core Course II

Paper name:Trends in Indian Historiography

Code: HIS2 B02

Course Outcome:

- Get the basic understanding regarding the development of Historical consciousness in India.
- Provide a basic understandingregarding the major trends in the arena of Historical Writing and Thought in India.
- Expose the students to the major paradigms associated with the study of Indian History, which will help them to understand the Indian History Courses in the following semesters.

Course Outcome: Modules	**Contents**	**Hours**	**Procedure/ Activity/ plans**	**Assessment**
Module I - Historical Consciousness in Pre- British India	Concept of time in early India	**3**		
	Jain and Buddhist Tradition	**3**		
	Ithihasa – Purana Tradition	**2**		
	Charithas and Kavyas- Harshacharitha – Mooshakavamsa- Rajatharangani	**3**		
	Kitab-al- Hind- Al- Biruni	**3**		
	Historical Writings of Sultanate Period- Barani- Amir Khusrau	**3**		
	Historiography of Mughal period - AbulFazal	**3**		
	Historical consciousness in other parts of India - Ferishta- Sheikh Zainuddeen- Mangalkabya	**3**		

Department of Commerce

MCM1C01: BUSINESS ENVIRONMENT AND POLICY

Number of Lecture Hours per week : 5
Number of credits: 4
Internal Credit: 0.8 External Credit: 3.2
Duration of Examination : 3 Hours

Objective:

- To familiarise students with the concepts of macro-economic in which a Business organization operates

Module I

Business Environment: Meaning & Elements -Components and significance–Scope–political, Economic, Social, Technological, Legal, Cultural and Labour Environment – Trade Unions – Quality Circles – External Factors Influencing Business Environment – Dimensions of International Business Environment –Challenges
(15 Hours)

Module II

Structure of Indian Economy: Economic Systems-Economic Planning– Planning Commission and NITI Ayog – Public Sector – Changing Role– Relevance – Public Sector Reforms – Public Private Participation – Privatization and Disinvestments – Fiscal Policy – Monetary Policy – Structure of Union and State Budgets – Sources of Revenue – Management of Public Debt. – GSTHistory and Development in India (20 hours)

Module III

Profile of Indian Economy: New Economic and Industrial Policy–Recent Economic & Tax Reforms in India – GST-Land Reforms – Liberalization – Problems of Growth – Unemployment – Poverty – Regional Imbalances – SEZ – Social Injustices – Inflation – Black Money – Lack of Technical Knowledge and Information – Globalization Various Aspects – Consequences. (15 hours)

Module IV

Foreign Direct Investment and Institutional Investment: Forms–Policy - FDI in Retail

Trade – Problems and Consequences – FEMA – Multinational Corporations Role and Recent Trends – Problems and Consequences – Competition Law-Import & Export Policies- Start-ups- Digital economy- CRYPTO currency, Fin tech (10 hours)

Module V

Environment management-Degradation of Natural Environment-Air pollution, Water Pollution, Land Pollution, National Wetland Policy-Madhav Gadgil Committee Report-KasturiRangan Report-Global warming-causes & Effects, Climate Change, KYOTO Protocol, GreenNi Financing, Carbon Credit, Environment Protection Act 1986(Basics)-National Green Tribunal Act (Basics) -Consumer Protection Act,1986 (Basics) – RTI 2005(Basics) Salient features of Information Technology Act:2000.

(20 hours)

References:

1. M. Adhikari: Economic Environment of Business, Sultan Chand and Sons, New Delhi.
2. Ian Worthington, Chris Britton: Business Environment.
3. Francis Cherunilam: Business Environment, Himalaya Publishing House, Mumbai.
4. Claire Capon: Understanding the Business Environment.
5. K.V.Sivayya and VBM Das: Indian Industrial Economy, Sultan Chand Publications, Delhi.
6. David Baron: Business and Its Environment.
7. Panday G.N: Environmental Management, Vikas Publishing House.
8. Raj Agarwal: Business Environment, Excel Publications, New Delhi.

OBJECTIVES

- To give an idea about the policies of the government and assess their impact on business

LESSON PLAN

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (15 Hours)	Meaning and definition of Business Environment, Components and significance, Types, Trade unions, Factors influencing Business Environment, Challenges	Lectures, Discussion and Participative learning	PowerPoint presentation on different types of business environment, Group discussion trade unions	To learn about business environment and its components. To understand the various challenges of business environment.	Evaluation through test paper
Module II (20 Hours)	Structure of Indian Economy, Economic Systems, PlanningCom	Seminars, Discussion and Participative learning	Seminar presentations on role of public sector in Indian economy, Group discussion on privatisation and	To evaluate the structure of Indian economy. To understand the history and	Evaluation through seminar

	mission and NITI Ayog, Relevance of Public sector, Privatization and Disinvestment, Fiscal policy and Monetary policy, Union and State Budget, Management of Public debt, GST - History and Development in India		disinvestment.	development of GST in India.	
Module III (15 Hours)	Profile of Indian Economy, Recent economic and Tax reforms in India, Liberalization and problems of growth, SEZ, Inflation and Black money, Globalisation.	Lectures, Discussion and Participative learning	PowerPoint presentation on profile of Indian Economy, Group discussion on inflation and Black money.	To provide an overview on the profile of the Indian economy. To understand the tax reforms in India.	Evaluation through assignmets

Module IV (10 Hours)	Introduction to Foreign Direct Investment and Institutional Investment, FDI in retail trade - Problems and consequences , Foreign Exchange Management Act, Role and problems of MNC, Competition Law, Start-ups and Digital economy, CRYPTO currency and Fintech	Lectures, Discussion and Participative learning	PowerPoint presentation on Foreign Direct Investment and Institutional Investment	To learn about Foreign Direct Investment and Institutional Investment. To know the problems and consequences of Multinational Corporations.	Evaluation through test paper
Module V (20 Hours)	Introduction to Environment Management, Degradation of natural environment, National	Lectures, Discussion and Assignments	Seminar on degradation of natural environment, Discussion on Global warming.	To provide an overview on environment management and various committees on environment. To learn about	Evaluation through assignment and seminars

	Wetland Policy, Madhav Gadgil Committee Report - Kasturi Rangan Report, Global warming, KYOTO Protocol, Carbon Credit, Environment Protection Act 1986, Consumer Protection Act 1986, Salient Features of IT Act 2000.			Environment Protection Act 1986, Consumer Protection Act 1986, and IT Act 2000.	

COURSE OUTCOME

CO1	Analyse the environment of a business from the various internal and external perspectives
CO2	Evaluate how the economic environment and its configurations influence in business decision making

CO3	Apply the role of New Economic Policy and the Economic reforms in the perspective of Business
CO4	To make understand the various policies related to FDI &Multi-National Corporations
CO5	To give an in-depth knowledge about the recent Government policies regarding Environment management

MCM1C02 CORPORATE GOVERNANCE AND BUSINESS ETHICS

Number of Lecture Hours per week : 5
Number of credits: 4
Internal Credit: 0.8 External Credit: 3.2
Duration of Examination : 3 Hours

Objectives:

- To familiarise the students with the knowledge of corporate ethics

Module-I

Meaning and Definition of Corporate Governance- Evolution of Corporate Governance- Major Stakeholders of a Corporate Body and their goals- Communication mechanism of corporate organisation with stakeholders-Objectives Corporate Governance- Principles of Corporate Governance. (15 Hours)

Module-II

Theories and Models of Corporate Governance- Conceptual Framework of Corporate Governance- Legal framework of Corporate and administrative framework- regulatory framework of corporate governance in India- SEBI guidelines and clause 49- Reforms in the Companies Act-Secretarial Audit-Class action- NCLT- Insider trading- rating agencies- green governance- shareholders' activism- corporate governance in PSUs and banks- Legislative framework of corporate governance- an international perspective (UK, USA, Australia, China, Russia, South Africa) (20 Hours)

Module-III

Various Committees on Corporate Governance- International- Blue riband Committee-Cadbury Committee- Greens burry Committee- Kings Committee- Securities and Exchange Commission Report- Indian; Birla Committee, Narayanamurthy Committee- JJ Irani Committee, Naresh Committee Report.

Uday Kodak Committee Report Corporate Reporting Framework- Reporting of Remuneration- Service Contract of Directors- Financial Reporting of the activities of the company as per clause 49 of the Companies and SEBI Act. IFRS- Need-Importance- Significance-Use. (15 Hours)

Module-IV

Elements of Corporate Governance- Board of Directors- Executive Directors- Independent Directors- Appointment, Remuneration- Powers, Duties and Responsibilities- Audit Committee- Composition Power and Responsibilities- Statutory Officers- Duties, Board Committees- Responsibilities and Powers-

Board meetings- Whistleblowing and Corporate Governance- The Concept of Whistle blowing-Types of whistle blowers- Whistle blower policy- the Whistle Blower Legislation across countries- Developments in India. (20 Hours)

Module-V

Business Ethics- Meaning-scope-Importance-Dimensions-Role of ethics in business-Law & ethics- Ethics and values-Important ethical principles in business-The new management philosophy-Ethics in business functional areas-integrity-Sales-HRM-Management of quality. Corporate excellence -corporate culture- Styles & values of management-managing cultural diversity in organisation- Building corporate image-knowledge workers & knowledge mgt.

(10 Hours)

Suggested Readings:

Books

1. Mallin, Christine A., Corporate Governance (Indian Edition), Oxford University Press, NewDelhi.
2. Blowfield, Michael, and Alan Murray, Corporate Responsibility, Oxford University Press.
3. Francesco Perrini, Stefano and Antonio Tencati, Developing Corporate Social Responsibility- AEuropean Perspective, Edward Elgar.
4. Sharma. J.P., Corporate Governance and Social Responsibility of Business., Ane Books Pvt Ltd,New Delhi
5. Jawahar Lal Corporate Financial Reporting Theory and Practice- Taxman
6. Singh S: Corporate Governance-Global Concepts and Practices- Excel Books
7. Robert A.G Monks & Nell Minow: Corporate Governance: Wiley
8. Bob Tricker: Corporate Governance: Principles, Policies and Practices- Oxford University Press.
9. Fernando.AC: Corporate Governance: Principles, Policies and Practices: Pearson Education
10. Indian Institute of Corporate Affairs- Corporate Governance: Taxman
11. Indrajit Dube: Corporate Governance- Lexis Nexis
12. Satheesh Kumar. T.N: Corporate Governance: Principles and Practices: Oxford University Press
13. Ghosh.B.N. Business Ethics and Corporate Governance- Mc Graw Hill Education
14. Robert Cobbaut et al: Corporate Governance: An Institutional approach- Kluwer Law International.

Cases-International

1. Bank of Credit and Commerce International – UK
2. Maxwell Communication Corporation and Mirror Group Newspapers (UK)
3. Enron (USA)
4. Anderson worldwide (USA)
5. Vivendi (France), Lehman Brothers (USA)

Cases-Indian
1.Satyam Computer Services Ltd
2. Sahara
3. Kingfisher Ltd
(Common governance problems noticed in various corporate failures; policy actions including major codes and standards.
Journal: Chartered Accountant

OBJECTIVES

- To enable the students to understand the emerging trends in good governance practices.
- To create corporate financial reports in the global and Indian context.

LESSON PLAN

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (15 Hours)	● Meaning and definition of corpora	● Lectures ● Participative learning	● PowerPoint presentation on meaning and definition of	To understand the meaning of corporate governance To identify the	● Evaluation through test

	te governance, ● Objectives and principles of corporate governance		corporate governance ● Group discussion on objectives and principles of corporate governance	objectives and principles of corporate governance	paper
Module II (20 Hours)	● Theories and models of corporate governance ● Insider trading, green governance, shareholders activism	● Discussion ● Lecture ● Demonstration	● Seminar presentations on theories and models of corporate governance ● Group discussion on insider trading, green governance and shareholders activism	● To provide an insight into the Theories and models of corporate governance ● To know more about the insider trading, green governance and shareholders activism	Evaluation through case study
Module III (15 Hours)	● Various committees on corporate	● Lectures ● Participative learning	● Assignments on various committees on corporate governance	● To learn about different committees on corporate governance	● Evaluation through test

	governance ● IFRS need and importance		● PowerPoint presentation on need and importance of IFRS	● To provide a clarity with regard to the need and importance of IFRS	paper
Module IV (20 Hours)	● Board of Directors, duties responsibilities and powers of board committee ● Whistle blowing and developments in India	● Lecture ● Discussion ● Participative learning	● Group discussion on duties, responsibilities and powers of board of committees ● PowerPoint presentation on whistle blowing	● To understand the powers, duties and responsibilities of board of directors	Evaluation through seminar presentations
Module V (10 Hours)	● Role of ethics in business law ● The new	● Seminars ● Assignments	● PowerPoint presentation on role of ethics in business law ● Group discussion on	● To observe and identify the role of ethics in business law ● To understand the new	● Evaluation through test paper

	management philosophy, corporate excellence ● Styles and values of management	● Discussion	the new management philosophy	management philosophy	

COURSE OUTCOME

CO1	To make an understanding about the concept of Corporate Governance and the communication mechanism
CO2	To Apply the various Theories and Models of Corporate Governance and the recent initiatives in India and abroad
CO3	To make an understanding about the various committees on Corporate Governance and theLegal framework
CO4	Evaluate the role of various stakeholders, whistleblowing and the recent developments in India.
CO5	To create Important ethical principles in Business in the cultural diversity

MCM1C03: QUANTITATIVE TECHNIQUES FOR BUSINESS DECISIONS

Number of Lecture Hours per week : 5
Number of credits: 4
Internal Credit: 0.8 External Credit: 3.2
Duration of Examination : 3 Hours

Objectives:

- To acquaint students with important quantitative techniques, which enable sound business decision making

Module 1

Quantitative Techniques: Introduction to quantitative techniques-Qualitative and quantitative approaches–role in decision making – Significance of quantitative decisions – Probability distributions- Discrete & Continuous-Binomial, Poisson, Uniform, Exponential, Normal distributions- Inferential analysis for management – statistical estimation – point estimation – interval estimation – Properties of a good estimator. Confidence intervals for means (a) when σ is known, and (b) when σ is not known. Sample size determination for a mean. Confidence intervals for proportions. (25 hours)

Module 2

Hypothesis Testing: One and Two-sample Tests: General methodology of hypothesis testing. One and two-tailed tests. Type I and type II Errors. One Sample Tests: Hypothesis testing of means when the population standard deviation is known and when it is not known. Hypothesis tests concerning proportions. Two-sample Tests: Tests for difference between means – when population standard deviations are known, and when they are not known. Inferences about difference between two means for matched samples. Testing the difference between two proportions. (15 hours)

Module 3

Analysis of variance & Non parametric tests: F-test of equality of variances. One-factor ANOVA (Completely Randomised Model) and Two-factor ANOVA without replication (Randomised Block Model). Chi-square test for independence & Goodness of fit. Sign test, one sample runs test and rank correlation test
(20 hours)

Module 4

Correlation and Regression analysis: Simple, partial & Multiple correlation, Simple & multiple linear regressions, Coefficient of Determination (10 Hours)

Module 5

Use of Excel and SPSS for quantitative methods (Application level)- Analysis tools - Descriptive statistics and inferential analysis (10 hours)

(Theory 30% Problem 70%)

References:

1. Levin & Rubin, Quantitative Approaches for Management, Pearson 2.
Anderson, 2. 2.QuantitativeMethods for Business Decisions, Thomson
2. Barry Render, Quantitative Analysis for Management, Prentice Hall of India
3. D.V.D. Vohra, Quantitative Techniques for Management
4. Anand Sharma, Quantitative Techniques for decision making, Himalaya Publishing House 15 hours
5. Gupta & Khanna, Quantitative Techniques for decision making, Prentice Hall of India.
6. Gupta SP, Statistical Methods, S. Chand & Sons.
7. P.N. Arora, Sumeet Arora, S. Arora, Comprehensive Statistical Methods, S. Chand and CompanyPrivate Limited, New Delhi
8. G.C. Beri, Business Statistics, Tata McGraw,Hill New Delhi

OBJECTIVES

- To make students learn the process of applying appropriate quantitative techniques for validating findings and interpreting results

LESSON PLAN

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (25 Hours)	• Introduction to QT, Qualitative and quantitative approaches • Probability distribution- Discrete and continuous	• Lectures • Discussions	• PowerPoint presentation on introduction to QT • Group discussion	• To learn about the qualitative and quantitative techniques • To provide an insight into the probability distribution	• Evaluation through test paper

Module II (15 Hours)	• Hypothesis testing, one and two tailed test • One sample test, two sample test	• Lectures • Participative learning • Discussion	• Seminar presentations on hypothesis testing • Group discussion on one sample test and two sample test	• To understand about the hypothesis testing on one sample tests and two sample tests.	• Evaluation through test paper
Module III (20 Hours)	• ANOVA (one factor and two factor) • Chi square test and rank correlation test	• Lectures • Assignments • Discussion	• Power point presentation on ANOVA • Group discussion on chi square test	• To provide a thorough knowledge about ANOVA and chi square test	• Evaluation through test paper
Module IV (10 Hours)	• Simple, partial and multiple correlation • Simple	• Lectures • Seminars • Assignments	• Power point presentation on correlation and	• To evaluate the role of correlation and regressions	• Evaluation through test paper

	and multiple linear regressions		regressions		
Module V (10 Hours)	• Use of Excel and SPSS for quantitative methods • Analysis tools • Descriptive statistics and inferential analysis	• Lectures • Discussion • Participative learning	• Power point presentation on Excel and SPSS	• To know about the applicational levels of use of Excellence and SPSS • To understand the descriptive statistics and inferential analysis	☐ Evaluation through test paper

COURSE OUTCOME

CO1	To remember and understand properties of probability distribution and to solve the problems
CO2	To apply hypothesis testing for validation and interpretation of the results

CO3	To evaluate the application of non-parametric tests for validation
CO4	To understand the tool for finding the relationship between variables and its magnitude
CO5	To create soft skill knowledge for data analysis

MCM1C04: MANAGEMENT THEORY AND ORGANISATIONAL BEHAVIOUR

Number of Lecture Hours per week : 5
Number of credits: 4
Internal Credit: 0.8 External Credit: 3.2
Duration of Examination : 3 Hours

Objectives:

- To understand human behaviour at Individual, Interpersonal, Group and InterGroup levels

Module I

Introduction to management –management concept-Historical evolution schools of management thought –Major contributors to management thought- Principles of management-modern techniques in management- Japanese Management System-Korean Management system - Leadership and Management-Theories of Management, Theories of Leadership, Quality circle- TQM- Six sigma- Kaizen-Benchmarking –Core competence-Bottom of pyramid approach-MDP- steps in MDP - Need for the knowledge of OB – Need for a contingency approach to the study of OB – Emerging challenges and opportunities for OB – the organization as

a system – System – System approach to organizational behaviour – Managerial functions – The organization and people.(20 Hours)

Module II

Basic psychological process-Perception-Factors influencing perception - Attribution theory – Specific applications in organizations – Learning - Theories of learning – Using learning concepts for self-management – implications for performance and satisfaction – Remembering – Basic motivational concepts – Theories of motivation. HRM approach to managing and controlling performance. Behavioural aspects of Control (15 hours)

Module III

Personality–Determinants of personality–Theories of personality–Major personality attributes influencing organization behaviour - Building and maintaining the self-values, attitudes and job satisfaction – Ethical issues in organizational behaviour – Mental and health problems in organizations – role of counselling. Building, leading and managing teams (20 hours)

Module IV

Group dynamic and inter group relationships–Characteristics of workgroup – Basic forces of group behaviour – Quality of Work Life-Work Life Balance-Dynamics of effective operating groups – Work group behaviour and productivity - Team management – Styles and skills in leadership and communication – Power and politics in organization – Managing differences and conflicts – managing change – Organization and society.(15 hours)

Module V

Organisational Culture, Organizational development–Techniques of organizational development Interventions – Grid management – Transactional analysis – Sensitivity training – Process consultancy -Case discussions and analysis. Techniques for managing organisational relationships. (10 hours)

References:

1. Fred Luthans: Organisational behaviour

2. Danial C. Fieldman and Hugh Arnold: Managing individual and group behaviour in organization.
3. Henry Mint berg: The structure of organization
4.Edwin Gerlog: Organization theory and design

OBJECTIVES

- To recognise issues inherent in organisational change, growth, development and conflict

LESSON PLAN

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (20 Hours)	*Introduction to management , theories of management, new concepts in management *Introduction to	☐ Lectures ☐ Discussion ☐ Participative learning	☐ PowerPoint presentation on concepts and theories of management ☐ Group discussion on one sample test and two sample test	☐ To provide an overview about management concepts and theories ☐ To learn about basics of Organisational behaviour	☐ Evaluation through test paper

	Organisational behaviour				
Module II (15 Hours)	*Basic psychological process *Perception,learning and motivation	• Lectures • Discussions	☐ Group discussion on perception and learning ☐ Powerpoint presentation on theories of motivation	☐ To understand basics of psychological process ☐ To know perception and attitudes	☐ Evaluation through test paper
Module III (20 Hours)	*Personality and attitudes theories and concepts	• Lectures • Assignments • Discussion	☐ Assignments on personality and different attitudes	☐ To evaluate about personality learning and motivation	☐ Evaluation through assignments
Module IV (15 Hours)	*Group dynamic and intergroup relationships *Team management *Power and politics *Organisational change.	☐ Lectures ☐ Seminars ☐ Assignments	☐ Seminar presentations on group behaviour and team management ☐ Group discussion on power and politics and organisational change	☐ To know group behaiour and intergroup relationships ☐ To understand power and politics ☐ To evaluate organisational change	☐ Evaluation through seminar presentation s

Module V (10 Hours)	*Organisational development *Leadership	• Lectures • Group discussion • Participative learning	☐ Group discussion leadership theories	☐ To examine organisational development ☐ To understand leadership concepts and theories	☐ Evaluation through test paper

COURSE OUTCOME

CO1	To impart a thorough understanding about various concepts and theories in management and organisational behaviour
CO2	Understand the various psychological process and different motivation theories which will influence the performance
CO3	To Evaluate the personality traits of human beings and various ethical issues in Organisational Behaviour.
CO4	To understand importance of group dynamics, need for work life balance and managing change
CO5	To apply the the various terms related to organisational culture and Techniques for managing organisational relationships

MCM1C05: ADVANCED MANAGEMENT ACCOUNTING

Number of Lecture Hours per week : 5

Number of credits: 4

Internal Credit: 0.8 External Credit: 3.2
Duration of Examination : 3 Hours

Objectives:

- To enable students to understand and apply tools, techniques, and concepts in the managerial decision-making process

Module 1

Introduction to Management Accounting : Meaning and importance of Management Accounting- Tools of Management Accounting (Descriptive, Analytical, Diagnostic, Predictive) – Skills required for Management Accountants- Strategic Role of Management Accountants- Functions of Management Accountants. (10 Hours)

Module 2

Performance Measurement : Financial and non-financial measurement of performance- ROI – Residual Income – KPI-Economic Value Added (EVA) – concept and measurement - Balanced ScoreCard- concepts and objectives- Multiple Scorecard measures- New horizons in management control- Responsibility Accounting- Performance Budgeting- ZBB and ABB – Social Cost-benefit Analysis- Modern production Management techniques originating from Japan – Flexible Manufacturing Systems (FMS)- TQM. (15 Hours)

Module 3

Decision making under Risk and Uncertainty: Nature and Types of risk- Techniques for decision making under risk and uncertainty- Optimistic and Pessimistic estimates- Risk adjusted Discount Rate- Certainty Equivalent Coefficient Method- Sensitivity technique- Probability technique- Standard Deviation method- Coefficient of Variation method- Simulation Technique- Decision Tree Analysis. (15 Hours)

Module 4

Standard Costing and Variance Analysis: Types of Standards – setting standards- Variance Analysis- Importance- Material, Labour, Overhead, Sales and Profit Variance – Interpretation of variance - Control and Efficiency Ratios- Investigation of Variance – Techniques of interpretation of variance. (20 Hours)

Module 5

Marginal Costing and its Application: CVP analysis and decision making – Managerial applications of CVP analysis- make or buy decision-Alternative methods of production- Buy or Lease Decision- Shut down or continue- Repair or replace –Accepting bulk orders for Idle capacity utilization- pricing under different situations- suitable product mix and Key Factor. (20 Hours)

(Theory 30% and Problems 70%)

References:

1. Cost and Management Accounting- Jain and Narang, Kalyani Publishers
2. Management Accounting and Financial Control-S N Maheshwari, Sultan Chand & Sons
3. Management Accounting N.K Kulshrestha, Taxman Publications
4. Management Accounting – Paresh Shah, Oxford Publishers
5. Advanced Management Accounting – Ravi.M Kishore, Taxman
6. Management and Cost accounting – Colin Drury, Cengage Learning
7. Management Accounting – Dr. S.P Gupta, SahityaBhavan Publishers
8. Catherine Stenzel& Joe Stenzel, Essential of Cost Management, John Wiley and sons, Latest Edition.
9. Roman I wiel& Michael W mahr Hand book of Cost Management, John Wiley and Sons, Latest Edition.
10. Lianabel Oliver, The cost management tool box. AMA Publication, Latest Edition.
11. John K. Shank & Vijay Govindarajan, Strategic Cost management: The new tool for competitive advantage, The free press, Latest Edition.
12. K.P. Gupta, Cost Management: Measuring, monitoring and motivating performance, Global India Publications, Latest Edition.

Journals/Newspapers

Management Accountant
Chartered Financial Analyst
Chartered accountant
Business line
Economic times.

OBJECTIVES

- To inculcate analytical skills in interpreting and diagnosing business problems

LESSON PLAN

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment	
Module I (10 Hours)	**Module I (20 Hours)**	Meaning and importance of Management Accounting Skills and Functions of Management Accountant	1.Lectures 2.Discussion	1.Group discussion on skills of Management Accountant 2.Power point presentation on meaning of Management Accounting	To provide an insight about meaning of Management Accounting	Evaluation through case study

					To get an idea about skill and functions of Management Accountant	
Module II (15 Hours)	**Module II (20 Hours)**	Financial measurement of performance New horizon in Management Control	1.Participative learning 2.Discussion	1.Seminars on financial performance measurement 2.Discussion on new horizons	To know more about performance measurement To understand new horizons of Management Control	Evaluation through Seminars
Module III (15 Hours)	**Module III (15 Hours)**	Techniques for decision making under risk and uncertainty	1.Demonstration 2.Lectures	1.Power point presentation on different techniques	To get more knowledge about techniques for decision making under risk	Evaluation through test paper

					and uncertainty	
Module IV (20 Hours)	**Module IV (20 Hours)**	Standard costing and techniques of interpretation of variances	1.Lectures 2.Participative Learning	1.Assignments on Standard Costing 2.Group discssion on Variance Analysis	To understand Standard costing and variance analysis	Evaluation through assignment
Module V (20 Hours)	**Module V (05 Hours)**	Meaning of marginal costing Applications of CVP Analysis	1.Discussion 2.Lectures 3.Participative Learning	1.Power point presentation on marginal costing 2.Seminars on Application of CVP Analysis	To provide more knowledge about marginal costing To undeestand applications of CVP analysis	Evaluation through test paper

COURSE OUTCOME

CO1	To remember and understand the knowledge to use different methods of measuring financial and non-financial performance

CO2	To measure and solve financial and non-financial performance-based business problems
CO3	To understand and apply comprehensive performance management initiatives for organizations
CO4	Understand and apply the significance of risk and uncertainty in decision making
CO5	To apply various techniques of interpreting Variances

MCM2C06: ADVANCED CORPORATE ACCOUNTING

Number of Lecture Hours per week : 5
Number of credits: 4
Internal Credit: 0.8 External Credit: 3.2
Duration of Examination : 3 Hours

Objectives:

- To provide knowledge and skills in the theory and practice of corporate financial accounting

Module 1

Group Financial Statements: Group accounts and group structures – consolidation procedures (IFRS 10 /Ind AS 110)- Non- Controlling Interest (NCI)- Goodwill valuation (IFRS 3/Ind AS 103)- Goodwill arising on consolidation – Intra-group transactions and mutual owing – Treatment of unrealised profit- revaluation of assets and liabilities- Treatment of dividend and bonus shares. (20 Hours)

Module 2

Accounting for Corporate Restructuring : Accounting for Mergers, Acquisition and Reconstruction (internal and external)- Accounting for liquidation of companies-

preparation of Statement of Affairs – Deficiency /Surplus Account- Liquidator's final statement of account- Receiver's statement of accounts. (20 Hours)

Module 3

Accounting for Taxation: Current Tax Expense –calculation and accounting entries- Deferred Tax – Temporary Difference- TTD and DTD – Deferred Tax Assets and Deferred Tax Liabilities – Deferred Tax Expense and Deferred Tax Income (Deferred Tax Reversal)- Recognition, Measurement, Presentation and Disclosure of Deferred Tax (15 Hours)

Module 4

Accounting for Revenue and Leases:Revenue from contact with customers (IFRS 15 / Ind AS 115) – Revenue Recognition model – Variable Consideration- Long term contracts – Revenue recognition from construction contracts Accounting for Leases (IAS 17 / Ind AS 17) – Classification of lease – Operating Lease – recognition, measurement,presentation and disclosure in the books of Lessor and Lessee – Financial Lease- recognition, measurement, presentation and disclosure in the books of Lessor and Lessee- New standard on lease (IFRS 16 /Ind AS 116) -major changes in the lease accounting (especially in the books of lessee).
(20 Hours)

Module 5

Modern Concepts in Accounting : Human Resource Accounting- Forensic Accounting – Social Responsibility Accounting – Environmental Accounting- Investment Accounting – Proactive Accounting – Inflation Accounting. (5 Hours)

(30% Theory and 70% Problems)

References:

1. Shukla and Grewal: advanced Accounts. (S. Chand & Co Ltd. New Delhi)
2. Jain and Narang: Advanced Accounts (Kalyani Publishers, Ludhiana)
3. Sr. K. Paul: Accountancy, Volume-I and II (New Central Book Agency, Kolkata)
4. R.K., Lele and Jawaharlal; Accounting Theory (Himalaya Publishers)
5. Dr. L.S. Porwal; Accounting Theory (Tata Mc Graw Hill)

6. Robert Anthony, D.F. Hawkins & K.A. Merchant: Accounting Text & Cases. (Tata Mc Graw Hill).
7. Dr.S.N. Maheshwari: Corporate Accounting (Viakas Publishing House Pvt. Ltd. New Delhi)
8. Dr. Ashok Sehgal & Dr. Deepak Sehgal; Advanced Accounting (Taxman, New Delhi).
9. RL Gupta & Radha Swamy Advanced Accountancy. (Sultan Chand and Co.)
10. Anthony, RN & Reece, JS: Accounting Principles, Richard Irwin, Inc.
11. Barker, P & O'hOgartaigh, C: Group Accounts – Theory and Practice, Oaktree Press 1st Edn.
12. Narayanswamy, R: Financial Accounting - A Managerial Perspective, PHI, New Delhi,
13. Hani & Mukherjee: Corporate Accounting, TMG, New Delhi.
14. Xavier, g Francis: Fundamentals of Advanced Accounts, Vol-III, TMG, New Delhi.
15. Financial Reporting Vol. 1 by The Institute of Chartered Accountants of India.
16. Advanced Accountancy MC Shukla. T.S. Grewal. & S.C. Gupta.
17. IFRS Red Book (Official Publication of IASB)
18. ICAI study material for Financial Reporting
19. Indian Accounting Standards, Chinten Patel & Bhupendra Mantri (Taxman Publication)
20. Illustrated Guide to Ind AS, T P Ghosh (Taxman Publication)

Journals : Chartered Accountant.

OBJECTIVES

- To provide insight into some of the important accounting standards of IFRS /Ind AS

- To enable problem solving abilities among students in matters of various corporate situations such as consolidation of group information, corporate restructuring and liquidation

LESSON PLAN

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (20 Hours)	Group accounts and group structures, consolidation procedures	• Lecture • Discussion • Participative Learning	Assignment on exercise questions	To study how to prepare financial statements	Assessment through test papers
Module II (20 Hours)	Accounting for mergers, accounting for liquidation of companies, preparation of statement of affairs, liquidators final statement of	• Lecture • Discussion • Participative Learning	Seminar on accounting for mergers , acquisition, and reconstruction Assignment on exercise questions	To study accounting for liquidation of companies	Assessment through test papers

	accounts				
Module III (15 Hours)	Current tax expenses , calculation and accounting entities, deferred tax asset and deferred tax liabilities	• Lecture • Discussion • Participative Learning	Assignment on exercise questions	To study current tax expenses To study deferred tax asset and liabilities	Assessment through test papers
Module IV (20 Hours)	Revenue from contract with customers, revenue recognition model, classification of lease, recognition , measurement , presentation, disclosure	• Lecture • Discussion • Participative Learning	Presentation on different types of lease Assignment on exercise questions	To study revenue from contract with customers To study recognition, measurement,presentation and disclosure in the books of Lessor and lessee	Assessment through test papers
Module V (05 Hours)	Human Resource Accounting- Forensic Accounting – Social Responsibility Accounting –	• Lecture • Discussion • Participative Learning	Seminar on social responsibility accounting Group discussion on responsibility accounting Assignment on	To study modern concepts in accounting	Assessment through test papers

	Environmental Accounting- Investment Accounting – Proactive Accounting – Inflation Accounting		inflation accounting		

COURSE OUTCOME

CO1	To understand the theory and practice of Corporate Financial Accounting
CO2	To create problem solving capacity in Corporate restructuring and liquidation
CO3	To understand skill in recognition, measurement and presentation of deferred tax
CO4	To understand insight into Accounting standards of IFRS, Ind AS, and Lease accounting
CO5	To evaluate different types of accounting

MCM2C07: ADVANCED STRATEGIC MANAGEMENT

Number of Lecture Hours per week : 5
Number of credits: 4
Internal Credit: 0.8 External Credit: 3.2
Duration of Examination : 3 Hours

Objectives:

- To provide an awareness regarding various types of strategies

Module 1

Introduction: Basic concepts of strategy and strategic management–level of strategy – Strategic Management Process – Models of strategic management – Approaches to strategic decision making – vision – mission – objectives – goals – strategic implications of social and ethical issues. (15 hours)

Module 2

Environmental Analysis : SWOC- Strategy and Competitive Advantage-Emerging trends in strategic management- New modes of leadership- Organisational Redesign (15 hours)

Module 3

Strategic Choice: Generating strategic alternatives–Strategic options at corporate level – Stability, Growth and Defensive Strategies – Strategic Alliance – SBUs – Portfolio models – BCG matrix – Michael Porter's competitive strategies Mintzberg's five Ps Strategy, KPI, KSF – External growth strategies – Competitive Advantage, Porters Value Chain Merger, acquisition, joint venture and strategic alliance (with business cases) (20 hours)

Module 4

Strategy implementation: Various approaches to implementation of strategy – Planning and allocating resources – Strategic Control. (15 hours)

Module 5

Strategy evaluation and control: Tools and techniques of evaluation-control techniques and process –DuPont Control model, Balanced scorecard-etc
(15 Hours)

At least one relevant case shall be discussed in each module and assignments shall be encouraged to be in the form of case studies

References:

1. Krishna Kumar: Cases in Strategic Management – Managerial Experiences, Global Business Press(1996).
2. RM Srivastava: Corporate Strategic Management, Pragati Prakashan.
3. AzharKazmi: Strategic Management and Business Policy, Tata McGraw-Hill Publishers (2010).
4. Stephen Hains: Strategic Thinking, Jaico Publishing House (2008)
5. RM Srivastava and DivyaNigan: Corporate Strategic Management, PragatiPrakashan (2000).
6.Frank T Paine and Carl R Anderson: Strategic Management, The Dryden Press

OBJECTIVES

- To study applications of the various strategies along with strategic formulation, implementation and evaluation.

LESSON PLAN

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment

Module I (15 Hours)	Concepts of strategy and strategic management, Levels of strategy, Strategic Management Process, Models of strategic management, Approaches to strategic decision making, strategic implications of social and ethical issues	Lectures Discussion Participative learning	• PowerPoint presentation on concept of strategy and strategic management, and process of strategic management • Group discussion on levels of strategy andstrategic decision making	To understand the concept of strategy, strategic management. To know the strategic management process, strategic decision making etc.	Assessment through test paper, performanc e in group discussion
Module II (15 Hours)	Strategy and Competitive Advantage, Emerging trends in strategic management, New modes of leadership, Organisationa l Redesign	Lectures Discussion Participative learning	• Presentation on SWOT analysis of various companies • Group discussion on emerging trends in strategic managemnt	To understand more about SWOT analysis, emerging trends in strategic management, modes of leadership and organizational design .	Assessment through test paper, Assessment of performanc e of presentation of SWOT analysis

Module III (20 Hours)	Strategic Choices, Corporate level strategies, Portfolio models, Competitive Advantage, Porter's Value Chain Merger, acquisition, joint venture and strategic alliance	Lectures Discussion Participative learning	• PowerPoint presentation on corporate level strategies • Group discussion on Competitive advantage	To understand the types of corporate level strategies, portfolio models, competitive advantage.	Assessment through test paper, performance in group discussion
Module IV (15 Hours)	Strategy implementation, Various approaches to implementation of strategy, Planning and allocating resources, Strategic Control.	Lectures Discussion Participative learning	• PowerPoint presentation on strategic implementation process • Group discussion on Strategic control	To understand strategic implementation and strategic control	Assessment through test paper, performance in group discussion
Module V (15 Hours)	Strategy evaluation and control: Tools and techniques of evaluation,	Lectures Discussion Participative learning	• PowerPoint presentation on strategic evaluation and controlling	To understand the strategic evaluation and controlling process and various techniques of strategic control	Assessment through test paper

	control techniques and process		process and techniques		

COURSE OUTCOME

CO1	To understand the Strategic Management Process and to provide basic idea about the Social and ethical issues
CO2	To understand and evaluate the Environment analysis and SWOC
CO3	Evaluate the strategic options at Corporate level and the different growth strategies
CO4	To understand the Strategy implementation and different approaches in planning and allocating resources
CO5	To apply and evaluate the Strategy evaluation, tools and techniques used and processes with case studies

MCM2C08 STRATEGIC COST ACCOUNTING

Number of Lecture Hours per week : 5

Number of credits: 4

Internal Credit: 0.8 External Credit: 3.2

Duration of Examination : 3 Hours

Objectives:

- To enable the students to know the applications of Cost accounting tools, Techniques and concepts in the managerial decision-making process.

Module I

Overview of Cost Accounting- Cost, Costing, Cost Accounting, Cost Accountancy, Scope of Cost Accounting, Objectives of Cost Accounting, Limitations of Cost Accounting, Art, Science and Practice. Cost Accounting System- Importance of Cost Accounting to Management, Workers, creditors, investors, government, general public, Advantages of Cost Accounting System, Essentials of a good Cost Accounting System, Reports provided by Cost Accounting Dept., Practical difficulty in installation of Costing System, suggestions to overcome practical difficulties. Comparison of Cost Accounting with other subjects- Cost Accounting and Financial Accounting, Cost Accounting and Management Accounting.
(10 hours)

Module II

Performance Measurement in Cost Accounting- Cost Unit, Composite Cost Unit, Cost object, Cost Centre, Profit Centre, Investment Centre. Costing Systems- Historical Costing, Absorption Costing, Direct Costing, Marginal Costing, Standard Costing, Uniform Costing. Cost Classification by Nature of Production Process-Batch Cost, Process Cost, Operation Cost, Operating Cost, Contract Cost, Joint Cost. Classification of Cost based on Behaviour- Variable Cost, fixed cost, semi-variable or semi fixed cost, stepped costs, specific and common fixed cost, committed fixed cost, discretionary fixed cost,engineered cost, managed cost, capacity cost, programmed cost. Importance of Behaviour wise cost classification, cost control, decision making, marginal costing, flexible budgets, CVP analysis, direct costing. (10 hours)

Module III

Process Costing- Features, Applications, Difference between Job Costing and Process Costing, Normal loss, abnormal loss, abnormal gain, inter process profits, equivalent production-FIFO, average method, weighted average method. Joint and

By-Products-Difference between Joint products and co-products, features of Joint Products, accounting for joint costs- split-off point, joint costs. Accounting treatment-physical quantity method, average unit cost method, weighted average method, selling price method. Meaning of by-products, accounting treatment-Non-cost methods, cost methods, difference between Main product and Joint & By products, value, manufacturing objective. (20 hours)

Module IV

Decision Making Tools-Absorption Costing-limitations of Absorption Costing, Marginal Costing-meaning, features, advantages/merits of Marginal Costing-limitations of marginal costing (Theory only), Throughput Accounting-concepts, throughput accounting and contribution approach, comparison of throughput costing and absorption costing, steps to be followed to increase throughput, problems faced in throughput accounting (theory and problems), Activity based costing-limitations of traditional costing system, definition, objectives, steps in ABC, limitations of ABC, Activity Based Budgeting, Activity Based Management, Difference between Activity Based Costing and Activity Based Management (problems in ABC). Transfer Pricing-Introduction, meaning, objectives of Inter Company Transfer Pricing, Methods of Transfer Pricing (Problems). Treatment of special expenses in Cost Accounts-Research and Development Expenses, Preliminary Expenses, Rectification Cost, Obsolescence, Waste, Scrap, Spoilage –normal & abnormal spoilage, conceptual difference of waste, scrap & spoilage, accounting and control of defectives.
(20 hours)

Module V

Emerging Costing Approaches: Productivity Management-meaning, measurement of productivity, misconceptions in measuring Productivity, ratios in measuring productivity index and total productivity index, distinction between productivity and profitability, productivity and value added, Productivity and quality, productivity and cost effectiveness, higher productivity and reduced cost, importance of human factor in productivity drive, productivity objectives, Plan, audit, advantages, causes of Low productivity, criticism, Total Productivity Management (TPM), Pareto analysis and Theory of Constraints- meaning, usefulness, practical application of Pareto Analysis, meaning of TOC, steps, key

measures, methodology of implementation of TOC, TOC and Cost Accounting Procedures. JIT or Lean Manufacturing, steps, implementation, features, merits and demerits, role of JIT in elimination of waste, increasing profitability, Project Life Cycle Costing, meaning, benefits, cost management in LCC, Value Chain Analysis- concept, definition, meaning, steps, Porter's Value Chain, Kaizen- concept, procedure for implementation, benefits, Target Costing- meaning, need, types, methods of establishment of target costs, backflush accounting.(20 hours)

(Theory 30% and Problems 70%)

References:

1. Catherine Stenzel& Joe Stenzel, Essential of Cost Management, John Wiley and sons, Latest Edition.
2. Roman I wiel& Michael W mahr Hand book of Cost Management, John Wiley and Sons, Latest Edition.
3. Lianabel Oliver, The cost management tool box. AMA Publication, Latest Edition.
4. John K. Shank & Vijay Govindarajan, Strategic Cost management: The new tool for competitive advantage, The free press, Latest Edition.
5. K.P. Gupta, Cost Management: Measuring, monitoring and motivating performance, Global India Publications, Latest Edition.
6. Strategic Cost Management- Ravi M. Kishore, Taxman Publications

Further reading

• http://icmai.in/upload/Students/Syllabus-2012/Study_Material_New/Inter-Paper8-Revised.pdf

OBJECTIVES

- To provide students adequate knowledge of cost management and control techniques and to enable them to apply these for managing business profitably

LESSON PLAN

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (10 Hours)	● Meaning and Definition of cost accounting, classification of cost accounting, cost accountancy,objectives importance and limitation of costing ● Practical difficulties to the installation of cost accounting and their suggestions,	● Lectures ● Discussions	● Powerpoint presentation on meaning and definition of cost accounting and related concepts ● Group discussion on practical difficulties of to the installation of cost accounting and their suggestions	● To understand the conceptual knowledge of Cost Accounting, comparison of cost accounting with other branches of accounting	● Evaluation done through test papers

	comparison of cost accounting with other subjects like Cost Accounting and Financial Accounting, Cost Accounting and Management Accounting				
Module II (10 Hours)	• Performance measurement in cost accounting and classification of different types of cost • Importance of behaviour wise cost classification,cost	1. Demonstrations 2. Lectures and 3. Discussions	1. Seminar presentations on classification of cost 2. Powerpoint presentation on meaning of flexible budgets	1. Provide students with a basic understanding of the different terminologies used in Cost Accounting and 2. different types of cost	Evaluation through seminar presentation

	control ,decision making,marginal costing,flexible budget and CVP analysis				
Module III (20 Hours)	• Meaning of Process Costing- Features, Applications, Difference between Job Costing and Process Costing, Normal loss, abnormal loss, abnormal gain, inter process profits, equivalent production- FIFO, average	• Lectures • Discussion • Participative Learning	Assignment on exercise questions	• Understand the treatment regarding the application of process costing and treatment of Joint products and By products	Assessment through test papers

	method, weighted average method. ● Joint and By-Products-Difference between Joint products and co-products, features of Joint Products, accounting for joint costs-split-off point, joint costs				
Module IV (20 Hours)	1. Deals with decision making tools like Absorption costing, throughput costing and ABC costing. 2. Meaning of transportati	1. Lectures 2. Discussion 3. Participative learning	1. Seminar on absorption, marginal and throughput accounting 2. Assignment on exercise questions	To understand and evaluate the practical application of Absorption Costing, Throughput Accounting, ABC Analysis and Transfer Pricing.	Assessment through test papers

	on costing and methods of transfer pricing 3. Treatment of special expenses in cost accounts and conceptual difference of waste ,scrap and spoilage.				
Module V (20 Hours)	● Meaning of emerging costing approaches like Productivity management, TPM, Theory of constraints and cost accounting procedure, JIT, Value chain analysis,	● Lectures ● Discussion ● Participative learning	Assignment on exercise question	To evaluate the application of Productivity Management	Assessment through test papers

	Kaizen Concept,target costing and Blackflush accounting				

COURSE OUTCOME

CO1	To understand the conceptual knowledge of Cost Accounting, comparison of cost accounting with other branches of accounting
CO2	Provide students with a basic understanding of the different terminologies used in Cost Accounting and different types of cost
CO3	Understand the treatment regarding the application of process costing and treatment of Joint products and By products
CO4	To understand and evaluate the practical application of Absorption Costing, Throughput Accounting, ABC Analysis and Transfer Pricing.
CO5	To evaluate the application of Productivity Management

MCM2C09: INTERNATIONAL BUSINESS

Number of Lecture Hours per week : 5

Number of credits: 4

Internal Credit: 0.8 External Credit: 3.2

Duration of Examination : 3 Hours

Objectives:

- To give a broader picture of different aspects of international trade and monetary systems and the operation of firms in an international environment

Module I

Meaning and Scope–Theories of International trade: classical and modern theories – protectionism vs. free trade – Trade barriers - Tariff and Non-tariff barriers – Terms of trade – Balance of payment– Components of BOP: Current account, Capital account and Official reserve account-disequilibrium and corrective measures International business-Local, regional, national, international and global business—management orientation of overseas business-ethnocentric, poly centric, region centric and geocentric orientation--reasons for internationalization of business-factors restricting internationalization of business—major global companies in the world.- Export –Import policy of India – Regulation and Promotion of foreign trade in India (20 Hours)

Module II

International business environment: Cultural, social, political and legal, technological, economic and trade environment—natural and demographic environment. Opportunities and threats of Indian companies in the international market. – Modes of Entry - exporting – Licensing – franchising – contract manufacturing – Management contracts, turnkey projects – Foreign Direct Investments- Theories of FDI-Cost & Benefits to Home & Host countries- Recent trends. Problems and prospects of foreign companies in the Indian market.
(18 Hours)

Module III

Strategy development in international business—the firm as a value chain—global expansion plan-: International business locations- factors influencing locations-factors restricting location. Value chain analysis, risk analysis, cost benefit analysis. Business entry strategy-exporting, licensing, investment, joint ventures, green fiend investment, strategic alliance, global strategic partnerships.

(15 Hours)

Module IV

International economic institutions and integrations: Types of Trade Agreements-WTO-GATT TRIPS- TRIMS-Regional economic integration-Levels of economic integrations –Arguments surrounding economic integration-E. U-NAFTA -ASEAN-SAARC-International Monetary Fund— International liquidity and SDRs- World Bank. (10 Hours)

Module V

International business functional strategies: International production strategy—international financing strategy—international humanK resources strategy and international marketing strategy. Stages of Internationalisation: International, Multinational, Global and Transnational corporations – strategic orientations – Growth of MNCs - contributing factors – merits and demerits of MNC – transfer of technology – regulation of MNCs-MNCs in India-Contribution of MNCs to India.
(17 Hours)

References:

1. Francis Cherunilam, International Business: Text and Cases, PHI, New Delhi.
2. Shyam Shukla, International Business, Excel Books, New Delhi
3. Rakesh Mohan Joshi, International Business, Oxford University Press, New Delhi.
4. P. Subba Rao, International Business, Himalaya Publishing House, Mumbai.
5. ManabAdhikary, Global Business Management in an International Economic Environment, Macmillan, New Delhi.
6. Charles W L Hill, International Business, McGraw Hill, New York.
7. Michael Czinkota, International Business, Wiley, New York.
8. Justin Paul, International Business, PHI, New Delhi.
9. Anant Kumar Sundaram and J, Stewart Black, The International Business Environment: Text and Cases, PHI, New Delhi.
10. John Daniels, Lee Radebaugh, Daniel Sullivan International Business, Pearson Education, New York.
11. Friedmann & J. Kim: Political risk and international Business

OBJECTIVES

- To evaluate various aspects on International Trade and Monetary Systems

LESSON PLAN

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (20 Hours)	Introduction to theories of International trade,Tariff and Non tariff barriers, Export and import policy of India, Regulation and promotion of foreign trader in India	Lecturers, Discussion and Participative learning	PowerPoint presentation on various theories of International trade.	To learn about theories of International trade. To understand the Export and Import policy of India.	Evaluation through test paper

Module II (18 Hours)	Introduction to International Business Environment, Opportunities and threats of Indian companies in International market, Theories of FDI	Lectures, Discussion and Assignments	Group discussion on International Business Environment, Seminar presentations on Opportunities and threats of Indian companies in the International market.	To understand the components of International Business Environment To provide knowledge on theTheories of FDI	Evaluation through seminar
Module III (15 Hours)	Strategy Development in International business, Value chain analysis,Risk analysis and cost benefit analysis, Business entry strategies	Lectures, Seminar and Assignments	PowerPoint presentation on developments in International business,	To provide an overview on the Development in International business To understand various business entry strategies.	Evaluation through assignments
Module IV (10 Hours)	International economic institutions and integrations, Types of trade agreements,	Lecturers, Discussion and Participative learning	PowerPoint presentation on International economic institutions and integrations, Seminar on	To evaluate various International economic institutions and integrations. To provide	Evaluation through seminar presentations

	International Monetary Fund and World bank		International Monetary Fund and World bank	knowledge on International Monetary Fund and World bank	
Module V (17 Hours)	Functional strategies of International business, Stages of Internationalisation, Growth and contributions of MNCs in India.	Lecturers and Discussions	Seminar and discussion on Growth and contributions of MNCs in India	To provide an overview on Functional strategies of Internationalisation. To learn about Growth and contributions of MNCs in India.	Evaluation through seminar presentations

COURSE OUTCOME

CO1	To study about the Theories of International Trade and reasons for internationalisation
CO2	Evaluate the International Business Environment opportunities and threats of Indian Companies
CO3	To understand the Strategy development in IB and the different business entry strategies
CO4	To evaluate the role International economic situations in the development of Business

CO5	To analyse the different strategies of internationalization and the contribution to Indian Course outcome economy

MCM2C10: MANAGEMENT SCIENCE

Number of Lecture Hours per week : 5
Number of credits: 4
Internal Credit: 0.8 External Credit: 3.2
Duration of Examination : 3 Hours

Objectives:

- To familiarize students with concepts of management science and tools supporting decision making

Module 1

Introduction to Management Science- Types of decisions; Steps in decision making; Quantitative analysis and decision making; Different types of models and their uses; Model building steps. (5 hours)

Module 2

Linear Programming: Basic concepts; mathematical formulation and applications; Solution of LP problem using graphic and simplex method; – Application in Business. Transportation and Assignment: Formulation; Solving transportation (NWC method – Least Cost method – Vogel's approximation method – stepping stone method – Modified Distribution method) and assignment problems (Hungarian Method).(30 hours)

Module3

Inventory and Queuing Management: Concepts of inventory management; Inventory models – classical EOQ, planned shortage model- deciding optimum safety stock and reorder level. Queuing models: Elements of a queuing system; Models with Poisson arrival and Exponential services rates single server and infinite and finite population. (17hours)

Module 4

Project Scheduling: Concepts of PERT & CPM techniques and their applications; Network analysis scheduling activities, determining critical path, calculation of floats; Time-cost trade-off; Resource allocation and resource levelling. (18 Hours)

Module 5

Markov Chains and Theory of Games: Markov Chains- decision processes; Market share analysis; Account receivable analysis. Game Theory- Pure strategy games; Mixed strategy games; Value of the game; Rules of Dominance.(10 hours)

Theory 30% Problems 70%

References:

1. Anderson: Introduction to Management Science – Quantitative Technique for Decision making Thomson.
2. Operations Research – Kautiswarup, P.K. Gupta, Manmohan – Sultan Chand & Sons.
3. Operations Research SD Sharma, Kadar Notes, Ramnath&G. Meerut.
4. Operations Research Techniques for management – VK Kapoor &Sumant Kapoor – Sultan Chand & Sons.
5. Quantitative Techniques in Management, Vohra N.D., The McGraw Hill companies
6. Anderson: Introduction to Management Science – Quantitative Technique for Decision making Thomson.
7. Operations Research – Kautiswarup, P.K. Gupta, Manmohan – Sultan Chand & Sons.

8. Operations Research SD Sharma, Kadar Notes, Ramnath&G. Meerut

OBJECTIVES

- To enable students to apply Management science techniques in appropriate decision situations

LESSON PLAN

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (05 Hours)	• Types of decision, steps in decision making • Different types of models and their uses	• Lectures • Participative learning	• Power point presentation on steps in decision making • Group discussion on different types of models and their uses	• To learn more about the steps in decision making • To evaluate the role of quantitative analysis and decision making	• Evaluation through test paper

Module II (30 Hours)	• Mathematical formulation and applications • Solution of LPP • Transportation and assignment (NWC method - least cost method -etc)	• Lectures • Seminars • Assignments	• Power point presentation on LPP methods • Group discussion on transportation and assignment problems	• To understand the application of LPP methods in business • To know more about the transportation and assignment problems	• Evaluation through test paper
Module III (17 Hours)	• Concepts of inventory management • Inventory models, classical EOQ • Queuin	• Lectures • Seminars • Assignments	• Power point presentation on inventory models • Group discussion on queuing models	• To evaluate different types of inventory models • To identify the elements of a queuing system	• Evaluation through test paper

	g models				
Module IV (18 Hours)	• Concepts of PERT & CPM techniques	• Lectures • Discussions • Participative learning	• Power point presentation on PERT&CPM techniques	• To understand and identify the network analysis and their applications • To determine the critical path	• Evaluation through test paper
Module V (10 Hours)	• Markov chains • Market share analysis • Game theory	• Lectures • Discussions • Seminars • Assignments	• Power point presentation on market share analysis • Group discussion on game theory	• To analyse the decision processes • To understand game theory and value of the game	• Evaluation through test paper

COURSE OUTCOME

CO1	To understand students with concepts of management science
CO2	To evaluate the application of various tools which support decision making process

CO3	To apply inventory management and managing the queue system in service sector
CO4	To evaluate and create the technique of project planning scheduling and controlling
CO5	To understand knowledge in share analysis and different strategies in game theory

MCM3C11 FINANCIAL MANAGEMENT

Number of Lecture Hours per week : 5
Number of credits: 4
Internal Credit: 0.8 External Credit: 3.2
Duration of Examination : 3 Hours

Objectives:

- To acquaint the students with the basic analytical techniques and methods of financial management of business organization

Module I

Foundation of Finance: Goals and functions of finance–Legal–Operating and Tax environment for financial decisions –Financial manager-Agency problem in financial management-Time value of money-compounding and discounting-An overview of capital investment decisions (25 hours)

Module II

Sources of long-term finance and Cost of Capital: Conventional and innovative sources leasing-factoring-securitisation- financial engineering-cost of capital-Concept–significance–Computation of cost of Debt, Preference capital, Equity capital and Retained Earnings – Opportunity cost of capital – Marginal cost of capital – WACC – Capital Asset Pricing Model. (10 hours)

Module III

Working Capital Management: Working Capital–meaning–concept and cycle – Working capital management strategy – Estimation of working capital– Mathematical and simulation models of working capital decisions – Management of cash and marketable securities – Cash management techniques – Lock box system, Concentration baking – Methods of Inventories – Techniques of inventory management – Management of receivables – Techniques of receivable management-working capital financing for Indian industry (25 hours)

Module IV

Financial leverage and Capital Structure: Definition of capital structure-Leverage Analysis– Operating, Financial & Combined leverage – EBIT – EPS Analysis – Financial Breakeven – Indifference Point – Capital Structure Theories – Optimum capital Structure – NI approach, NOI approach, Traditional approach & Modigliani Miller approach – Arbitrage process– Determinants of Capital Structure- over capitalisation, under capitalisation and fair capitalisation (10 hours)

Module V

Mechanics and practices of dividend payment–factors affecting dividend policy – legal framework of payment of dividend – dividend theories – determinants of dividend policy and some case studies. (10 hours)

(Theory 30%, Problems 70%)

References:

1. Soloman, Ezra, Theory of Financial Management, Columbia Press (Latest Edition)
2. James C Van Horne. Financial Management and Policy Prentice Hall of India (Latest Edition)

3. Weston, J. Fred and Brigham, Eugne F. Managerial Finance, Dryden Press (Latest Edition)
4. Prasanna Chandra. Financial Management, Tata McGraw Hill (Latest Edition)
5. Khan, M.Y. and P.K. Jain. Financial Manager, Tata McGraw Hill (Latest Edition).
6. Pandey, I.M. Financial Management, Tata McGraw Hill (Latest Edition)
7. Ravi M. Kishore. Financial Management, Taxmann (Latest Edition)
8. Brigham, Ehrhavdt. Financial Management, Cengage Learning India Private Ltd. New Delhi – 110082 (Latest Edition)
9. Ross S.A., R.W. Westerfield and J. Jaffe, Corporate Finance, McGraw Hill (Latest Edition)
10. Anderson, Sweeney and Williams. An Introduction to Management Science, Cengage Learning India Private Ltd. New Deli – 110092 (Latest Edition)
11. Brigham and Houston. Fundamentals of Financial Management, Cengage Learning India Private Ltd., New Delhi – 110091 (Latest Edition)
12. Brealey R.A. and S.C. Myers. Principles of Corporate Finance, McGraw Hill, (Latest Edition)
13. Sudhirbhat. Financial Management. Excel Book (Latest Edition)
14. Damodaran, A. "Corporate Finance: Theory and Practice". John Wiley & Sons (Latest Edition)

Journals
Finance India
Applied Finance, ICFA
Journal of Finance
Journal of Financial Economics
Chartered Financial Analyst
Financial Dailies

OBJECTIVES

- To provide the students the exposure to certain advanced analytical techniques that are used for taking financial policy decisions

LESSON PLAN

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (25 Hours)	Goals and functions of finance–Legal –Operating and Tax environment for financial decisions –Financial manager-Agency problem in financial management-Time value of money-compounding and discounting-An overview of capital investment decisions	● Lectures ● Group discussions ● Working out practical problems	● Lectures on basics of finance, legal and operating environment, agency problems ● Practical problems on Time value of money, Capital budgeting techniques	To understand the concept of financial management, legal operating and tax environment, time value of money , capital investment decisions etc	Evaluation done through test papers
Module II (10 Hours)	Sources of long-term finance and Cost of Capital: Conventional	● Lectures ● Group discussions ● Working out	● Seminars by students on sources of finance, leasing, factoring,	To understand Various sources of long term finance, and to know the calculation of cost of different sources of capital using different methods	Evaluation done through test papers and assessment of seminars

	and innovative sources leasing-factoring-securitisation- financial engineering-cost of capital-Concept–significance–Computation of cost of Debt, Preference capital, Equity capital and Retained Earnings – Opportunity cost of capital – Marginal cost of capital – WACC – Capital Asset Pricing Model.	practical problems ● Seminars	securitization etc. ● Practical problems on Cost of capital of different sources of finance as well as overall cost of capital (WACC)		
Module III (25 Hours)	Working Capital Management: Working Capital–meaning–concept and cycle –	● Lectures ● Group discussions ● Working out practical	● Seminars by students on Management of Working Capital, Inventory management	To understand the concept of working capital, Working capital management and its estimation.	Evaluation done through test papers and assessment of seminars

	Working capital management strategy – Estimation of working capital– Mathematical and simulation models of working capital decisions – Management of cash and marketable securities – Cash management techniques – Lock box system, Concentration baking – Methods of Inventories – Techniques of inventory management – Management of receivables – Techniques	problems ● Seminars	etc ● Lectures and Practical problems on Working capital management, estimating working capital requirements etc.		

	of receivable management-working capital financing for Indian industry				
Module IV (10 Hours)	Financial leverage and Capital Structure: Definition of capital structure-Leverage Analysis– Operating, Financial & Combined leverage – EBIT – EPS Analysis – Financial Breakeven – Indifference Point – Capital Structure Theories – Optimum capital Structure – NI approach,	• Lectures • Group discussions • Working out practical problems	• Lectures and discussion on Capital structure, and Leverage analysis • Exercising practical problems in Leverage analysis and Capital structure	To understand the concept of Capital structure, capital structure theories, Leverage analysis, Determinants of capital structure etc.	Evaluation done through test papers

	NOI approach, Traditional approach & Modigliani Miller approach – Arbitrage process– Determinants of Capital Structure- over capitalisation, under capitalisation and fair capitalisation				
Module V (10 Hours)	Mechanics and practices of dividend payment–factors affecting dividend policy – legal framework of payment of dividend – dividend theories – determinants of dividend policy and	• Lectures • Group discussions • Working out practical problems • Seminars	• Lectures and discussion on Dividend theories, and dividend policy • Seminars on mechanics and practices of dividend payment • Exercising practical problems dividend	To understand the concept of Dividend theories, develop knowledge on dividend theories and dividend policy	Evaluation done through test papers and assessment of seminars

	some case studies		theories		

COURSE OUTCOME

CO1	To understand the role of finance and finance manager in an organisation
CO2	To Evaluate and apply sources of financing and corresponding cost of capital
CO3	To Understand and evaluate working capital decisions
CO4	To understand and apply Capital structure and leverage analysis
CO5	To understand and apply dividend theory and dividend decisions

MCM3C12: INCOME TAX: LAW, PRACTICE AND TAX PLANNING I

Number of Lecture Hours per week : 5
Number of credits: 4
Internal Credit: 0.8 External Credit: 3.2
Duration of Examination : 3 Hours

Objectives:

- To enable students to understand computation of income under various heads, taxable income of various entities, tax planning and procedure of assessment

Module 1

Basic Concepts-Direct and indirect taxes- Capital& revenue- Tax planning, tax evasion, tax management, tax avoidance - residence and incidence of tax-exempted income- Tax planning relating to residence & incidence of tax (10 hours)

Module 2

Computation of Taxable Income under different heads-income from salary- house property-income from business/profession- capital gains-other sources – Tax planning relating to different heads of income (20 hours)

Module 3

Assessment-Clubbing of incomes and aggregation of income – Set off and carry forward of losses – Incomes exempt from taxes – Deductions in computing total income – Rebates and reliefs of tax- Assessment of agricultural Income – Computation of Agricultural Income – Calculation of tax on integration. Assessment of individuals- AMT- Assessment of HUF -Tax planning related to clubbing and aggregation of income, set off and Carry forward of losses-Agricultural income, Individual Assessment –Tax planning- Assessment of HUF-Tax planning (20 hours)

Module 4

Income Tax Authorities: Powers and functions–Provisions of advance payment of tax – Tax payment – Deduction and collection of tax at source – Recovery of tax – Computer applications in tax management. (15 hours)

Module 5

Procedure for assessment of Income Tax: Filing of return of Income–Voluntary return of income – Statutory obligations for filing of return – Time and documents for filing of returns – Return of loss – Belated returns – Revised returns – Defective returns – PAN – Different types of assessment – Self assessment –

Assessment on the basis of return – Best judgment assessment – Regular assessment – Reassessment – Protective assessment. (15 hours)

(30% theory and 70% problems)

References:

1. BB Lal, Income Tax, Pearson (Dorling Kindersley (India) Publication, Latest Edition,
2 Dr. H C. Mehrotra and Dr.S P . Goyal, Income Tax including Tax Planning and Management, Sahitya Bhavan Publications, Agra – latest
3. Ahuja GK & Gupta Ravi, Systematic Approach to Income Tax, Bharat Law House, Latest Edition.
4. BB Lal, Income Tax, Pearson (Dorling Kindersley (India) Publication, Latest Edition.
5. AC SampatAyengar, Law of Income Tax, Bharat Law House, Latest Edition.

OBJECTIVES

- To impart basic knowledge about income tax rules and equip the students to compute the total income of an individual.

LESSON PLAN

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment

Module I (10 Hours)	Basic concepts of Income Tax, Tax Planning, evasion, management, Residence and incidence of Tax	• Lectures • Seminars • Discussio-ns	• Discussion on residential status • Seminar presentations on exempted income	• To understand the basic concepts Income Tax • To understand the residential status of an individual. and incidence of tax	• Evaluation through test paper
Module II (20 Hours)	Computation of Taxable Income under different heads, Tax Planning relating to different heads of Income	• Discussions • Lectures	• Discussion on different heads of incomes • Discussion on Tax Planning relating to different heads of incomes	• To provide an insight into different heads of income • To get an idea about Tax Planning relating to different heads of incomes	Evaluation through Test Paper
Module III (20 Hours)	Assessment , clubbing and aggregation of Income, set off and carry forward, deductions, rebates and reliefs, agricultural	• Lectures • Seminars • Assignme-nts	• Assignments on Assessment of Individuals • Seminars on Deductions in computing total income	• To learn about Assessment of Individuals • To know about various deductions available to an assessee	• Evaluation through test paper

	income, Assessment of individual and HUF				
Module IV (15 Hours)	Income Tax Authorities, powers and functions, advance payment of tax, TDS and TCS, Computer applications in tax	• Lecture • Discussion • Seminars	• Discussions on tax authorities and their powers and functions. • Seminars on TDS and TCS	• To understand the powers and functions of Tax Authorities • To know about TDS and TCS	• Evaluation through asking questions
Module V (15 Hours)	Procedure for assessment of Income Tax, filing of returns, types of return, PAN, Different types of assessment.	• Lectures • Discussions	• Discussion on filing of returns and different types of returns	• To understand about filing of returns	• Evaluation through Seminars.

COURSE OUTCOME

CO1	To understand tax planning tips to individuals on the basis of residential status.
CO2	To understand and evaluate the computation of income under five heads and to apply tax planning tips for these five heads of income
CO3	To understand and apply tax planning tips for Hindu Undivided family, set off and carry forward provisions and tax planning tips for individuals
CO4	To remember and understand the powers of income tax authorities and should be able to calculate advanced tax liability and TDS of an individual
CO5	To create ability to file the return of income of individuals and should be aware of different types of assessment

MCM3C13: RESEARCH METHODOLOGY

Number of Lecture Hours per week : 5
Number of credits: 4
Internal Credit: 0.8 External Credit: 3.2
Duration of Examination : 3 Hours

Objectives:

- To acquaint students with process and methodology of research

Module I

Research: Basic concepts - Meaning–Objectives–Types–Approaches – Significance of research in social sciences – Process of research – Formulating problem – Literature Survey – Hypothesis – Research Design – Types – Exploratory, Descriptive, Diagnostic, Experimental – Sample Design – Collecting, analysing, testing, interpreting and presenting result. (15 hours)

Module II

Population Survey and Sample Study: Population & Sample–Sampling theories - Techniques of sampling – Random and Non-random techniques – Sample Size – Determination of sample size – Sampling Errors – Non sampling Errors – Factors influencing sample size – Optimum sample size – Case Study – Pilot Survey.
(10 hours)

Module III

Data collection: collection of Primary Data–Methods of Data Collection – Observation – Field Survey – Questionnaire - Interview Schedule – Preparation of Questionnaire – Process of Interviewing – Collection of secondary data – Sources of secondary data. (10 hours)

Module IV

Measurement and Scaling: Variables–Attributes – Process of measurement – Attitude Measurement – Scaling - Scaling Techniques – Graphic Rating – Likert – Thurstone – Semantic Differential – Stapel – Dichotomous – Scales – Types of Scales – Scale Values – Validity and Reliability of Scales – Errors in measurement. (20 hours)

Module V

Data Processing and Presentation : Field Work–Editing–Classification – Coding – Tabulation – Summarization – Analysis of data – One way ANOVA - Univariate, Bivariate and Multi variable methods - Tools of Analysis – Descriptive Analysis – Inferential analysis – Interpretation – Presentation – Report Writing - Types of Reports – Contents of Reports – Format of Reports – Documentation StylesPlagiarism (Theory only) (25 hours)

Theory 70% Problem 30%

References:

1. S. Kevin, Research Methodology for Social Sciences, Ane Publishing House, New Delhi.
2. Tandon BC, Research Methodology in Social Sciences, Chaitanya Publishing House
3. Whitney FL, Elements of Research, Prentice Hall o India

4. Ferber R, Research Methods in Economics and Business, Macmillan
5. Deming W Edwards, Sample Design in Business Research, John Wiley
6. Bailey Kenneth D, Method of Social Research, Macmillan
7. Krishna Swamy, Methodology of Research in Social Science Prentice Hall of India.
8.Achalapathi KC, Readings in Research Methodology in Commerce and Business Management, Himalaya Publishing House.

OBJECTIVES

- To enable students to identify research problems, collect and analyse data and present results.

LESSON PLAN

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (15 Hours)	● Basic concepts, meaning and definition of research ● Types and	● Lectures ● Seminars ● Group discussion	● Group discussion on types and process of research ● PowerPoint presentation on Hypothesis and research design	● To understand the basic concepts of research ● To evaluate different types of research ● To identify the process of research	● Evaluation through test paper ● Evaluation through prese

	Proeces s of researc h ● Hypoth esis and researc h design				ntatio ns
Module II (10 Hours)	● Populat ion and sample ● Techni ques of sampli ng ● Case study and pilot survey	● Lectures ● Participati ve learning ● Demonstr ations	● Seminar presentations on techniques of sampling ● Group discussion on population and sample	● To provide an insight into the techniques of sampling ● To know more about the population, sample, case study and pilot survey	● Evalu ation throu gh case study
Module III (10 Hours)	● Method s of data collecti on ● Collect ion and sources of second ary	● Lectures ● Group discussion	● PowerPoint presentation on data collection methods ● Group discussion on sources and collection of secondary data	● To understand different types of data collection methods	● Evalu ation throu gh test paper

	data				
Module IV (20Hours)	• Measurements and scaling • Types of scales • Validity and reliability of scales	Seminar presentations Assignments Discussions	• PowerPoint presentation on measurements and scaling • Group discussion on validity and reliability of scales	• To provide an idea about the types of scaling • To learn more about the validity and reliability of scales	• Evaluation through test paper
Module V (15 Hours)	• Data processing and presentation • Analysis of data • Report writing • Documentation styles	• Lectures • Participative learning • Discussions • Seminar presentations	• PowerPoint presentation on data processing and presentation • Assignments on different types of report writing • Seminars on analysis tools	• To provide an exact idea about data processing, its analysis and so on. • To deliver a picture about different types of report writing	• Evaluation through test paper

COURSE OUTCOME

CO1	To understand and apply different research approaches and methodologies
CO2	To evaluate and apply Population survey and sample survey – theories and techniques
CO3	To understand and apply the Data collection methods and enable them to conduct a comprehensive research
CO4	To Evaluate the Measurement and scaling and the validation and reliability testing
CO5	To understand and evaluate Data processing, analysing, interpretation and report writing a create awareness about plagiarism

MCM3EF01: INVESTMENT MANAGEMENT

Number of Lecture Hours per week : 5
Number of credits: 4
Internal Credit: 0.8 External Credit: 3.2
Duration of Examination : 3 Hours

Objectives:

- To establish a conceptual framework for the study of security analysis and portfolio management

Module I

Investments: Meaning and concept–Investment objectives–various asset classes – factors in investment decisions- Investment process – concept of risk and return – sources of risk – Measurement of risk and return – Diversification and hedging – ethical investing. (10 hours)

Module II

Bond Investment analysis: Types of bonds–International bonds–Bond yields – Yield to Maturity (YTM) – risk analysis is bonds – Bond value theorem – Bond immunization strategies. (10 hours)

Module III

Equity Analysis: Approaches to equity analysis–Fundamental analysis – Economy, Industry and Company (EIC) analysis – Equity valuation models – Dividend Discount Models (DDM) and PriceEarnings Ratio (PER) models – Technical analysis – Dow theory – Chart and Chart Patterns – Market and Mathematical Indicators (Problems)– Efficient Market Hypothesis (EMH) and Random Walk theory – Tests of market efficiency – Critique of Investor rationality – Behavioural Finance. (20 hours)

Module IV

Portfolio analysis and selection: Risk return analysis of investment portfolio – Individual and Interactive risks – measurement of portfolio risks – Risks tolerance and asset allocation – optimal portfolio – portfolio selection models-Markowitz model – Sharpe single index model – Capital Asset Pricing Model (CAPM) – Capital Market Line (CML) and Security Market Line (SML) – Market anomalies : calendar effect, size effect and market overreaction – Arbitrage Pricing Theory (APT) – Multifactor asset pricing Models – Behavioural finance – Behavioural finance theories . (25 hours)

Module V

Portfolio Management: Active and Passive investment strategies–Value and growth investing, contrarian strategies – index investing and tracking efficiency, Portfolio evaluation- Sharpe, Treynor and Jensen measures, Fama'sDecomposition Index – Portfolio revision- Investment accounting (15 hours)

Theory 40 % Problems 60 %

References:

1. Bodie, Zvi, Kane Alex and Alan, J. Marcus, Investments, McGraw Hill.
2. Bhalla, V.K. Investment Management, S. Chand & Company Ltd.
3. Chandra, P. Security Analysis and Portfolio Management, Tata McGraw Hill.4.Elton, E. and Gurber, M.
4. Modern Portfolio Theory and Investment Analysis, John Wiley and Sons
5. Fischer, Donald E. and Ronald J. Jordan, Security Analysis and Portfolio Management, PHI Learning.
6. Preeti Singh, Investment Management, Himalaya Publishers.
7. Sharpe William, F. and Bailey Jeffery V. Alexander Gordon, J. Investments, PHI Learning.
8. S. Kevin , Security Analysis and Portfolio Management, PHI Learning
9. Stephen Ross and R. Westerfield, Corporate Finance, McGraw-Hill.
10.Vishwanath, R and Krishna Murthi,C., Investment Management, Springer.
11.V.A. Avadhani, Security Analysis and Portfolio Management, Himalaya Publishers.
12. Fabozzi, Frank, J. Investment Management, PHI learning

OBJECTIVES

- To provide the students the ability to understand and utilize the skill of optimizing returns

LESSON PLAN

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (10 Hours)	Investments: Meaning and concept–Investment objectives–various asset classes – factors in investment decisions- Investment process – concept of risk and return – sources of risk – Measurement of risk and return – Diversification and hedging – ethical investing	● Lectures ● Seminars ● Group discussion	● Powerpoint presentations on various asset classes and factors in investment decisions ● Group discussion on measurement of risk and return	To understand the concept of risk, return, diversification and hedging	Evaluation done through test papers
Module II (10 Hours)	Equity Analysis: Approaches to equity	● Lectures ● Seminars ● Group discussion	● powerpoint presentations on Equity analysis	To understand and apply the different types of bonds and bond valuation	Evaluation done through test papers

	analysis–Fundamental analysis – Economy, Industry and Company (EIC) analysis – Equity valuation models – Dividend Discount Models (DDM) and PriceEarnings Ratio (PER) models – Technical analysis – Dow theory – Chart and Chart Patterns – Market and Mathematical Indicators (Problems)– Efficient Market Hypothesis (EMH) and Random Walk theory – Tests of market		• Group discussion on different types of bonds and their valuation		

	efficiency – Critique of Investor rationality – Behavioural Finance				
Module III (20 Hours)	Equity Analysis: Approaches to equity analysis–Fundamental analysis – Economy, Industry and Company (EIC) analysis – Equity valuation models – Dividend Discount Models (DDM) and PriceEarnings Ratio (PER) models – Technical analysis – Dow theory – Chart and Chart Patterns	• Lectures • Seminars • Group discussion	• powerpoint presentations on fundamental and technical analysis	Provide thorough understanding and evaluation of fundamental analysis and technical analysis	Evaluation done through test papers

	– Market and Mathematical Indicators (Problems)– Efficient Market Hypothesis (EMH) and Random Walk theory – Tests of market efficiency – Critique of Investor rationality – Behavioural Finance				
Module IV (25 Hours)	Portfolio analysis and selection: Risk return analysis of investment portfolio – Individual and Interactive risks – measurement of portfolio risks – Risks tolerance and asset	• Lectures • Seminars • Group discussion	• Powerpoint presentation on risk returns analysis of investment portfolio • Assignment on CAPM model	To understand the measurement of portfolio risk, optimal portfolio, portfolio selection models	Evaluation done through test papers

	allocation – optimal portfolio – portfolio selection models-Markowitz model – Sharpe single index model – Capital Asset Pricing Model (CAPM) – Capital Market Line (CML) and Security Market Line (SML) – Market anomalies : calendar effect, size effect and market overreaction – Arbitrage Pricing Theory (APT) – Multifactor asset pricing Models – Behavioural finance –				

	Behavioural finance theories				
Module V (15 Hours)	Portfolio Management: Active and Passive investment strategies–Value and growth investing, contrarian strategies – index investing and tracking efficiency, Portfolio evaluation- Sharpe, Treynor and Jensen measures, Fama'sDecomposition Index – Portfolio revision- Investment accounting	● Lectures ● Seminars ● Group discussion	● powerpoint presentations on portfolio management ● Group discussion on portfolio evaluation and its strategies	To understand and create portfolio management, portfolio evaluation and revision	Evaluation done through test papers

COURSE OUTCOME

CO1	To understand the concept of risk, return, diversification and hedging
CO2	To understand and apply the different types of bonds and bond valuation
CO3	Provide thorough understanding and evaluation of fundamental analysis and technical analysis
CO4	To understand the measurement of portfolio risk, optimal portfolio, portfolio selection models
CO5	To understand and create portfolio management, portfolio evaluation and revision

MCM3EF 02: FINANCIAL MARKETS AND INSTITUTIONS

Number of Lecture Hours per week : 5
Number of credits: 4
Internal Credit: 0.8 External Credit: 3.2
Duration of Examination : 3 Hours

Objectives:

- To provide the students a sound information and knowledge of broad framework of financial markets and institutions

Module I

An overview of financial markets: Financial markets–Nature–Functions – money market – Capital markets – Markets for derivatives – Working of stock exchange in India – NSE and BSE, – Role of SEBI – Major international stock markets.
(20 hours)

Module II

Commodity markets: MCX, NCDEX, and ICEX–Functions, administration, regulations and general mechanism – International commodity markets – Debt market – Types, functions, instruments – Operational mechanism –Hindrances for the development of debt market. (15 hours)

Module III

Financial Instruments- issue of financial instruments-Primary issue, Book building process, private placement, offer for sale, buy back of shares –various innovative financial instruments, bitcoin, crypto currency etc (15 Hours)

Module IV

Development financial institutions: AMFI, IFCI, NABARD, SFCs, UTI, SIDBI – Mutual Fund, SEBI guidelines on mutual fund – Provident Fund – Pension Funds – PFRDA – Insurance Companies – IRDA. (15 hours)

Module V

Foreign capital flows: forms of foreign capital–FDI and FPI–FIIs – International financial instruments – ADR, GDR. IDR and Euro bonds – Role of foreign capital in Indian financial system – Trends in foreign capital inflows to India – Regulatory framework for foreign capital flows. (15hours)

References:

1. LM Bhole and JitendraMahakud: Financial Institutions and markets, Tata McGraw-Hill Publishers, (2009).
2. Shashi K Gupta: Nisha Agarwal and Neeti Gupta, Financial Markets and Institutions, Kalyani Publishers, (2013)
3. S Sachdeva: Indian Financial System, Educational Publishers, (2005).

4. MY Khan: Financial Services, Tata McGraw-Hill publishers (2004)
5.Keith Pilbeam: Finance and Financial Markets, Palgrave Macmillan (2005).
6. Gordon and Nataraj: Financial Markets and Services, Himalaya Publishing House.
7. Bharati V Pathak: The Indian Financial System: Markets, Institutions and Services, Dorling Kindersley India (pvt) ltd (2009).
8.Clifford Gomez: Financial Markets, Institutions and Financial Services, Prentice-Hall of India (2008)

OBJECTIVES

- To impart the students an understanding of the inter-linkages and regulatory framework within which the system operates in India

LESSON PLAN

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (20 Hours)	1. An overview of financial markets nature and Functio	Seminar presentations Assignments Discussions	• Powerpoint presentation on overview of financial markets nature and Functions of money market	To provide the students a sound information and knowledge of broad framework of financial markets and institutions	Evaluation done through test papers

	ns of money market Capital market 2. Markets for derivatives – Working of stock exchange in India – NSE and BSE, – Role of SEBI – Major international stock markets.		● Group discussion on Money Market vs Capital market		
Module II (15 Hours)	MCX, NCDEX, and ICEX–Functions, administration, regulations	Seminar presentations Lectures Discussions	● Powerpoint presentations on commodity markets ● Group	To acquire knowledge in national and international commodity market	Evaluation done through test papers

	and general mechanism of International commodity markets, Debt market Types, functions, instruments and Operational mechanism		discussion on Hindrances for the development of debt market		
Module III (15 Hours)	• Meaning of Financial Instruments, Issue of financial instruments,Primary issue, Book building process, private placement, offer	Seminar presentations Lectures Discussions	• Powerpoint presentations on financial instruments • Group discussion on various innovative financial instruments, bitcoin and crypto currency	To understand various types financial instruments and their sale and buy back	Evaluation done through test papers

	for sale, buyback of shares ● various innovative financial instruments, bitcoin, crypto currency				
Module IV (15 Hours)	● Meaning of financial institutions like AMFI, IFCI, NABARD, SFCs, UTI, SIDBI and Mutual Fund.	Lectures Participative learning Discussions Seminar presentations	● Powerpoint presentations on financial institutions ● Webinar on Stock exchange in India.	To gain knowledge about the working of major financial institutions	Evaluation done through test papers

	• Meaning of SEBI, guidelines on mutual fund, Provident Fund ,Pension Funds FRDA Companies IRDA				
Module V (15 Hours)	• Meaning of foreign capital, FDI and FPI,FIIs and International financial instruments like ADR, GDR.	• Seminar presentations • Lectures • Discussions	• Powerpoint presentation on Foreign capital flows and International financial instruments • Group discussion on Role of foreign capital in Indian financial system and Trends in	To familiarize with different forms of foreign capital inflows and its role in Indian financial system Seminar on social responsibility accounting Group discussion on responsibility accounting Assignment on inflation accounting	Evaluation done through test papers

	IDR and Euro bonds ● Role of foreign capital in Indian financial system Trends in foreign capital inflows to India Regulatory framework for foreign capital flows		foreign capital inflows to India		

COURSE OUTCOME

CO1	To provide the students a sound information and knowledge of broad framework of financial markets and institutions
CO2	To acquire knowledge in national and international commodity market
CO3	To understand various types financial instruments and their sale and buy back
CO4	To gain knowledge about the working of major financial institutions
CO5	To familiarize with different forms of foreign capital inflows and its role in Indian financial system

MCM4C14: FINANCIAL DERIVATIVES AND RISK MANAGEMENT

Number of Lecture Hours per week : 5
Number of credits: 4
Internal Credit: 0.8 External Credit: 3.2
Duration of Examination : 3 Hours

Objectives:

- To make the students efficient in the area of derivatives, by giving them the knowledge of basics in options, futures, swaps etc

Module I

Introduction to risk management–Meaning and need–importance–Types of market risk – Risk management issues in business – Financial derivatives– Meaning – Need – Growth of financial derivatives markets in India – Derivative markets –

Exchange traded financial derivatives for risk management in India – Participants – Functions – Types of risk management instruments – Forwards – Futures – Options – Swaps – The regulatory framework of derivative trading in India. (16 hours)

Module II

Future's growth and development - Difference between forwards and futures - financial future - Future trading – currency futures – Interest rate futures Pricing and valuation of future contracts – Value at riskHedging risk – Hedging with stock index future – types of members and margin system in India-Future trading in stock exchange for risk management. (20 hours)

Module III

Options–meaning–needs and importance-options and futures-fundamental option strategies-type of option-put-call- Valuation of options -trading strategies of risk instruments-positions in options-stock indices-options in Indian stock market.
(16 hours)

Module IV

Risk pricing of options-intrinsic value and time value-pricing at the expiry of contact-factors affecting option pricing-put-call-parity pricing-models of pricing-binomial option-pricing models-Black Scholes pricing methods. (16 hours)

Module V

Swaps-meaning and definition-development-structure of swap dealing for risk management-interest rate swaps-forward swaps and swap option contracts-cancellable and extendable swaps-no generic swaps transactions. Currency swaps - Valuation and pricing of swaps - risk management function of swap transaction. Recent trends in derivatives –Taxation on derivatives (12 hours)

(60% Theory 40% Problems)

OBJECTIVES

- To evaluate the performance of different forward, futures and options contracts and understand the various future and option pricing models

LESSON PLAN

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (16 Hours)	● Meaning and types of market risk, risk management issues in business ● Financial derivatives, participants of derivative markets, functio	● Lectures ● Discussions ● Participative learning	● Powerpoint presentation on Meaning and types of market risk, risk management issues in business and Financial derivatives and types of derivatives	To understand and apply the terms and concepts of underlying risk management	Assessment done through test papers

	ns and types of risk management instrument and regulatory framework of risk derivative trading in India.				
Module II (20 Hours)	1. Meaning of forward and futures, future's growth and development, future trading, currency futures and	● Lectures ● Discussions ● Participative learning		To understand and evaluate growth and development of future	Assessment done through test papers

	interest futures 2. Value at risk, 38 hedging risk, hedging with stock index future				
Module III (16 Hours)	• Meaning and importance of option, fundamental option strategies, type of option, put call parity option, binomial and blackscholes pricing method	• Lectures • Discussions • Participative learning	• Group discussion on types of option • PowerPoint presentation on meaning of option and fundamental option strategies and valuation of option strategies	To understand and apply the option trading and various strategies involved in it	Assessment done through test papers

	s.				
Module IV (16 Hours)	• Risk pricing of options, intrinsic values and time value of time value,factors affecting option pricing, put call parity pricing and models of pricing	• Lectures • Discussions • Participative learning	• PowerPoint presentation on put call parity pricing,models of pricing, binomial and black Scholes pricing methods.	To understand about the pricing of options-call and put option	Assessment done through test papers
Module V (12 Hours)	• Meaning of swaps, structure of swap dealing	• Lectures • Discussions • Participative learning	• Group discussion on types swaps • PowerPoint presentation on valuation and pricing	To evaluate and apply SWAP contract and pricing of different instruments under SWAP	Assessment done through test papers

	for risk management, types of swap and risk management function of swap ● Recent trend in derivatives and taxation on derivatives.		of swaps		

COURSE OUTCOME

CO1	To understand and apply the terms and concepts of underlying risk management
CO2	To understand and evaluate growth and development of future
CO3	To understand and apply the option trading and various strategies involved in it

CO4	To understand about the pricing of options- call and put option
CO5	To evaluate and apply SWAP contract and pricing of different instruments under SWAP

MCM4C15: INCOME TAX: LAW, PRACTICE AND TAX PLANNING II

Number of Lecture Hours per week : 5
Number of credits: 4
Internal Credit: 0.8 External Credit: 3.2
Duration of Examination : 3 Hours

Objectives:

- To acquaint the students with theoretical and practical knowledge of assessment and tax planning of different assessees

Module 1

Assessment of firms- (including limited liability partnership) –Computation of book profitRemuneration to partners –Computation of taxable income and tax liability-AMT-Tax planning regarding Assessment of AOP/BOI- Computation of taxable income and tax liability-AMT-Tax planning regarding Assessment of AOP/BOI (20 hours)

Module 2

Assessment of Co-operative societies and trusts-Deductions under 80 P-Tax Planning-TrustsDefinition-creation-types-tax exemptions-Assessment of trusts-Tax planning (15 hours)

Module 3

Assessment of Companies: Residential status and incidence of tax-Special Provisions applicable to assessment of total income of companies-Deductions available to corporate assesses – Computation of taxable income of companies and determination of corporate tax liability – Minimum Alternate Tax-Tax on distributed profit of domestic companies- Tax on income distributed to unit holders-Security Transaction Tax – Tonnage Tax. (20 hours)

Module 4

Corporate tax planning and managerial decisions: Tax planning in respect of make or buy, own or lease, repair or replace, export or domestic sales, shut down or continue, expand or contract, amalgamate or demerger, invest or disinvest-Financial Management decisions, Capital Structure, dividend policy and bonus shares. (15 hours)

Module 5

Tax planning under various circumstances: Tax planning while setting up of a business-with reference to location, nature and form of organizations-Tax planning related to Special Economic Zones (SEZ), Export Processing Zones (EPZ)and Export Oriented Units (EOUs) – Infrastructure sector and background areas – Tax incentives for exporters. (10 hours)

(30% Theory and 70% problems)

References:

1. VK Singhania, Direct Tax's Planning and Management, Taxman, Latest Edition.
2. VS Sundaram, Commentaries on the Law of Income Tax in India, Pearson Law Publishers, Latest Edition.
3. AC SampatAyengar, Law of Income Tax, Bharat Law House, Latest Edition.
4. Bhagmati Prasad, Direct Taxes Laws Practice, WishwaPrakashan, Latest Edition.
5. Kaushal Kumar Agarwal, Direct Tax Planning and Management, Atlantic Publishers, Latest Edition.
6. Dr.H . C Mehrotra and Dr.S.P. Goyal , 1ncome tax including tax planning and Management, Sahitya Bhavan Publications,Latest edition

OBJECTIVES

- To familiarize the students with major and latest provisions of the India tax laws and related judicial pronouncements pertaining to various assesses with a view to derive maximum possible tax benefits admissible under the law

LESSON PLAN

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (20 Hours)	• Assessment of firms, computation of taxable income and tax liability, AMT, Tax Planning regarding Assessment of AOP/B	• Lectures • Assignments	• Assignments on computation of taxable income of firms	• To understand the tips for tax planning of partnership firms	• Assessment through test papers

	OI				
Module II (15 Hours)	Assessment of Cooperative Societies and Trusts and tax planning regarding this	• Lectures • Discussio-ns	• Discussions on tax planning of cooperative societies and trusts	• To learn how to compute the tax liability of cooperative societies and trusts • To know the tax planning tips regarding cooperative societies and trusts	• Evaluation through test papers and case studies
Module III (20 Hours)	Assessment of Companies, Computation of Taxable Income of Companies and determination of corporate tax liability, Tonnage Tax	• Lectures • Seminars • Discussions	• Seminars on residential status of companies and incidence of tax • Discussion on computation of taxable income of companies and determine tax liabilities of companies	• To understand and evaluate the tax liability of companies including shipping companies	• Assessment through presentations

Module IV (15 Hours)	Corporate tax planning and managerial decisions: Tax planning in respect of make or buy, own or lease, repair or replace, export or domestic sales, shut down or continue, expand or contract, amalgamation or demerger, invest or disinvest.	• Lectures • Seminars • Participative learning	• Seminars on corporate tax planning • Participative learning of different managerial decisions	• To understand the implication of tax on different managerial decisions	• Assessment through assignments
Module V (10 Hours)	Tax planning under various circumstances : Tax planning while setting up of a business with reference to location, nature and form of	• Lectures • discussions	• Discussions on tax planning while setting up a new business, tax planning relating to SEZ,EPZ, EOUs	• To understand tax planning under various circumstances • To understand the tax liability of business units	• Assessment through test papers

	organisations, SEZ, EPZ, EOU, Infrastructure sector and background areas, Tax incentives for exporters				

COURSE OUTCOME

CO1	To understand and apply tax planning tips for partnership firm, AOP and BOI in India
CO2	To understand and apply tax liabilities of cooperative society and trust and should also be able to advocate tax planning tips to them
CO3	To understand and evaluate the tax liability of Companies including shipping companies
CO4	To understand and evaluate the implications of tax on various managerial decisions
CO5	To understand and evaluate the tax liability of business units

MCM4EF03: INTERNATIONAL FINANCE

Number of Lecture Hours per week : 5
Number of credits: 4
Internal Credit: 0.8 External Credit: 3.2
Duration of Examination : 3 Hours

Objectives:

- To understand the concept and significance of international finance

Module I

International Finance: Meaning, Importance- International financial environment-Risk associated with international finance- International Financial Markets- International Money Markets – Money Market Instruments – International Capital Markets – Comparison of New York, and Indian Money Market – International Bond Market - Recent changes in global financial markets. -International Monetary system- Multilateral financial institutions International Institutions –Brettenwood and International Monetary Fund (IMF)-Objectives- Role of IMF in International Liquidity Conditionalities of IMF lending-World Bank - International Development Association (IDA)- Objectives- International Financial Corporation (IFC)- Objectives- Asian Development Bank (ADB)- Objectives- International trade Centre. (20 hours)

Module II

International financial markets-foreign exchange market-foreign exchange trading-Cash and spot exchange rates-foreign exchange rate and quotation forward markets- Exchange rate behaviour cross rates-foreign exchange market participants-SWIFT Mechanism-Forecasting exchange rate measuring exchange rate movements-Exchange rate equilibrium-factors affecting foreign exchange forecasting- international parity relationship-interest rate parity, purchasing power parity and Fisher effects (20 hours)

Module III

Exchange rate definition- Spot and forward exchange- Exchange rate determination- Theories and models of exchange rate, Purchasing power parity theory, Asset market model, Portfolio balancing model- Exchange rate of rupee-recent trends in exchange rate -convertibility of Indian rupee. Foreign Exchange exposure: Management of transaction exposure-Management of translation exposure- Management of economic exposure- Management of political exposure-Management of interest rate exposure-Foreign exchange risk management-Hedging against foreign exchange exposure-Forward Market-Futures market-options market-swap market-Hedging through currency of invoicing-Hedging through selection of supplying country-Country risk analysis. (20 hours)

Module IV

International capital budgeting-concept, problems associated, evaluation of a project, factors affecting risk evaluation, impact on value-Long term asset and liability management-foreign direct investment-foreign portfolio management.
(10 hours)

Module V

Short term asset and liability management: Working capital management - international cash management- receivables and inventory management-management of short-term overseas financing resources- international banking and money market International Monetary and Financial Environment – International Monetary Investments –International Investments-Types of foreign investment- Significance of foreign investments- Factors affecting international investment (10 hours)

Theory 75% Problems 25 %

References:

1. A.K Seth, international financial management, Galgotia
2. V.K.Bhalla,international financial management, Anmol publications, 2000
3. V.Sharon, International financial management, Prentice hall
4. Jeff Madura, international financial management, Asia books

5. Eun & Resnick, international financial management, Tata McGraw Hill Publishing co.
6. John Holland, International financial management, Blackwell publishers, Oxford
7. Keith Pilbeam “International Finance” Palgrave, New York
8. Apte PG. “International Financial Management” Prentice Hall of India New Delhi
9. Alan C. Shapiro “Multinational Financial Management” Prentice Hall of India New Delhi
10. Soderston B O “International Economics” Macmillan London.
11. Cheol S Eun and Bruce G Resnick “International Financial Management” Irwin McGraw Hill, New York
12. Arthur Stonehill et al ``International Finance” Pearson Education Asia, Delhi
13. Maurice D Levi “International Finance” Tata McGraw Hill, New Delhi.

OBJECTIVES

- To understand the international financial markets and exchange theories
- To get an idea about foreign exchange exposure and risk management

LESSON PLAN

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment

Module I (20 Hours)	• Meaning and Importance of International Finance • Risks associated with international finance • Concepts about International market • IMF - Objectives and its role in International Liquidity • IFC and ADB	• Lectures • Discussion • Participative learning	• Seminar on International markets • Assignment on International Finance - Objectives, Risks	• Various concepts about International Market • Knowledge on IMF	Evaluation through test papers

Module II (20 Hours)	• International Financial Market • Different exchange rates • International Parity Relationship	• Lectures • Discussion • Participative learning	• Powerpoint Presentation on various exchange rates in International market • Seminar on International Parity relationship	• Idea about International Financial Market	Assessment through test papers
Module III (20 Hours)	• Exchange rate determination • Purchasing Power Parity Theory • Hedging against foreign exchange exposure	• Lectures • Discussion • Participative learning	• Webinar on Foreign Exchange Exposure • Seminar on Purchasing Power Parity Theory	• Determination of exchange rates	Evaluation through MCQs

Module IV (10 Hours)	• International Capital Budgeting - Concept and Problems associated • Impact on value of Long term asset and liability management • Foreign Portfolio Management	• Lectures • Discussion • Participative learning	• PPT on International Capital Budgeting • Assignment on Foreign Portfolio Management	• Various concepts of International Capital Budgeting • Asset - Liability Management	Evaluation through test papers
Module V (10 Hours)	• Working Capital Management • Internat	• Lectures • Discussion • Participative learning	• Seminar on various types of Foreign Investments • Assignment on Working	• Concepts of International Cash Management • Types of Foreign	Evaluation through test papers

	ional cash management, Receivables and Inventory Management ● International Investments - Types and significance		Capital Management	Investments ● International Banking	

COURSE OUTCOME

CO1	Students should familiarize with the concept and significance of International Finance, IDA, IFC and ADB
CO2	Students should understand international financial markets , foreign exchange rate , its measurement and movements.
CO3	Students should acquire knowledge in exchange rate theories and models of exchange rate, risk management in foreign exchange

CO4	Students should develop knowledge in international capital budgeting, asset liability management and foreign portfolio management
CO5	Students should acquaint knowledge in Working capital management, international cash and inventory management and international monetary investment

MCM4 EF04 ADVANCED STRATEGIC FINANCIAL MANAGEMENT

Number of Lecture Hours per week : 5
Number of credits: 4
Internal Credit: 0.8 External Credit: 3.2
Duration of Examination : 3 Hours

Objectives:

- To build an understanding among students about the concepts, vital tools and techniques used for financial decision making by a business firm

Module I

Financial goals and strategy: Shareholder value creation (SCV)– Economic Value Added (EVA) - Market Value Added (MVA) – Market – to – Book Value (MBV) — managerial implications of shareholder value creation – Growth ratios – Internal Growth Rate (IGR) – Sustainable Growth Rate (SGR) (12 Hours)

Module II

Financial strategy for capital structure: Leverage effect and shareholders risk – Capital structure planning and policy – Financial options and the value of the firm – Dividend policy and the value of the firm. (20 hours)

Module III

Lease Financial strategy: Leasing concept–Types–Cash flow consequences of lease – Financial evaluation of leasing - Lessee's point of view – leasing versus buying – NPV method – Equivalent loan method – Evaluation from lesser's point of view – NPV and IRR methods. (16 hours)

Module IV

Merger strategy: Theories of Merger–Horizontal, vertical and conglomerate mergers – Merger procedure – Valuation of firm – Financial impact of merger – Merger and dilution effect on EPS – Merger and dilution effect on business control. (16 hours)

Module V

Take over strategy: Types of takeovers–Negotiated and hostile bids–Take over procedures – Takeover defences – Takeover regulations of SEBI – Distress restructuring strategy – Sell offs – Spin offs – Leveraged buy outs. (16 hours)

(Theory 40% problem 60%)

References:

1. Vanhorne, James C: Financial Management and policy, Pearson, New Delhi, (Latest edition)
2. Brighham and Ehrhardt: Financial Management, Thomson India, (Latest edition)
3. Chandra, Prasanna: Financial Management, Tata McGraw Hill, New Delhi, (Latest edition)
4.Khan, MY and James PK: Financial Management, Tata McGraw Hill New Delhi, (Latest edition)
5. Pandey IM: Financial Management, Vikas Publishing House, New Delhi, (Latest edition)

6. Gitman, LJ: Principles of Managerial Finance, Harper and Row (Latest edition)
7. Hampton: Financial decision making, Concepts, problems and cases, Prentice Hall of India, New Delhi (Latest edition)
8. Brealey and Meyers: Principles of Corporate Finance, Tata McGraw Hill, New Delhi (Latest edition)

OBJECTIVES

- To apply financial management concepts and theories for strategic financial management decision making

LESSON PLAN

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (12 Hours)	Financial goals and strategy: Shareholder value creation (SCV)– Economic Value Added (EVA) -	● Lectures ● Group discussions ● Working out practical problems	● Lectures and Powerponit presentations on concept of Advanced strategic financial management ● Practical	To understand the concept of Strategic financial management, shareholder value creation, economic value added,etc	Evaluation done through test papers

	Market Value Added (MVA) – Market – to – Book Value (MBV) — managerial implications of shareholder value creation – Growth ratios – Internal Growth Rate (IGR) – Sustainable Growth Rate (SGR)		problems on SVC, EVA, MVA, MBV, IGR, SGR		
Module II (20 Hours)	Financial strategy for capital structure: Leverage effect and shareholders risk – Capital structure planning and policy – Financial options and the value of	• Lectures • Group discussions • Working out practical problems • Seminars	• Seminars and discussion by students on Leverage analysis and dividend policy • Lectures and powerpoint presentation on Capital structure planning and policy,	To develop knowledge about financial strategy for capital structure, capital structure planning and policy, dividend policy etc	Evaluation done through test papers and assessment of seminars

	the firm – Dividend policy and the value of the firm.		financial options and value of firm. ● Practical problems on leverage analysis dividend policy and value of firm etc.		
Module III (16 Hours)	Lease Financial strategy: Leasing concept–Types–Cash flow consequences of lease – Financial evaluation of leasing - Lessee's point of view – leasing versus buying – NPV method – Equivalent loan method – Evaluation from lesser's point of view	● Lectures ● Group discussions ● Working out practical problems ● Seminars	● Seminars and discussion by students on leasing concept and evaluation ● Lectures and Practical problems on buy or lease decisions, NPV method, Equivalent loan method, Evaluation from lesser's point of view, NPV and IRR methods.	To understand the leasing concept and evaluation and to develop knowledge about NPV method, Equivalent loan method, Evaluation from lesser's point of view, NPV and IRR methods.	Evaluation done through test papers and assessment of seminars

	– NPV and IRR methods.				
Module IV (16 Hours)	**Module IV** Merger strategy: Theories of Merger–Horizontal, vertical and conglomerate mergers – Merger procedure – Valuation of firm – Financial impact of merger – Merger and dilution effect on EPS – Merger and dilution effect on business control. (16 hours)	• Lectures • Group discussions • Participative learning	• Powerpoint presentations and discussion on merger strategy and types of merger and impact of merger etc. • Lectures on Merger procedure, valuation of firm etc	To understand the concept of Merger, Merger strategies, effects of merger etc	Evaluation done through test papers
Module V (16 Hours)	Take over strategy: Types of takeovers–Negotiated and hostile bids–Take	• Lectures • Group discussions • Participative learning	• Powerpoint presentations and discussion on Take over strategy • Lectures on	To understand the concept of takeover, to know about take over strategies, take over procedures and SEBI regulations on the same.	Evaluation done through test papers

	over procedures – Takeover defences – Takeover regulations of SEBI – Distress restructuring strategy – Sell offs – Spin offs – Leveraged buyouts.		take over procedures, takeover regulations of SEBi, Takeover Defences etc		

COURSE OUTCOME

CO1	To build an understanding among students about the concepts, vital tools and techniques used for financial decision making
CO2	To understand the concept of capital structure planning and policies, and to find the value of a firm.
CO3	To familiarise with the concept of lease financing and various methods of lease financing
CO4	To gain knowledge in theories of merger, different types of merger and the financial impact of merger
CO5	To understand take over strategy and procedure and regulations

BC1B01 MANAGEMENT CONCEPTS AND BUSINESS ETHICS

Number of Lecture Hours per week: 6
Number of Credits: 4
Internal : 20, External : 80
Examination Hours : 3

Objectives:

- To understand the process of business management and its functions

Module I

Nature and Scope of Management: Evolution of Management - Schools of management thought - F.W.Taylor and Henry Fayol - Principles of Management - Management as a science and an art - Management process. 15 Hours

Module II

Functions of Management: Planning: Types of plan - Planning process – Organizing: Span of control - Line and staff functions - Centralization and decentralization – Delegation - Staffing: Manpower planning: Recruitment - Selection and placement - Directing: Principles of direction – Coordinating and controlling. 30 Hours

Module III

Manager Vs Leader: Leadership and motivation: leadership styles -Theories of motivation - MBO - Management of performance - Understanding and managing group processes -Characteristics of work group - Work group behaviour and productivity - Team creation and management. 15 Hours

Module IV

Ethics, Culture and Values: Importance of culture in organizations - Indian ethos and value systems - Model of management in the Indian socio political environment - Work ethos - Indian heritage in production and consumption. 15 Hours

Module V

Business Ethics : Relevance of values in management – Holistic approach for managers in decision making - Ethical Management: Role of organisational culture in ethics - structure of ethics management - Ethics Committee. 15 Hours

Reference Books:

1. Boatwright. John R: Ethics and the Conduct of Business, Pearson Education, New Delhi.
2. Sathish Modh: Ethical Management, Macmillan.
3 Koontz, H and Wechrick, H: Management, McGraw Hill Inc, New York.
4 Drucker, Peter, F., Management: Tasks, Responsibilities and Practices, Allied Publishers, New Delhi.
5. L.N Prasad : Principles of Management.
6. R.S Davar; Management Process
7. Rustum & Davan, Principles and Practice of Management.
8. Srinivasan & Chunawalla, Management Principles and Practice.
9. S. V. S. Murthy. Essentials of Management.

OBJECTIVES

- To familiarize the students with current management practices.
- To understand the importance of ethics in business.
- To acquire knowledge and capability to develop ethical practices for effective management.

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment

Module I (15 Hours)	Schools of Management Thought, Principles of Management, Management Process	• Discussion • Lecture • Participative Learning	• Discussion on Principles of Henry Fayol • Assignment on Management Process • Slide Presentation on Management as a Science and an Art	• To study about different schools of management thought • To understand the process of management • To learn about 14 principles of Henry Fayol	• Assessment through test papers
Module II (30 hours)	Functions of management, planning process, manpower planning, principles of direction	• Discussion • Lecture • Participative Learning	• Group discussion on staffing function • Powerpoint presentations on planning process	• To study the principles of direction • To study different recruitment process • To study various types of plan	• Evaluation through descriptive examination

Module III (15 hours)	Leadership and motivation, Theories of motivation, MBO, Characteristics of Workgroup, team creation and management	• Discussion • Lecture • Participative Learning	• Seminars on the topic management by objectives(MBO) • Leadership programmes and games • Slide presentation on motivational theories	• To study various leadership styles • To evaluate various motivational theories • To study the workgroup behaviour and productivity	• Assessment through MCQ and test papers
Module IV (15 hours)	Ethics, Culture and Values, Importance of culture in organizations, Indian ethos and value system,Work ethos.	• Discussion • Lecture • Participative Learning	• Seminar on culture in organisation • Group Discussion on India ethos and Value system.	• To study about ethics, culture and value To understand the importance of ethics, in organisation.	• Evaluation through case study

Module V (15 hours)	Business ethics, ethical management, Structure of ethics management, Role of organisational culture in ethics	• Discussion • Lecture • Participative Learning	• Assignments on organisational culture in ethics • Discussion on relevance of values in management	• To study about ethics committee • To study holistics approach in decision making • To evaluate the relevance of ethical management	• Evaluation through Test paper.

BC1C01 MANAGERIAL ECONOMICS

Number of Lecture Hours per week : 5
Number of Credits : 4
Internal : 20, External : 80
Examination Hours: 3

Objectives:

- To enable the students to understand micro and macroeconomic concepts relevant for business decisions

Module I

Introduction - Definition of Managerial Economics - Objectives - Characteristics - Uses - Decision making and forward planning - Basic economic tools in management economics. 08 Hours

Module II

The Concept of Demand and Elasticity of Demand - Demand curve: Individual demand curve - Market demand curve - Movement along Vs shifts in the Demand curve - Elasticity of Demand: Price, Income and cross - Demand estimation and demand forecasting - Concept of Revenue: Average Revenue and Total Revenue - Marginal Revenue and Incremental Revenue. 12 Hours

Module III

Production: Fixed and Variable inputs - Production function - Total, Average and Marginal Product - Law of variable proportions - Linear homogeneous production function - Production isoquant - Marginal rate of technical substitution - Optimal combination of resources - Return to scale - Cost of production - Social and private cost of production - Difference between economic and accounting cost - Long run and short run cost of production - Economies and diseconomies of scale. 20 Hours

Module IV

Price and Output Decisions Under Different Market Structures: Price and output decisions under perfect competition, monopoly and monopolistic competition -

Pricing under oligopoly - Kinked demand curve - Price leadership - Pricing under collusion. 10 Hours

Module V

A. Pricing Policies and Practices: Factors governing prices - Objectives of pricing policy - Role of cost in pricing - Demand factor in pricing - Consumer psychology and pricing - Pricing methods: Cost-plus or full-cost pricing - Target pricing - Marginal cost pricing - Going rate pricing - Follow up pricing - Barometric pricing - Customary prices - Pricing of new products: Penetrating pricing - Price skimming.

B. Macro Economics and Business Decisions: Phases of Business cycle - Evil effects of cyclical fluctuations on business firms - Minimising effects of Business cycles - Economic Forecasting for business: Economic and Business forecasting - Uses of economic forecasts - Methods of economic forecasting - Selecting a forecast - Evaluating forecasts. 25 Hours

Reference Books:

1. R.L. Varshney and K.L. Maheswari, Managerial Economics
2. D.N. Dwivedi, Managerial Economics
3. Dr. S. Sankaran, Managerial Economics
4. DM Mithani: Business Economics
5. Seth M L Text Book of Economic Theory
6. K K Dewett: Economic Theory
7. Petersen &. "Lewis: Managerial Economics
8. Mote V L peul. S & Gupta G S: Managerial Economics
9. H. Craig Petersen & W. Cris lewis: Managerial Economics
10 Dr. P.N. Reddy and H.R, Appanaiah : Essentials of Business Economics
11 Barry Keating and J. Holton Wilson: Managerial Economics

OBJECTIVES

- To help the students to understand the Application of economic principles in business management

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (08 hours)	Managerial economics-definition,objectives,characteristics,basic economic tools in management	● Discussion ● Lecture ● Participative Learning	● Power Point presentation on definition, objectives of Managerial Economics ● Discussion on basic economics tools in Managerial Economics	● To understand characteristics of Managerial Economics ● To evaluate the economic tools	Assessment through Test papers.

Module II (12 hours)	The Concept of Demand and Elasticity of Demand, Demand curve, Individual demand curve, Market demand curve, Elasticity of Demand, Concept of Revenue, Marginal Revenue and Incremental Revenue.	• Discussion • Lecture • Participative Learning	• Assignments on market demand curve • Slide presentation on concept of Revenue	• To study Elasticity of Demand • To understand the concept of Demand curve • To study marginal revenue	Evaluation through Essay writing

Module III (20 hours)	Production, Fixed and Variable inputs, Law of variable proportions, Linear homogeneous production function, Cost of production, Difference between economic and accounting cost, Economies and diseconomies of scale	• Discussion • Lecture • Participative Learning	• Seminar on law of variable proportions • Group Discussion on economies and diseconomies	• To study the concept of fixed and variable inputs • To understand the law of variable proportions • To evaluate the cost of production	Assessment through descriptive exam

Module IV (10 hours)	Market Structures, perfect competition, monopoly and monopolistic competition, Pricing under oligopoly, Price leadership,	• Discussion • Lecture • Participative Learning	• Assignments on prefect competition • Group discussion on difference between perfect competition and monopolistic competition	• To understand various structure of Market • To study the price leadership	Evaluation through Test papers and MCQ
Module V (25 hours)	Pricing Policies and Practice- features, objectives, Pricing methods, Macro Economics and Business Decisions, Economic Forecasting for business.	• Discussion • Lecture • Participative Learning	• Discussion on different pricing methods • Assignments on business cycles	• To study the Demand factor in pricing • To evaluate the phases of business cycle • To understand economic forecasting	Assessment through Test paper

BC2B02 FINANCIAL ACCOUNTING

Number of Lecture Hours per week : 6

Number of Credits: 4
Internal : 20, External : 80
Examination Hours: 3

Objectives:

- To enable the students to acquire knowledge of preparing financial statements

Module I

Conceptual Framework for Preparation of Financial Statements: Capital and revenue expenditure - Capital and revenue receipts - Accounting Standards - Object of Accounting Standards - Accounting Standard Board of India – Functions - Indian Accounting Standards - International Financial Reporting Standards - Final accounts of sole trader and non-profit organizations. 20 Hours

Module II

Final Accounts From Incomplete Records - Limitations of single entry - Calculation of profit or loss from single entry books - Statement of affairs method - Conversion method - Total debtors and creditors account - Missing items - Memorandum trading account - Preparation of Trading and Profit and Loss Account and Balance Sheet. 20 Hours

Module III

Accounting for Hire Purchase and Installment System – Meaning - Features of hire purchase agreement - Distinction between hire purchase and sale - Interest calculation - Recording transactions in the books of both parties - Default and repossession -Installment system – Features - Distinction between hire purchase and installment system 15 Hours

Module IV

Departmental Accounts – Meaning – Objects – Advantages - Accounting procedure Allocation of expenses and income – Inter-departmental transfers -

Provision for unrealized profits - Branch accounts – Features – Objects - Types of branches – Dependent branches - Accounting systems - Stock and Debtors System - Independent branches – Features - Preparation of Consolidated Profit and Loss Account and Balance Sheet. 20 Hours

Module V

Accounting for Hotels and Restaurants – Introduction – Features - Revenue earning and non-revenue earning departments - Heads of revenue and heads of expenditure - Preparation of Trial Balance and final accounts : Trading Account - Profit and Loss Account and Balance Sheet. 15 Hours

Reference Books :

1. M.C. Shukla, T.S. Grewal and S. C. Gupta, Advanced Accounts, S. Chand & Co., New Delhi.
2. S.N. Maheswari and S.K. Maheswari, Financial Accounting.
3. R.L. Gupta and Radhaswamy, Advanced Accounting, Sultan Chand & Sons, New Delhi.
4. R.K. Malhotra, Financial Management in Hotels and Restaurant Industry, Anmol Publishers.
5. Dr. Goyal V.K., Financial Accounting, Excel Books, New Delhi.
6. Ashok Sehgal and Deepak Sehgal, Advanced Accounting , Volume I , Taxmann, New Delhi.
7. Jain and Narang, Financial Accounting.
8. B.S. Raman, Advanced Accountancy.
9. P.C. Tulasian, Introduction to Accounting, Pearson Education.

OBJECTIVES

- To equip the students with the skill of preparing accounts for various types of organizations.
- To enable the students to acquire knowledge about Accounting Standards and to understand corporate accounting methods.

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (20 hours)	Preparation of financial statements,accounting standards, Indian Accounting Standards, Final accounts of sole trader and non-profit organizations.	● Discussion ● Lecture ● Participative Learning	● Problem solving ● Assignments on international financial reporting standards ● Discussion on Indian standards	● To study how to prepare financial statements ● To understand the objectives of Accounting Standards ● To evaluate the preparation of accounts of sole trader ● To study the difference between Indian standards and international financial reporting standards	Assessment through Test papers

Module II (20 hours)	Final Accounts under single entry, Calculation of profit or loss from single entry books, Statement of affairs method, Conversion method,Memorandum trading account	• Discussion • Lecture • Participative Learning	• Discussion on single entry system • Assignments on single entry system	• To study the limitations of single entry • To understand the preparation of memorandum trading account	Evaluation through test paper
Module III (15 hours)	Hire Purchase -Meaning, Features, Distinction between hire purchase and sale, Interest calculation, Installment system, Distinction between hire purchase and installment system	• Discussion • Lecture • Participative Learning	• Assignment on difference between hire purchase and installment system • Problem solving	• To study the accounting of hire purchase • To study the distinguishment between hire purchase and sale • To understand what is installment system	Evaluation through essay writing

Module IV (20 hours)	Departmental Accounts–Meaning, Objects, Advantages, Inter-departmental transfers, Branch accounts, Types of branches, Dependent branches, Independent branches,Preparation of Consolidated Profit and Loss Account and Balance Sheet.	• Discussion • Lecture • Participative Learning	• Discussion on departmental accounting and branch accounting • Assignment on different accounting systems • Problem solving	• To study about dependent and independent branches • To study about the inter department transfer • To understand the preparation of consolidated profit and loss account and balance sheet	Assesment through descriptive exam
Module V (15 hours)	Accounting for Hotels and Restaurants, Heads of revenue and heads of expenditure, Preparation of Trial Balance and final accounts	• Discussion • Lecture • Participative Learning	• Assignment on hotels and restaurants-features, preparation of final accounts • Problem solving	• To study the features of hotel and restaurant accounting • To evaluate the heads of revenue and expenditure • To study the preparation of final accounts of hotels and restaurants	Evaluation through test papers

BC2C02 MARKETING MANAGEMENT

Number of Lecture Hours per week: 5
Number of Credits: 4
Internal : 20, External : 80
Examination Hours: 3

Objectives:

- To provide basic knowledge about the concepts, principles, tools and techniques of marketing

Module I

Marketing: Meaning and definition - Scope and importance - Evolution of marketing concepts -Modem concept of marketing - Marketing mix - Marketing environment - Consumer behaviour -Buying motives - Consumer buying process - Factors influencing consumer buying decision -Market segmentation - Basis-target marketing - Product positioning - Importance and bases 20 Hours

Module II

Product: Meaning and importance – Classification - Concept of product mix – Packaging - Branding - Brand loyalty and brand equity – Labeling - Product life cycle - New product development – Pricing - Factors influencing product price - Pricing policies and strategies 15 Hours

Module III

Physical distribution: Meaning and importance - Levels of marketing channels - Wholesaling and retailing - Types of retailing - Factors influencing choice of distribution channel 10 Hours

Module IV

Promotion: Meaning and importance - Promotion mix – Advertising - Personal selling – Sales promotion - Public relation - Factors affecting promotion mix decisions 10 Hours

Module V

Rural Marketing : Growing importance - Unique features of rural markets - Market mix planning for rural market - Service marketing Vs. product marketing - Green marketing - Social marketing - Relationship marketing - Niche marketing 15 Hours

Module VI

E-Marketing: Traditional marketing Vs. E-marketing - Internet marketing - E-advertising - New trends in internet marketing – E-branding - E-payment systems and security features in the internet. 05 Hours

Reference Books:

1. Marketing Management, S.A. Sherlakar ,. Himalaya.
2. Fundamentals of Marketing, William J Stanton, Me Graw Hill Publishing Co, New York
3. Marketing by Lamb. Hair, Me Danniel - Thomson.
4. Marketing by Evans &. Berman, 2/e, Biztantra.
5. Marketing - Concepts, strategies by William M Pride. O C Fewell. Biztantra.
6. Marketing Management, Ramaswamy & Namakumari, Macmillan.
7. Marketing Management, Arun Kumar & "Meenakshi. Vikas.
8. Principles of Marketing, Philip Kotler, Armstrong, Pearson Education.

OBJECTIVES

- To impart necessary knowledge which helps the student to choose a career in the field of marketing.
- To expose the students to the latest trends in marketing.

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (20 hours)	Marketing: Meaning and definition, Marketing mix, Marketing environment, Consumer buying process, Market segmentation, Product positioning.	● Discussion ● Lecture ● Participative Learning	● Seminar on consumer behaviour and buying process ● PPT on market segmentation	● To study the modern concepts of marketing ● To evaluate the factors affecting consumer buying behaviour ● To understand the product positioning	Evaluation through case study
Module II (15 hours)	Product, Concept of product mix, Packaging, Branding, Labeling, New product development, Pricing, Pricing policies and strategies	● Discussion ● Lecture ● Participative Learning	● Presentation on product life cycle ● Discussion on classification of products and factors affecting price	● To study the concepts of product mix ● To understand new product development ● To study pricing policies and strategies	Assessment through test papers

Module III (10 hours)	Physical distribution- Meaning and importance, Wholesaling and retailing, Factors influencing choice of distribution channel	• Discussion • Lecture • Participative Learning	• Assignments on wholesale marketing and retail marketing • Debates on direct marketing and online marketing	• To study the meaning and importance of physical distribution • To understand the difference between wholesale and retail marketing • To evaluate different marketing channels	Assessment through descriptive exams
Module IV (10 hours)	Concept of Promotion, Promotion mix, Sales promotion, Public relation, Factors affecting promotion mix decisions	• Discussion • Lecture • Participative Learning	• Assignments on promotion mix and sale promotion • Group discussion on factors affecting promotion mix decision	• To understand what is promotion and promotion mix • To analyse the factors that have effect on promotion mix decision	Assessment through test papers and MCQ

Module V (15 hours)	Rural Marketing- feature, Market mix planning for rural market, Green marketing, Social marketing, Relationship marketing, Niche marketing	• Discussion • Lecture • Participative Learning	• Seminar on different marketing- green marketing, social marketing, relationship marketing, niche marketing • Assignments on service marketing and product marketing	• To evaluate the growing importance of rural marketing • To understand the concept of service marketing and product marketing • To study different types of marketing	Evaluation through test papers
Module VI (05 Hours)	E-Marketing- Traditional marketing Vs. E-marketing, E-advertising, E-branding - E-payment systems.	• Discussion • Lecture • Participative Learning	• Debates on traditional marketing VS electronic marketing • Assignments on new trends in internet marketing • Discussion on E-payment system	• To study about E-Market • To evaluate the difference between traditional marketing and electronic marketing • To Understand what is E-payment and E-branding	Assessment through descriptive exams

BC3A11 BASIC NUMERICAL SKILLS

Number of Lecture Hours per week : 5

Number of Credits : 4

Internal : 20, External : 80

Examination Hours: 3

Objectives:

- To enable the students to acquire knowledge of Mathematics and Statistics

Module I

Sets and Set Operation – Venn Diagrams – Elements of Coordinate system – Matrices – Fundamental ideas about matrices and their operational rules – Matrix multiplication – Inversion of square matrices of not more than 3rd order – Solving system of simultaneous linear equations. 15 Hours

Module II

Theory of Equations : Meaning - types of equations – Simple linear and Simultaneous equations (only two variables) eliminations and substitution method only - Quadratic equation factorization and formula method ($ax2 + bx + c = 0$ form only) - Problems on business applications. 10 Hours

Module III

Progressions : Arithmetic Progressions - Finding the ‘n’th term of an AP and also sum to ‘n’ terms of an AP - Insertion of Arithmetic means in given terms of AP and representation of AP - Geometric Progression : Finding ‘n’th term of GP - Insertion of GMs in given GP and also representation of GP – Mathematics of Finance – Simple and compound interest (Simple problems only). 15 Hours

Module IV

Meaning and Definition of Statistics - Scope and limitations – Statistical enquiries – Scope of the problem – Methods to be employed – Types of enquiries – Presentation of data by Diagrammatic and Graphical Method – Formation of Frequency Distribution. 15 Hours

Module V

Measures of Central Tendency – Arithmetic Mean – Median – Mode - Geometric and Harmonic Mean - Measures of variation and standard, mean and quartile deviations – Skewness and Kurtosis and Lorenz curve . Analysis of Time Series : Methods of measuring – Trend and Seasonal variations – Index number – Unweighted indices – Consumer price and cost of living indices. 20 Hours

(Theory and problems may be in the ratio of 20% and 80% respectively. An overview of the topics is expected and only simple problems shall be given)

Reference Books:

1. Sundaresan and Jayaseelan – An Introduction to Business Mathematics and Statistical Methods
2. Dr. A K Arte & R V Prabhakar - A Text Book of Business Mathematics.
3. Sanchethi and Kapoor - Business Mathematics.
4. Gupta S.P - Statistical Methods
5. Navaneethan P – Business Mathematics
6. R.S.N. Pillai, Mrs. Bhagavathi – Statistics
7. P.R. Vittal - Business Mathematics and Statistics.

OBJECTIVES

- At the end of this course, the students should have understood set operations, matrix and Mathematics of finance, Statistical tools and their applications.

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (15 hours)	Sets and Set Operation, Venn Diagrams, Matrices, Matrix multiplication ,Solving system of simultaneous linear equations	• Discussion • Lecture • Participative Learning	• Problem solving • Assignments on basic ideas on set,venn diagrams,matrices.	• To study about set operation,venn diagrams,Matrices • To study the methods of solving matrix multiplication and simultaneous linear equations	Assessment through test papers
Module II (10 hours)	Theory of Equations-Meaning, types of Simple linear and Simultaneous equations,Quadratic equation factorization and formula method,	• Discussion • Lecture • Participative Learning	• Assignments on theory of equation • Problem solving •	• To study the theory of equations • To understand simple linand simultaneous equation • To evaluate the problems on business applications	Assessment through Test papers and MCQ

	Problems on business applications.				
Module III (15 hours)	Arithmetic Progressions, Geometric Progression, Insertion of GMs in given GP and also representation of GP, Simple and compound interest	• Discussion • Lecture • Participative Learning	• Problems solving	• To understand Arithmetic Progressions and Geometric Progression • To study the calculation of Simple and compound interest	Evaluation through Test papers
Module IV (15 hours)	Statistics-Meaning and Definition of, Types of enquiries, Presentation of data by Diagrammatic and Graphical Method, Formation of Frequency Distribution.	• Discussion • Lecture • Participative Learning	• Assignments on Presentation of data by Diagrammatic and Graphical Method • Problem solving	• To evaluate the meaning and definition of statistics • To understand different types of enquiries • To study presentation of data by Diagrammatic and Graphical Method • To understand Formation of Frequency Distribution	Assessment through Test papers

Module V (20 hours)	Measures of Central Tendency,mean and quartile deviations, Skewness and Kurtosis and Lorenz curve . Analysis of Time Series, Index number.	• Discussion • Lecture • Participative Learning	• Problems solving • Seminars on measures of central Tendency	• To understand measures of central Tendency • To understand the analysis of Time Series • To evaluate the trends and seasonal variations • To study index numbers	Assessment through Test papers

BC3A12 GENERAL INFORMATICS

Number of Lecture Hours per week : 5
Number of Credits : 4
Internal : 20, External : 80
Examination Hours: 3

Objectives:

- To update and expand basic Informatics skills of the students

Module I

Computers and Operating Systems : Features of New Generation Personal Computers and Peripherals - Computer networks - Types of networks - Components of networks – Topology – Internet - Uses of internet - Introduction to Software – License – Open source - Overview of operating systems and major application software. 10 Hours

Module II

Basics of IT : Information – Prerequisites and needs - IT and its components - IT and Internet – IT Applications - E-Governance - IT for National Integration - IT Applications in Health Care, Business, Commerce and Resource Management - Emerging Trends in IT: Electronic Data Interchange - Mobile Computing – SMS – MMS - Wireless Applications – Bluetooth - Global Positioning System - Infrared Communication - Smart Card - DNA Computing - Cloud computing 15 Hours

Module III

Knowledge Skills for Higher Education : Data, Information and Knowledge - Knowledge Management - Internet as a knowledge repository - Academic search techniques - Case study of academic websites - Basic concepts of IPR – Copyrights and Patents. Introduction to use of IT in teaching and learning. Case study of educational software - Academic Service – INFLIBNET – NICENET - BRNET.
15 Hours

Module IV

Social Informatics : IT and society - Issues and concerns - Digital Divide - Free Software Movement – IT and industry - New opportunities and threats - Cyber ethics - Cyber crimes – Security – Privacy issues - Cyber Laws - Cyber addictions - Information overload - Health issues - Guidelines for proper usage of computers and internet - e waste and Green Computing – Unicode - IT and regional languages. 15 Hours

Module V

Programmes for Office Management : Introduction to Linux - Linux systems - Linux distributions – Operating systems and Linux - History of Linux and UNIX - Open source software – Linux software - Software Repositories - Third party Linux Repositories - Linux Office and Database software - Internet servers - Development resources - Setting the Desktop - The GNOME Desktop environment – Using the Metacity Window Manager – Using GNOME Panels – Change in the GNOME preferences - Exiting GNOME – Working with words and images - Desktop Publishing in Linux – Using Open Office.org office suit. 20 Hours

References Books:

1. Peter Norton, Introduction to Computers, Tata McGraw Hill Private Limited, New Delhi, 2009.
2. Alan Evans, ITL ESL, Leslie Lamport, Dolores Etter, Darren George, Kenneth C Laoudon, Gary Rogers, Rainer Handel, INFORMATICS -Technology in Action, Pearson Education, Delhi, 2009.
3. V.Rajaraman, Introduction To Information Technology, PHI Learning Private Limited, New Delhi, 2009.
4. Alex Leon, The Complete Reference Linux Sixth Edition, Tata McGraw Hill Private Limited, New Delhi, 2009.
5. Christopher Mathews Leon, Fundamentals of Information technology, Leon Vikas, Chennai, 2009.
6. Richard Peterson Negus, Linux Bible, Wiley India Private Limited, 2009.
7. Mike McGrath, Linux In Easy Steps , Dream TechPress, New Delhi, 2009
8. Daniel Minoli &Emma Minoli, Web Commerce Technology Hand Book, Tata McGraw Hill, New Delhi, 2009
www.wikipedia.com
www.google.scholarr.com
www.bing.com
www.google.com
www.afk.com
www.yahoosearch.com
www.comp.os.linux.admin
www.comp.os.linux.answers

OBJECTIVES

- To equip the students to effectively utilize the digital knowledge resources for their study

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (10 hours)	Computers and Operating Systems, Computer networks, Types of networks, Topology, Software, Overview of operating systems and major application software.	● Discussion ● Lecture ● Participative Learning	● Assignments on network and different network topology ● Group discussion onoperating systems and major application software.	● To study about operating systems and computer networks ● To understand different network topologies ● To understand operating systems and major application software	Assessment through Test papers
Module II (15 hours)	Basics of IT, IT and its components, IT and its components, E-Governance, IT Applications, Emerging Trends in IT, Global Positioning System, DNA Computing, Cloud	● Discussion ● Lecture ● Participative Learning	● Seminars on Global Positioning System ● Assignments on DNA Computing and Cloud computing.	● To understand IT and its components ● To study about E-Governance ● To evaluate DNA Computing and Cloud computing. ● To understand Global Positioning System ● To evaluate IT	Evaluation through MCQ

	computing			Applications and Emerging Trends in IT.	
Module III (15 hours)	Knowledge Skills-Data, Information and Knowledge, Academic search techniques, Basic concepts of IPR, Academic Service, INFLIBNET, NICENET, BRNET	• Discussion • Lecture • Participative Learning	• Peer Group Discussion on knowledge skills - Data, Information and Knowledge • Assignments on INFLIBNET, NICENET, BRNET	• To study about knowledge skills • To understand academic search techniques • To evaluate the concepts of IPR • To study about INFLIBNET, NICENET, BRNET	Evaluation through descriptive exam
Module IV (15 hours)	Social Informatics, Digital Divide, Cyber ethics, Cyber crimes, Health issues e-waste and Green Computing	• Discussion • Lecture • Participative Learning	• Group discussion on cyber ethics and cyber crime • Assignments on green compounding	• To study about Social Informatics • To evaluate the effects of Cyber ethics and Cyber crimes • To understand Green Computing	Evaluation through Test papers

Module V (20 hours)	Programmes for Office Management, Linux - Linux systems, Linux software, Development resources, GNOME Desktop environment, GNOME preferences, Desktop Publishing in Linux	• Discussion • Lecture • Participative Learning	• Seminar on the topic Linux - Linux systems and Linux software • Slide presentation on Desktop Publishing in Linux	• To understand programmes for Office management • To Linux - Linux systems and Linux software • To GNOME Desktop environment. • To study about GNOME preferences	Evaluation through Test papers

BC3BO3 BUSINESS REGULATIONS

Number of Lecture Hours per week : 4
Number of Credits : 4
Internal : 20, External : 80
Examination Hours: 3

Objectives:

- To familiarise the students with certain statutes concerning and affecting business organizations in their operations

Module I

Business Laws : Introduction – Nature of Business Law – Meaning and definition -Indian Contract Act, 1872: Contract – Definition – Essentials of valid contracts - Classification of contracts – Offer and acceptance – Consideration – Capacity to contract – Free consent –Coercion – Undue influence – Misrepresentation – Fraud

– Mistake – Void agreements – Discharge of contract – Breach of contract and remedies – Contingent contracts - Quasi contracts. 25 Hours

Module II

Special Contracts: Contract of Indemnity: Meaning - Nature – Right of indemnity holder and indemnifier – Contract of Guarantee : Meaning – Nature - Rights and liabilities of surety – Discharge of surety from liability – Contract of Bailment and Pledge: Rights and duties of bailor and bailee, pledger and pledgee – Contract of Agency – Creation of agency – Delegation of authority - Duties and liabilities of principal and agent – Termination of agency. 12 Hours

Module III

Sale of Goods Act 1930 : Contract for sale of goods – Essentials of a contract of sale – Conditions and Warranties – Caveat emptor – Sale by non owners – Rules as to delivery of goods – Unpaid seller and his rights . 08 Hours

Module IV

The Consumer Protection Act 1986: Objects and scope – Definition of consumer and consumer dispute – Complaint – Goods - Service - Unfair trade practices – Restrictive trade practices - Rights of consumers – Consumer Protection Council – Consumer Disputes Redressal Agencies. 10 Hours

Module V

The Information Technology Act 2000: Scope and extent – Digital signature – Digital signature certificate – Electronic records and governance – Certifying authorities – Cyber crimes – Offences and penalties under IT Act, 2000. 05 Hours

Reference Books:

1. Singh Avtar, The Principles of Mercantile Law , Eastern Book Company, Lucknow.
2. Kuchal M.C, Business Law , Vikas Publishing House, New Delhi
3. Kapoor N.D, Business Law , Sultan Chand & Sons, New Delhi.
4. Chandha P.R , Business Law.
5. S.S. Gulshan, Business Laws.
6. B. Sen and Mitra, Business and Commercial Laws.

7. Chandha P.R, Business Law, Galgotia, New Delhi.
8. Balchandani , Business Laws.
9. Relevant Bare Acts.
10. Government of India, Information Technology Act, 2000
11. Desai T.R. , Indian Contract Act, Sale of Goods Act and Partnership Act , S.C. Sarkar & Sons Pvt. Ltd. Kolkata.

OBJECTIVES

- To enlighten the students with the legal framework influencing business decisions.

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (25 hours)	Business Laws - nature, meaning, definition,Indian Contract Act, 1872, contract - Definition, essential, classification, Capacity to contract, Void agreements, Breach of contract and	● Discussion ● Lecture ● Participative Learning	● Seminar on topic Indian Contract Act, 1872. ● Discussion on Quasi contracts	● To study about Business Laws - nature, meaning, definition. ● To understand contract its Definition, essentials, classification,Capacity to contract ● To study what is void agreements.	Evaluation through Test papers

	remedies, Contingent contracts, Quasi contracts.			• To understand Quasi contracts	
Module II (12 hours)	Contract of Indemnity, Right of indemnity holder and indemnifier, Contract of Guarantee, Rights and liabilities of surety, Contract of Bailment and Pledge, Rights and duties of bailor, Contract of Agency, Duties and liabilities of principal and agent.	• Discussion • Lecture • Participative Learning	• Power Point presentation on special contract • Discussion on rights and duties of bailor	• To study special contract • To understand Contract of Indemnity • To study Contract of Guarantee and Rights and liabilities of surety • To understand Contract of Agency and Duties,liabilities of principal and agent	Assessment through Essay Writing

Module III (08 hours)	Sale of Goods Act 1930, Essentialsof a contract of sale, Conditions and Warranties, Caveat emptor, Rules as to delivery of goods, Unpaid seller and his rights	• Discussion • Lecture • Participative Learning	• Discussion on Sale of Goods Act 1930 • Assignment on Conditions and Warranties	• To study Sale of Goods Act 1930 • To understand Essentials of a contract of sale • To understand Conditions and Warranties • To study about Caveat emptor • To understand Rules as to delivery of goods	Assessment through Test papers
Module IV (10 hours)	The Consumer Protection Act 1986, Goods, Service, Unfair trade practices, Rights of consumers, Consumer Protection Council, Consumer Disputes, Redressal Agencies	• Discussion • Lecture • Participative Learning	• Presentation on The Consumer Protection Act 1986 • Peer Group Discussion on Consumer Disputes and Redressal Agencies	• To study about The Consumer protection act, 1986 • To understand unfair trade practices • Evaluate consumer protection Council • To understand Redressal Agencies	Evaluation through Essay writing

Module V (05 hours)	The Information Technology Act 2000, Digital signature, Electronic records and governance, Cyber crimes, Offences and penalties under IT Act, 2000.	• Discussion • Lecture • Participative Learning	• Seminars on Electronic records and governance • Assignments on Offences and penalties under IT Act, 2000.	• To study about Information Technology Act 2000 • To understand about Digital signature • To understand Electronic records and governance • To study about Offences and penalties under IT Act, 2000.Offences and penalties under IT Act, 2000.	Assessment through Test papers

BC3BO4 CORPORATE ACCOUNTING

Number of Lecture Hours per week : 6
Number of Credits: 4
Internal : 20, External : 80
Examination Hours: 3

Objectives:

- To help the students to acquire conceptual knowledge of the fundamentals of the corporate accounting

Module I

Accounting for Share Capital : Issue, forfeiture and reissue of forfeited shares – Redemption of preference shares including buy-back of equity shares – Issue and redemption of debentures. 15 Hours

Module II

Final Accounts of Limited Liability Companies: Preparation of Profit and Loss Account – Profit and Loss Appropriation Account and Balance Sheet in accordance with the provisions of the existing Companies Act (excluding managerial remuneration). 15 Hours

Module III

Accounting for Amalgamation of Companies with reference to Accounting Standards issued by the Institute of Chartered Accountant of India (excluding intercompany transactions and holdings) – Accounting for Internal Reconstruction (excluding preparation of scheme for internal reconstruction 20 Hours

Module IV

Bank Accounts : General information relating to bank accounts – Legal requirements affecting final accounts – Concept of Non Performing Assets (NPA) - Preparation of Profit and Loss Accounts – Asset classification – Preparation of Balance Sheet. 20 Hours

Module V

Insurance Companies: Book maintained by insurance companies – Explanation of special terms peculiar to insurance business – Accounts for life insurance business – Types of policies – Annuity business – Surrender value – Paid up policy – Life assurance fund – Valuation balance sheet - Preparation of final accounts of life and general insurance business (as per the provisions of IRDA Act). 20 Hours

(Theory and Problems may be in the ratio of 30% and 70% respectively)

Reference Books:

1. M.C. Shukla , T.S. Grewal and S.C. Gupta : Corporate Accounting , S. Chand and Co., New Delhi.

2. R.L. Gupta and M. Radhaswamy : Corporate Accounting, Sultan Chand and Sons, New Delhi.
3. Ashok Sehgal and Deepak Sehgal : Advanced Accounting, Volume II, Taxmann, New Delhi.
4. S. P. Jain and K.L. Narang : Financial Accounting , Kalyani Publishers, New Delhi.
5. S.N. Maheswari and S.K. Maheswari : Corporate Accounting , Vikas Publication, New Delhi.
6. Dr. V.K. Goyal, Corporate Accounting , Excel Books , New Delhi.
7. Nirmal Kumar Gupta : Corporate Accounting , Sahitya Bhawan , Publishers and Distributors.

OBJECTIVES

- To enable the students to learn about techniques of preparing the financial statements in Corporate Accounting

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (15 hours)	Accounting for Share Capital : Issue, forfeiture and reissue of forfeited shares – Redemption of preference	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on share capital issue • Discussion on redemption on preference shares	• To provide knowledge about forfeiting and redemption of shares	• Evaluation done through test papers

	shares including buy-back of equity shares – Issue and redemption of debentures.				
Module II (15 hours)	Final Accounts of Limited Liability Companies: Preparation of Profit and Loss Account – Profit and Loss Appropriation Account and Balance Sheet in accordance with the provisions of the existing Companies Act (excluding managerial remuneration)	● Discussion ● Lecture ● Participative Learning	● Powerpoint presentation on final accounts of limited liability companies ● Discussion on appropriation of account with the provision of existing companies act	● To provide information about final accounts of limited liability companies	● Evaluation done through test papers

Module III (20 hours)	Accounting for Amalgamation of Companies with reference to Accounting Standards issued by the Institute of Chartered Accountant of India (excluding intercompany transactions and holdings) – Accounting for Internal Reconstruction (excluding preparation of scheme for internal reconstruction	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on Accounting for amalgamation of companies • Discussion on accounting for internal reconstruction	• To familiarise the students about the amalgamation of companies with reference to accounting standards • To provide knowledge about internal reconstruction	• Evaluation done through test papers

Module IV (20 hours)	Bank Accounts : General information relating to bank accounts – Legal requirements affecting final accounts – Concept of Non Performing Assets (NPA) - Preparation of Profit and Loss Accounts – Asset classification – Preparation of Balance Sheet	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on Concept of NPA • Discussion on general information relating to bank accounts and legal requirement affecting final accounts	• To provide knowledge about general accounts relating to bank accounts	• Evaluation done through test papers
Module V (20 hours)	Insurance Companies: Book maintained by insurance companies – Explanation of special terms peculiar to insurance	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on Insurance companies • Powerpoint presentation on preparation on final accounts of life and general	• To familiarise the students about the information on the insurance companies	• Evaluation done through test papers

	business – Accounts for life insurance business – Types of policies – Annuity business – Surrender value – Paid up policy – Life assurance fund – Valuation balance sheet - Preparation of final accounts of life and general insurance business (as per the provisions of IRDA Act)		insurance		

BC3C03 E-COMMERCE MANAGEMENT

Number of Lecture Hours per week: 5

Number of Credits: 4
Internal : 20, External : 80
Examination Hours: 3

Objectives:

- To enable the student to understand basics of E - Commerce

Module I

Introduction to E- commerce : Meaning and concept - E – commerce V/s Traditional Commerce - E- Business & E- Commerce - History of E - Commerce - EDI - Importance , features & benefits of E- Commerce - Impacts. Challenges & Limitations of ECommerce - Supply Chain Management & E – Commerce
15 Hours

Module II

Business Models of E - Commerce: Business to Business - Business to customers - Customers to customers - Business to Government- Business to employee - E-Commerce strategy -Influencing factors of successful E- Commerce - E-Business Infrastructure -The internet -Intranets and Extranets - World Wide Web - Voice over IP (VoIP) - The Internet Standards - The HTTP Protocol - Audio and Video Standards - Managing E- Business Infrastructure - Web services - New access devices - Future of the internet infrastructure. 25 Hours

Module III

Marketing strategies & E- Commerce : Website - Components of website - Concept & Designing website for E- Commerce - Corporate Website - Portal - Search Engine - Internet Advertising - Emergence of the internet as a competitive advertising media - Models of internet advertising - Weakness in Internet advertising - Mobile Commerce. 15 Hours

Module IV

Electronic Payment System : Introduction - Online payment systems - Prepaid and postpaid payment systems - E- cash - E- Cheque - Smart Card - Credit Card - Debit

Card - Electronic purse - Security issues on electronic payment system - Solutions to security issues - Biometrics - Types of biometrics. 15 Hours

Module V

Legal and Ethical Issues in E- Commerce: Security issues in E- Commerce - Regulatory framework of E- commerce. 05 Hours

Reference Books:

1. Turban, Efraim, David King et. el.: Electronic Commerce: A Managerial Perspective, Pearson Education Asia, Delhi.
2. Dave Chaffey: E-Business and E-Commerce Management, Pearson Education.
3. Kalakota, Ravi: Frontiers of Electronic Commerce, Addison – Wesley, Delhi.
4. Rayport, Jeffrey F and Jaworksi, Bernard J: Introduction to E-Commerce, Tata McGraw Hill, New Delhi.
5. Smantha Shurety: E-Business with Net Commerce, Addison - Wesley, Singapore.
6. Rich, Jason R: Starting an ECommerce Business, IDG Books, Delhi.
7. Laudon, Kenneth C and Carol Guercio Traver: E-Commerce Business, Technology, Society, Pearson Education, Delhi.
8. Stamper David A, and Thomas L.Case: Business Data Communications, Pearson Education, New Delhi. 9. William Stallings: Business Data Communications, Pearson Education, New Delhi.

OBJECTIVES

- To Gain a practical orientation to E-Commerce and E- Business management

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment

Module I (15 hours)	Introduction to E-commerce : Meaning and concept - E – commerce V/s Traditional Commerce - E- Business & E-Commerce - History of E - Commerce - EDI - Importance , features & benefits of E-Commerce - Impacts. Challenges & Limitations of ECommerce - Supply Chain Management & E – Commerce	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on E-commerce v/s traditional commerce • Discussion on E-commerce and history of ecommerce • Seminar on EDI	• To provide knowledge about E-commerce and EDI	• Evaluation done through test papers

Module II (25 hours)	Business Models of E - Commerce: Business to Business - Business to customers - Customers to customers - Business to Government- Business to employee - E-Commerce strategy -Influencing factors of successful E-Commerce - E-Business Infrastructure -The internet -Intranets and Extranets - World Wide Web - Voice over IP (VoIP) - The Internet Standards - The HTTP Protocol - Audio and Video	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on business models of E-commerce • Discussion on factors influencing successful E-commerce	• To provide information about different models of E-commerce • To familiarise knowledge about the Internet and Intranet.	• Evaluation done through test papers

	Standards - Managing E-Business Infrastructure - Web services - New access devices - Future of the internet infrastructure				
Module III (15 hours)	Marketing strategies & E- Commerce : Website - Components of website - Concept & Designing website for E-Commerce - Corporate Website - Portal - Search Engine - Internet Advertising - Emergence of the internet as a competitive advertising media -	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on Marketing strategies in E-commerce • Discussion on the emergence of Internet as a competitive advertising media	• To provide knowledge about impact of website in E-commerce business • To provide information about emergence of internet	• Evaluation done through test papers

	Models of internet advertising - Weakness in Internet advertising - Mobile Commerce				
Module IV (15 hours)	Electronic Payment System : Introduction - Online payment systems - Prepaid and postpaid payment systems - E-cash - E-Cheque - Smart Card - Credit Card - Debit Card - Electronic purse - Security issues on electronic payment system - Solutions to security	• Discussion • Lecture • Participative Learning	• Seminar on various electronic payment system • Powerpoint presentation on security issues relating to payment system and its solutions	• To provide knowledge about electronic payment systems • To provide the security problem related with electronic payment system and its solutions	• Evaluation done through test papers

	issues - Biometrics - Types of biometrics				
Module V (05 hours)	Legal and Ethical Issues in E-Commerce: Security issues in E-Commerce - Regulatory framework of E- commerce	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on legal and ethical issues in E-commerce • Seminar on regulatory framework of E-commerce	• To familiarise the students about the legal and ethical issues in E-commerce	• Evaluation done through test papers

BC4A13 ENTREPRENEURSHIP DEVELOPMENT

Number of Lecture Hours per week : 5
Number of Credits : 4
Internal : 20, External : 80
Examination Hours: 3

Objectives:

- To familiarise the students with the concept of entrepreneurship

Module I

Entrepreneur and Fundamentals of Entrepreneurship: Entrepreneurial competencies – Factors affecting entrepreneurial growth – Role of entrepreneur in economic development - Challenges of women entrepreneurs. 20 Hours

Module II

Micro, Small and Medium Enterprises: Legal Framework – Licenses – Role of promotional institutions with special reference to KINFRA , KITCO , MSME & DICs – Concessions – Incentives and subsidies. 10 Hours

Module III

Project Management: Feasibility and Viability Analysis – Technical – Financial – Network – Appraisal and evaluation - Project Report preparation. 30 Hours

Module IV

Identification of Business Opportunities in the Context of Kerala: Rate of ED Clubs – Industrial Policies – Skill development for entrepreneurs – Business Incubation : Meaning - Setting up of Business Incubation Centres. 15 Hours

Reference Books :

1. S.S. Kanka , Entrepreneurial Development , Sultan Chand.
2. Prasanna Chandra , Project Planning, Analysis, Selection, Implementation and Review, Tata McGraw Hill.
3. Vasantha Desai , Dynamics of Entrepreneurial Development, Himalaya.
4. C.B. Gupta & N.P. Sreenivasan , Entrepreneurial Development , Sultan Chand.
5. Nirmal K Gupta , Small Industry –Challenges and Perspectives, Anmol Publications.
6. Vasantha Desai , Small scale Industries and Entrepreneurship, Himalaya.

OBJECTIVES

- To identify and develop the entrepreneurial talents of the students.
- To generate innovative business ideas in the emerging industrial scenario.

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (20 hours)	Entrepreneur and Fundamentals of Entrepreneurship: Entrepreneurial competencies – Factors affecting entrepreneurial growth – Role of entrepreneur in economic development - Challenges of women entrepreneurs	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on Entrepreneur and fundamentals of Entrepreneurs • Seminar on role of entrepreneur in economic development	• To familiarise the students with the concept of entrepreneurship	• Evaluation done through test papers
Module II (10 hours)	Micro, Small and Medium Enterprises: Legal Framework – Licenses – Role of promotional	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on Micro, small and medium Enterprises • Seminar on role of	• To familiarise the knowledge about Incentives and subsidies relating to Micro, Small and Medium	• Evaluation done through test papers

	institutions with special reference to KINFRA , KITCO , MSME & DICs – Concessions – Incentives and subsidies		promotional institutions with special reference to KINFRA, KITCO, MSME and DICs ● Discussion on incentives and subsidies	Enterprises.	
Module III (30 hours)	Project Management: Feasibility and Viability Analysis – Technical – Financial – Network – Appraisal and evaluation - Project Report preparation	● Discussion ● Lecture ● Participative Learning	● Powerpoint presentation on Feasibility and viability analysis of project management ● Discussion on project report preparation	● To familiarise the students about project feasibility and its appraisal and evaluation	● Evaluation done through test papers
Module IV (15 hours)	Identification of Business Opportunities in the Context of Kerala: Rate of ED Clubs – Industrial Policies –	● Discussion ● Lecture ● Participative Learning		● To identify and develop the entrepreneurial talents of the students. ● To generate innovative business ideas	● Evaluation done through test papers

	Skill development for entrepreneurs – Business Incubation : Meaning - Setting up of Business Incubation Centres			in the emerging industrial scenario.	

BC4A14 BANKING AND INSURANCE

Number of Lecture Hours per week: 5

NUmber of Credits: 4

Internal : 20, External : 80

Examination Hours:3

Objectives:

- To enable the students to acquire knowledge about basics of Banking and Insurance

Module I

Introduction to Banking : Meaning and definition - Origin and development of banking – Customer of a bank - Structure of banking in India – Banks and economic development – Functions of commercial banks (conventional and innovative functions) – Central bank – RBI – Functions –Emerging trends in banking. 15 Hours

Module II

Negotiable Instruments : Definition - Characteristics – Types – Parties to negotiable instruments – Cheques – Types of cheques – Crossing of cheques – Drafts - Cheque vs. Draft - Endorsement – Significance – Regularity of endorsement – Liability of endorser – Electronic payments. 15 Hours

Module III

E-Banking – Centralised Online Real time Electronic Banking (CORE) – Electronic Clearing Service (ECS) – Electronic Fund Transfer (EFT) – Real Time Gross Settlement (RTGS) – National Electronic Fund Transfer (NEFT) – Society for Worldwide Interbank Financial Telecommunication (SWIFT) – E-cheque – Any Time Money – ATM s – Credit card – Debit card – Smart card – Internet banking – Mobile banking – Telebanking. 15 Hours

Module IV

Introduction to Insurance : Concept - Need of insurance - Insurance as a social security tool - Insurance and economic development - Principles of insurance - various kinds of insurance – Life and General insurance (Fire, Marine, Medical, Personal Accident , Property and Motor Vehicles Insurance) – Features – Life Insurance Vs General Insurance. 15 Hours

Module V

Life Insurance - Law relating to life Insurance - General Principles of Life Insurance Contract; Proposal and Policy - Assignment and Nomination - Title and claims - General Insurance - Law relating to General Insurance - IRDA – Powers and functions - Insurance business in India 15 Hours

Reference Books:

1. Sheldon H.P : Practice and Law of Banking.
2. Bedi. H.L : Theory and Practice of Banking.
3. Maheshwari. S.N. : Banking Law and Practice.
4. Shekar. K.C : Banking Theory Law and Practice.
5. Pannandikar & Mithami': Banking in India.
6. Radhaswamy & Vasudevan: Text Book of Banking.
7. Indian Institute of Bankers (Pub) Commercial Banking Vol-I/Vol-II (part I& II) Vol- III.

8. Varshaney: Banking Law and Practice.
9. Dr. P. Periasamy: Principles and Practice of Insurance Himalaya Publishing House, Delhi.
10. Inderjit Singh, Rakesh Katyal & Sanjay Arora: Insurance Principles and Practices,Kalyani Publishers, Chennai.
11. M.N. Mishra: Insurance Principles and Practice, S. Chand & Company Ltd, Delhi.
12. G. Krishnaswamy : Principles & Practice of Life Insurance
13. Kothari & Bahl : Principles and Pratices of Insurance
14. B.S. Khubchandani, "Practice and Law of Banking",Ma
c Millan India Ltd ,2000.
15. K.C. Nanda," Credit Banking", Response Book, Sage Publication,1999.

OBJECTIVES

- To familiarise the students with the modern trends in banking

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (15 hours)	Introduction to Banking : Meaning and definition - Origin and development of banking – Customer of a	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on Introduction to Banking • Discussion on RBI and its important function	• To provide knowledge about banking structure of India and the functions of RBI	• Evaluation done through test papers

	bank - Structure of banking in India – Banks and economic development – Functions of commercial banks (conventional and innovative functions) – Central bank – RBI – Functions –Emerging trends in banking				
Module II (15 hours)	Negotiable Instruments : Definition - Characteristics – Types – Parties to negotiable instruments – Cheques – Types of cheques – Crossing of cheques –	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on Negotiable instrument • Discussion on electronic payment system	• To provide knowledge about various negotiable instruments • To provide information about electronic payment system	• Evaluation done through test papers

	Drafts - Cheque vs. Draft - Endorsement – Significance – Regularity of endorsement – Liability of endorser – Electronic payments				
Module III (15 hours)	E-Banking – Centralised Online Real time Electronic Banking (CORE) – Electronic Clearing Service (ECS) – Electronic Fund Transfer (EFT) – Real Time Gross Settlement (RTGS) – National Electronic Fund Transfer	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on E-banking • Discussion on Debit, Credit, ATM and Mobile banking	• To familiarise the students about E-banking	• Evaluation done through test papers

	(NEFT) – Society for Worldwide Interbank Financial Telecommunication (SWIFT) – E-cheque – Any Time Money – ATM s – Credit card – Debit card – Smart card – Internet banking – Mobile banking – Telebanking				
Module IV (15 hours)	Introduction to Insurance : Concept - Need of insurance - Insurance as a social security tool - Insurance and economic development - Principles of insurance -	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on Insurance and economic development • Discussion on various kinds if Insurance	• To enable the students to acquire knowledge about basics of Insurance	• Evaluation done through test papers

	various kinds of insurance – Life and General insurance (Fire, Marine, Medical, Personal Accident , Property and Motor Vehicles Insurance) – Features – Life Insurance Vs General Insurance				
Module V (15 Hours)	Life Insurance - Law relating to life Insurance - General Principles of Life Insurance Contract; Proposal and Policy - Assignment and Nomination -	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on Life Insurance v/s general insurance • Discussion on law relating to general insurance	• To provide knowledge about laws relating to LIC and general insurance	• Evaluation done through test papers

	Title and claims - General Insurance - Law relating to General Insurance - IRDA – Powers and functions - Insurance business in India				

BC4B05 COST ACCOUNTING

Number of Lecturer Hours per week : 6

Number of Credits : 4

Internal : 20, External : 80

Examination Hours: 3

Objectives:

- To familiarise the students with the various concepts and elements of cost.

Module I

Introduction : Definition – Meaning and scope – Objectives – Functions –Merits and Demerits – Cost Accounting and Financial Accounting – Cost classification – Elements of cost – Cost units – Cost centre – Types - Methods and Techniques of Costing . 15 Hours

Module II

Materials : Importance of Material cost control – Purchase Procedure – Store control – Types of Store - Stores Records – Perpetual Inventory – ABC Analysis -

VED Analysis – JIT Inventory – Stock levels – EOQ - Issue of materials – FIFO , LIFO , Simple and Weighted Average methods. 15 Hours

Module III

Labour and Overheads : Importance of Labour cost control – Time Keeping and Time Booking – Idle Time – Overtime – Computation of Labour cost - Remuneration Systems and Incentive Schemes. Overheads : Definition – Overhead Allocation – Apportionment – Reapportionment – Direct distribution - Step Ladder – Reciprocal Service methods – Repeated Distribution and Simultaneous Equation methods – Absorption of overheads – Methods of Absorption - Labour Hour Rate and Machine Hour Rate . 25 Hours

Module IV

Methods of Costing : Unit Costing – Job Costing – Contract Costing – Process Costing – Process Losses – Service Costing (only Transport) 15 Hours

Module V

Cost Control Techniques : Budgetary Control and Standard Costing : Budget and Budgetary Control – Need and Importance – Types of Budgets –Preparation of Financial Budget – Flexible Budget and Fixed Budget – ZBB – Programme and Performance Budgets . 15 Hours

(Theory and Problems may be in the ratio of 40% and 60% respectively)

Reference Books :

1. N.K. Prasad : Cost Accounting
2. Nigam & Sharma : Cost Accounting
3. Khanna Pandey & Ahuja : Cost Accounting
4. M.L. Agarwal : Cost Accounting
5. Jain & Narang : Cost Accounting
6. S.P. Iyengar : Cost Accounting
7. S.N. Maheswari : Cost Accounting
8. Horngren : Cost Accounting : A Managerial Emphasis.
9. M.N. Arora : Cost Accounting
10. Dutta : Cost Accounting

OBJECTIVES

- To create cost consciousness among the students

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (15 hours)	Introduction : Definition – Meaning and scope – Objectives – Functions –Merits and Demerits – Cost Accounting and Financial Accounting – Cost classification – Elements of cost – Cost units – Cost centre – Types - Methods and	• Discussion • Lecture • Participative Learning	• PowerPoint presentation on various concept and elements of cost • Discussion on difference between Cost accounting and financial accounting	• To familiarise the students with the various concepts and elements of cost.	• Evaluation done through test papers

	Techniques of Costing				
Module II (15 hours)	Materials : Importance of Material cost control – Purchase Procedure – Store control – Types of Store - Stores Records – Perpetual Inventory – ABC Analysis - VED Analysis – JIT Inventory – Stock levels – EOQ - Issue of materials – FIFO , LIFO , Simple and Weighted Average methods	• Discussion • Lecture • Participative Learning	• PowerPoint presentation on importance of Material cost control and purchase procedure • Discussion on Inventory, ABC analysis, VED analysis, JIT. • Assignment on FIFO,LIFO,Simple and Weighted Average methods problems	• To provide students about various types cost control techniques about material, labour and inventory • To familiarise students about the calculation of optimum inventory level by using FIFO, LIFO and Weighted average method.	• Evaluation done through test papers

Module III (25 hours)	Labour and Overheads : Importance of Labour cost control – Time Keeping and Time Booking – Idle Time – Overtime – Computation of Labour cost - Remuneration Systems and Incentive Schemes. Overheads : Definition – Overhead Allocation – Apportionment – Reapportionment – Direct distribution - Step Ladder – Reciprocal Service methods – Repeated Distribution and Simultaneous	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on meaning of labour, importance of labour cost, Idle time and overtime • Assignment on computation of Labour cost • Seminar on remuneration and Incentive systems	• To provide knowledge about the computation of labour cost, idle time and overtime • Familiarise the student about the various apportionment and allocation of overheads methods and techniques	• Evaluation done through test papers

	Equation methods – Absorption of overheads – Methods of Absorption - Labour Hour Rate and Machine Hour Rate				
Module IV (15 hours)	Methods of Costing : Unit Costing – Job Costing – Contract Costing – Process Costing – Process Losses – Service Costing (only Transport)	● Discussion ● Lecture ● Participative Learning	● Powerpoint presentation on methods of costing ● Assignment on Process costing	● Provide information about various methods of costing and to calculate cost per unit of each process.	● Evaluation done through test papers
Module V (15 Hours)	Cost Control Techniques : Budgetary Control and Standard Costing : Budget and Budgetary Control – Need and	● Discussion ● Lecture ● Participative Learning	● Powerpoint presentation on Cost control techniques like Budgetary control and Standard costing	● Provide knowledge about to make budget and techniques of budgetary control	● Evaluation done through test papers

	Importance – Types of Budgets –Preparation of Financial Budget – Flexible Budget and Fixed Budget – ZBB – Programme and Performance Budgets		• Seminar on need and importance of budgets and ZBB		

BC4BO6 CORPORATE REGULATIONS

Number of Lecture Hours per week : 4
Number of Credit:4
Internal : 20, External : 80
Examination Hours: 3

Objectives:

- To familiarise the students with corporate law and to make them aware of the importance of corporate governance in the management of organisations

Module I

Introduction to Companies Act 2013: Objects of the Act – Salient features of the Act - Meaning and definition of company – Features – Kinds of companies – Private company - Public company – Associate company – Dormant company -

One person company – Small company - Government company - Lifting of corporate veil. 05 Hours

Module II

Formation of Companies : Promotion – Role of promoters – Incorporation – Capital subscription – Commencement of business – Pre-incorporation and provisional contracts. Document of companies: Memorandum of Association – Definition - Contents and alteration - Doctrine of Ultravires – Articles of Association – Definition - Contents and alteration – Distinction between Memorandum and Articles - Constructive notice of Memorandum and Articles – Doctrine of Indoor management – Prospectus – Contents – Statement in lieu of prospectus – Liabilities for misstatement. 20 Hours

Module III

Share Capital : Shares – Kinds of shares – Public issue of shares – Book building - Allotment of shares - Irregular allotment – Issue prices of shares – Listing of shares - Employees stock option scheme - Sweat equity shares - Right shares – Bonus shares - Shares with differential rights – Share certificate and share warrant - Calls - Forfeiture – Surrender of shares – Buyback of shares – De materialisation and re materialisation of shares – Transfer and transmission of shares – Transfer under Depository system. 15 Hours

Module IV

Management of Companies : Board and Governance – Directors: Appointment – Position – Powers - Rights - Duties and liabilities – Qualification – Disqualification – Removal of directors – Key Managerial Personnel – Introduction to Corporate Governance – Need and importance of Corporate Governance – Corporate social responsibility. Securities and Exchange Board of India Act 1992 – Object – Establishment and management of SEBI – Powers and functions of SEBI – Securities Appellate Tribunal (SAT). 20 Hours

Module V

Company Meetings and Winding up : Requisites of a valid meeting – Statutory meeting – Annual general body meeting – Extra ordinary meeting – Board meetings – Resolutions – Types - Company Secretary : Qualification –

appointment – duties - Winding up : Meaning – Modes of winding up – Winding up by Tribunal - Members' voluntary winding up – Creditors' voluntary winding up – Liquidator: Powers - Duties and liabilities – Consequences of winding up. 15 Hours

Reference Books:

1. M.C. Shukla & Gulshan :Principles of Company Law.
2. N.D. Kapoor : Company Law and Secretarial Practice.
3. Manual of Companies Act, Corporate Laws and SEBI Guidelines", Bharat Law House, New Delhi.
4. M.C. Bhandari : Guide to Company Law Procedures.
5. Tuteja :Company Administration and Meetings.
6. S.C. Kuchal :Company Law and Secretarial Practice.
7. Dr. P.N. Reddy and H.R. Appanaiah : Essentials of Company Law and Secretarial Practice, Himalaya Publishers.
8. M.C. Kuchal : Secretarial Practice.
9. Ashok Bagrial : Secretarial Practice.

OBJECTIVES

- To enlighten the students with the management and administration of joint stock companies in India as per Companies Act, 2013

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment

Module I (05 hours)	Introduction to Companies Act 2013: Objects of the Act – Salient features of the Act - Meaning and definition of company – Features – Kinds of companies – Private company - Public company – Associate company – Dormant company - One person company – Small company - Government company - Lifting of corporate veil.	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on Introduction to companies Act 2013 • Discussion on kinds of companies	To provide information about companies act 2013	Evaluation done through test papers

Module II (20 hours)	Formation of Companies : Promotion – Role of promoters – Incorporation – Capital subscription – Commencement of business – Pre-incorporation and provisional contracts. Document of companies: Memorandum of Association – Definition - Contents and alteration - Doctrine of Ultravires – Articles of Association – Definition - Contents and alteration – Distinction between Memorandum and Articles -	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on promotion and role of promoters of companies • Seminar on different documents of companies	To familiarise the students about the formation of companies	Evaluation done through test papers

	Constructive notice of Memorandum and Articles – Doctrine of Indoor management – Prospectus – Contents – Statement in lieu of prospectus – Liabilities for misstatement				
Module III (15 hours)	Share Capital : Shares – Kinds of shares – Public issue of shares – Book building - Allotment of shares - Irregular allotment – Issue prices of shares – Listing of shares - Employees stock option scheme -	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on shares and kinds of shares • Discussion of Employees stock option scheme • Seminar on forfeiture and surrender of buy back of shares	• To provide knowledge about share capital • To provide information about buyback of shares and surrender value	Evaluation done through test papers

	Sweat equity shares - Right shares – Bonus shares - Shares with differential rights – Share certificate and share warrant - Calls - Forfeiture – Surrender of shares – Buyback of shares – De materialisation and re materialisation of shares – Transfer and transmission of shares – Transfer under Depository system				

Module IV (20 hours)	Management of Companies : Board and Governance – Directors: Appointment – Position – Powers - Rights - Duties and liabilities – Qualification – Disqualification – Removal of directors – Key Managerial Personnel – Introduction to Corporate Governance – Need and importance of Corporate Governance – Corporate social responsibility. Securities and Exchange Board of India Act 1992 – Object	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on management of companies, board and governance • Seminar on duties and responsibilities or qualification needed for appointment of directors • Powerpoint presentation on Establishment and management of SEBI	To enable students about Management of companies	Evaluation done through test papers

	– Establishment and management of SEBI – Powers and functions of SEBI – Securities Appellate Tribunal (SAT)				
Module V (15 Hours)	Company Meetings and Winding up : Requisites of a valid meeting – Statutory meeting – Annual general body meeting – Extra ordinary meeting – Board meetings – Resolutions – Types - Company Secretary : Qualification	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on requisite of a valid meetings • Seminar on qualification and appointment of company secretary	To familiarise the students about the company meeting and winding up	Evaluation done through test papers

	– appointment – duties - Winding up : Meaning – Modes of winding up – Winding up by Tribunal - Members' voluntary winding up – Creditors' voluntary winding up – Liquidator: Powers - Duties and liabilities – Consequences of winding up				

BC4C04 QUANTITATIVE TECHNIQUES FOR BUSINESS

Number of Lecture Hours per week : 5

Number of Credits : 4

Internal : 20 , External : 80

Examination Hours: 3

Objectives:

- To familiarize students with the use quantitative techniques in managerial decision making.

Module I

Quantitative Techniques – Introduction - Meaning and definition – Classification of QT - QT and other disciplines – Application of QT in business – Limitations. 05 Hours

Module II

Correlation and Regression Analysis : Meaning and definition of Correlation - Karl Pearson's co-efficient of correlation - Rank correlation - Regression – Types - Determination of simple linear regression - Coefficient of determination. 20 Hours

Module III

Set Theory - Probability: Concept of probability - Meaning and definition - Approaches to probability - Theorems of probability - Addition Theorem - Multiplication Theorem - Conditional probability - Inverse probability - Baye's Theorem. 15 Hours

Module IV

Theoretical Distribution: Binomial distribution – Basic assumptions and characteristics – Fitting of binomial distribution – Poisson distribution – characteristics - Fitting of Poisson distribution – Normal distribution – Features and properties – Standard normal curve. 15 Hours

Module V

Statistical Inference : Testing of hypothesis – Procedure – Error in testing – Two tail tests and one tail tests – Non parametric tests (Chi-square test only) - Parametric tests – Z test – Test of significance of large samples – Test for two sample means – Small sample mean tests – Students t test – Analysis of Variance – F test – One way ANOVA . 20 Hours

Reference Books :

1. Richard I. Levin and David S. Rubin, Statistics for Management, Prentice Hall of India, latest edition.
2. S.P.Gupta, Statistical Methods, Sultan Chand, latest edition
3. Sanchetti and Kapoor, Statistics, Sultan Chand.
4. G.C.Beri, "Statistics For Managemet",Tata Mc Graw Hill, 2003.
5. J.K. Sharma, "Business Statstics:, Pearson, 2004
6. Anderson Sweeney Williams, "Statistics for Business and Economics", Thomson.
7. R.P.Hooda, "Statistics for Business", Mc Millan.
8. Levine Krebiel & Bevenson, "Business Statistics", Pearson edition, Delhi.

OBJECTIVES

- To make students familiarise with basic tools of statistics and quantitative techniques applied.

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (05 hours)	Quantitative Techniques – Introduction - Meaning and definition – Classification of QT - QT and other disciplines –	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on meaning and definition of QT • Discussion on disciplines, Application of QT in business	To enable students about the term QT and its application	Evaluation done through test papers

	Application of QT in business – Limitations.				
Module II (20 hours)	Correlation and Regression Analysis : Meaning and definition of Correlation - Karl Pearson's co-efficient of correlation - Rank correlation - Regression – Types - Determination of simple linear regression - Coefficient of determination	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on meaning and definition of Correlation and regression • Assignment on Correlation and Regression	• To make students familiarise with basic tools of QT especially Correlation and Regression	Evaluation done through test papers

Module III (15 hours)	Set Theory - Probability: Concept of probability - Meaning and definition - Approaches to probability - Theorems of probability - Addition Theorem - Multiplication Theorem - Conditional probability - Inverse probability - Baye's Theorem	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on Theory of probability • Discussion on theorems of probability	• To make students familiarise with basic tools SET and Probability	Evaluation done through test papers
Module IV (15 hours)	Theoretical Distribution: Binomial distribution – Basic assumptions and characteristics – Fitting of binomial distribution – Poisson distribution –	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on theoretical distribution • Assignment on binomial and poisson distribution	To provide information about theoretical distribution	Evaluation done through test papers

	characteristics - Fitting of Poisson distribution – Normal distribution – Features and properties – Standard normal curve				
Module V (20 Hours)	Statistical Inference : Testing of hypothesis – Procedure – Error in testing – Two tail tests and one tail tests – Non parametric tests (Chi-square test only) - Parametric tests – Z test – Test of significance of large samples – Test for two sample means – Small	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on testing of hypothesis and its procedure • Discussion on one way ANOVA	• To make students familiarise with basic tools of statistics and quantitative techniques applied.	Evaluation done through test papers

	sample mean tests – Students t test – Analysis of Variance – F test – One way ANOVA				

BC5B07 ACCOUNTING FOR MANAGEMENT

Number of Lectures Hours per week : 4
Number of Credits : 4
Internal : 20, External : 80
Examination Hours: 3

Objectives:

- To enable the students to understand the concept and relevance of Management Accounting.

Module I

Management Accounting : Nature and Scope - Difference between cost Accounting, Financial accounting and Management accounting - Recent trends in Management Reporting. 05 Hours

Module II

Analysis and Interpretation of Financial Statements : Meaning - Types and Methods of Financial Analysis – Comparative Statements - Trend Analysis – Common size Statements (a general discussion only). 05 Hours

Module III

Ratio Analysis : Meaning - Nature - uses and limitations of Ratios - Liquidity, Profitability , Turnover, Solvency, Leverage. Market test Ratios. Construction of Financial Statements from ratios - Judgment of financial stability through ratios - (Focus to be given to problems solving and Interpretation skills) 25 Hours

Module IV

Fund Flow and Cash Flow Analysis :

A. Fund Flow Statements: Meaning and concept of Fund - Current and Non Current Accounts - Flow of fund - Preparation of Fund Flow statement - Uses and Significance.

B. Cash Flow Statement: Difference between Fund flow Statement and Cash flow Statement - Preparation of Cash Flow Statement as per AS - 3 Norms - Direct and Indirect methods (Stress to be given to Problems). 20 Hours

Module-V

Managerial Decision making with the help of CVP Analysis : Marginal Costing - Fixed Cost - Variable Cost - Contribution - P/V Ratio - Break Even Analysis - Algebraic and Graphic presentation - Decision making : Fixation of Selling Price - Exploring new markets - Make or Buy - Key Factor - Product Mix - Operate or Shutdown. 20 Hours

(Theory and Problems may be in the ratio of 40% and 60% respectively)

Reference Books :

1. Dr. S.N. Maheswari : Management Accounting.
2. Saxena : Management Accounting.
3. Made Gowda : Management Accounting.
4. Dr. S. N. Goyal and Manmohan : Management Accounting.
5. B. S. Raman : Management Accounting.
6. R.S.N. Pillai and Bagavathi : Management Accounting.
7. Sharma and Gupta : Management Accounting.
8. J. Batty : Management Accounting.
9. Foster : Financial Statement Analysis , Pearson Education.
10. P.N. Reddy & Appanaiah : Essentials of Management Accounting.

OBJECTIVES

- To provide the students an understanding about the use of accounting and costing data for planning, control, and decision making

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (05 Hours)	Management accounting, difference between cost accounting , financial accounting and management accounting	● Lecture ● Discussion ● Participative Learning	Online peer group discussion on recent trends in management accounting	To evaluate difference between cost accounting and management accounting To analyse recent trends in management accounting	Assessment through case study
Module II (05 Hours)	Analysis and interpretation of financial statement,methods of financial analysis	● Lecture ● Discussion ● Participative Learning	Collect final accounts of various companies and make financial analysis	To develop the skill for financial analysis on financial statement	Assessment trough assignment

Module III (25 Hours)	Ratio analysis , liquidity ratios, profitability ratios.solvency , leverage, judgement of financial stability	• Lecture • Discussion • Participative Learning	Assignment on exercise questions	To study judgement analysis on financial statement with the help of ratio analysis	Assessment trough test papers
Module IV (20 Hours)	Fund flow statement-preparation Cash flow statement - direct and indirect method	• Lecture • Discussion • Participative Learning	Assignment on exercise questions	To study the preparation of fund flow and cash flow statement	Assessment through test papers
Module V (20 Hours)	Managerial decision making with the help of CVP analysis-marginal costing,break even analysis	• Lecture • Discussion • Participative Learning	Assignment on exercise questions	To study managerial analysis through CVP analysis	Evaluation through case study

BC5B08 BUSINESS RESEARCH METHODS

Number of Lecture Hours per week : 4
Number of Credits: 4
Internal : 20, External : 80
Examination Hours: 3

Objectives:

- To enable students to acquire basic knowledge in business research methods

Module I

Business Research: Meaning and definition - Features of business research - Theory building -Induction and Deduction Theory - Concept - Operational definition - Variable - Proposition –Hypothesis - Types of business research: Basic and applied – Exploratory - Descriptive and causal - Phases of business research. 10 Hours

Module II

Exploratory Research: Objectives - Methods - Experience survey - Secondary data analysis - Case study - Pilot study by focus group interview - Process of problem definition - Understand background of the problem - Determination of unit of analysis -Determine the relevant variables and state the research questions - Hypothesis and research objectives. 10 Hours

Module III

Meaning of Research Design: Methods of descriptive and causal research - Survey - Experiments - Secondary data studies and observation - Sampling design: Simple random sampling - Restricted random sampling – Stratified - Cluster and systematic – Non random sampling - Convenient and judgment sampling - Sampling error and non sampling error. 10 Hours

Module IV

Measurement and Scaling: Nominal - Ordinal - Interval and ratio scale - Criteria for good measurement - Reliability and validity - Designing questionnaire - Means

of survey data collection - Personal interview - Telephonic mail and internet. 10 Hours

Module V

A. Data Processing: Processing stages - Editing - Coding and data entry - Descriptive analysis under different types of measurements - Percentages - Frequency table - Contingency table - Graphs - Measures of central tendency and index number - Interpretation.

B. Preparation of Research Report: Format - Report writing stages - Gathering material and data - Make overall format - Make detailed outline - Write first draft – Rewrite - Final word processing and publishing. 20 Hours

Reference Books:

1. Donald R.Cooper and Pamela S, Schindler: Business Research Methods. Latest Edition, Irwin McGraw- Hill International Editions, New Delhi.
2. John Adams, Hafiz T.A. Khan Robert Raeside, David white: Research Methods for Graduate Business and Social Science Students, Response Books. New Delhi - 110044.
3. Neresh K. Malhotra: Marketing Research, Latest edition. Pearson Education.
4. William G. Zikmund, Business Research Methods, Thomson
5. Wilkinson T.S. and Bhandarkar P.L.: Methodology and Techniques of Social Research, Himalaya
6. S N Murthy &. U Bhojanna: Business Research Methods, Excel Books, New Delhi.
7. Jan Brace: Questionnaire Design, Kogan Page India
8. Michael V.P. Research Methodology in Management, Himalaya.
9. Dipak kumar Bhattacharyya. Research Methodology. Excel Books, New Delhi.
10. R. Paneerselvan: Research Methodology, Prentice-Hall of India
11. Ajai S Gaur & Sanjaya S Gaur: Statistical Methods for Practice &. Research, Response Books, New Delhi.
12. Kultar Singh: Quantitative Social Research Methods. Response Books, New Delhi.

OBJECTIVES

- To enable the students to develop basic skills in them to conduct survey research and case studies.

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (10 hours)	• Basic concepts of Research • Process of research • Types of research • Research design • Sample design	• Discussion • Lecture • Participative Learning	• Assignment on types of research • Discussion on research design and sample design	• To study about the basic concepts of research • To learn various types of reports • To understand the difference between research design and sample design	Evaluation through test papers

Module II (10 hours)	Exploratory Research: Objectives - Methods - Experience survey - Secondary data analysis - Case study - Pilot study by focus group interview - Process of problem definition - Understand background of the problem - Determination of unit of analysis -Determine the relevant variables and state the research questions - Hypothesis and research objectives.	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on Exploratory research methods • Discussion on secondary data analysis	• To acquaint students with the process and methodology of research To enable students to identify research problems, collect and analyse data and present results.	Evaluation done through question papers

Module III (10 hours)	• Population survey and sample study • Sampling theories • Techniques of sampling • Sampling errors and non sampling errors • Optimum sample size	• Discussion • Lecture • Participative Learning	• PPT on sampling theories • Seminar on techniques of sampling	• To study various techniques of sampling and theories • To understand the difference between population survey and sample study	Assessment through viva

Module IV (10 hours)	Measurement and Scaling: Nominal - Ordinal - Interval and ratio scale - Criteria for good measurement - Reliability and validity - Designing questionnaire - Means of survey data collection - Personal interview - Telephonic mail and internet.	• Discussion • Lecture • Participative Learning	• Assignment on various measurement and scaling methods	• To learn about various measurement and scaling methods	Assessment through test papers
Module V (20 Hours)	A. Data Processing: Processing stages - Editing - Coding and data entry - Descriptive analysis under different types of	• Discussion • Lecture • Participative Learning	• Assignment on various types of research reports • Peer learning on format of research report	• To study about various types of research report • To understand the format of report	Assessment through viva

	measurements - Percentages - Frequency table - Contingency table - Graphs - Measures of central tendency and index number - Interpretation. B. Preparation of Research Report: Format - Report writing stages - Gathering material and data - Make overall format - Make detailed outline - Write first draft – Rewrite - Final word processing and publishing				

BC5B09 HUMAN RESOURCES MANAGEMENT

Number of Lecture Hours per week : 4

Number of Credits : 4

Internal : 20, External : 80

Examination Hours: 3

Objectives:

- To familiarize the students with the different aspects of managing human resources in an organization.

Module I

Introduction to Human Resource Management : Concept – Scope – Importance – Objectives and functions of Human Resource Management – Personnel Management Vs Human Resource Management - Human resource planning, Recruitment and Selection : Manpower planning – Concept and objectives – Process of manpower planning – Methods of manpower planning – Conventional Vs Strategic planning – Recruitment : Meaning – Sources of recruitment – Modern trends in recruitment - Selection : Meaning and importance – Steps in selection procedure – Interviews – Types of interview – Test – Types of test – Induction – Job changes – Transfer – Promotion – Demotion – Separation. 20 Hours

Module II

Human Resource Development: Training – Concept – Need for training – Objectives – Approaches – Methods of training – Training environment – Areas of training – Training evaluation – Executive development – Process and techniques . 15 Hours

Module III

Performance Appraisal and Career Planning : Need and importance – Objectives – Process – Methods and problems of performance appraisal – Concept of career planning – Features – Methods – Uses – Career development . 15 Hours

Module IV

Compensation Management : Compensation planning – Objectives – Wage systems – Factors influencing wage system – Components of employee remuneration – Basic wage – Dearness Allowance – Bonus – Fringe benefits and incentives 15 Hours

Module V

Grievance redressal : Meaning and causes of grievances – Procedure of grievance handling – Absenteeism – Discipline – Essentials of good discipline system. 10 hours

Reference Books :

1. Bernardin. John H, Human Resource Management. Tata McGraw Hill. New Delhi.
2. Arthur M, Career Theory Handbook, Prentice Hall Inc. Englewood Cliff.
3. Belkaoui, A.R. and Belkaoui J.M, Human Resource Valuation: A Guide to Strategies and Techniques, Quarum Books, Greenwood, 1995.
4. Dale, B, Total Quality and Human Resources: An Executive Guide. Blackwell, Oxford.
5. Greenhaus, J.H.. Career Management, Dryden, New York.
6. Mabey, C and Salama, G., Strategic Human Resource Management. Blackwell. Oxford.
7. Aswathappa, K., Human Resource Management
8. Subba Rao, Human Resources Management.
9. Michael Porter. HRM and Human Relations
10. Garry Dessler & Biju Varkkey, Human Resource Management, Pearson, 2012.
11. Amstrong's Handbook of Human Resource Management ,Kogan Page, 2012.

OBJECTIVES

- To equip the students with basic knowledge and skills required for the acquisition, development and retention of human resources.

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (20 hours)	Introduction to Human Resource Management : Concept – Scope – Importance – Objectives and functions of Human Resource Management – Personnel Management Vs Human Resource Management - Human resource planning, Recruitment and Selection : Manpower planning – Concept and objectives – Process of	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on concept of human resource management and its objectives and functions • Discussion on manpower planning, its objectives and recruitment process • Seminar on various procedure relating to selection	• To familiarize the students with the different aspects of managing human resources in an organization. • To provide basic knowledge about the criteria included in recruitment and selection	Evaluation done through test papers

	manpower planning – Methods of manpower planning – Conventional Vs Strategic planning – Recruitment : Meaning – Sources of recruitment – Modern trends in recruitment - Selection : Meaning and importance – Steps in selection procedure – Interviews – Types of interview – Test – Types of test – Induction – Job changes – Transfer – Promotion – Demotion – Separation.				

Module II (15 hours)	Human Resource Development: Training – Concept – Need for training – Objectives – Approaches – Methods of training – Training environment – Areas of training – Training evaluation – Executive development – Process and techniques	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on concept of training, methods and approaches of training • Discussion the areas of training and training evaluation	• To familiarise the students about the training needs and its essentials.	Evaluation done through test papers
Module III (15 hours)	Performance Appraisal and Career Planning : Need and importance – Objectives – Process – Methods and problems of performance appraisal –	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on meaning, importance and methods of performance planning • Discussion on Career planning and development	• To familiarise the students about various techniques used in performance appraisal • To help students the need for career development and planning	Evaluation done through test papers

	Concept of career planning – Features – Methods – Uses – Career development				
Module IV (15 hours)	Compensation Management : Compensation planning – Objectives – Wage systems – Factors influencing wage system – Components of employee remuneration – Basic wage – Dearness Allowance – Bonus – Fringe benefits and incentives	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on wage systems and factors affecting wage system • Seminar on components various employee remuneration	• To provide knowledge about various compensation packages relating to employee	Evaluation done through test papers

Module V (10 Hours)	Grievance redressal : Meaning and causes of grievances – Procedure of grievance handling – Absenteeism – Discipline – Essentials of good discipline system.	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on meaning of grievance redressal and the procedure of grievance handling • Seminar on Absenteeism and essentials of a good discipline	• To provide knowledge about Grievance redressal procedures.	Evaluation done through test papers

BC5 B10 FINANCIAL REPORTING

Number of Lecture Hours per week: 5

Number of Credits: 4

Internal : 20, External : 80

Examination Hours: 3

Objectives:

- To enable the students to have a basic knowledge of the latest financial reporting standards.

Module I

Basics Of Financial Reporting: Objectives and uses of financial statements for users - Role/objectives of accounting standards - Development of accounting standards in India - Requirements of international accounting standards - International organizations engaged in accounting harmonization - IASB - FASB - Role of IASB in developing IFRS - IFRS adoption or convergence in India - Implementation plan in India - Ind AS - Differences between Ind AS and IFRS -

Conceptual framework - Definition of financial elements - Principles of recognition, measurements, presentation and disclosure. 10 Hours

Module II

Assets Based Accounting Standards: Accounting for tangible non-current assets (IAS 16 and Ind AS 16) - Accounting for intangible assets (IAS 38 and Ind AS 38) - Accounting for impairment of assets (IAS 36 and Ind AS 36) – Inventories (IAS 2 and Ind AS 2) - Accounting for borrowing costs (IAS 23 and Ind AS 23). 15 Hours

Module III

Revenue And Liabilities Based Accounting Standards: Revenue from contracts with customers (IFRS 15 and Ind AS 115) - Income tax (IAS 12 and Ind AS 12) - Employee benefits (IAS 19 and Ind AS 19) - Provisions, contingent liabilities and contingent assets (IAS 37 and Ind AS 37) - Share based payments (IFRS 2 and Ind AS 102) – Accounting for taxation (IAS 12). 15 Hours

Module IV

Other Reporting Standards: Accounting for financial and operating leases (IAS 17 and Ind AS 17) - Accounting for basic and diluted earnings per share (IAS 33 and Ind AS 33) - Accounting for agriculture (IAS 17 and Ind AS 41) - Disclosure of related party transactions (IAS 24 and Ind AS 24) - Interim reporting (IAS 34 and Ind AS 34) - Operating segments (IFRS 8 and Ind AS 108). 15 Hours

Module V

Preparation Of Single Entity Financial Statements: Presentation of financial statements (IAS 1 and Ind AS 1) - Accounting policies, accounting estimates (IAS 8 and Ind AS 8) - Events after reporting date (IAS 10 and Ind AS 10) - Structure and content of financial statements - Preparation of financial statements : Statement of Financial Position (SOFP) - Statement of Profit or Loss (SOPL) - Statement of Changes in Equity (SOCE) - Cash Flow Statement (SOCF) (IAS 7 and Ind AS 7). 20 Hours

(Basic knowledge in Accounting Standards and simple problems only are expected. Theory and Problems may be in the ratio of 40% and 60% respectively)

Reference Books:

1. Chintan Patel, Bhupendra Mantri, Indian Accounting Standards, Taxmann Publications.
2. T. P, Ghosh , Illustrated Guide To Indian Accounting Standards, Taxmann Publications.
3. B. D, Chatterjee, Illustrated Guide To Indian Accounting Standards, Taxmann Publications.
4. Dolphy D'Souza, Vishal Bansal, Indian Accounting Standards, Snow White Publications.
5. ICAI, Study material of ICAI – Financial Reporting (Final level).
6. IASB, IFRS (Red Book).

OBJECTIVES

- To help the students to learn various decisions about how to manage the business

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (10 hours)	Basics Of Financial Reporting: Objectives and uses of financial statements for users - Role/objectiv	• Discussion • Lecture • Participative Learning	Assignment on financial reporting Seminars on accounting standards	To study the relevance of financial reporting To understand role and objectives of accounting standards	Assessment through test paper

	es of accounting standards				
Module II (15 hours)	Assets Based Accounting Standards: Accounting for tangible non-current assets (IAS 16 and Ind AS 16)	• Discussion • Lecture • Participative Learning	Assignment on asset based standards	To get a detailed view on asset based standards	Assessment through case study
Module III (15 hours)	Revenue And Liabilities Based Accounting Standards	• Discussion • Lecture • Participative Learning	Seminars on revenue and liabilities based standards	To understand more about revenue and liabilities based accounting standards	Assessment through test paper
Module IV (15 hours)	Other Reporting Standards	• Discussion • Lecture • Participative Learning	Assignments on other reporting standards Discussion on different standards	To evaluate different reporting standards	Assessment through case study

Module V (20 Hours)	Preparation of Single Entity Financial Statements: Presentation of financial statements (IAS 1 and Ind AS 1)	• Discussion • Lecture • Participative Learning	Discussions on presentation of financial statements	To study single entity financial statements presentation	Assessment through case study

BC5B10 BUSINESS APPLICATIONS OF COMPUTERS

Number of Lecture Hours per week : 5
Number of Credits : 4
Internal : 20, External : 80
Examination Hours: 3

Objectives:

- To help the students to acquire basic knowledge about computer and its applications in various areas of business

Module I

Computer Systems : Introduction - Types of computer systems – Data - Information – Data Processing - Data storage and Data retrieval - Importance of computers in business - Computer applications in various areas of business.
10 Hours

Module II

Operating Systems: Introduction -Types of operating systems :DOS - Internal commands - External commands - Windows - UNIX - Windows NT - Windows 98 – Windows XP – Advanced features - Linux – Linux distributions - Free software

and open source software - Batch - Online - Real time system - Time sharing - Multiprogramming and Multiprocessing systems. 20 Hours

Module III

Networking : Networking basics - Sharing data anywhere, anytime - The uses of a network - Common types of networks - Hybrid networks – Structure of network – Network topologies and protocols - Network media - Network hardware - Local and Wide Area Network – E-commerce – Intranet – Extranet - E-mail and its uses - World Wide Web. 15 Hours

Module IV

Introduction to Information Technology Act - Computer ethics and security issues – System Security – Definitions - Threats to system security - Control measures - Disaster/Recovery - Ethics codes and standard of behavior - Modern trends and technologies in computer application : Mobile connectivity – Wireless delivery technology - Mobile information access devices - M-business 20 Hours

Module V

Social Communication Network System : Introduction - Types - Facebook – TwitterWhatsApp - YouTube – Skype – Google plus - Impacts of social communication networking. 10 Hours

Reference Books :

1. Rajaraman , Introduction to Information Technology, PHI
2. Rajaraman , Fundamentals of Computers 4/E, PHI
3. P. Mohan , Fundamentals of Computers, Himalaya Publishing House
4. Dennis P. Curtin , Information Technology, McGraw Hill International
5. Behrouz A. Forouzan , Data Communication and Networking 2nd edition , McGraw- Hill
6. Avi Silberschatz, Peter Galvin & Greg Gagne Willey, Operating System Concepts (Windows XP update).
7. Uyless Black , Computer Networks Protocols, Standards and Interface: Prentice Hall India Pvt. Ltd.
8. P.K.Sinha and Priti Sinha , Computer Fundamentals .
9. Basandara , Computer Today

10. Alfred Glkossbrenner , Internet 101 Computing MGH, 1996
11. Alex Leon & Mathews Leon, Fundamentals of Information Technology, Leon Techworld, 1999.
12. Vikas Gupta, Comdex Computer Kit, Wiley Dream Tech, Delhi, 2004
13. P. K. Sinha & Priti Sinha , Computer Fundamentals, BPB Public

OBJECTIVES

- To enable the students to understand the modern trends and technologies in computer applications.

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (10 hours)	Computer Systems, Types of computer systems, Data, Information, Data storage and Data retrieval, Computer applications in various areas of business.	• Discussion • Lecture • Participative Learning	• Power Point presentation on Computer applications in various areas of business. • Discussion about Data storage and Data retrieval	• To study Computer Systems and Types of computer systems • To understand what is Data and Information • To understand the process of Data storage and Data retrieval	Evaluation through Test papers

				• To study about Computer applications in various areas of business.	
Module II (20 hours)	Operating Systems, Types of operating systems, Windows, UNIX, Linux distributions, Real time system, Multiprogramming and Multiprocessing systems.	• Discussion • Lecture • Participative Learning	• Seminar on Operating Systems and Types of operating systems • Discussion on Multiprogramming and Multiprocessing systems.	• To study about Operating Systems and Types of operating systems • To understand Windows, UNIX, Linux distributions • To evaluate Real time system • To understand Multiprogramming and Multiprocessing systems.	Assessment through descriptive exam
Module III (15 hours)	Networking, The uses of a network, Hybrid networks, Network topologies and protocols, E-commerce	• Discussion • Lecture • Participative Learning	• Discussion on lNetwork topologies and protocols • Assignment on E-commerce	• To study about Networking and The uses of a network • To understand Hybrid networks • To evaluate Network topologies and protocols	Evaluation through MCQ and Test papers

				• To study about E-commerce	
Module IV (20 hours)	Introduction to Information Technology, Act, System Security, Threats to system security, Ethics codes and standard of behavior, Wireless delivery technology, Mobile information access devices, M-business	• Discussion • Lecture • Participative Learning	• Seminar on Information Technology Act • Assignment onMobile information access devices	• To study about Information Technology Act • To understand Threats to system security • To evaluate Wireless delivery technology • To understand Ethics codes and standard of behavior • To analyse Mobile information access devices.	Evaluation through Test papers
Module V (10 Hours)	Social Communication Network,Types - Facebook , Twitter, WhatsApp, YouTube, Skype, Google plus, Impacts of social communication networking	• Discussion • Lecture • Participative Learning	• Presentation on Social Communication Network • Discussion on Impacts of social communication networking	• To study about Social Communication Network • To understand different Types of Social Communication Network-Facebook, Twitter, WhatsApp, YouTube, Skype, Google	Evaluation through MCQ

				plus	

BC5B11 FINANCIAL MANAGEMENT

Number of Lecture Hours per week: 5
Number of Credits: 4
Internal : 20, External : 80
Examination Hours: 3

Objectives:

- To familiarize the students with the concepts, tools and practices of financial management

Module I

Introduction: Nature, scope and objectives of financial management - Time value of money and mathematics of finance - Concept of risk and return. 10 Hours

Module II

Investment Decision: Capital budgeting process - Estimation of relevant cash flows - Payback Period method - Accounting Rate of Return - Net Present Value - Net Terminal Value - Internal Rate of Return - Profitability Index - Capital budgeting under risk - Certainty Equivalent Approach and Risk Adjusted Discount Rate. 20 Hours

Module III

Financing Decision: Cost of capital and financing decision - Estimation of components of cost of capital : Equity capital - Retained earnings - Debt and Preference capital - Weighted average cost of capital and Marginal cost of capital - Sources of long term financing - Capital structure - Operating and financial leverage - Determinants of capital structure. 20 Hours

Module IV

Dividend Decision: Relevance and irrelevance of dividend decision - Cash and stock dividends - Dividend policy in practice. 10 Hours

Module V

Working Capital Management: Meaning and nature of working capital - Determination of working capital requirement - A brief overview of Cash management, Inventory management and Receivables management. 15 Hours

(Theory and problems may be in the ratio of 50% and 50% respectively)

Reference Books:

1. Home, J.C. Van: "Financial Management and Policy". Prentice Hall of India , New Delhi.
2. Khan and Jain: "Financial Management Text and Problems", Tata McGraw Hill, New Delhi.
3. Pandey, I.M: "Financial Management", Vikas Publications.
4. Bhalla, V.K.: "Financial Management & Policy," Anmol Publications. Delhi.
5. Chandra, P: "Financial Management - Theory and Practice", Tata Mc Graw Hill.
6. Singh, J.K.: "Financial Management- Text and Problems". Dhanpat Rai and Company. Delhi.
7. R. S. Kulshrestha: Financial Management. Sahitya Bhawan.
8. R. P. Rastogi: Fundamentals of Financial Management, Galgotia Publications. New Delhi.
9. Ravi M Kishore: Fundamentals of Financial Management. Taxmann Publications.).
10 Bhattacharya, Hrishikas: Working Capital Management - Strategies and Techniques, Prentice Hall of India, New Delhi.

OBJECTIVES

- To learn about the decisions and processes of financial management in a business firm.

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (10 hours)	Introduction: Nature, scope and objectives of financial management - Time value of money and mathematics of finance	● Discussion ● Lecture ● Participative Learning	Group discussion on introduction to financial management	To develop the skill for financial management To analyse time value of money	Assessment through test paper
Module II (20 hours)	Investment Decision: Capital budgeting process - Estimation of relevant cash flows	● Discussion ● Lecture ● Participative Learning	Assignment on exercise questions	To understand investment decision and and different techniques	Assessment through test paper

Module III (20 hours)	Financing Decision: Cost of capital and financing decision - Estimation of components of cost of capital	• Discussion • Lecture • Participative Learning	Presentations on different types of cost of capital	To understand more about components of cost of capital To study financial decision	Assessment through seminars
Module IV (10 hours)	Dividend Decision: Relevance and irrelevance of dividend decision - Cash and stock dividends - Dividend policy in practice.	• Discussion • Lecture • Participative Learning	Assignment and group discussion	To study about dividend decision To evaluate relevance of dividend decision and dividend policy	Assessment through case study

Module V (15 Hours)	Working Capital Management: Meaning and nature of working capital - Determination of working capital requirement	• Discussion • Lecture • Participative Learning	Assignment and presentations	To understand working capital management To get a detailed explanation on determinants of working capital requirement	Assessment through test paper

BC5B11 BUSINESS INFORMATION SYSTEMS

Number of Lecture Hours per week : 5

Number of Credits : 4

Internal : 20, External : 80

Examination Hours: 3

Objectives:

- To enable the students to acquire basic knowledge in information technology and its relevance to the various areas of business.

Module I

Information Technology in Business: Business pressures - Global competition - Real-time operations - Workforce customer behaviour - Technological innovation and obsolescence - Organizational responses - Strategic alliances - Office automation technologies -Overview of information systems - IT support at

different organizational levels – Managing information systems in organizations. 15 Hours

Module II

Data, Information and Knowledge: Definition of information - History of information - Quality of information - Information processing - Management decision making - IT support for management decision making - Data transformation and management - Decision Support Systems (DSS) - Characteristics and capabilities of DSS - Components and structures of DSS - Data and information analysis. 15 Hours

Module III

Information Systems for Enterprise: Information and enterprises - Information systems to support business functions - Functional information systems - Management information systems - Transaction processing information systems - Integrated information systems - Enterprise Resource Planning (ERP) - Advantages of ERP - Benefits of an ERP system - Inter-organizational information systems - Global information systems - Information as a competitive weapon.
15 Hours

Module IV

Database Management Systems : DBMS - Definition - Necessity of a database - Characteristics of database - Database management systems - Types of database management systems - Logical data models - Hierarchical model - Network model - Relational model - Object-oriented model - Object relational model - Deductive/inference model - Comparison between various database models.
15 Hours

Module V

Computer Software : Definition - Hardware/Software interaction - Software categories - Retail software - Public domain software - Shareware - Freeware - Crippleware - Classification of software - Utilities - Compilers and interpreters - Word processor - Spreadsheets Presentation software - Image processors - Enterprise software. 15 Hours

Reference Books :

1. Alexis Leon, Mathews Leon, and Vijay Nicole , Introduction to Information Systems, Imprints Private Limited, Chennai, 2004.
2. Uma G Gupta, Management Information Systems, Galgotia Publications Pvt Ltd, New Delhi, 1993
3. Bob Hughes and Mike Cotterell , Software Project Management, Third Edition, , Tata McGraw- Hill Pushing Company Limited, New Delhi, 2004.
4. Henry C.Lucas, Information Technology for Management

OBJECTIVES

- To help the students to understand the relevance of Information Technology in various areas of business.

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Outcome	Assessment
Module I (15 hours)	Information Technology in Business, Global competition, Technological innovation and obsolescence, Real-time operations, Strategic	● Discussion ● Lecture ● Participative Learning	● Presentation on Overview of information systems ● Seminar on Office automation technologies	● To study about Information Technology in Business ● To understand Global competition and Real-time operations ● To understand Office	Assessment through Test papers

	alliances, Overview of information systems, Office automation technologies, IT support at different organizational levels, Managing information systems in organizations			automation technologies ● To study about how IT support at different organizational levels ● To understand Managing information systems in organizations	
Module II (15 hours)	Data, Information and Knowledge, Information processing, IT support for management decision making, Decision Support Systems (DSS), Characteristics and capabilities of DSS, Data and information analysis.	● Discussion ● Lecture ● Participative Learning	● Seminar on Decision Support Systems (DSS), its characteristics and Components ● Assignment on Data and information analysis.	● To study about Data, Information and Knowledge ● To understand Information processing ● To evaluate how IT support for management decision making ● To understand Decision Support Systems (DSS), its Characteristics and	Evaluation through MCQ

				capabilities of DSS ● To study about Data and information analysis.	
Module III (15 hours)	Information Systems for Enterprise, Management information systems, Enterprise Resource Planning (ERP), Advantages, Global information systems, Information as a competitive weapon.	● Discussion ● Lecture ● Participative Learning	● Discussion on Information as a competitive weapon. ● Assignments Global information systems	● To study about Enterprise Resource Planning (ERP) ● To understand Global information systems ● To evaluate Information systems to support business functions ● To study about Information as a competitive weapon.	Evaluation through descriptive exam

Module IV (15 hours)	Database Management Systems-Definition, Necessity, Characteristics, Databasemanagement systems, Logical data models, Object-oriented model, Comparison between various database models.	• Discussion • Lecture • Participative Learning	• Assignment on Database Management Systems and its Definition, Necessity and Characteristics. • Discussion on Object-oriented model	• To understand what is Database Management Systems • To study Logical data models • To analyse Object-oriented modelAssignment on • Evaluate Comparison between various database models.	Assessment through Test papers
Module V (15 Hours)	Computer Software, Software categories, Public domain software, Classification of software, Wordprocessor, Spreadsheets, Presentation software, Enterprise software.	• Discussion • Lecture • Participative Learning	• Assignment on Computer Software and its categories and classification • Peer Group Discussion on Enterprise software.	• To study about Computer Software and Software categories • To understand Public domain software • To evaluate Classification of software • To understand about Spreadsheets Presentation software	Assessment through Essay Writing

BC5D01 E-COMMERCE

Number of Lecture Hours per week: 3

Number of Credits : 2

Internal : 10, External : 40

External Hours: 1.5

Objectives:

- To enable the students to understand basics of E- Commerce

Module I

Introduction to ECommerce: Meaning and concept - E-Commerce v/s Traditional Commerce - E-Business &. E-Commerce – History of E- Commerce - EDI - Importance, features & benefits of E- Commerce - Impacts, challenges & limitations of E-Commerce - Supply chain management & E-Commerce - E-Commerce infrastructure. 10 Hours

Module II

Business Models of E - Commerce: Business to business - Business to customers - customers to customers - Business to government - Business to employee - E - Commerce strategy - Influencing factors of successful E- Commerce. 10 Hours

Module III

Marketing Strategies & E – Commerce : Website - Components of website - Concept & designing website for E- Commerce - Corporate website - Portal - Search Engine - Internet advertising - Emergence of the internet as a competitive advertising media - Models of internet advertising - Weakness in internet advertising - Mobile commerce. 10 Hours

Module IV

Electronic Payment System : Introduction - Online payment systems - prepaid and postpaid payment systems - E-cash - E- cheque - Smart card - Credit card - Debit card - Electronic purse - Security issues on electronic payment system - Solutions to security issues - Biometrics - Types of biometrics. 15 Hours

Module V

Legal and Ethical Issues in E- Commerce : Security issues in E- Commerce – Regulatory framework of E-Commerce. 05 Hours

Reference Books:

1. Turban, Efraim, David King et. el.: Electronic Commerce: A Managerial Perspective, Pearson Education Asia, Delhi.
2. Kalakota, Ravi: Frontiers of Electronic Commerce, Addison - Wesley, Delhi.
3. Rayport, Jeffrey F and Jaworksi. Bernard J: Introduction to E-Commerce, Tata Mc Graw Hill, New Delhi.
4. Smantha Shurety,: E-Business with Net Commerce, Addison - Wesley, Singapore.
5. Rich, Jason R: Stalling an E-Commerce Business, IDG Books, Delhi.
6. Laudon, Kenneth C and Carol Guercio Traver : E-Commerce business. Technology. Society, Pearson Education, Delhi.
7. Stamper David A. and Thomas L.Case: Business Data Communications, Pearson Education, New Delhi.
8. Willam Stallings: Business Data Communications. Pearson Education, New Delhi.

OBJECTIVES

- To Gain a practical orientation to E-Commerce and E- Business management.

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (10 hours)	Introduction to ECommerce: Meaning and concept - E-Commerce v/s Traditional Commerce - E-Business &. E-Commerce – History of E- Commerce - EDI - Importance, features & benefits of E-Commerce - Impacts, challenges & limitations of E-Commerce - Supply chain management & E-Commerce	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on meaning and concept of E-commerce • Discussion on Traditional v/s E-commerce	• To enable the students to understand basics of E-Commerce	Assessment done through test papers

	- E-Commerce infrastructure				
Module II (10 hours)	Business Models of E - Commerce: Business to business - Business to customers - customers to customers - Business to government - Business to employee - E - Commerce strategy - Influencing factors of successful E-Commerce	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on business models of E-commerce • Discussion on factors influencing successful E-commerce	• To provide information about different models of E-commerce • To familiarise knowledge about the Internet and Intranet.	• Evaluation done through test papers
Module III (10 hours)	Marketing Strategies & E – Commerce : Website - Components of website - Concept & designing website for E-Commerce -	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on Marketing strategies in E-commerce • Discussion on the emergence of Internet as a competitive advertising media	• To provide knowledge about impact of website in E-commerce business • To provide information about emergence of internet	• Evaluation done through test papers

	Corporate website - Portal - Search Engine - Internet advertising - Emergence of the internet as a competitive advertising media - Models of internet advertising - Weakness in internet advertising - Mobile commerce				
Module IV (15 hours)	Electronic Payment System : Introduction - Online payment systems - prepaid and postpaid payment systems - E-cash - E-cheque -	• Discussion • Lecture • Participative Learning	• Seminar on various electronic payment system • Powerpoint presentation on security issues relating to payment system and its solutions	• To provide knowledge about electronic payment systems • To provide the security problem related with electronic payment system and its solutions	• Evaluation done through test papers

	Smart card - Credit card - Debit card - Electronic purse - Security issues on electronic payment system - Solutions to security issues - Biometrics - Types of biometrics				
Module V (05 Hours)	Legal and Ethical Issues in E-Commerce : Security issues in E-Commerce – Regulatory framework of E-Commerce	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on legal and ethical issues in E-commerce • Seminar on regulatory framework of E-commerce	• To familiarise the students about the legal and ethical issues in E-commerce	• Evaluation done through test papers

BC6B12 INCOME TAX LAW AND PRACTICE

Number of Lecture Hours per week: 6

Number of Credits: 4

Internal : 20, External : 80

Examination Hours: 3

Objectives:

- To impart basic knowledge of Income - tax Act, 1961 amended up to date.

Module I

Basic Concepts: Income - Agricultural income - Person - Assessee - Assessment Year - Previous Year - Gross total income - Total income - Maximum marginal rate of lax - Residential status - Scope of total income on the basis of residential status - Exempted income under section 10. 10 Hours

Module II

Computation of Income Under Different Heads: Salaries - Allowances - Perquisites - Profit in lieu of salary - Gratuity - Pension - Income from house property: Annual Value of House property - Computation under different circumstances - Deduction from annual value. 25 Hours

Module III

Profits and Gains of Business or Profession: Definition - Computation - Allowable expenses and not allowable expenses - General deductions - Provisions relating to Depreciation. 15 Hours

Module IV

Capital Gains: Definition of Capital Assets - Long term and Short term - Transfers - Cost of acquisition - Cost of improvement - Exempted Capital gains. Income from Other Sources: Definition - Computation - Grossing up - Deductions and other relevant provisions. 20 Hours

Module V

Total Income and Tax Computation: Income of other persons included in assessee's total income - Aggregation of income and set- off and carry forward of losses - Deductions from gross total income - Computation of Total Income of individuals. 20 Hours

(Theory and problems may be in the ratio of 40% and 60% respectively .Only simple problems are to be expected)

Reference Books :

1. Dr. Vinod K. Singhania : Direct Taxes - Law and Practice, Taxman publication.
2. B.B. Lal : Direct Taxes, Konark Publisher (P) ltd.
3. Bhagwathi Prasad : Direct Taxes - Law and Practice. Wishwa Prakashana.
4. Dr. Mehrotra and Dr. Goyal : Direct Taxes - Law and Practice, Sahitya Bhavan Publication.
5. Dinakar Pagare : Law and Practice of Income Tax. Sultan Chand and sons
6. Gaur & Narang : Income Tax.

OBJECTIVES

- To equip students with application of principles and provisions of Income - tax Act, 1961 amended up to date

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (10 hours)	Basic Concepts: Income - Agricultural income - Person - Assessee - Assessment Year -	● Discussion ● Lecture ● Participative Learning	● Discussion on the basic concepts of Income Tax and Agricultural Income ● Discussion on residential status and	● Understand the basic concepts of Income Tax and Agricultural Income	Evaluation through test papers.

	Previous Year - Gross total income - Total income - Maximum marginal rate of lax - Residential status - Scope of total income on the basis of residential status - Exempted income under section 10.		exempted Income		
Module II (25 hours)	Computation of Income Under Different Heads: Salaries - Allowances - Perquisites - Profit in lieu of salary - Gratuity - Pension - Income from house property:	● Discussion ● Lecture ● Participative Learning	● Discussion on how to compute income under the heads salary and house property.	To equip students to compute income under the heads salary and house property.	Evaluation through test papers and spot assignments.

	Annual Value of House property - Computation under different circumstances - Deduction from annual value.				
Module III (15 hours)	Profits and Gains of Business or Profession: Definition - Computation - Allowable expenses and not allowable expenses - General deductions - Provisions relating to Depreciation.	• Discussion • Lecture • Participative Learning	A detailed discussion on the computation of income under the head Profits and Gains of Business or Profession	To equip students to compute income coming under the head Profits and Gains of Business or Profession.	Evaluation through test papers and Assignments.

Module IV (20 hours)	Capital Gains: Definition of Capital Assets - Long term and Short term - Transfers - Cost of acquisition - Cost of improvement - Exempted Capital gains. Income from Other Sources: Definition - Computation - Grossing up - Deductions and other relevant provisions.	• Discussion • Lecture • Participative Learning	Discussion on computation of Income under the heads Capital Gains and Other Sources	• Understand the concepts related to the head Capital Gains such as capital assets and liabilities, cost of acquisition and cost of improvement. • To learn how to compute income under the heads capital gains and other sources	Evaluation through test papers and Assignments

Module V (20 Hours)	Total Income and Tax Computation: Income of other persons included in assessee's total income - Aggregation of income and set- off and carry forward of losses - Deductions from gross total income - Computation of Total Income of individuals.	• Discussion • Lecture • Participative Learning	• Discussion on the computation of Total Income of Individuals • Discussion on clubbing and aggregation of Incomes and set off and carry forward	• To understand the deductions available while computing total income • To learn the different terms such as clubbing , set off, carry forward etc.	Evaluation through test papers and seminars.

BC6B13 AUDITING

Number of Lecture Hours per week : 5

Number of Credits : 4

Internal : 20, External : 80

Examination Hours: 3

Objectives:

- To impart knowledge about auditing principles, procedures and techniques in accordance with current legal requirements and professional standards

Module I

Introduction : Meaning – Objects - Basic principles - Auditing and Investigation - Auditing and Assurance Standards and Techniques - Classification of audit – Audit planning – Qualities of an auditor - Advantages and limitations of an audit.
10 Hours

Module II

Internal Control , Internal Check and Internal Audit : Introduction – Necessity – Definitions - Internal check : Definitions - Difference between internal check and internal control - Fundamental Principles of internal check - Difference between internal check and internal audit 20 Hours

Module III

Audit Procedures : Vouching – Definition – Features - Examining vouchers - Vouching of cash book - Vouching of trading transactions - Verification and valuation of assets and liabilities: Meaning - Definition and objects - Vouching v/s verification – Verification -Valuation of different assets and liabilities 15 Hours

Module IV

Audit Approach : EDP and mechanical systems - Use of computers - Nature of EDP -Internal control in EDP - Evaluating internal control in an EDP system - Auditing with the aid of computers - Audit of limited companies: Company auditor - Qualification and disqualification – Appointment – Removal – Remuneration – Rights - Duties and liabilities - Audit committee - Auditor's Report - Contents and types - Auditors certificates. 20 Hours

Module V

Special Areas of Audit : Tax audit and Management Audit - Recent trends in auditing - basic considerations of Audit in EDP environment. 10 Hours

Reference Books:

1. Jha, Aruna : "A Student's guide to Auditing", Taxmann
2. Tandon, BN, S. Sudarsanan and S. Sundarabahu, : "A handbook of practical auditing", S Chand and Co. Ltd. New Delhi.
3. Pagare , Dinkar : "Principles and Practice of Auditing", Sultan Chand and sons, New delhi.
4. Institute of Chartered Accountant of India, "Auditing and Assurance Standards", ICAI New Delhi
5. Gupta, Kamal and Aok Arora : "Fundamentals of auditing", Tata MCGraw Hill Publishing Co. Ltd. New Delhi.
6. Ghatalia, SV "PracticalAuditing", Allied Publishers PVt. Ltd. New Delhi.

OBJECTIVES

- To familiarize the students with the understanding of issues and practices of Audit in various areas

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment

Module I (10 hours)	Introduction : Meaning – Objects - Basic principles - Auditing and Investigation - Auditing and Assurance Standards and Techniques - Classification of audit – Audit planning – Qualities of an auditor - Advantages and limitations of an audit.	• Discussion • Lecture • Participative Learning	• Discussion on basic concepts of auditing. • Discussion on auditing techniques and standards.	Understand the concepts involved in auditing and its standards and techniques.	Evaluation through test papers.

Module II (20 hours)	Internal Control , Internal Check and Internal Audit : Introduction – Necessity – Definitions - Internal check : Definitions - Difference between internal check and internal control - Fundamental Principles of internal check - Difference between internal check and internal audit	• Discussion • Lecture • Participative Learning	• A comparative discussion on Internal Control V/s Internal Check and Internal Check V/s Internal Audit	Understand the concepts of internal check, internal control and internal audit.	Evaluation through test papers.

Module III (15 hours)	Audit Procedures : Vouching – Definition – Features - Examining vouchers - Vouching of cash book - Vouching of trading transactions - Verification and valuation of assets and liabilities: Meaning - Definition and objects - Vouching v/s verification – Verification -Valuation of different assets and liabilities.	• Discussion • Lecture • Participative Learning	• Discussion on vouching, verification and valuation	Understand the technical terms of auditing such as vouching, verification and valuation.	Evaluation through test papers.

Module IV (20 hours)	Audit Approach : EDP and mechanical systems - Use of computers - Nature of EDP -Internal control in EDP - Evaluating internal control in an EDP system - Auditing with the aid of computers - Audit of limited companies: Company auditor - Qualification and disqualification – Appointment – Removal – Remuneration – Rights - Duties and liabilities - Audit committee	• Discussion • Lecture • Participative Learning	• Discussion on different auditing approaches • Seminars on EDP based auditing • Discussion on qualities and qualifications of an auditor and audit reports.	Understand the different approaches of auditing and know the qualities and qualifications of an auditor.	Evaluation through test papers.

	Auditor's Report - Contents and types - Auditors certificates. Auditor's Report - Contents and types - Auditors certificates.				
Module V (10 Hours)	Special Areas of Audit : Tax audit and Management Audit - Recent trends in auditing - basic considerations of Audit in EDP environment.	• Discussion • Lecture • Participative Learning	Seminar on special areas of auditing and recent trends of auditing.	Understand the new changes in auditing	Evaluation through test papers.

BC6B14 FINANCIAL MARKETS AND SERVICES

Number of Lecture Hours per week: 5
Number of Credits: 4
Internal : 20, External : 80
Examination Hours: 3

Objectives:

- To provide basic knowledge about the structure, organization and working of the financial system in India.

Module I

Financial System: Meaning and Significance - Functions of the financial system - Financial concepts - Financial Assets - Financial markets – Classification - Financial instruments -Weakness of Indian Financial System. Financial services-Meaning –Types. 15 Hours

Module II

Money Market: Definition – Features – Objectives - Features of a developed .money market -Importance of Money market - Composition of Money market - Operations and Participants -Money market Instruments - Features of Indian money market - Recent developments 12 Hours

Module III

Capital Market: New issue market – meaning – functions - methods floating new issue - intermediaries in the new issue market - Merchants bankers and their functions - Recent trends in new issue market - Stock Exchanges – Functions - Structure of Stock Exchanges – BSE - NSE - Listing of securities - Advantages of listing - Methods of trading in stock exchanges - Online trading - Stock indices. Venture Capital-Concept and meaning. 25 Hours

Module IV

Financial Institutions: Commercial banks - Development financial institutions - NonBanking Financial Corporations - Mutual Funds , Insurance Companies - Objectives and functions- Lease Financing-meaning- Factoring and Forfaiting (only a brief outline) 15 Hours

Module V

Regulatory Institutions - RBI - Role and Functions - The Securities and Exchange Board of India : Objectives - Functions - Powers - SEB1 Guidelines for primary and secondary market. 08 Hours

Reference Books:

1. Kohn, Meir: Financial Institutions and Markets, Tata McGraw Hill.
2. Bhole L.M: Financial Institutions and Markets, Tata McGraw Hill.
3. Desai, Vasantha: The Indian Financial System, Himalaya Publishing House.
4. Machiraju.R.H: Indian Financial System, Vikas Publishing House.
5. Khan M.Y: Indian Financial System, Tata McGraw Hill.
6. Varshney, P.M., & D. K. Mittal, D.K.: Indian Financial System, Sulthan Chand & Sons
7. Gordon E. & Natarajan K.: Financial Markets & Services, Himalaya Publishing House.
8. Pathak. V. Bharati: Indian Financial System. Pearson Education.

OBJECTIVES

- To familiarize the students with financial market operations in India

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment

Module I (15 hours)	Financial System: Meaning and Significance - Functions of the financial system - Financial concepts - Financial Assets - Financial markets – Classification - Financial instruments -Weakness of Indian Financial System. Financial services-Meaning –Types	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on overview of financial markets nature and Functions of financial market and Classification and weakness of financial system	• To provide the students a sound information and knowledge of broad framework of financial markets and institutions	• Evaluation done through test papers
Module II (12 hours)	Money Market: Definition – Features – Objectives - Features of a developed .money market -Importance	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on money market and its composition • Discussion on features of a developed money market	• To familiarize the students with money market operations in India	• Evaluation done through test papers

	of Money market - Composition of Money market - Operations and Participants -Money market Instruments - Features of Indian money market - Recent developments				
Module III (25 hours)	Capital Market: New issue market – meaning – functions - methods floating new issue - intermediaries in the new issue market - Merchants bankers and their functions - Recent trends in new issue	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on Capital Markets • Group discussion on BSE, NSE and OTCEI	• To provide basic knowledge about the structure, organization and working of the Capital market in India.	• Evaluation done through test papers

	market - Stock Exchanges – Functions - Structure of Stock Exchanges – BSE - NSE - Listing of securities - Advantages of listing - Methods of trading in stock exchanges - Online trading - Stock indices. Venture Capital-Concept and meaning				
Module IV (15 hours)	Financial Institutions: Commercial banks - Development financial institutions - NonBanking Financial Corporations	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on commercial bank and its function • Group discussion on developmental financial institutions.	• To acquire knowledge in financial institutions.	• Evaluation done through test papers

	- Mutual Funds , Insurance Companies - Objectives and functions- Lease Financing-meaning- Factoring and Forfaiting				
Module V (08 Hours)	Regulatory Institutions - RBI - Role and Functions - The Securities and Exchange Board of India : Objectives - Functions - Powers - SEB1 Guidelines for primary and secondary market	• Discussion • Lecture • Participative Learning	• Powerpoint presentations on Regulatory institutions • Group discussion various regulators like SEBI,IRDA	• To provide the students a sound information and knowledge of regulatory institutions and regulators of Indian financial markets	• Evaluation done through test papers

BC6B14 OFFICE AUTOMATION TOOLS

Number of Lecture Hours per week : 5
Number of Credits : 5
Internal : 20, External : 80
Examination Hours: 3

Objectives:

- To enable the students to acquire basic knowledge in the various office automation tools

Module I

MS-Word : Word Basics - Starting word - Creating a new document - Opening pre existing document - The parts of a word window - Typing text - Selecting text - Deleting text – Undo - Redo - Repeat - Inserting text - Replacing text - Formatting text - Cut - Copy - Paste - Formatting Text and Documents - Auto format - Line spacing - Margins - Borders and Shading. Headers and Footers : Definition - Creating basic headers and footers - Tables - Creating table - Adding, changing, deleting rows – Inserting, changing, deleting column – Graphics - Importing graphics - Clipart - Insert picture - Clip Art Gallery - Drawing objects - Text in drawing . Templates : Template types - Using templates - Exploring templates - Modifying templates - Macros : Record in macros - Editing macros - Running a macro – Mail Merge: Mail Merge concept - Main document - Data sources - Merging data source and main document - Overview of word menu options - Word basic toolbar. (Theory 15 Hours and Practical 10 Hours)

Module II

MS EXCEL : Electronic Spreadsheet - Structure of spreadsheet and its applications to accounting, finance, and marketing functions of business -Creating a dynamic / sensitive worksheet - Concept of absolute and relative cell reference - Using built in functions - Goal seeking and solver tools - Using graphics and formatting of worksheet - Sharing data with other desktop applications - Strategies of creating error- free worksheet. (Theory 15 Hours and Practical 10 Hours)

Module III

Ms-Power Point : Powerpoint – Basics – Terminology – Getting started – Views – Using auto content wizard - Using blank presentation option - Using design template option - Adding slides Deleting a slide - Importing images from the outside world - Drawing in powerpoint - Transition and build effects - Deleting a slide - Numbering a slide - Saving presentation - Closing. (Theory 9 Hours and Practical 6 Hours)

Module IV

The Internet and its Basic Concepts : Internet concept - History - Development in India - Technological foundation of internet - Distributed computing - Client-server computing - Internet protocol suite - Application of distributed computing – Client-server computing (Theory 10 Hours)

Module V

Internet protocol suite in the internet environment - Domain Name System (DNS) - Generic Top Level Domain (g TLD) - Country Code Top Level Domain (cc TLD) - Indian - Allocation of second level domains - IP addresses - Internet Protocol - Applications of internet in business, Education, Governance, etc. (Theory 10 Hours)

Reference Books :

1. Ron Mansfield, Working in Microsoft office, Tata Mc Graw Mill (2008)
2. Ed Bott, woody Leonard, Using Microsoft Office 2007, Pearson Education (2007)
3. R.K.Taxali, PC Software Made Simple.
4. Stephen L.Nelson , Office 2000 Complete Reference.
5. Joyce Cox ,Polly Orban, Quick course in Microsoft Office.
6. Gimi Couster , Mastering Office 2000.
7. Rajkamal, Internet and Web Technologies, Tata McGraw Hill (2007).

OBJECTIVES

- To make the students understand the applications of office automation tools in various areas of business

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (15 hours)	MS-Word, Basics, Creating a new document, The parts of a word window, Formatting text, Headers and Footers, Templates, Modifying templates, Macros, Running a macro, Mail Merge, Overview of word menu options.	● Discussion ● Lecture ● Participative Learning	● Practical lab ● Assignment on preparing document	● To study how to create new document	Assessment through Test papers
Module II (15 hours)	MS EXCEL, Structure of spreadsheet and its applications, Goal seeking and solver tools, Sharing data with other	● Discussion ● Lecture ● Participative Learning	● Seminar on creating worksheet ● Practical lab	● To study creating worksheet	Evaluation through MCQ and Test papers

	desktop applications, Strategies of creating error.				
Module III (09 hours)	Ms-Power Point, Powerpoint, Creating presentations, Using auto content wizard, Using design template option, Importing images from the outside world, Transition and build effects, Numbering a slide, Saving presentation.	• Discussion • Lecture • Participative Learning	• Practical lab • Assignment on creation of power point presentation	• To study creating powerpoint slide	Assessment through descriptive exam
Module IV (10 hours)	The Internet, its Basic, Concepts, History, Technological foundation of internet, Client-server computing, Internet protocol suite, Application of	• Discussion • Lecture • Participative Learning	• Assignment on internet concept • Practical lab	• To study basic concepts of internet • To study technological foundation of internet • To understand Client-server computing	Assessment through practical exam

	distributed computing,				
Module V (10 Hours)	Internet protocol suite in the internet environment, Domain Name System (DNS), Generic Top Level Domain (g TLD), Country Code Top Level Domain (cc TLD), Allocation of second level domains, IP addresses, Applications of internet in business, Education, Governance, etc.	• Discussion • Lecture • Participative Learning	• Seminar on internet protocol applications of internet in business, education, governance • Practical lab	• To study about Internet protocol • To understand Internet Protocol applications • To evaluate the Applications of internet in business.	Assessment through Test papers

BC6B15 FUNDAMENTALS OF INVESTMENTS

Number of Lecture Hours per week: 5

Number of Credits: 5

Internal : 20, External : 80

Examination Hours: 3

Objectives:

- To familiarize the students with the world of investments

Module I

The Investment Environment: The investment decision process - Types of Investments - Commodities, Real Estate and Financial Assets - Security market indices - Sources of financial information - Concept of return and risk of investments. 20 Hours

Module II

Fixed Income Securities: Bond - Features - Types of bonds - Estimating bond yields - Types of bond risks - Default risk and credit rating - Bond valuation.
08 Hours

Module III

Security Analysis: Fundamental Analysis - Equity valuation - Dividend capitalisation models - Dividend Growth model - Price to Earnings ratio – Valuation of preference shares - Technical Analysis - Security market theories – Efficient Market Theory – Random Walk Theory – Elliott Waves Theory. 20 Hours

Module IV

Portfolio Analysis and Financial Derivatives: Portfolio and Markowitz Diversification - Portfolio Risk and Return - Introduction to Financial Derivatives: Meaning and need - Exchange Traded Financial Derivatives in India – Participants – Functions – Types of derivatives – Forward – Futures – Options – Swaps – The regulatory framework of derivative trading in India. 20 Hours

Module V

Investor Protection: SEBI & role of stock exchanges in investor protection - Investor grievances and their redressal system - Insider trading - Investors' awareness and activism. 07 Hours

(Theory and problems may be in the ratio of 40% and 60% respectively)

Reference Books:

1. Donald E. Fisher and Ronald J. Jordan: Securities Analysis and Portfolio Management, Prentice Hall, New Delhi.
2. S. Kevin: Security Analysis and Portfolio Management.
3. Sourain. Harry; Investment Management, Prentice Hall of India.
4. Francis and Archer: Portfolio Management , Prentice Hall of India.
5. Gupta L.C.: Stock Exchange Trading in India, Society for Capital Market Research and Development, Delhi.
6. Machi Raju, H.R.: Working of Stock Exchanges in India, Wiley Eastern Ltd, New Delhi.

OBJECTIVES

- To provide a theoretical framework for the analysis and valuation of investments

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (20 hours)	The Investment Environment: The investment decision process - Types of Investments - Commodities, Real Estate and Financial	• Discussion • Lecture • Participative Learning	• Assignment on investment environment • Seminar on source of financial information	• To study essential features of investment • To study investment environment • To study	Assessment through test papers

	Assets - Security market indices - Sources of financial information - Concept of return and risk of investments			investment management process ● To study calculation of return on investment and expected return	
Module II (08 hours)	● Security valuation ● Valuation of fixed income securities ● valuation of security ● Default risk and credit rating	● Lecture ● Discussion ● Participative Learning	● Assignment on exercise questions	● To study valuation of fixed income securities ● To study valuation of equity	Assessment through test papers

	• Bond valuation				
Module III (20 hours)	• Approach to security analysis • tools for technical analysis • Dividend Capitalisation models • Price earning multiple approach to equity valuation	• Lecture • Discussion • Participative Learning	• Pictorial presentation of stock chart • Seminar on trend and trend reversals	• To study security analysis • To study leading and lagging indicators	Assessment through test papers

Module IV (20 hours)	• Portfolio analysis-need and importance • portfolio diversification • calculation of portfolio risk and return • Markowitz Model • Single index and multi index model	• Lecture • Discussion • Participative Learning	• Seminar on portfolio diversification, • Assignment on exercise question	• To study portfolio analysis • To study portfolio diversification • To study calculation of portfolio risk • To study portfolio return	Assessment through test papers

Module V (07 Hours)	• Investor protection • role of SEBI and stock exchange in investor protection • investor grievance and their redressal system	• Lecture • Discussion • Participative Learning	• Presentation on investors grievances and redressal system • Group discussion on investors education and awareness measures	• To evaluate role of SEBI and stock exchanges in investor protection • To evaluate investor grievance and redressal system	Assessment through case study

BC6B15 COMPUTERISED ACCOUNTING WITH TALLY

Number of Lecture Hours per week : 5

Number of Credits : 5

Internal : 20, External : 80

Examination Hours: 3

Objectives:

- To enable the students to acquire basic knowledge in the computerised accounting systems.

(Out of the 75 Lecture hours, the ratio between theory and practical hours shall be 3:2)

Module I

Introduction to Accounting: Accounting basis and terms -Branches of accounting - Mode of accounting - Manual accounting - Computerized accounting fundamentals. 05 Hours

Module II

Accounting with Tally : Introduction to Tally - Tally interface - f11 features - f12 configuration - Company creation - Accounting groups - Accounting ledgers - Accounting vouchers - Vouchers entry. 10 Hours

Module III

Inventory Management with Tally - Stock groups - Stock items - Stock category - Unit of measures - Godown inventory vouchers (Pure inventory and inventory vouchers). 15 Hours

Module IV

Integration of Accounting with Inventory : Bill wise details - Invoicing - Voucher entry - Cost centre - Cost category - Budget and control - Bank reconciliation - Interest calculation - Order processing - Stock valuation methods - Reorder levels - Tracking numbers - Bill of material - Inventory ageing. 15 Hours

Module V

Tax Application in Tally - Introduction to VAT - VAT activation and classification - VAT computation - Composite VAT - Input VAT on capital goods - CST introduction - Central Excise Tax - Interstate transfer - Service tax. 15 Hours

Module VI

Accounting and Inventory Reports - Trading, Profit and loss A/c - Balance Sheet - Ledgers - Cost centre and budget reports - Cash book and bank book - Inventory

reports - Decision supporting tools - Ratio analysis - Cash flows - Fund flow - Budgeting system - Printing of reports - Voucher and bill printing etc. 10 Hours

Module VII

Technology Advantage of Tally - Tally audit - Tally vault - Back up, restore, merge and split of database - ODBC interface – Export and import of data - web enabled reporting – On line support of software. 10 Hours

Reference Books:

l. A.K. Nadhani and K.K. Nadhani, Implementing Tally 6.3, l/e BPB Publications, New Delhi.
2. Namrata Agarwal, Tally 6.3 , 2004 Edition , Dream Tech. , New Delhi.
3. Sridharan, , Narmadha Publications, May 2003.

OBJECTIVES

- To enable the students to understand the applications of Computerized Accounting with Tally in the area of business

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment

Module I (05 hours)	• Introduction to Accounting - basis and terms • Branches of Accounting • Computerized accounting fundamentals	• Discussion • Lecture • Participative Learning	• Assignment on Computerized accounting fundamentals	• To study about computerized accounting fundamentals • To learn accounting basis and terms	Assessment through viva
Module II (10 hours)	• Accounting with tally • Company Creation • ACcounting Ledgers • Accounting Vouchers	• Discussion • Lecture • Participative Learning	• Discussion on Accounting with tally • Assignment on Accounting Ledgers and Vouchers	• To learn about accounting ledgers and vouchers • To understand the concept of Tally	Evaluation through test papers

Module III (15 hours)	• Inventory management with tally • Godown Inventory vouchers	• Discussion • Lecture • Participative Learning	• Assignment on Inventory management with tally	• To learn inventory management with tally • To study pure inventory and inventory vouchers	Evaluation through test papers
Module IV (15 hours)	• Integration of accounting with inventory • Voucher entry • Budget and control • Bank reconciliation • Stock valuation methods • Inventory ageing • Reorder levels	• Discussion • Lecture • Participative Learning	• Seminar on Bank reconciliation • Assignment on stock valuation methods	• To learn about bank reconciliation • To study various stock valuation methods	Assessment through viva

Module V (10 Hours)	• Tax application in tally • Introduction to VAT • VAT computation • CST introduction • Central Excise Tax • Service tax	• Discussion • Lecture • Participative Learning	• Assignment on VAT	• To learn about VAT • To study tax application in tally	Evaluation through mcqs
Module VI (10 Hours)	• Accounting and inventory reports • Preparation of Trading, Profit and Loss A/c, Balance sheet • Cash book and bank	• Discussion • Lecture • Participative Learning	• Peer learning on preparation of reports- Trading, Profit and Loss A/c and Balance sheet • Assignment on the difference between cash flow and fund flow	• To learn the preparation of financial reports on tally • To know the difference between cash flow and fund flow	Evaluation through test papers

	book ● Ratio analysis ● Cash flows and fund flows ● Budgeting system ● Voucher and bill printing				
Module VII (07 Hours)	● Technology advance of tally ● Tally audit ● Backup, restore, merge and split of database ● ODBC interface ● Export and import of data ● Online support	● Discussion ● Lecture ● Participative Learning	● Discussion on Online support of software ● Assignment on tax audit	● To study about technology advance of tally ● To learn about ODBC interface	Evaluation through test papers

	of softwar e				

SEMESTER I

MC1C1: BUSINESS ENVIRONMENT

80 Hours

Marks: 80

Objectives:

- To familiarise students with the concepts of macro-economic in which a Business organization operates.

- To give an idea about the policies of the government and assess their impact on business.

Module I:
Business Environment: Components and significance – Scope – political, Economic, Social, Technological, Legal, Cultural and Labour Environment – Trade Unions – Quality Circles – External Factors Influencing Business Environment – Dimensions of International Business Environment – Challenges. (15 hours)

Module II: Structure of Indian Economy: Economic Systems – Economic Planning – Planning Commission and NITI Ayog – Public Sector – Changing Role – Relevance – Public Sector Reforms – Public Private Participation – Privatization and Disinvestments – Fiscal Policy – Monitory Policy – Structure of Union and State Budgets – Sources of Revenue – Management of Public Debt.(20 hours)

Module III: Profile of Indian Economy: New Economic and Industrial Policy – Economic Reforms – Land Reforms – Liberalization – Problems of Growth – Unemployment – Poverty – Regional Imbalances – SEZ – Social Injustices – Inflation – Black Money – Lack of Technical Knowledge and Information – Globalization Various Aspects – Consequences (15 hours)

Module IV : Foreign Direct Investment and Institutional Investment : Forms – Policy - FDI in Retail Trade – Problems and Consequences – FEMA –

Multinational Corporations Role and Recent Trends – Problems and Consequences – Competition Law. (10 hours)

Module V: International Agreements – An Overview: WTO – WTO and India – Trade Related Intellectual Property Rights (TRIPS) – Trade related Investment Measures (TRIMS) – General Agreement on Trade in Services (GATS) – BRICS – GAAT – SAARC – ASEAN – OPEC – Intellectual Property Rights – Barriers to Trade – Recent Foreign trade policy.
(20 hours)

References:
1. M. Adhikari: Economic Environment of Business, Sulthan Chand and Sons, New Delhi.
2. Ian Worthington, Chris Britton: Business Environment.
3. Francis Cherunilam: Business Environment, Himalaya Publishing House, Mumbai.
4. Claire Capon: Understanding the Business Environment.
5. K.V.Sivayya and VBM Das: Indian Industrial Economy, Sulthan Chand Publications, Delhi.
6. David Baron: Business and Its Environment.
7. Panday G.N: Environmental Management, Vikas Publishing House.
8. Raj Agarwal: Business Environment, Excel Publications, New Delhi

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**

Module I (20hours)	Meaning and definition of Business Environment, Components and significance, Types, Trade unions, Factors influencing Business Environment, Challenges	• Discussion • Lecture • Participative Learning	PowerPoint presentation on different types of business environment, Group discussion on trade unions	To learn about business environment and its components. To understand the various challenges of business environment.	Evaluation through test paper
Module II (15 hours)	Structure of Indian Economy, Economic Systems, PlanningCommission and NITI Ayog, Relevance of Public sector, Privatization and Disinvestment, Fiscal policy and Monetary policy, Union and State Budget,	• Discussion • Lecture • Participative Learning	Seminar presentations on role of public sector in Indian economy, Group discussion on privatisation and disinvestment.	To evaluate the structure of Indian economy. To understand the history and development of GST in India.	Evaluation through seminar

	Management of Public debt, GST - History and Development in India				
Module III (15 hours)	Profile of Indian Economy, Recent economic and Tax reforms in India, Liberalization and problems of growth, SEZ, Inflation and Black money, Globalisation.	• Discussion • Lecture • Participative Learning	PowerPoint presentation on profile of Indian Economy, Group discussion on inflation and Black money.	To provide an overview on the profile of the Indian economy. To understand the tax reforms in India.	Evaluation through assignmets
Module IV (15 hours)	Introduction to Foreign Direct Investment and Institutional Investment, FDI in retail trade - Problems and consequences, Foreign Exchange	• Discussion • Lecture • Participative Learning	PowerPoint presentation on Foreign Direct Investment and Institutional Investment	To learn about Foreign Direct Investment and Institutional Investment. To know the problems and consequences of Multinational Corporations.	Evaluation through test paper

	Management Act, Role and problems of MNC, Competition Law				
Module V (20 hours)	International Agreements, WTO and India, Trade Related Intellectual Property Rights – Trade related Investment Measures,, General Agreement on Trade in services BRICS, GAAT, SAARC, ASEAN, OPEC,Intellectual Property Rights, Barriers to Trade, Recent Foreign trade policy.	• Discussion • Lecture • Participative Learning	Seminar on degradation International Agreements and WTO	To provide an overview on International trade agreements. To learn about recent foreign trade policy	Evaluation through assignment and seminars

MC1C2: QUANTITATIVE TECHNIQUES FOR BUSINESS DECISIONS

80 Hours **Marks: 80**

Objectives:

- To acquaint students with important quantitative techniques, which enable sound business decision making
- To make students learn the process of applying appropriate quantitative techniques for validating findings and interpreting results.

Module 1:

Quantitative Techniques :Qualitative and quantitative approaches – role in decision making – Significance of quantitative decisions - Inferential analysis for management – statistical estimation – point estimation – interval estimation – Confidential Limits – estimating population mean –estimating population proportion – Sample size and its determination. 15 hours

Module 2:

Tests of significance : Basic concepts – parametric tests – sampling distribution – large and small samples – standard error – hypothesis – level of significance – degree of freedom – central limit theorem – critical value. Parametric tests – tests for means, tests for proportions, tests for variance – Z test, t test, F test – Test for Paired Observations – Analysis of Variance – one way and two way classifications. 20 hours

Module 3 :

Non-parametric tests : assumptions – Features – Advantages – Limitations – Chi Square test – contingency tables – tests for goodness of fit – test for independency – Sign test, Wilcoxon Signed Rank test – Mann Whitney U test – Kruskell Wallis test – Wald Wolfowitz Runs test – Applications in business. 15 hours

Module 4 :

Statistical quality control : variations – Assignable variations and chance variations – process control – product control – control charts for variables – control for attributes – X chart –R chart – P chart –np chart –C chart – merits of

control charts – Applications in business. 15 hours Module 5: Correlation : types – Coefficient of Correlation – Rank correlation – Partial and Multiple correlation – Regression – probable error – Software for Quantitative methods – SPSS – Data Entry – Analysis tools – Descriptive statistics – Inferential Analysis. 15 hours

Module 5:

Correlation : types – Coefficient of Correlation – Rank correlation – Partial and Multiple correlation – Regression – probable error – Software for Quantitative methods – SPSS – Data Entry – Analysis tools – Descriptive statistics – Inferential Analysis

References:

1. Levin & Rubin, Quantitative Approaches for Management, Pearson
2. Anderson, Quantitative Methods for Business Decisions, Thomson
3. Barry Render, Quantitative Analysis for Management, Prentice Hall of India
4. Dr.N.D.Vohra, Quantitative Techniques for Management
5. Anand Sharma, Quantitative Techniques for decision making, Himalya Publishing House
6. Gupta & Khanna, Quantitative Techniques for decision making, Prentice Hall of India.
7. Gupta SP, Statistical Methods, S. Chand & Sons

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**

Module I (15hours)	• Qualitative and quantitative approaches • Inferential analysis for management • Estimating population mean, population proportion • Sample size and its determination	• Discussion • Lecture • Participative Learning	• Assignment on quantitative and Qualitative approaches • Discussion on Inferential analysis for management • Seminar on population mean and population proportion estimation	• To understand the significance of quantitative decisions • To evaluate statistical estimation, point estimation, interval estimation	• Assessment through test papers

Module II (15 hours)	• Parametric tests, standard error • Hypothesis • Central limit theorem • Analysis of variance	• Discussion • Lecture • Participative Learning	• Assignment on Parametric tests, Hypothesis • Discussion on central limit theorem , analysis of variance	• To know more about parametric tests and Hypothesis • To understand the central limit theorem, analysis of variance	• Assessment through test paper
Module III (15 hours)	• Non parametric tests , assumptions, features, advantages and limitations • Chi square	• Discussion • Lecture • Participative Learning	• Seminars on non parametric tests • Discussion on chi Square test	• To learn more about the non parametric tests • To understand the chi square tests	• Assessment through test paper

	test				
Module IV (15 hours)	• Assignable variations and chance variations • X chart, R chart, P chart, np chart, C chart, - applications in business	• Discussion • Lecture • Participative Learning	• Powerpoint presentations on assignable variations and chance variations • Discussion on different charts and its applications in business	• To understand the statistical quality control • To learn more about the different charts and its applications in business	• Assessment through test papers
Module V (15hours)	• Coefficient of Correlation • Rank correlation, Partial and Multiple	• Discussion • Lecture • Participative Learning	• Discussion on correlation and Regression • Seminars on SPSS	• To understand the nature and application of Correlation and Regress	Assessment through test paper

	correlation ● Regression ● SPSS ● Descriptive statistics and Inferential analysis		● Assignment on Descriptive statistics and Inferential analysis	ion ● To provide an insight into the Descriptive statistics and Inferential analysis, and SPSS	

MC1C3: ACCOUNTING FOR MANAGERIAL DECISIONS

80 Hours **Marks: 80**

Objectives:

- Enable the students to know the applications of accounting tools, techniques and concepts in managerial decision making process

Module 1:

Management Accounting: Nature, Scope and functions – Role of management Accountant – Cost concepts and classifications – Variable costing and Absorption costing – emerging costing approaches – Life Cycle Costing – Quality costing – kaizen costing – throughput costing – Back flush costing. Activity based costing – Introduction – Concepts – cost drivers and cost pools – Steps to develop ABC system – ABC system – ABC system and corporate strategy. (10 hours)

Module 2 :

Capital investment Process : Investment appraisal methods – Payback period – ARR – Time adjusted methods – Discounted payback period – Net Present value method – IRR – Profitability index – Terminal value method – Capital Rationing

– Risk analysis – Decision tree approach – sensitivity analysis – Other statistical methods. (20 hours)

Module 3:

CVP Analysis and Decision making : Managerial applications of CVP analysis – Make or Buy decisions – Alternative methods of Production – Buy or lease decision – Shut down or continue – Repair or replace – Accepting bulk orders for Idle capacity utilization – Pricing under different situations – Suitable product mix, and Key Factor.(15 hours)

Module 4:

Cost of capital: Concept – Relevance – Elements of cost of capital – Cost of equity – Cost of debt – Cost of retained earnings – calculation of weighted Average Cost of Capital – Cost control and cost reduction techniques – Value Engineering. (15 hours)

Module 5: Performance measurement : Financial and non-financial measurement of performance – Return on investment – Residual income – Economic value added (EVA) – Concept – measurement – Balanced score card – Concept – objectives – Multiple score card measures – New horizons in Managerial control – Transfer pricing – Responsibility accounting – Performance Budgeting – ZBB – Social cost benefit analysis.(20 hours)

References:

1. Cost and Management Accounting- Jain and Narang, Kalyani Publishers
2. Management Accounting and Financial Control-S N Maheswari, Sulthan Chand & Sons
3. Management Accounting N.K Kulshrestha,Taxman Publications
4. Management Accounting – Paresh Shah, Oxford Publishers
5. Advanced Management Accounting – Ravi.M Kishore, Taxman
6. Management and Cost accounting – Colin Drury, Cengage Learning
7. Management Accounting – Dr. S.P Gupta, Sahitya Bhavan Publishers

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment

Module I (20hours)	Management Accounting: Nature, Scope and functions – Role of management Accountant	• Discussion • Lecture • Participative Learning	Group discussion on management accounting concepts Seminars on role of management accountant	To learn more about management accounting To get an insight aboiut the role of management accountant	Evaluation through case study
Module II (15 hours)	Capital investment Process : Investment appraisal methods – Payback period – ARR – Time adjusted methods	• Discussion • Lecture • Participative Learning	Assignment on capital investment process Presentations on investment appraisal methods	To understand capital investment process To identify different investment appraisal methods	Assessment through test paper

Module III (15 hours)	CVP Analysis and Decision making : Managerial applications of CVP analysis – Make or Buy decisions	• Discussion • Lecture • Participative Learning	Discussion on CVP Analysis Assignment on practical applications of CVP Analysis	To evaluate CVP Analysis To understand more about managerial applications of CVP Analysis	Assessment through case study
Module IV (15 hours)	Cost of capital: Concept – Relevance – Elements of cost of capital	• Discussion • Lecture • Participative Learning	Presentations on cost of capital Assignment on different elements	To understand about cost of capital concept and relevance	Assessment through test paper
Module V (20 hours)	Performance measurement : Financial and non-financial measurement of performance	• Discussion • Lecture • Participative Learning	Assignment on performance measurement	To evaluate performance measurement	Assessment through case study

MC1C4: IT APPLICATIONS IN COMMERCE

80 Hours **Marks: 80**

Objectives:

- To get an overall idea about various IT applications used in the business platform especially MIS.
- To make a practical approach in spreadsheet modeling and database management System.
- To get an idea about the integrated business solution package.

Module I:

Concept of MIS : Information- Concept of information – Characteristics of information – quality of information - information overload – System - System concepts – Types of systems – characteristics of system – control in systems – system stress – Characteristics of MIS – MIS architecture – Basic structural concepts – MIS and other academic disciplines – Need for MIS – Strategic role of MIS - Limitations of MIS – Approaches for system development : System development life cycle – prototyping – Rapid Application development – End user development. 20 hours

Module II: Introduction to different Sub-systems: Transaction Processing Systems, Office Automation Systems - Decision Support Systems - Executive Information Systems - Artificial intelligence and Expert systems. Functional Information Systems in Business - Production Information system – Marketing Information System – Financial Information System – HR Information System. 12 hours

Module III : Spread sheet based application for business : basic concept of spreadsheet – popular spreadsheet based programmes – Modeling in spreadsheet – formulation – Logical functions – Financial functions – Statistical analysis – spreadsheet security – database function in spreadsheet – linking data between work sheets – developing models for liquidity and profitability analysis by using accounting ratios – Project appraisal using spread sheet – Inventory management. 20 hours

Module IV : Database management technology : Data base concept – Database terminology – DBMS – Popular DB softwares – Components of DBMS – Database structure – RDBMS – DBA – Data mining – Data warehousing – Introduction to database software – Elements and objects of

database software – Table creation – 8 Query creation – Form creation – Report Generation – Business application of Database software 20 hours

Module V : Enterprise Resource Planning: Introduction – Features of ERP – Database and ERP – ERP & BPR – ERP Modules – ERP implementation methodology – Popular ERP Packages. 8 hours

References:

1. Management Information Systems: LM Prasad & Usha Prasad – Sulthan Chand & Sons.

2. Management Information Systems: AK Gupta – S Chand & Co. Ltd.

3. Management Information Systems: James O Breien, George M Marakas & Ramesh Behl-Mc Grawhill

4. Enterprise Resource Planning: Alexis Leon.

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**
Module I (20hours)	Concept of MIS, Information, information overload, System concepts, Types of systems, MIS architecture, MIS and	● Discussion ● Lecture ● Participative Learning	● Discussion on the topic system development cycle ● Seminar on MIS-Information and system	● To understand the concepts of MIS ● To study about Information and system, and types of system ● To evaluate MIS and other academic disciplines	Assessment through Test papers

	other academic disciplines, System development life cycle			• To study about the system development cycles	
Module II (15 hours)	Sub-system, Transaction Processing Systems,Office Automation Systems, Decision Support Systems, Executive Information Systems, Functional Information Systems in Business, Financial Information System	• Discussion • Lecture • Participative Learning	• Power Point presentation on Transaction Processing Systems • Assignments on executive information system	• To study about Transactions processing System • To understand decision support system • To evaluate functional information system in business • To study financial information system	Evaluation through Essay writing

Module III (15 hours)	Spread sheet based application for business, popular spreadsheet based programmes, Logical functions, Financial functions, linking data between work sheets, Project appraisal using spread sheet, Inventory management	• Discussion • Lecture • Participative Learning	• Seminars on popular spreadsheet based programmes • Group discussion on project appraisal using spreadsheet	• To study the spreadsheet application for business • To analyse main spreadsheet based programmes • To understand inventory management	Assessment through Test papers

Module IV (15 hours)	Database, Database terminology, DBMS, Components of DBMS, RDBMS, DBA, Data warehousing,8 Query creation, Business application of Database software.	• Discussion • Lecture • Participative Learning	• Assignments on the topic Database • Peer group discussion on DBMS, RDBMS, DBA.	• To study the concept and terminology of Database • To understand what is DBMS, RDBMS, DBA • To study 8 Query creation • To study business application of Database software	Assessment through MCQ and Test papers
Module V (20 hours)	Enterprise Resource Planning, Features of ERP, Database and ERP, ERP Modules	• Discussion • Lecture • Participative Learning	• Presentation on the topic enterprise resource planning.	• To study Enterprise resources planning • To understand database and ERP • To study the modules of ERP	Evaluation through Test papers

MC1C5: ORGANISATIONAL THEORY AND BEHAVIOR

80 Hours **Marks: 80**

Module I:

Organizational basis for behavior – Contributing disciplines to the OB field - Need for the knowledge of OB – Need for a contingency approach to the study of OB – Emerging challenges and opportunities for OB – the organization as a system – System – System approach to organizational behavior – Managerial functions – The organization and people. 10 hours

Module II :

Basic psychological process – Perception – Factors influencing perception - Attribution theory – Specific applications in organizations – Learning - Theories of learning – Using learning concepts for self management – implications for performance and satisfaction – Remembering – Basic motivational concepts – Theories of motivation. 20 hours

Module III:

Personality – Determinants of personality – Theories of personality – Major personality attributes influencing organization behavior - Building and maintaining the self values, attitudes and job satisfaction – Ethical issues in organizational behavior – Mental and health problems in organizations – role of counseling. 20 hours

Module IV:

Group dynamic and inter group relationships – Characteristics of workgroup – Basic forces of group behavior – Dynamics of effective operating groups – Work group behavior and productivity - Team management – Styles and skills in leadership and communication – Power and politics in organization – Managing differences and conflicts – managing change – Organization and society. 20 hours

Module V :

Organizational development – Techniques of organizational development Interventions – Grid management – Transactional analysis – Sensitivity training – Process consultancy - Case discussions and analysis. 10 hour

References:

1. Fred Luthans: Organisational behavior
2. Danial C. Fieldman and Hugh Arnold: Managing individual and group behavior in organization.
3. Henry Mint berg: The structure of organization
4. Edwin Gerlog: Organization theory and design

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**
Module I (20hours)	Organizational basis for behavior – Contributing disciplines to the OB field - Need for the knowledge of OB	● Discussion ● Lecture ● Participative Learning	Discussion on concept of organizational behaviour Assignment on need for the knowledge of OB	To understand more about organisational behaviour	Assessment through test paper

Module II (15 hours)	Basic psychological process – Perception – Factors influencing perception - Attribution theory	• Discussion • Lecture • Participative Learning	Presentations on basic psychological process	To evaluate perception,attitude etc	Assessment through case study
Module III (15 hours)	Personality – Determinants of personality – Theories of personality – Major personality attributes influencing organization behavior	• Discussion • Lecture • Participative Learning	Assignment on personality and its determinants	To understand the determinants of personality To evaluate major personality attributes influencing organization behavior	Assessment through test paper

Module IV (15 hours)	Group dynamic and inter group relationships – Characteristics of workgroup – Basic forces of group behavior	• Discussion • Lecture • Participative Learning	Seminars on group dynamic Assignment on work group characteristics	To study group dynamic and inter group relationships To evaluate basic forces of group behavior	Assessment through case study
Module V (20 hours)	Organizational development – Techniques of organizational development Interventions – Grid management	• Discussion • Lecture • Participative Learning	Discussion on organisational development	To understand organisational developmemt	Assessment through test paper

Semester II

MC2C6: INTERNATIONAL BUSINESS

80 Hours Marks: 80

Objectives:

- To acquaint the students with various concepts of foreign trade and international business.

Module I:

International Business: Meaning and Scope – Theories of International trade: classical and modern theories – protectionism vs. free trade – Trade barriers - Tariff and Non-tariff barriers – Terms of trade – Balance of payment – disequilibrium and corrective measures. 15 hours

Module 2:

International Business Analysis: Internal and External environment analysis – Modes of Entry - exporting – Licensing – franchising – contract manufacturing – Management contracts, turnkey projects – Foreign Direct Investments: Greenfield Investments – Mergers & Acquisitions – joint ventures – FDIs in emerging markets: recent trends. 15 hours

Module 3:

Stages of Internationalization: International, Multinational, Global and Transnational corporations – strategic orientations – Growth of MNCs - contributing factors – merits and demerits of MNC – transfer of technology – regulation of MNCs – MNCs in India. 18 hours

Module 4:

International Traded Agreements: Bilateral, Plurilateral and Multilateral agreements – GATT and WTO – WTO agreements - TRIPs, TRIMs, GATS and AoA – Trade Facilitation Issues – Environmental issues – India and WTO 17 hours

Module 5:

Regional Economic Integrations: Meaning and rationale – Forms of integrations – EU, NAFTA, ASEAN, SAFTA, APEC and other groupings – International Financial Institutions - IMF, World Bank and ADB – functions and role in economic development. 15 hour

References:

1. Francis Cherunilam, International Business: Text and Cases, PHI, New Delhi.
2. Shyam Shukla, International Business, Excel Books, New Delhi
3. Rakesh Mohan Joshi, International Business, Oxford University Press, New Delhi.
4. P.Subba Rao, International Business, Himalaya Publishing House, Mumbai. 5. Manab Adhikary, Global Business Management in an International Economic Environment, Macmillan, New Delhi.
6. Charles W L Hill, International Business, Mc Graw Hill, New York.
7. Michael Czinkota, International Business, Wiley, New York.
8. Justin Paul, International Business, PHI, New Delhi.
9. Anant Kumar Sundaram and J, Stewart Black, The International Business Environment: Text and Cases, PHI, New Delhi.
10. John Daniels, Lee Radebaugh, Daniel Sullivan International Business, Pearson Education, New York

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**
Module I (20hours)	International Business: Meaning and Scope, Theories of International trade,	● Discussion ● Lecture ● Participative Learning	PowerPoint presentation on various theories of International trade.	To learn about theories of International business. To understand various tariff and non-tariff barriers	Evaluation through test paper

	Trade barriers, Tariff and Non-tariff barriers, Balance of payment – disequilibrium and corrective measures				
Module II (15 hours)	International Business Analysis, Internal and External environment analysis, Modes of Entry, Exporting, Licensing, franchising, Foreign Direct Investments, Greenfield Investments,	• Discussion • Lecture • Participative Learning	Group discussion on International Business Environment, Seminar presentations on Foreign Direct Investment	To understand the components of International Business Environment To provide knowledge on theTheories of FDI	Evaluation through seminar

	Mergers & Acquisitions, FDIs in emerging markets				
Module III (15 hours)	Stages of Internationalization, International, Multinational, Global and Transnational corporations, Growth of MNCs, merits and demerits of MNC, Regulation of MNCs in India.	• Discussion • Lecture • Participative Learning	PowerPoint presentation on stages of internationalization	To understand various stages of Internationalization To provide an overview on the growth of MNCs in India	Evaluation through assignments

Module IV (15 hours)	International Traded Agreements, GATT and WTO – WTO agreements, India and WTO	• Discussion • Lecture • Participative Learning	PowerPoint presentation on International trade agreements, Seminar on WTO and GATT	To evaluate various International trafe agreements. To provide knowledge on India and WTO	Evaluation through seminar presentations
Module V (20 hours)	Regional Economic Integrations, Meaning and rationale, Forms of integrations, EU, NAFTA, ASEAN, SAFTA, APEC, International Financial Institutions - IMF, World Bank and ADB – functions	• Discussion • Lecture • Participative Learning	Seminar and discussions on International Financial Institutions	To provide an overview on regional economic integrations.. To learn about Growth and contributions of International Financial Institutions	Evaluation through seminar presentations

	and role in economic developm ent.				

MC2C7: ADVANCED CORPORATE ACCOUNTING

80 Hours **Marks: 80**

Objectives:

- To provide theoretical knowledge of International Financial Reporting Standards.
- To enable the students to gain ability to solve problems relating to Holding Company, Accounts, Liquidation of Companies and various other Accounts.

Module 1:

International Financial Reporting Standards (IFRS): Introduction – Meaning – Scope – An Overview of the International Financial Reporting Standards – IFRS 1 to 13, Role of IASB – Arguments for Global Convergence – Required disclosure as per IFRS – Achievements of IASB and Obstacles in Convergence – Difference between IFRS and Indian Accounting Standards – US GAAP. 15 hours

Module 2 :

Accounting for Group companies: Holding Companies – Definition – Accounts Consolidation – Preparation of Consolidated Balance Sheet – Minority Interest – Pre – acquisition or Capital Profits – Cost of Control or Goodwill – Intercompany Balance – Unrealized inter company profits – Revaluation of assets and liabilities – Bonus Shares – Treatment of Dividend 20 hours

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Module 3:

Accounting for corporate restructuring - Internal - External - Merges and Acquisition - Accounting for Liquidation of Companies: Preparation of Statement of Affairs – Deficiency/Surplus Account – Liquidator's Final Statement of Account-Receiver's Statement of Accounts. 25 hours

Module 4:

Voyage Accounts: Meaning of important terms – Voyage in progress - Farm Accounts: Characteristics – Advantages and Disadvantages – Final Accounts of Farms. 10 hour

Module 5:

Human Resources Accounting: Objectives – Methods of Valuation – Advantages and Disadvantages Accounting for Price Level Changes: Methods – CPP, CCA and Hybrid. 10 hours

References:

1. Shukla and Grewal: advanced Accounts. (S.Chand & Co Ltd. New Delhi)
2. Jain and Narang: Advanced Accounts (Kalyani Publishers, Ludhiana)
3. Sr. K. Paul: Accountancy, Volume-I and II (New Central Book Agency, Kolkata)
4. R.K., Lele and Jawaharlal; AccountingTheory (Himalaya Publishers)
5. Dr. L.S. Porwal; Accounting Theory (Tata Mc Graw Hill)
6. Robert Anthony, D.F. Hawkins & K.A.Merchant: Accounting Text & Cases. (Tata Mc GrawHill).
7. Dr.S.N. Maheshwari: Corporate Accounting (Viakas Publishing House Pvt. Ltd. New Delhi)
8. Dr.Ashok Sehgal & Dr. Deepak Sehgal; Advanced Accounting (Tazmann, New Delhi).
9. RL Gupta & Radhaswamy Advanced Accountancy. (Sultan Chand and Co.)
10. Anthony, RN & Reece, JS: Accounting Principles, Richard Irwin, Inc.
11. Barker, P & O'hOgartaigh, C:Group Accounts – Theory and Practice, Oaktree Press 1st Edn.
12. Narayanswamy, R: Financial Accounting - A Managerial Perspective, PHI, New Delhi,
13. Hani & Mukherjee: Corporate Accounting, TMG, New Delhi.
14. Xavier, g Francis: Fundamentals of Advanced Accounts, Vol-III, TMG, New Delhi.
15. Financial Reporting Vol. 1 by The Institute of Chartered Accountants of India.

16. Advanced Accountancy MC Shukla. T.S.Grewal. & S.C. Gupta.

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**
Module I (15hours)	IFRS meaning and introduction, an overview of IFRS,arguments for global convergence,difference between IFRS and Indian standards, US GAAP	● Discussion ● Lecture ● Participative Learning	Assignment on GAAP Discussion on difference between IFRS and IND AS Seminar on arguments for global convergence	To study basic concept of IFRS To evaluate the difference between IFRS and Indian standards	Assessment through MCQ
Module II (20 hours)	Group accounts and group structures, consolidation procedures	● Discussion ● Lecture ● Participative Learning	Assignment on exercise questions	To study how to prepare consolidated balance sheet	Assessment through test papers

Module III (25 hours)	Accounting for mergers, accounting for liquidation of companies, preparation of statement of affairs, liquidators final statement of accounts	• Discussion • Lecture • Participative Learning	Seminar on accounting for mergers , acquisition, and reconstruction Assignment on exercise questions	To study accounting for liquidation of companies	Assessment through test papers
Module IV (10 hours)	Voyage account, farm accounts	• Discussion • Lecture • Participative Learning	Assignment on exercise questions	To study voyage accounts To study the preparation of final accounts of farms	Assessment through test papers
Module V (10 hours)	Human resource accounting, accounting for price level changes	• Discussion • Lecture • Participative Learning	Seminar on accounting for price level changes methods	To study HRA and Inflation accounting	Assessment through test papers

MC2C8: BUSINESS COMMUNICATION

80 Hours **Mark: 80**

Objectives:

- To understand the process of business communication
- To acquire required skills to manage business communication
- To give awareness about and to help develop the personality of the students.

Module I:

Business Communication : meaning – need – process – methods – written, verbal, non-verbal, visual, telecommunications; types of business communications – internal and externals, upward and downward, lateral; barriers to communication – physical, psychological, linguistic, mechanical. 10 hours

Module II:

Communication through letters: business letters - layout of letters, kinds of business letters- characteristics of a good letter, application for appointment – resume – references; appointment orders: Business enquiries - offers and quotations - orders execution of orders – cancellation of orders - Letters of complaint, letters of agency – status enquiries - circulars and circular letters notices report by individuals - reports by committees- annual report - writing of reports. 20 hours

Module III:

Non-verbal communication: Body language - Kinesics, proxemics, para language -Effective listening- Principles of effective listening: factors affecting listening - Interviewing skills - appearing in interviews - conducting interviews. 20 hours

Module IV:

Self development and communication: development of positive personal attitudes SWOT analysis - Personality development- concept of personality, concept of self- perception, personality Types. 15 hours

Module V:

Transactional analysis: Games and exercises: Business games, Group discussions; Mock interviews; Seminars - effective listening exercises - Public speaking - preparing and delivering effective public speeches - Physical exercises - Yoga and meditation for personality development. 15 hour

References:

1. O'Hair. Dan. Gustav W. Friedrich and Lynda Dee Dixon, Strategic Communication in Business and the Professions, Pearson Education, Delhi, 2008.
2. Dalmal Fisher. Communications in Organizations, Jaico Publishing House, Mumbai – 1999.
3. Bovee. Thill & Schatzman, Business Communication Today. Pearson Education, Delhi, 2004.
4. Shirley Taylor, Model Business Letters, E-mails & other Business Documents, Pearson Education, Delhi, 2004.
5. Soundararaj, Francis, Speaking and Writing for Effective Business Communication, Macmillan India Ltd., Delhi, 2007.
6. Rajendra Pal & Korlahalli, Essentials of Business Communication, Sultan Chand & Sons, New Delhi 2004

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**

Module I (20hours)	Business Communication-meaning, need, process, methods - written, verbal, non-verbal, visual, telecommunications, types of business communications – internal and externals, upward and downward, lateral, barriers to communication.	• Discussion • Lecture • Participative Learning	• Presentation on business communication - meaning, method, Types • Assignments on barriers of communication	• To study business communication - meaning, need, process. • To understand different communication methods • To evaluate various types of business communications • To study the barriers of communication	Assessment through descriptive exam

Module II (15 hours)	Communication through letters, layout of letters, kinds of business letters,application for appointment, appointment orders, Business enquiries, Letters of complaint, letters of agency, circulars and circular letters notices report, annual report, writing of reports.	• Discussion • Lecture • Participative Learning	• Discussion on communication letters • Seminars on the topic business enquiries, Letters of agency, letters of complaint	• To study the letters used in communication • To understand about business enquiries • To study circulars and circular letters • To understand reports and reports writing	Assessment descriptive exam

Module III (15 hours)	Non-verbal communication, Body language - Kinesics, proxemics, para language, Principles of effective listening, Interviewing skills, conducting interviews.	• Discussion • Lecture • Participative Learning	• Peer Group Discussion on non verbal communication • Assignments on principles of effective learning	• To understand different non-verbal communication • To study principles of effective learning • To understand different interviewing skills	Evaluation through MCQ
Module IV (15 hours)	Self development and communication, development of positive personal attitudes SWOT analysis, Personalit	• Discussion • Lecture • Participative Learning	• Assignments on SWOT analysis • Group discussion on personality development, concept, Types of personality	• To understand Self development and communication • To study SWOT analysis • To understand personality development • To study	Assessment through Test papers

	y developm ent, concept of personalit y, concept of self-perce ption, personalit y Types.			different types of personality	
Module V (20 hours)	Transactio nal analysis, Games and exercises, Group discussion s, Mock interviews , Public speaking, Physical exercises, Yoga and meditation for personalit y developm ent.	● Discussio n ● Lecture ● Participati ve Learning	● Conducting Mock interviews ● Seminars on Transactional analysis.	● To study what is translational analysis ● To understand group discussion, mock interview ● To understand the effect of yoga and meditation for personality development	Assessmen t through Essay Writing

MC2C9: MANAGEMENT SCIENCE

80 Hours **Marks: 80**

Objectives:

- To familiarize students with concepts of management science and tools supporting decision making
- To enable students to apply Management science techniques in appropriate decision situations.

Module 1:

Management science: basic concepts – Operations Research and Management science – Models – modeling – important management science techniques – Merits and demerits. 10 hours

Module 2:

Linear Programming : basic concepts – formulation of LPP – solutions to LPP – Graphic method – simplex method – maximizing and minimizing with inequality of constraints – applications in business 15 hours

Module 3:

Transportation and Assignment :Transportation – basic concepts – NWC method – Least Cost method – Vogel's approximations method – stepping stone method – Modified Distribution method – Assignment - basic concepts – solution for assignment model – Hungarian assignment method. 20 hours

Module 4:

Network Analysis : Basic concepts – network – CPM – Calculation of project duration – critical activities – PERT – Time estimates in PERT – Probability of project completion – applications in business.

Module 5:

Queuing theory: basic concepts – Waiting line models – characteristics of single facility - single line model - Game theory– Traffic in Orensity – decision making on queues - Applications – softwares. 15 hours

References:

1. Anderson: Introduction to Management Science – Quantitative Technique for Decision making Thomson.
2. Operations Research – Kautiswarup, P.K. Gupta, Manmohan – Sulthan Chand & Sons.
3. Operations Research SD Sharma, Kedar Notes, Ramnath & G.Meerut.
4. OR Techniques for management – VK Kapoor & Sumant Kapoor – Sulthan Chand & Sons.

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**
Module I (10hours)	● Operation research and management science ● Models	● Discussion ● Lecture ● Participative Learning	● Discussion on basic concepts, operations Research and Management science	● To understand about the basic concepts, models and techniques of management science	● Assessment through test paper

	, important management science techniques		• Power point presentations on models and techniques		
Module II (15 hours)	• Linear Programming, formulation, solution and graphic method • Application	• Discussion • Lecture • Participative Learning	• Power point presentation on LPP its formulation, solution and graphic method • Discussion on applications	• To get an idea about LPP • To understand its applications in business	• Assessment through test papers

	in business		in business		
Module III (15 hours)	• Transportation and Assignment, • basic concepts and its different methods	• Discussion • Lecture • Participative Learning	• Discussion on transportation and Assignment , basic concepts • Seminar on its models	• To evaluate the role of transportation and Assignment models	• Assessment through test papers

Module IV (15 hours)	• Network Analysis, basic concepts • CPM, PERT, its applications in business	• Discussion • Lecture • Participative Learning	• Assignment on CPM and PERT • Seminars on applications in business	• To provide an insight into the network analysis • To understand its applications in business	• Assessment through test paper
Module V (15 hours)	• Queuing theory, basic concepts • Ga	• Discussion • Lecture • Participative Learning	• Assignments on Queuing theory and its basic concepts • Discus	• To learn about the applications of Queuing theory and game	• Assessment through test papers

	me theo ry • App licat ions and soft war es		sion on game theory and its applica tions	theory	

MC2C10: STRATEGIC MANAGEMENT AND CORPORATE GOVERNANCE

80 Hours **Marks: 80**

Module 1: Introduction: Basic concepts of strategy and strategic management – level of strategy – Strategic Management Process – Models of strategic management – Approaches to strategic decision making – vision – mission – objectives – goals – strategic implications of social and ethical issues. 12 hours

Module 2:

Environmental Analysis – Concept of environment – Micro and macro environment – Environmental Scanning – SWOT analysis – Strategy and Competitive advantage. 12 hours

Module 3 :

Strategic Choice: Generating strategic alternatives – Strategic options at corporate level – Stability, Growth and Defensive Strategies – Strategic Alliance – SBUs – Portfolio models – BCG matrix – Michael Porter's competitive strategies – External growth strategies – Merger, acquisition, joint venture and strategic alliance (with business cases) 24 hours

Module 4:

Strategic implementation: Various approaches to implementation of strategy – Planning and allocating resources – Strategic Control. 12 hours

Module 5:

Corporate Governance and Business ethics – issues and concepts of corporate governance – Corporate governance practices in India – Board composition and audit committee – Corporate governance in family business and state owned business – An overview of business ethics – Concept – nature – relationship between ethics and corporate excellence – social, environmental and economic responsibilities of business. 20 hours

References:

1. Krishna Kumar: Cases in Strategic Management – Managerial Experiences, Global Business Press (1996) .

2. RM Srivastava: Corporate Strategic Management, Pragati Prakashan.

3. Azhar Kazmi: Strategic Management and Business Policy, Tata McGrawhill Publishers (2010).

4. Stephen Hains: Strategic Thinking, Jaico Publishing House (2008) 19

5. RM Srivastava and Divya Nigan: Corporate Strategic Management, Pragati Prakashan (2000).

6. Frank T Paine and Carl R Anderson: Strategic Management, The Dryden Press.

7. Charles W.L.Hill, Garethe R. Jones and A Shilling: Strategic Management, Cengage Learning (2013).

8. Christine A.Mallin: Corporate Governance, Oxford University Press (2007).

9. A.C. Fernando: Business Ethics and Corporate Governance, Pearson Education (2012).

10. Das: Corporate Governance in India, Prentice Hall of India (2008).

11. A.C. Fernando: Corporate Governance – Principles, policies and practices, Pearson Education (2009).

12. UC Mathur: Corporate Governance and Business Ethics: Text and Cases, Mcmillan India ltd (2005).

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**
Module I (12hours)	Concepts of strategy and strategic management, Levels of strategy, Strategic Management Process, Models of strategic management, Approaches to strategic decision making, strategic implications of social and ethical issues	• Lectures • Discussion • Participative learning	• PowerPoint presentation on concept of strategy and strategic management, and process of strategic management • Group discussion on levels of strategy andstrategic decision making	To understand the concept of strategy, strategic management. To know the strategic management process, strategic decision making etc.	Assessment through test paper, performance in group discussion

Module II (12hours)	Environment analysis, micro and macro environment, SWOT analysis, strategy and competitive advantages	• Lectures • Discussion • Participative learning	• Presentation on SWOT analysis of various companies • Peer group learning in micro and macro environment	To understand more about SWOT analysis To study micro and macro environment To evaluate strategy and competitive advantage	Assessment through test paper, Assessment of performance of presentation of SWOT analysis
Module III (24 hours)	Strategic Choices, Corporate level strategies, Portfolio models, Competitive Advantage, Porter's Value Chain Merger, acquisition, joint venture and strategic alliance	• Lectures • Discussion • Participative learning	• PowerPoint presentation on corporate level strategies • Group discussion on Competitive advantage	To understand the types of corporate level strategies, portfolio models, competitive advantage.	Assessment through test paper, performance in group discussion

Module IV (12 hours)	Strategy implementation, Various approaches to implementation of strategy, Planning and allocating resources, Strategic Control.	• Lectures • Discussion • Participative learning	• PowerPoint presentation on strategic implementation process • Group discussion on Strategic control	To understand strategic implementation and strategic control	Assessment through test paper, performance in group discussion
Module V (20 hours)	Corporate governance and business ethics , corporate governance practice in India, an overview business ethics	• Lectures • Discussion • Participative learning	Group discussion on corporate governance practice in India Presentation on corporate governance in family business and ste owned business	To understand the corporate governance and business ethics To evaluate corporate governance practice in India	Assessment through test paper

Semester III

MC3C11: FINANCIAL MARKETS AND INSTITUTIONS

80 Hours **Marks: 80**

Objectives:

- To provide the students a sound information and knowledge of broad framework of financial markets and institutions.
- To impart the students an understanding of the inter-linkages and regulatory framework within which the system operates in India

Module 1:

An overview of financial markets: Financial markets – Nature – Functions – money market – Capital markets – Markets for derivatives – Working of stock exchange in India – NSE, BSE, OTCEI – Role of SEBI – Major international stock markets. 15 hours

Module 2:

Interest rates :Theories of Interest rate - determination - Maturity and structure of interest rates - Term structure of interest rates - Financial repression and interest rate - The yield curve - interest rates savings - Interest rate and investment - issues of relative rates and return. 15 hours

Module 3:

Commodity markets : MCX, NCDEX, and NMCE – Functions, administration, regulations and general mechanism – International commodity markets – Debt market – Types, functions, instruments – Operational mechanism – Hindrances for the development of debt market. 15 hours **Module 4:** Development financial institutions: IDBI, IFCI, NABARD, SFCs, UTI, SIDBI – Mutual Fund SEBI guidelines on mutual fund – Provident Fund – Pension Funds – PFRDA – Insurance Companies – IRDA. 15 hours

Module 5:

Foreign capital flows : forms of foreign capital – FDI and FPI – FIIs – International financial instruments – ADR, GDR. IDR and Euro bonds – Role of foreign capital in Indian financial system – Trends in foreign capital inflows to India – Regulatory framework for foreign capital flows. 20 hours

References:

1. LM Bhole and Jitendra Mahakud: Financial Institutions and markets, Tata Mc Grawhill Publishers, (2009).

2. Shshi K Gupta: Nisha Agarwal and Neeti Gupta, Financial Markets And Institutions, Kalyani Publishers, (2013)

3. S Sachdeva: Indian Financial System, Educational Publishers, (2005). 21

4. MY Khan: Financial Services, Tata McGrawhill publishers (2004)

5. Keith Pilbeam: Finance and Financial Markets, Palgrave Macmillan (2005).

6. Gordon and Nataraj: Financial Markets and Services, Himalaya Publishing House.

7. Bharati V Pathak: The Indian Financial System: Markets, Institutions and Services, Dorling Kindersley India (pvt) ltd (2009).

8. Clifford Gomez: Financial Markets, Institutions and Financial services, Prentice-Hall of India (2008

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**
Module I (20hours)	An overview of financial markets: Financial markets ,Nature , Functions , money market , Capital markets , Markets for derivatives , Working of stock exchange in India , NSE, BSE, OTCEI , Role of SEBI , Major international stock markets	● Seminar presentations ● Assignments ● Discussions	● Powerpoint presentation on overview of financial markets nature and Functions of money market and capital market	● To provide the students a sound information and knowledge of broad framework of financial markets and institutions	● Evaluation done through test papers

Module II (15 hours)	Interest rates :Theories of Interest rate - determination - Maturity and structure of interest rates - Term structure of interest rates - Financial repression and interest rate - The yield curve - interest rates savings - Interest rate and investment - issues of relative rates and return	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on the term of interest rate and its determination • Group discussion on various theories of interest rate	• To provide students knowledge about various theories of interest rate and their effective determination	• Evaluation done through test papers
Module III (15 hours)	Commodity markets : MCX, NCDEX, and NMCE – Functions, administration, regulations and general mechanism – International	• Discussion • Lecture • Participative Learning	• Powerpoint presentations on commodity markets • Group discussion on	• To acquire knowledge in national and international commodity market	• Evaluation done through test papers

	commodity markets – Debt market – Types, functions, instruments – Operational mechanism – Hindrances for the development of debt market.		Hindrances for the development of debt market		
Module IV (15 hours)	Development financial institutions: IDBI, IFCI, NABARD, SFCs, UTI, SIDBI – Mutual Fund SEBI guidelines on mutual fund – Provident Fund – Pension Funds – PFRDA – Insurance Companies – IRDA	• Discussion • Lecture • Participative Learning	• Powerpoint presentations on financial institutions and markets • Group discussion various regulators like SEBI,IRDA	• To provide the students a sound information and knowledge of Developmental institutions and regulators of Indian financial markets	• Evaluation done through test papers

Module V (20 hours)	Foreign capital flows : forms of foreign capital – FDI and FPI – FIIs – International financial instruments – ADR, GDR. IDR and Euro bonds – Role of foreign capital in Indian financial system – Trends in foreign capital inflows to India – Regulatory framework for foreign capital flows	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on Foreign capital flows and International financial instruments • Group discussion on Role of foreign capital in Indian financial system and Trends in foreign capital inflows to India	To familiarize with different forms of foreign capital inflows and its role in Indian financial system	• Evaluation done through test papers

MC3C12: INCOME TAX LAW AND PRACTICE

80 Hours **Marks: 80**

Objectives:

- To enable students to understand computation of taxable income of various entities and procedure of assessment.

Module 1:

Computation of Taxable Income: An overview of different heads of income – Clubbing of incomes and aggregation of income – Set off and carry forward of losses – Incomes exempt from taxes – Deductions in computing total income – Rebates and reliefs of tax. 20 hours

Module 2:

Assessment of various entities: i. Assessment of agricultural Income – Computation of Agricultural Income – Calculation of tax on integration. ii. Assessment of individuals – Treatment of income received from various institutions – Applicability of Alternate Minimum Tax (AMT) – Computation of Taxable Income and Tax Liability. iii. Assessment of Hindu Undivided Family (HUF) – Computation of Total Income and Tax Liability of HUF. 20 hours

Module 3:

Assessment of firms (Including Limited Liability Partnership – LLP): i. Computation of book profit – Remuneration to partners – Computation of Total Income and Tax Liability – Applicability of Alternate Minimum Tax on firms. ii. Assessment of AOP/BOI – Computation of Total Income and Tax liability of AOP/BOI – Application of Alternate Minimum Tax on AOP/BOI iii. Assessment of Co-operative societies and trusts – Deductions under 80P – Other deductions – Computation of trusts – Definition – Creation – Types of trusts – Tax exemptions – Accumulation of income – Assessment of trusts. 20 hours

Module 4:

Income Tax Authorities : Powers and functions – Provisions of advance payment of tax – Tax payment – Deduction and collection of tax at source – Recovery of tax – Computer applications in tax management. 23 10 hour

Module 5 :

Procedure for assessment of Income Tax: Filing of return of Income – Voluntary return of income – Statutory obligations for filing of return – Time and documents for filing of returns – Return of loss – Belated returns – Revised returns – Defective returns – PAN – Different types of assessment – Self assessment – Assessment on the basis of return – Best judgment assessment – Regular assessment – Reassessment – Protective assessment. 10 hours

References:

1. BB Lal, Income Tax, Pearson (Dorling Kindersley (India) Publication, Latest Edition, 2. Dr. hc. mehrotra and dr.sp. goyal, income tax law and practice

sahitya bhavan publications – latest 3. Ahuja GK & Gupta Ravi, Systematic Approach to Income Tax, Bharat Law House, Latest Edition. 4. BB Lal, Income Tax, Pearson (Dorling Kindersley (India) Publication, Latest Edition. 5. AC Sampat Ayengar, Law of Income Tax, Bharat Law House, Latest Edition. 6. Singhania VK, Income Taxes: Law and Practice, Taxman, Latest Edition.

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**

Module I (20hours)	Computation of Taxable Income: An overview of different heads of income – Clubbing of incomes and aggregation of income – Set off and carry forward of losses – Incomes exempt from taxes – Deductions in computing total income – Rebates and reliefs of tax. 20 hours	• Discussion • Lecture • Participative Learning	• Discussion on different heads of income and computation of taxable Income. • Participative learning on deductions and exemptions of tax	• To understand how to calculate total income. • To understand deductions and exemptions of tax.	• Evaluation through test papers

Module II (15 hours)	Assessment of various entities: i. Assessment of agricultural Income – Computation of Agricultural Income – Calculation of tax on integration. ii. Assessment of individuals – Treatment of income received from various institutions – Applicability of Alternate Minimum Tax (AMT) – Computation of	• Discussion • Lecture • Participative Learning	• Discussion on computation of Agricultural Income • Discussion on Computation of Taxable Income of HUF	• To get an idea about the computation of Agricultural Income and it's integration. • To understand how to assess HUF.	• Evaluation through test papers and Assignments.

	Taxable Income and Tax Liability. iii. Assessment of Hindu Undivided Family (HUF) – Computation of Total Income and Tax Liability of HUF				
Module III (15 hours)	Assessment of firms (Including Limited Liability Partnership – LLP): i. Computation of book profit – Remuneration to partners – Computation of Total Income and Tax	• Discussion • Lecture • Participativ toe Learning	• Discussion on assessment of Firm including LLP, AOP and BOI	• To understand the Assessment of Firms, AOP and BOI.	• Evaluation through test papers.

	Liability – Applicability of Alternate Minimum Tax on firms. ii. Assessment of AOP/BOI – Computation of Total Income and Tax liability of AOP/BOI – Application of Alternate Minimum Tax on AOP/BOI iii. Assessment of Co-operative societies and trusts – Deductions under 80P – Other deductions – Computation of trusts –				

	Definition – Creation – Types of trusts – Tax exemptions – Accumulation of income – Assessment of trusts.				
Module IV (15 hours)	Income Tax Authorities : Powers and functions – Provisions of advance payment of tax – Tax payment – Deduction and collection of tax at source – Recovery of tax – Computer applications in tax	● Discussion ● Lecture ● Participative Learning	● Discussion on various Income Tax authorities and their powers and functions. ● Discussion on TDS and TCS.	● To know about various Income Tax authorities and their role. ● To understand the TDS and TCS.	● Evaluation through test papers.

	management				

Module V (20 hours)	Procedure for assessment of Income Tax: Filing of return of Income – Voluntary return of income – Statutory obligations for filing of return – Time and documents for filing of returns – Return of loss – Belated returns – Revised returns – Defective returns – PAN – Different types of assessment – Self assessment – Assessment	• Discussion • Lecture • Participative Learning	• Discussion on the procedure of assessment and filing of returns. • Participative learning on different types of returns.	• To understand the procedure of assessment and filing of returns.	• Evaluation through assignment.

	on the basis of return – Best judgment assessment – Regular assessment – Reassessment – Protective assessment.				

MC3C13: RESEARCH METHODOLOGY

80 Hours **Marks: 80**

Objectives:

- To acquaint students with the process and methodology of research To enable students to identify research problems, collect and analyse data and present results.

Module 1:

Research: Basic concepts - Meaning – Objectives – Types – Approaches – Significance of research in social sciences – Process of research – Formulating problem – Literature Survey – Hypothesis – Research Design – Types – Exploratory, Descriptive, Diagnostic, Experimental – Sample Design – Collecting, analyzing, testing, interpreting and presenting result. 15 hours

Module 2 :

Population Survey and Sample Study: Population & Sample – Sampling theories - Techniques of sampling – Random and Non random techniques – Sample Size – Determination of sample size – Sampling Errors – Non sampling Errors – Factors influencing sample size – Optimum sample size – Case Study – Pilot Survey. 20 hours

Module 3 :

Data collection : collection of Primary Data – Methods of Data Collection – Observation – Field Survey – Questionnaire - Interview Schedule – Preparation of Questionnaire – Process of Interviewing – Collection of secondary data – Sources of secondary data. 10 hours

Module 4 :

Measurement and Scaling : Variables – Attributes – Process of measurement – Attitude Measurement – Scaling - Scaling Techniques – Graphic Rating – Likert – Thurstone – Semantic Differential – Stapel – Dichotomous – Scales – Types of Scales – Scale Values – Validity and Reliability of Scales – Errors in measurement. 20 hours

Module 5:

Data Processing and Presentation : Field Work – Editing – Classification – Coding – Tabulation – Summarization – Analysis of data – One way ANOVA - Univariate, Bivariate and Multi variable methods - Tools of Analysis – Descriptive Analysis – Inferential analysis – Interpretation – Presentation – Report Writing - Types of Reports – Contents of Reports – Format of Reports – Documentation Styles. 15 hours

References:

1. Tandon BC, Research Methodology in Social Sciences, Chaithanya Publishing House
2. Whitney FL, Elements of Research, Prentice Hall o India
3. Ferber R, Research Methods in Economics and Business, Macmillan
4. Deming W Edwards, Sample Design in Business Research, John Wiley
5. Bailey Kenneth D, Method of Social Research, Macmillan
6. Krishna Swamy, Methodology of Research in Social Sciencem Prentice Hall of India.
7. Achalapathi KC, Readings in Research Methodology in Commerce and Business Management, Himalaya Publishing House

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**
Module I (20hours)	• Basic concepts of Research • Process of research • Types of research • Research design • Sample design	• Discussion • Lecture • Participative Learning	• Assignment on types of research • Discussion on research design and sample design	• To study about the basic concepts of research • To learn various types of reports • To understand the difference between research design and sample design	Evaluation through test papers
Module II (15 hours)	• Population survey and sample study • Sampling theories • Techniques of sampling • Samplin	• Discussion • Lecture • Participative Learning	• PPT on sampling theories • Seminar on techniques of sampling	• To study various techniques of sampling and theories • To understand the difference between population survey and sample study	Assessment through viva

	g errors and non sampling errors ● Optimum sample size				
Module III (15 hours)	● Data collection methods ● Observation ● Interview ● Schedule	● Discussion ● Lecture ● Participative Learning	● Discussion on various methods of collecting data ● Seminar on data collection methods	● To study various methods of data collection	Evaluation through test papers
Module IV (15 hours)	● Measurement and scaling ● Likert scale ● Thurstone ● Semantic differential ● Stapel ● Types of scales ● Validity	● Discussion ● Lecture ● Participative Learning	● Assignment on various measurement and scaling methods	● To learn about various measurement and scaling methods	Assessment through test papers

	and reliability of scales ● Errors in measurement				
Module V (20 hours)	● Data processing and presentation ● Classification ● Coding ● Tabulation ● Summarization ● Types of report ● Format of report	● Discussion ● Lecture ● Participative Learning	● Assignment on various types of research reports ● Peer learning on format of research report	● To study about various types of research report ● To understand the format of report	Assessment through viva

Elective: Finance

Semester: III

MC3 E (F) 01 FINANCIAL MANAGEMENT

80 Hours **Marks: 80**

Objectives:

- **T**o acquaint the students with the basic analytical techniques and methods of financial management of business organization.

- To provide the students the exposure to certain advanced analytical techniques that are used for taking financial policy decisions.

Module 1:

Foundation of Finance: Goals and functions of finance – Legal – Operating and Tax environment for financial decisions – Sources of short term finance – Sources of long term finance – Retained earnings – Common stock and right issues – ADRs and GDRs – Long term debt – Preferred stock – Convertible securities – Warrants and exchangeable – ECBs – FCCBs – Lease finance. 16 hours

Module II:

Working Capital Management: Working Capital – meaning – concept and cycle – Working capital management strategy – Estimation of working capital – Mathematical and simulation models of working capital decisions – Management of cash and marketable securities – Cash management techniques – Lock box system, Concentration baking – Methods of Inventories – Techniques of inventory management – Management of receivables – Techniques of receivable management. 24 hours

Module III:

Cost of Capital: Concept – significance – Computation of cost of Debt, Preference capital, Equity capital and Retained Earnings – Opportunity cost of capital – Marginal cost of capital – WACC – Capital Asset Pricing Model. 12 hours

Module IV:

Capital Structure: Leverage Analysis – Operating, Financial & Combined leverage – EBIT – EPS Analysis – Financial Breakeven – Indifference Point – Capital Structure Theories – Optimum capital Structure – NI approach, NOI approach, Traditional approach & Modigliani Miller approach – Arbitrage process – Determinants of Capital Structure. 16 hours 31

Module V :

Dividend policy : Mechanics and practices of dividend payment – factors affecting dividend policy – legal framework of payment of dividend – dividend theories – determinants of dividend policy and some case studies. 12 hours (Theory 50%, Problems 50%)

References:

1. Soloman, Ezra, Theory of Financial Management, Columbia Press (Latest Edition)

2. James C Van Horne. Financial Management and Policy Prentice Hall of India (Latest Edition)

3. Weston, J. Fred and Brigham, Eugne F. Managerial Finance, Dryden Press (Latest Edition)

4. Prasanna Chandra. Financial Management, Tata McGraw Hill (Latest Edition)

5. Khan, M.Y. and P.K. Jain. Financial Manager, Tata McGraw Hill (Latest Edition).

6. Pandey, I.M. Financial Management, Tata McGraw Hill (Latest Edition)

7. Ravi M. Kishore. Financial Management, Taxmann (Latest Edition)

8. Brigham, Ehrhavdt. Financial Management, Cengage Learning India Private Ltd. New Delhi – 110082 (Latest Edition)

9. Ross S.A., R.W. Westerfield and J. Jaffe, Corporate Finance, McGraw Hill (Latest Edition)

10. Anderson, Sweeney and Williams. An Introduction to Management Science, Cengage Learning India Private Ltd. New Deli – 110092 (Latest Edition)

11. Brigham and Houston. Fundamentals of Financial Management, Cengage Learning India Private Ltd., New Delhi – 110091 (Latest Edition)

12. Brealey R.A. and S.C. Myers. Principles of Corporate Finance, McGraw Hill, (Latest Edition)

13. Sudhirbhat. Financial Management. Excel Book (Latest Edition)

14. Damodaran, A. "Corporate Finance : Theory and Practice". John Wiley & Sons (Latest Edition) Journals Finance India Applied Finance, ICFA Journal of Finance Journal of Financial Economics Chartered Financial Analyst Financial Dailie

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process) students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (16hours)	Foundation of finance , legal operating and tax environment in finance decision,sources of short term finance , sources of long term finance,retained earnings , common stock and right issue,	• Discussion • Lecture • Participative Learning	Assignment on legal operating and tax environment in finance decision Seminar on short term and long term source of finance	To study foundation of finance To evaluate legal operating and tax environment in finance decision To identify source of finance	Assessment through MCQ
Module II (24 hours)	Working Capital Management: Working Capital–meaning–concept and cycle – Working capital management strategy – Estimation of working capital– Mathematical and simulation models of	• Discussion • Lecture • Participative Learning	Seminars by students on Management of Working Capital, Inventory management etc Lectures and Practical problems on Working capital management, estimating working capital requirements etc.	To understand the concept of working capital, Working capital management and its estimation.	Evaluation done through test papers and assessment of seminars

	working capital decisions – Management of cash and marketable securities – Cash management techniques – Lock box system, Concentration baking – Methods of Inventories – Techniques of inventory management – Management of receivables – Techniques of receivable management-working capital financing for Indian industry				

Module III (12 hours)	Sources of long-term finance and Cost of Capital: Conventional and innovative sources leasing-factoring -securitisation-financial engineering-cost of capital-Concept –significance–Computation of cost of Debt, Preference capital, Equity capital and Retained Earnings – Opportunity cost of capital – Marginal cost of capital – WACC – Capital Asset Pricing Model.	• Discussion • Lecture • Participative Learning	Seminars by students on sources of finance, leasing, factoring, securitization etc. Practical problems on Cost of capital of different sources of finance as well as overall cost of capital (WACC)	To understand Various sources of long term finance, and to know the calculation of cost of different sources of capital using different methods	Evaluation done through test papers and assessment of seminars

Module IV (15 hours)	Financial leverage and Capital Structure: Definition of capital structure-Leverage Analysis– Operating, Financial & Combined leverage – EBIT – EPS Analysis – Financial Breakeven – Indifference Point – Capital Structure Theories – Optimum capital Structure – NI approach, NOI approach, Traditional approach & Modigliani Miller approach – Arbitrage process– Determinants of Capital Structure- over capitalisation, under	• Discussion • Lecture • Participative Learning	Lectures and discussion on Capital structure, and Leverage analysis Exercising practical problems in Leverage analysis and Capital structure	To understand the concept of Capital structure, capital structure theories, Leverage analysis, Determinants of capital structure etc.	Evaluation done through test papers

	capitalisation and fair capitalisation				
Module V (12 hours)	Mechanics and practices of dividend payment–factors affecting dividend policy – legal framework of payment of dividend – dividend theories – determinants of dividend policy and some case studies	• Lectures • Group discussions • Working out practical problems • Seminars	• Lectures and discussion on Dividend theories, and dividend policy • Seminars on mechanics and practices of dividend payment • Exercising practical problems dividend theories	To understand the concept of Dividend theories, develop knowledge on dividend theories and dividend policy	Evaluation done through test papers and assessment of seminars

Elective: Finance

MC3 E (F) 2: SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT

80 Hours **Marks:80**

Objectives:

- To establish a conceptual framework for the study of security analysis and portfolio management.

- This course will provide the students the ability to understand and utilize the skill of optimizing returns.

Module I:

Investments: Meaning and concept – Investment objectives – various asset classes – factors in investment decisions- Investment process – concept of risk and return – sources of risk – Measurement of risk and return – Diversification and hedging – ethical investing. 13 hours

Module II;

Bond Investment analysis: Types of bonds – International bonds – Bond yields – Yield to Maturity (YTM) – risk analysis is bonds – Bond value theorem – Bond immunization strategies. 15 hours

Module III:

Equity Analysis: Approaches to equity analysis – Fundamental analysis – Economy, Industry and Company (EIC) analysis – Equity valuation models – Dividend Discount Models (DDM) and Price Earnings Ratio (PER) models – Technical analysis – Dow theory – Chart and Chart Patterns – Market and Mathematical Indicators – Efficient Market Hypothesis (EMH) and Random Walk theory – Tests of market efficiency – Critique of Investor rationality – Behavioural Finance. 20 hours

Module IV:

Portfolio analysis and selection: Risk return analysis of investment portfolio – Individual and Interactive risks – measurement of portfolio risks – Risks tolerance and asset allocation – optimal portfolio – portfolio selection modelsMarkowtiz model – Sharpe single index model – Capital Asset Pricing Model (CAPM) – Capital Market Line (CML) and Security Market Line (SML) – Market anomalies : calendar effect, size effect and market overreaction – Arbitrage Pricing Theory (APT) – Multifactor asset pricing Models. 20 hours

Module V:

Portfolio Management: Active and Passive investment strategies – Value and growth investing, contrarian strategies – index investing and tracking efficiency,

Portfolio evaluation- Sharpe, Treynor and Jensen measures, Fama's Decomposition Index – Portfolio revision. 12 hours 33

References:

1. Bodie, Zvi, Kane Alex and Alan, J. Marcus, Investments, McGraw Hill.
2. Bhalla, V.K. Investment Management, S. Chand & Company Ltd.
3. Chandra, P. Security Analysis and Portfolio Management, Tata McGraw Hill.
4. Elton, E. and Gurber, M. Modern Portfolio Theory and Investment Analysis, John Wiley and Sons
5. Fischer, Donald E. and Ronald J. Jordan, Security Analysis and Portfolio Management, PHI Learning.
6. Preeti Singh, Investment Management, Himalaya Publishers.
7. Sharpe William, F. and Bailey Jeffery V. Alexander Gordon, J. Investments, PHI Learning.
8. S.Kevin, Security Analysis and Portfolio Management, PHI Learning
9. Stephen Ross and R. Westerfield, Corporate Finance, McGraw-Hill.
10. Vishwanath, R and Krishna Murthi,C., Investment Management, Springer.
11. V.A. Avadhani, Security Analysis and Portfolio Management, Himalaya Publishers.
12. Fabozzi, Frank, J. Investment Management, PHI learning.

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**

Module I (20hours)	• Investments - meaning, objectives and concept • Factors in investment decisions • Investment process • Concept of risk and return • Diversification and hedging	• Discussion • Lecture • Participative Learning	• Seminar on investment decisions and the factors influencing it • Assignment on diversification and hedging	• To learn more about various investment decisions • To understand the factors influencing the investment decisions • To study the concept of risk and return	Evaluation through test papers
Module II (15 hours)	• Bond investment analysis • Types of bonds • Yield to maturity (YTM) • Bond value theorem • Bond immunization strategies	• Discussion • Lecture • Participative Learning	• Discussion on various types of bonds. • Slide presentation on Yield to Maturity (YTM) • Peer learning on bond value	• To learn about bond investment analysis • To study the various types of bonds • To understand bond value theorem • To know what is YTM	Assessment through viva

			theorem		
Module III (15 hours)	• Equity Analysis • Approaches to equity analysis • Economy, industry and company (EIC) analysis • Dividend discount models • Price earning ratio • Dow theory • Efficient market hypothesis • Behavioural finance	• Discussion • Lecture • Participative Learning	• Slide presentation om various dividend discount models • Assignment on behavioural finance	• To study the approaches to equity analysis • To understand price earning ratio, dow theory, EIC analysis	Evaluation through test papers

Module IV (15 hours)	• Portfolio analysis and selection • Measurement of portfolio risks • Portfolio selection models • Markowitz model • CAPM method • Capital Market Line and Security market line	• Discussion • Lecture • Participative Learning	• Seminar on portfolio analysis and selection • Assignment on difference between CML and SML	• To study portfolio selection models • To learn to measure risks in portfolio • To understand the difference between capital market line and security market line • To study un detail about CAPM model	Evaluation through descriptive tests
Module V (20 hours)	• Portfolio management • Active and passive investment strategies • Portfolio evaluation • Sharpe,	• Discussion • Lecture • Participative Learning	• Assignment on various portfolio evaluation measures	• To study about portfolio management • To evaluate various portfolio evaluation measures • To understand ortfolio revision	Evaluation through mcqs

	Treynor and Jensen measures ● Portfolio revision				

Semester IV

MC4C14: FINANCIAL DERIVATIVES AND RISK MANAGEMENT

80 Hours **Marks: 80**

Course Objectives:

- To make the students efficient in the area of derivatives, by giving them the knowledge of basics in options, futures, swaps etc.

Module 1:

Introduction to risk management – Meaning and need – importance – Types of market risk – Risk management issues in business – Financial derivatives – Meaning – Need – Growth of financial derivatives markets in India – Derivative markets – Exchange traded financial derivatives for risk management in India – Participants – Functions – Types of risk management instruments – Forwards – Futures – Options – Swaps – The regulatory framework of derivative trading in India. 16 hours

Module 2:

Future's growth and development t- Difference between forwards and futures - financial future - Future trading – currency futures – Interest rate futures Pricing and valuation – of future contacts – Value at risk-Hedging risk – Hedging with stock index future – types of members and margin system in India-Future trading in stock exchange for risk management. 20 hours

Module 3:

Options – meaning – needs and importance-options and futuresfundamental option strategies-type of option-put-call-trading strategies of risk instruments-positions in options-stock indices-options in Indian stock market. 16 hours

Module 4 :

Risk pricing of options-intrinsic value and time value-pricing at the expiry of contact-factors affecting option pricing-put-call-parity pricing-models of pricing-binomial option-pricing models-Black Scholes pricing methods. 16 hours

Module 5:

Swaps-meaning and definition-development-structure of swap dealing for risk management-interest rate swaps-forward swaps and swap option contracts cancellable and extendable swaps-no generic swaps transactions. Currency swaps - Valuation and pricing of swaps - risk management function of swap transaction. 12 hour

References:

1. Kevin Dowd-Measuring Market risk, second edition.
2. John C Hull-Options futures and other derivatives, seventh edition.
3. Jayanth Rama Varma, Derivatives and Risk Management, TMH, Latest Edition.
4. Mishra, Financial Derivatives, Excel publishers, Latest Edition.
5. SL. Gupta, Financial Derivatives: Theory, concepts and problems, Prentice Hall of India, Latest Edition
. 6. SS Kumar, Financial Derivatives, Prentice Hall of India, Latest Edition

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**

Module I (20hours)	Introduction to risk management – Meaning and need – importance – Types of market risk – Risk management issues in business – Financial derivatives – Meaning – Need – Growth of financial derivatives markets in India – Derivative markets – Exchange traded financial derivatives for risk management in India –	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on Meaning and types of market risk, risk management issues in business and Financial derivatives and types of derivatives	• To understand and apply the terms and concepts of underlying risk management	Assessment done through test papers

	Participants – Functions – Types of risk management instruments – Forwards – Futures – Options – Swaps – The regulatory framework of derivative trading in India.				
Module II (15 hours)	Future's growth and development t- Difference between forwards and futures - financial future - Future	• Discussion • Lecture • Participative Learning	• Powerpoint presentation on Future and their trading • Group discussion on Currency futures and interest rates futures • Group discussion on	To understand and evaluate growth and development of future	Assessment done through test papers

	trading – currency futures – Interest rate futures Pricing and valuation – of future contacts – Value at risk-Hedging risk – Hedging with stock index future – types of members and margin system in India-Future trading in stock exchange for risk management		hedging strategies		

Module III (15 hours)	Options – meaning – needs and importance-options and futures fundamental option strategies-type of option-put-call-trading strategies of risk instruments-positions in options-stock indices-options in Indian stock market.	• Discussion • Lecture • Participative Learning	• Group discussion on types of option • PowerPoint presentation on meaning of option and fundamental option strategies and valuation of option strategies	• To understand and apply the option trading and various strategies involved in it	Assessment done through test papers

Module IV (15 hours)	Risk pricing of options-intrinsic value and time value-pricing at the expiry of contact-factors affecting option pricing-put-call-parity pricing-models of pricing-binomial option-pricing models-Black Scholes pricing methods	• Discussion • Lecture • Participative Learning	• PowerPoint presentation on put call parity pricing,models of pricing, binomial and black Scholes pricing methods.	• To understand about the pricing of options- call and put option	Assessment done through test papers

Module V (20 hours)	Swaps-meaning and definition-development-structure of swap dealing for risk management-interest rate swaps-forward swaps and swap option contracts cancellable and extendable swaps-no generic swaps transactions. Currency swaps - Valuation and pricing of swaps - risk manageme	• Discussion • Lecture • Participative Learning	• Group discussion on types swaps • PowerPoint presentation on valuation and pricing of swaps	• To evaluate and apply SWAP contract and pricing of different instruments under SWAP	Assessment done through test papers

	nt function of swap transactio n				

MC4C15: COST MANAGEMENT

80 Hours **Marks: 80**

Objectives:

- To provide students the adequate knowledge of modern cost management techniques and
- to enable them apply these techniques for managing a profitable and competitive enterprises.

Module 1:

Cost Management – Nature – Cost management system – Strategic cost management (SCM) – Components of SCM – Cost concepts in decision making. Activity Based Costing (ABC) – Need for emergence of ABC – Concept of ABC – Kaplam and Cooper's approach to ABC-Cost drivers and cost pools – Characteristics of ABC-Allocation of overheads under ABC-Steps in ABC systemImplementation of ABC and its benefits. 15 hours

Module 2:

Modern cost management concepts–Kaizen costing–concepts–procedures–evaluation–benefits–target costing– nature– methods–steps-life cycle costing-phases-features-stages and importance-Product Life Cycle costing and cost control. 15 hours

Module 3:

Emerging Costing Approaches: Measuring productivity - Productivity index - Advantages of Higher productivity - Causes of low productivity - Business Process Reengineering - Concept-Importance - Issues in BPR-Just In Time (JIT) - Objectives – Features - Implementation and benefits of JIT - Value Chain Analysis - Internal linkages - Supplier linkages - role of value chain in decision analysis. 15 hours

Module 4:

Costing in service sector and process costing : Classification and collection of costs in operating costing - Transport costing-Boiler house costingPower house costing - Hospital costing – Canteen costing – Cinema theatre costingHotel costing - Process costing - process losses and gains – valuation of work in progress (equivalent production) – Joint products and by products – Accounting for joint products and by products – Inter – process profits. 20 hours

Module 5:

Standard costing and variance analysis: Types of standard-setting standards – advantages – variance analysis – importance – material, labour, overhead, sales and profit variance – interpretation of variance - control and efficiency ratios – investigation of variances – techniques of interpretation of variances. 15 hours (40% theory and 60% problems) 29

References:

1. Catherine Stenzel & Joe Stenzel, Essential of Cost Management, John Wiley and sons, Latest Edition.
2. Roman I wiel & Michael W mahr Hand book of Cost Management, John Wiley and Sons, Latest Edition.
3. Lianabel Oliver, The cost management tool box. AMA Publication, Latest Edition.
4. John K. Shank & Vijay Givindarajan, Strategic Cost management: The new tool for competitive advantage, The free press, Latest Edition.
5. K.P.Gupta, Cost Management: Measuring, monitoring and motivating performance, Global India Publications, Latest Edition.

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**

Module I (15 hours)	Strategic cost management, ABC. allocation of overhead under ABC, implementation of ABC and its benefits	• Discussion • Lecture • Participative Learning	Seminar on implementation of ABC and its benefits Assignment on exercise questions	To study strategic cost management To study ABC system for OH allocation	Evaluation done through test papers
Module II (15 hours)	Modern cost management concepts	• Discussion • Lecture • Participative Learning	Assignment on kaizen costing Seminar on life cycle costing	To study Modern cost management concepts	Evaluation done through test papers
Module III (15 hours)	Emerging costing approach, productivity index, BPR, JIT,value chain analysis	• Discussion • Lecture • Participative Learning	Assignment on exercise questions	To study emerging costing approach	Evaluation done through test papers

Module IV (20 hours)	Costing in service sector and process costing transport costing, canteen costing, house costing hotel costing , cinema theater costing,valuation in working progress, joint products and by products costing	• Discussion • Lecture • Participative Learning	Seminar on service sector and process costing \ Assignment on exercise questions	To study costing of service sector and process costing	Evaluation done through test papers
Module V (15hours)	Standard costing and variance analysis material , labour, OH	• Discussion • Lecture • Participative Learning	Assignment on exercise questions Seminar on techniques of interpretation of variance	To study standard costing and variance analysis	Assessment through test papers

Elective: Finance Semester:

IV MC4 E (F) 03: STRATEGIC FINANCIAL MANAGEMENT

80 Hours Marks: 80

Course Objective

- To build an understanding among students about the concepts, vital tools and techniques used for financial decision making by a business firm.

Module I:

Financial goals and strategy : Shareholder value creation (SCV) – Market Value Added (MVA) – Market – to – Book Value (M.BV) – Economic Value Added (EVA) – managerial implications of shareholder value creation – Growth ratios – Internal Growth Rate (IGR) – Sustainable Growth Rate (SGR) 12 hours

Module II:

Financial strategy for capital structure: Leverage effect and shareholders risk – Capital structure planning and policy – Financial options and the value of the firm – Dividend policy and the value of the firm. 20 hours

Module III:

Lease Financial strategy: Leasing concept – Types – Cash flow consequences of lease – Financial evaluation of leasing - Lessee's point of view – leasing versus buying – NPV method – Equivalent loan method – Evaluation from lesser's point of view – NPV and IRR methods. 16 hours

Module IV:

Merger strategy : Theories of Merger – Horizontal, vertical and conglomerate mergers – Merger procedure – Valuation of firm – Financial impact of merger – Merger and dilution effect on EPS – Merger and dilution effect on business control. 16 hours

Module V:

Take over strategy : Types of takeovers – Negotiated and hostile bids – Take over procedures – Takeover defenses – Takeover regulations of SEBI – Distress restructuring strategy – Sell offs – Spin offs – Leveraged buy outs 16 hours

References:

1. Vanhorne, James C: Financial Management and policy, Pearson, New Delhi, (Latest edition)

2. Brighham and Ehrhardt: Financial Management, Thomson India, (Latest edition)

3. Chandra, Prasana: Financial Management, Tata McGraw Hill, New Delhi, (Latest edition)
4. Khan, MY and James PK: Financial Management, Tata McGraw Hill New Delhi, (Latest edition)
5. Pandey IM: Financial Management, Vikas Publishing House, New Delhi, (Latest edition)
6. Gitman, LJ: Principles of Managerial Finance, Harper and Row (Latest edition)
7. Hampton: Financial decision making, Concepts, problems and cases, Prentice Hall of India, New Delhi (Latest edition)
8. Brealey and Meyers: Principles of Corporate Finance, Tata McGraw Hill, New Delhi (Latest edition

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**
Module I (12hours)	Financial goals and strategy: Shareholder value creation (SCV)– Economic Value Added (EVA) - Market Value	● Discussion ● Lecture ● Participative Learning	● Lectures and Powerponit presentations on concept of Advanced strategic financial management ● Practical problems on SVC, EVA, MVA, MBV, IGR,	To understand the concept of Strategic financial management, shareholder value creation, economic value added,etc	Evaluation done through test papers

	Added (MVA) – Market – to – Book Value (MBV) — managerial implications of shareholder value creation – Growth ratios – Internal Growth Rate (IGR) – Sustainable Growth Rate (SGR)		SGR ●		
Module II (20 hours)	Financial strategy for capital structure: Leverage effect and shareholders risk – Capital	● Lectures ● Group discussions ● Working out practical problems ● Seminars	● Seminars and discussion by students on Leverage analysis and dividend policy ● Lectures and powerpoint	To develop knowledge about financial strategy for capital structure, capital structure planning and policy, dividend policy etc	Evaluation done through test papers and assessment of seminars

	structure planning and policy – Financial options and the value of the firm – Dividend policy and the value of the firm.		presentation on Capital structure planning and policy, financial options and value of firm. ● Practical problems on leverage analysis dividend policy and value of firm etc.		
Module III (16hours)	Lease Financial strategy: Leasing concept–Types–Cash flow consequences of lease – Financial evaluation of leasing - Lessee's point of view –	● Lectures ● Group discussions ● Working out practical problems ● Seminars	● Seminars and discussion by students on leasing concept and evaluation ● Lectures and Practical problems on buy or lease decisions, NPV method, Equivalent loan method, Evaluation	To understand the leasing concept and evaluation and to develop knowledge about NPV method, Equivalent loan method, Evaluation from lesser's point of view, NPV and IRR methods.	Evaluation done through test papers and assessment of seminars

	leasing versus buying – NPV method – Equivalent loan method – Evaluation from lesser's point of view – NPV and IRR methods.		from lesser's point of view, NPV and IRR methods.		
Module IV (16 hours)	Merger strategy: Theories of Merger–Horizontal, vertical and conglomerate mergers – Merger procedure – Valuation of firm – Financial	• Lectures • Group discussions • Participative learning	• Powerpoint presentations and discussion on merger strategy and types of merger and impact of merger etc. • Lectures on Merger procedure, valuation of firm etc	To understand the concept of Merger, Merger strategies, effects of merger etc	Evaluation done through test papers

	impact of merger – Merger and dilution effect on EPS – Merger and dilution effect on business control. (16 hours)				
Module V (16 hours)	Take over strategy: Types of takeovers– Negotiated and hostile bids–Take over procedures – Takeover defences – Takeover regulations of SEBI – Distress restructuring	• Lectures • Group discussions • Participative learning	• Powerpoint presentations and discussion on Take over strategy • Lectures on take over procedures, takeover regulations of SEBi, Takeover Defences etc	To understand the concept of takeover, to know about take over strategies, take over procedures and SEBI regulations on the same.	Evaluation done through test papers

	strategy – Sell offs – Spin offs – Leveraged buyouts.				

Elective: Finance

MC4E (F) 04: TAX PLANNING AND MANAGEMENT

80 Hours **Marks: 80**

Objectives:

- To acquaint the students with theoretical and practical knowledge of tax planning and management techniques.
- To familiarize the students with major and latest provisions of the India tax laws and related judicial pronouncements pertaining to various assesses with a view to derive maximum possible tax benefits admissible under the law.

Module 1:

Introduction to tax planning and management: Concept of tax planning and management – Tax evasions and tax avoidance-Need and significance of tax planning and management-Tax Planning in respect of residential status. 10 hours

Module 2:

Assessment of companies: Residential status and incidence of taxSpecial Provisions applicable to assessment of total income of companiesDeductions available to corporate assesses – Computation of taxable income of companies and determination of corporate tax liability – Minimum Alternate TaxTax on distributed profit of domestic companies- Tax on income distributed to unit holders-Security Transaction Tax – Tonnage Tax. 25 hours

Module 3:

Tax Planning: Individuals – Tax Planning with reference to all five heads of income for individuals – Salary, House Property, Profit from business and profession, Capital Gains and Income from other sources – Tax planning with respect to deductions, exemptions, Rebate, Relief, Concession and incentives (Problems focused on tax planning). 20 hours

Module 4:

Tax planning and managerial decisions: Tax planning in respect of make or buy, own or lease, repair or replace, export or domestic sales, shut down or continue, expand or contract, amalgamation or demerger, invest or disinvestFinancial Management decisions, Capital Structure, dividend policy and bonus shares. 15 hours

Module 5:

Tax planning under various circumstances: Tax planning while setting up of a business-with reference to location, nature and form of organizations-Tax planning related to Special Economic Zones (SEZ), Export Processing Zones (EPZ) 37 and Export Oriented Units (EOUs) – Infrastructure sector and background areas – Tax incentives for exporters. 10 hours (50% theory and 50% problem)

References:

1.VK Singhania, Direct Tax's Planning and Management, Taxman, Latest Edition.

2. VS Sundaram, Commentaries on the Law of Income Tax in India, Pearson Law Publishers, Latest Edition.

3. AC Sampat Ayengar, Law of Income Tax, Bharat Law House, Latest Edition.

4. Bhagmati Prasad, Direct Taxes Laws Practice, Wishwa Prakashan, Latest Edition.

5. Kaushal Kumar Agarwal, Direct Tax Planning and Management, Atlantic Publishers, Latest Edition.

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**

Module I (20hours)	Introduction to tax planning and management: Concept of tax planning and management – Tax evasions and tax avoidance-Need and significance of tax planning and management-Tax Planning in respect of resident	• Discussion • Lecture • Participative Learning	• Discussion on the concepts of tax planning, management, evasion and avoidance	Understand the concepts related to Income Tax such as tax planning, management, evasion and avoidance.	Evaluation through est papers

	ial status.				
Module II (15 hours)	Assessment of companies: Residential status and incidence of taxSpecial Provisions applicable to assessment of total income of companiesDeductions availablle to corporate assesses – Comput	• Discussion • Lecture • Participative Learning	• Discussion on assessment of companies and its residential status and incidence of tax	• To understand the assessment of companies including shipping companies	• Evaluation through assignments and test papers

	ation of taxable income of companies and determination of corporate tax liability – Minimum Alternate TaxTax on distributed profit of domestic companies- Tax on income distributed to unit holders- Security Transac				

	tion Tax – Tonnage Tax.				
Module III (15 hours)	Tax Planning: Individuals – Tax Planning with reference to all five heads of income for individuals – Salary, House Property, Profit from business and profession, Capital Gains and Income	• Discussion • Lecture • Participative Learning	• Discussion on tax planning related to individuals with respect different heads of income	• To understand the tax planning of individuals with reference to five heads of income.	• Evaluation through test papers

	from other sources – Tax planning with respect to deductions, exemptions, Rebate, Relief, Concession and incentives (Problems focused on tax planning)				

Module IV (15 hours)	Tax planning and managerial decisions: Tax planning in respect of make or buy, own or lease, repair or replace, export or domestic sales, shut down or continue, expand or contract, amalgamation or demerger,	• Discussion • Lecture • Participative Learning	• Discussion on tax planning relating to different managerial decisions.	• To understand how to take different managerial decisions by considering its tax implications.	• Evaluation through assignments and test papers

	investor disinvestFinancial Management decisions, Capital Structure, dividend policy and bonus shares. 15 hours				
Module V (20 hours)	Tax planning under various circumstances: Tax planning while setting up of a business-with	• Discussion • Lecture • Participative Learning	• Discussion on tax planning under various circumstances	• To equip students to take decisions under different circumstances by evaluating tax implications of the same	• Evaluation through assignments and test papers

	reference to location, nature and form of organizations-Tax planning related to Special Economic Zones (SEZ), Export Processing Zones (EPZ) 37 and Export Oriented Units (EOUs) – Infrastructure sector and backgro				

	und areas – Tax incentives for exporters				

BCM1B01 BUSINESS MANAGEMENT

Number of Lecture Hours per week : 6
Number of Credits : 4
Internal : 20, External :80
Examination Hours :3

Objectives:

- To understand the process of business management and its functions.

Module I

Concepts of Management – Characteristics of management – Schools of management thought - Management and administration –Functions of management- Management by objectives – Management by participation – Management by exception – Management by motivation. 15 Hours

Module II

Functions of Management: Planning – concept and importance - Decision making – barriers to effective planning – Organizing – concept and importance – different organization models – Span of management – Departmentation – Delegation. 20 Hours

Module III

Functions of Management: Motivation: – concept and importance – Contributions of McGregor, Maslow and Herzberg – Leadership: – Concept and styles – Leadership traits - situational theory of leadership - Communication: – process and barriers – Control: – concept steps – tools – Coordination: Concept – Principles - Techniques 20 Hours

Module IV

Business Ethics: Meaning and scope – Types of ethics – Characteristics – Factors influencing business ethics – Arguments for and against business ethics – Basics of business ethics - Corporate social responsibility - Environmental issues in business – Ethics in advertising – Globalization and business ethics. 20 Hours

Module V

Emerging concepts in management – Kaizen – TQM – TPM – MIS – ISO – Change management – Stress management – Fish bone (ISHIKAWA) Diagram – Business ecosystem – Logistic management. 15 Hours

Reference Books:

1. Boatwright. John R: Ethics and the Conduct of Business, Pearson Education, New Delhi.
2. Gupta. CB; Business management, Sultan Chand & sons
3 Koontz, H and Wechrick, H: Management, McGraw Hill Inc, New York.
4 Prasad. LM; Principles and Practice of Management; Sultan Chand & sons
5 Stoner. AF and Freeman RE; Management; Prentice Hall of India
6.Drucker, Peter, F., Management: Tasks, Responsibilities and Practices, Allied Publishers, New Delhi.
7. R.S Davar; Management Process
8. Rustum & Davan, Principles and Practice of Management.
9. Srinivasan & Chunawalla, Management Principles and Practice.
10. S. V. S. Murthy. Essentials of Management.

OBJECTIVES

- To familiarize the students with current management practices
- To understand the importance of ethics in business
- To acquire knowledge and capability to develop ethical practices for effective management.

Lesson plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (15 hours)	Concepts of Management, management and administration, MBO,management by participation, management by motivation	● Lecture ● Discussion ● Participative Learning	● Assignments on the topic Management By Objectives (MBO) ● Discussion on Concept of Management	● To understand the concepts of Management ● To evaluate different schools of Management Thoughts ● To identify various functions of Management	● Business Quiz

Module II (20 hours)	Functions of Management- Planning concept, Barriers to effective planning, Organisation concept, Departmentation and Delegation	• Lecture • Discussion • Participative Learning	• Group Discussion on Departmentation and Delegation • Assignment on Barriers to effective Planning	• To study the concept of planning and organisation • To understand the meaning of Departmentation and Delegation	Assessment through viva
Module III (20 hours)	Functions of management, Concepts of Motivation, Communication process and barriers Leadership - Concepts and Styles, Control - Tools	• Lecture • Discussion • Participative Learning	• Powerpoint Presentation on Motivation Theories • Group discussion on various communication gadgets available and its importance in business • Leadership games	• To evaluate various motivation theories • Identify communication channels and study communication process and barriers in business • To understand leadership qualities and skills	Evaluation through test papers

Module IV (20 hours)	Business ethics, theories of ethics,factors influencing business ethics, globalization and business ethics	• Lecture • Discussion • Participative Learning	• Group Discussion on Business Ethics	• To understand factors influencing business ethics • To identify different views of business ethics	• Evaluation through essay writing
Module V (15 hours)	Emerging concepts in Management - KAIZEN, TQM, TPM, MIS, ISO Change Management, Stress management, Business Ecosystem, Logistics Management	• Lecture • Discussion • Participative Learning	• Assignment on Emerging Concepts of Management • Powerpoint presentation on various areas of Stress Management • Collage on Business Ecosystem	• To study the emerging concepts of Business management • To identify various concepts of stress management and logistics management	• Assessment through Descriptive test

BCM1C01 MANAGERIAL ECONOMICS

Number of Lecture Hours per week: 5
Number of Credits: 4
Internal: 20, External: 80
Examination Hours : 3

Objectives :

- To enable the students to understand micro and macro economic concepts relevant for business decisions.

Module I

Managerial Economics:- – Definition and characteristics – Nature and Scope - Economics Vs Managerial Economics - Decision making and forward planning – Relationship of managerial economics with other disciplines - Basic economic tools in management economics – The role of managerial economist. (10 Hours)

Module II

Basic concepts of Demand and Cost :- Demand Function, Demand Curve, Elasticity of Demand, Demand Forecasting - Production, Production Function, Law of variable proportions, returns to scale, isoquants, isocost, optimum combination of inputs, economies and diseconomies of scale - costs, types of costs, cost minimization, profit maximisation. (10 Hours)

Module III

Theory of consumer behaviour: - Cardinal analysis - Law of diminishing marginal utility – consumer surplus; Ordinal approach – indifference curve analysis – consumer equilibrium – income consumption curve and price consumption curve – Hicksian decomposition of price effect in to substitution effect and income effect – Demand curve for normal, inferior and giffen goods – concept of elasticity of demand – measurement of various elasticities – Elasticity of supply. (20 Hours)

Module IV

Market structure:-

a. Perfect competition: – profit maximization and equilibrium of firm and industry – short run and long term supply curves – price and output determination.
b. Monopoly: – Price determination under monopoly – equilibrium of firm – comparison between perfect competition and monopoly – price discrimination.
c. Monopolistic competition: price and output determination – product differentiation – comparison with perfect competition – excess capacity under monopolistic competition.
d. Oligopoly: indeterminate pricing and output – classical models of oligopoly – price leadership - collusive oligopoly – kinked demand curve. (20 Hours,20 marks)

Module V

Macro Economics: Indian Economy- Basic characteristics of Indian Economy - Issues in Indian Economy: Problems of growth, unemployment, inequality in income distribution, inflation - Concept of Parallel Economy - Indian economy under WTO regime.

Reference Books:

1. R.L. Varshney and K.L. Maheswari, Managerial Economics
2. Ahuja. HL; Business Economics, S. Chand & co.
3. D.N. Dwivedi, Managerial Economics
4. Dr. S. Sankaran, Managerial Economics
5. DM Mithani: Business Economics
6. Seth M L Text Book of Economic Theory
7. K K Dewett: Economic Theory
8. Dutt & Sundaram: Indian Economy
9. Petersen &. "Lewis: Managerial Economics
10. Mote V L peul. S & Gupta G S: Managerial Economics
11. H. Craig Petersen & W. Cris lewis: Managerial Economics
12. Dr. P.N. Reddy and H.R, Appanaiah : Essentials of Business Economics
13. Barry Keating and J. Holton Wilson: Managerial Economics

OBJECTIVES

- To help the students to understand the Application of economic principles in business management.

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (10 Hours)	Managerial Economics - Definition and nature, The role of managerial economists, Basic economic tools in Managerial Economics	• Lecture • Discussion • Participative Learning	• Powerpoint presentation on Definition and nature of Managerial Economics • Group Discussion on Role of managerial Economists	• To understand nature of managerial economics • To evaluate the role of managerial economists	• Evaluation through Case Study

Module II (10 Hours)	Basic Concepts of Demand and Cost, Demand Function, Production Function, Law of Variable Proportions, Economies and Diseconomies of scale, Cost Minimization, Profit Maximization	• Lecture • Discussion • Participative Learning	• Group Discussion on Economies and Diseconomies of scale • Presentation on Law of Variable Proportions • Assignment on Cost Minimization and Profit Maximization	• To study various concepts of demand and cost • To understand law of variable proportions • To analyze economies and diseconomies of scale	• Evaluation through test papers

Module III (20 Hours)	Theory of Consumer Behaviour, Law of Diminishing Marginal Utility, Indifference Curve Analysis, Demand Curve, Concept of Elasticity of Demand, Elasticity of Supply	• Lecture • Discussion • Participative Learning	• Consumer Behaviour Survey on various products • Powerpoint presentation on Elasticity of Demand and Elasticity of Supply	• To evaluate theories of Consumer Behaviour • To study Law of Diminishing Marginal Utility • To understand the concept of Indifference Curve Analysis	• Assessment through Test paper
Module IV (20 Hours)	Perfect Competition, Monopoly, Monopolistic Competition, Oligopoly	• Lecture • Discussion • Participative Learning	• Peer Group Discussion on different types of Market Structure • Powerpoint presentation on difference between perfect competition and monopolistic competition	• To evaluate various structure of Market	• Assessment through Essay Writing

Module V (15 Hours)	Macro Economics, Indian Economy - Characteristics and issues, Problems of Growth, Poverty, Unemployment, Inflation, Inequality in Income Distribution, Indian Economy under WTO regime	• Lecture • Discussion • Participative Learning	• Assignment on Indian Economy - Problems, Characteristics • Discussion on Indian Economy under WTO regime	• To learn about macro economics • To study about Indian Economy	• Evaluation through test papers

BCM2B02 FINANCIAL ACCOUNTING

Number of Lecture Hours per week: 6

Number of Credits: 4

Internal: 20, External: 80

Examination Hours : 3

Objectives:

- To equip the students with the skills of preparing financial statements for various type of organizations

Module I

Preparation of Financial Statements of Non Corporate Entities not covered by IFRS Convergence: Preparation of Financial Statements of sole trader - Single Entry: Meaning - Methods of profit determination - Capital comparison method - Conversion method – Depreciation accounting - 25 Hours

Module II

Accounts of Corporate Entities not Covered by IFRS Convergence: Issue of shares and debentures, Forfeiture of shares (An overview) - Preparation of financial statements of Joint stock companies 20 Hours

Module III

Accounting For Banking Companies: Bank accounts - Concept of Non-Performing Assets (NPA) -Preparation of Profit and Loss Account - Asset classification - Preparation of Balance Sheet. 15 Hours

Module IV

Accounting For Insurance Companies: Insurance Accounts – types of insurance accounts-Final accounts of life Insurance - Profit determination of life insurance
15 Hours

Module V

Accounting Standards for Financial Reporting: Objectives and uses of financial statements for users - Role/objectives of accounting standards - Development of accounting standards in India - Requirements of international accounting standards -International organizations engaged in accounting harmonization - IASB – FASB- Role of IASB in developing IFRS - IFRS adoption or convergence in India -Implementation plan in India - Ind AS - Differences between Ind AS and IFRS -Conceptual framework - Definition of financial elements - Principles of recognition, measurements, presentation and disclosure. 15 Hours

Reference Books:

1. Chintan Patel, BhupendraMantri, Indian Accounting Standards, TaxmannPublications.

2. T. P, Ghosh , Illustrated Guide To Indian Accounting Standards, TaxmannPublications.
3. M.C. Shukla, T.S. Grewal and S. C. Gupta, Advanced Accounts, S. Chand &Co., New Delhi.
4. S.N. Maheswari and S.K. Maheswari, Financial Accounting.
5. R.L. Gupta and Radhaswamy, Advanced Accounting, Sultan Chand & Sons,New Delhi.
6. Dr. Goyal V.K., Financial Accounting, Excel Books, New Delhi.
7. Ashok Sehgal and Deepak Sehgal, Advanced Accounting, VolumeI,Taxmann, New Delhi.
8. Jain and Narang, Financial Accounting, Kalyani Publishers.
9. B.S. Raman, Advanced Accountancy.
10. P.C. Tulasian, Introduction to Accounting, Pearson Education.

OBJECTIVES

- To enable the students to acquire knowledge about financial reporting standards and to understand corporate accounting methods.

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**

Module I (25 Hours)	Preparation of Financial Statements of Sole trader, Single Entry System, Methods of profit determination ,Depreciation Accounting	• Lecture • Discussion • Participative Learning	• Problem Solving on exercise questions	• To study about the preparation of financial statements of sole trader • To learn various methods to profit determinatio n	Assessment through test papers
Module II (20 Hours)	Issue of shares and debentures,fo rfeiture of shares,prepar ation of financial statements of joint stock company	• Lecture • Discussion • Participative Learning	• Assignments on forfeiture of shares • Seminars on issue of shares and debentures • problem solving on exercise questions	• To study issue of shares and debentures • To understand forfeiture of shares • To study financial statement of joint stock company	Evaluation through test papers
Module III (15 Hours)	Concept of Non - Performing Assets (NPA), Preparation of Profit and Loss Account,	• Lecture • Discussion • Participative Learning	• Group discussion on meaning and concepts of banking • Problem solving	• To understand meaning and concepts of banking • To study non performing asset (NPA) • To study how	Assessment through test papers

	Preparation of Balance Sheet			to prepare profit and loss account and balance sheet	
Module IV (15 Hours)	Insurance accounts, types of insurance,final accounts of insurance, Profit determination of life insurance	● Lecture ● Discussion ● Participative Learning	● Assignment on types of insurance ● Problem solving	● To identify insurance accounts and type of insurance ● To study the preparation of final accounts	Evaluation through test papers and MCQ

Module V (15 Hours)	Objectives and uses of financial statements,development of accounting standards in India , IASB and FASB, IFRS convergence in India, Difference between And AS and IFRS	• Lecture • Discussion • Participative Learning	• Presentation on difference between Ind AS and IFRS • Peer group discussion on requirement of IFRS	• To evaluate objective and uses of financial statements • To identify the development of accounting standards in India • To study about IASB and FASB • To identify international organisations engaged in accounting harmonizations • Study difference between Ind AS and IFRS	evaluation through descriptive exam

BCM2C02 MARKETING MANAGEMENT

Number of Lecture Hours per week: 5
Number of Credits: 4
Internal: 20, External: 80
Examination Hours : 3

Objectives:

- To provide basic knowledge about the concepts, principles, tools and techniques of marketing

Module I

Marketing Management: The value of marketing–Core marketing concepts–The new marketing realities–Philosophy of marketing - Creating long term loyalty relationships – Marketing management tasks –Analyzing consumer markets-Factors influencing consumer behaviour-Buying decision process - market segmentation; bases for segmenting consumer markets – market targeting - marketing of services - rural marketing in India; potential, challenges and strategies. (20 Hours)

Module II

Creating and Capturing Value: The fundamentals of product management; product levels; customer value hierarchy– Classification of product–Managing brands and brand equity-Product and Services differentiation-Product and brand relationships - Product Life Cycle Marketing Strategies - New product development-Packaging, labeling, Warranties and Guarantees.

Pricing to capture value; setting the price; methods of pricing; pricing strategies; pricing for rural markets. (20 Hours)

Module III

Delivering Value: Distribution -marketing channels and value networks-role of marketing channels-channel design and management decision-channel integration and system-conflict, cooperation and competition-Managing retailing, wholesaling and logistics-Direct and online marketing (10 Hours)

Module IV

Communicating Value: Integrated Marketing Communications; role of marketing communication; developing effective communication; marketing communication mix - managing advertising; deciding on media and measuring effectiveness ; communicating to rural audience- Sales Promotion-Personal selling; principles of personal selling-Events and experiences-Public relation-Interactive marketing-word of mouth marketing. (15 Hours)

Module V

`E-commerce and E-marketing: Concept and nature; Reason for growth of e-marketing - E-commerce marketing practices; types of E-commerce; E-commerce business models; E-commerce marketing strategies - M-commerce marketing practices- Electronic Payment System-Security issues in E commerce. (15 Hours)

Reference Books:

1. Philip Kotler, Kevin Lane Keller,"Marketing Management" (15e), Pearson India Education Services Pvt Ltd
2. V S Ramaswamy& S Namakumari,"Marketing Management" (Latest Edition)- McGraw Hill Education (India) Private Limited, New Delhi
3. S.A. Sherlekar, "Marketing Management-Concepts and Cases", Himalaya Publishing House Pvt Ltd
4. William J Stanton,"Fundamentals of Marketing", McGraw Hill Publishing Co, New York
5. Lamb. Hair, McDaniel, ―Marketing", Cengage Learning Inc USA.
6. Rayport, Jeffrey F and Jaworksi. Bernard J, "Introduction to E-Commerce", Tata Mc Graw Hill, New Delhi

OBJECTIVES

- To impart necessary knowledge which helps the student to choose a career in the field of marketing.
- To expose the students to the latest trends in marketing

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**

Module I (20 Hours)	Value of marketing,philosophy of marketing,marketing management tasks,factors influencing buying behaviour,market segmentation ,rural marketing, market targeting,marketing of service	● Lecture ● Discussion ● Participative Learning	● PPT on market segmentation ● Seminar presentation on consumer behaviour of various products ● Survey of various marketing strategies adopted by service providers ● Assignment on rural marketing	● To study Value of marketing and philosophy ● To learn about Marketing management tasks and Market segmentation ● To evaluate factors influencing buying behaviour ● To understand about Marketing of services and Rural marketing	Evaluation through case study

Module II (20Hours)	Fundamentals of product management, Classification of products,brand and brand equity, product life cycle ,pricing strategies	• Lecture • Discussion • Participative Learning	• Assignment on classification of products • Seminar on product life cycle	• To study fundamentals of product management • To evaluate videos stages in Product Life Cycle (PLC)	Assessment through descriptive eam
Module III (10 Hours)	Marketing channels,managing retailing,wholesaling and logistics direct and online marketing	• Lecture • Discussion • Participative Learning	• Seminars on marketing channels • Debates on direct and online marketing • Marketing games	• To evaluate about Marketing channels • To study about Management of wholesaling and logistics • To understand Direct and online marketing	Evaluation through essay writing

Module IV (15 Hours)	Marketing communication, sales promotion, marketing communication mix, personal selling, interactive marketing	● Lecture ● Discussion ● Participative Learning	● Peergroup discussion on marketing communication mix ● Assignment on personal selling and interactive marketing	To identify;_ ● Marketing communication mix ● Decision on media and effectiveness ● Principles of personal selling	Evaluation through essay writing
Module V (15 Hours)	E commerce, e commerce marketing strategies,e commerce marketing practices, m-commerce marketing practices	● Lecture ● Discussion ● Participative Learning	● Presentation on e commerce marketing strategies	● Evaluate E-commerce marketing strategies and M-commerce marketing practices	Evaluation trough test paper

BCM3A11 BASIC NUMERICAL SKILLS

Number of Lecture Hours per week: 5
Number of Credits: 4
Internal: 20, External: 80
Examination Hours : 3

Objectives:

- To enable the students to acquire knowledge of Mathematics and Statistics.

Module I

Sets and Set Operation - Venn Diagrams - Elements of Co-ordinate system - Matrices -Fundamental ideas about matrices and their operational rules - Matrix multiplication - Inversion of square matrices of not more than 3rd order - Solving system of simultaneous linear equations. 15 Hours

Module II

Theory of Equations : Meaning - types of equations - Simple linear and Simultaneous equations (only two variables) eliminations and substitution method only - Quadratic equation factorization and formula method ($ax2 + bx + c = 0$ form only) - Problems on business applications. 10 Hours

Module III

Progressions : Arithmetic Progressions - Finding the 'n'th term of an AP and also sum to 'n' terms of an AP - Insertion of Arithmetic means in given terms of AP and representation of AP - Geometric Progression : Finding 'n'th term of GP - Insertion of GMs in given GP and also representation of GP - Mathematics of Finance - Simple and compound interest (Simple problems only). 15 Hours

Module IV

Meaning and Definition of Statistics - Scope and limitations - Statistical enquiries -Scope of the problem - Methods to be employed - Types of enquiries - Presentation of data by Diagrammatic and Graphical Method - Formation of Frequency Distribution. 15 Hours

Module V

Measures of Central Tendency - Arithmetic Mean - Median - Mode - Geometric and Harmonic Mean - Measures of variation and standard, mean and quartile deviations -Skewness and Kurtosis - Lorenz curve. Analysis of Time Series: Methods of measuring - Trend and Seasonal variations - Index number - Unweighted indices -Consumer price and cost of living indices. 20 Hours

(Theory and problems may be in the ratio of 20% and 80% respectively. An overview of the topics is expected and only simple problems shall be given)

Reference Books:

1. Sundaresan and Jayaseelan - An Introduction to Business Mathematics and Statistical Methods.
2. Dr. A K Arte & R V Prabhakar - A Text Book of Business Mathematics.
3. Sanchethi and Kapoor- Business Mathematics.
4. Gupta S.P- Statistical Methods
5. Navaneethan P- Business Mathematics
6. R.S.N. Pillai, Mrs. Bhagavathi - Statistics
7. P.R. Vittal - Business Mathematics and Statistics.

OBJECTIVES

- At the end of this course, the students should have understood set operations, matrix and Mathematics of finance, Statistical tools and their applications.

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (15 Hours)	Sets and sets operation,matrices,venn diagram, matrix and operations, solving system of simultaneous linear equations	● Lecture ● Discussion ● Participative Learning	● Presentation on fundamental ideas about matrices and their operational rules ● Problem solving	● To study Sets and sets operations ● To learn about matrices and its operations ● To solve Simultaneous linear equation	Assessment through test papers
Module II (10 Hours)	Theory of equation meaning and type, Simple linear and Simultaneous equations, Quadratic equations, Problems on Business Applications	● Lecture ● Discussion ● Participative Learning	● Assignment on simple linear and simultaneous equations ● Problem solving on Quadratic Equations ● Discussion on Problems on Business Applications	● To study theory of equation and types ● To understand application level problem on Business	Evaluation through test papers

Module III (15 Hours)	Arithmetic progression, Geometric progression, mathematics of finance,simple and compound interest	• Lecture • Discussion • Participative Learning	• Problem solving on Arithmetic and Geometric Progression	• To study arithmetic progression and geometric progression • To calculate simple and compound interest	Evaluation through test papers
Module IV (15 Hours)	Meaning and definition of statistics , Types of enquiries ,Presentation of data by diagrammatic and graphical method, Formation of frequency distribution	• Lecture • Discussion • Participative Learning	• Presentation on type of enquiries • Presentation of data on diagrammatic and graphical method • Problem solving	• To study meaning and definition of statistics • To understand various types of enquiries • To study Presentation of data by diagrammatic and graphical method • To learn about the formation of frequency distribution	Assessment through test papers
Module V (20 Hours)	Measures of central tendency, skewness and kurtosis,	• Lecture • Discussion • Participative Learning	• Assignment on central tendency • Problem solving on	• To study about Measures of central tendency	Evaluation through Test papers

	Lorenz curve, Analysis of time series, Index numbers		Arithmetic Mean, Geometric Mean and Harmonic Mean ● Presentation on Skewness and Kurtosis	● To learn Analysis of time series ● To evaluate trend and seasonal variations ● To understand about Index number	

BCM3A12 GENERAL INFORMATICS

Number of Lecture Hours per week: 5
Number of Credits 4
Internal: 20, External: 80
Examination Hours: 3

Objectives:

- To update and expand basic Informatics skills of the students

Module I

Computers and Operating Systems : Features of New Generation Personal Computers and Peripherals - Computer networks - Types of networks - Components of networks -Topology - Internet - Uses of internet - Introduction to Software - License - Open source - Overview of operating systems and major application software. 10 Hours

Module II

Basics of IT : Information - Prerequisites and needs - IT and its components - IT and Internet - IT Applications - E-Governance - IT for National Integration - IT Applications in Health Care, Business, Commerce and Resource Management -Emerging Trends in IT: Electronic Data Interchange - Mobile Computing - SMS -MMS - Wireless Applications - Bluetooth - Global Positioning System - Infrared Communication - Smart Card - DNA Computing - Cloud computing 15 Hours

Module III

Knowledge Skills for Higher Education : Data, Information and Knowledge - Knowledge Management - Internet as a knowledge repository - Academic search techniques - Case study of academic websites - Basic concepts of IPR - Copyrights and Patents - Introduction to use of IT in teaching and learning - Case study of educational software -Academic Service – INFLIBNET - NICENET - BRNET. 15 Hours

Module IV

Social Informatics : IT and society - Issues and concerns - Digital Divide - Free Software Movement - IT and industry - New opportunities and threats - Cyber ethics - Cyber crimes - Security - Privacy issues - Cyber Laws - Cyber addictions - Information overload - Health issues - Guidelines for proper usage of computers and internet - e-waste and Green Computing - Unicode - IT and regional languages. 15 Hours

Module V

Programmes for Office Management : Introduction to Linux - Linux systems - Linux distributions - Operating systems and Linux - History of Linux and UNIX - Open source software - Linux software - Software Repositories - Third party Linux Repositories - Linux Office and Database software - Internet servers - Development resources -Setting the Desktop - The GNOME Desktop environment - Using the Metacity Window Manager - Using GNOME Panels - Change in the GNOME preferences - Exiting GNOME - Working with words and images - Desktop Publishing in Linux - Using Open Office.org office suit. 20 Hours

References Books:

1. Peter Norton, Introduction to Computers, Tata McGraw Hill Private Limited, New Delhi, 2009.
2. Alan Evans, ITL ESL, Leslie Lamport, Dolores Etter, Darren George, Kenneth C Laoudon, Gary Rogers, Rainer Handel, INFORMATICS -Technology in Action, Pearson Education, Delhi, 2009.
3. V.Rajaraman, Introduction To Information Technology, PHI Learning Private Limited, New Delhi, 2009.
4. Alex Leon, The Complete Reference Linux Sixth Edition, Tata McGraw Hill Private Limited, New Delhi, 2009.
5. Christopher Mathews Leon, Fundamentals of Information technology, Leon Vikas, Chennai, 2009.
6. Richard Peterson Negus, Linux Bible, Wiley India Private Limited, 2009.
7. Mike McGrath, Linux In Easy Steps , Dream TechPress, New Delhi, 2009
8. Daniel Minoli &Emma Minoli, Web Commerce Technology Hand Book, Tata McGraw Hill, New Delhi, 2009
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OBJECTIVES

- To equip the students to effectively utilize the digital knowledge resources for their study.

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (10 Hours)	● Computers and Operating System ● New generation personal computers ● Computer network ● Introduction to Software ● Overview of operating system	● Lecture ● Discussion ● Participative Learning	● Assignment on Computer Network - Components, Types ● Presentation on New Generation Personal Computer	● To learn about application software ● To study about Computer Network	Evaluation through test papers
Module II (15 Hours)	● IT and Internet ● E Governance ● IT	● Lecture ● Discussion ● Participative Learning	● Discussion on IT in various fields ● Seminar on Emerging	● To study about IT and Internet ● To learn E-Governance ● To understand	Assessment through mcqs

	Applications in Healthcare, Business, Commerce and REsource Management ● Emerging trend in IT ● DNA Computing and Cloud Computing		trends in IT	IT applications in various fields	
Module III (15 Hours)	● Knowledge skills for Higher Education ● Internet as Knowledge Repository	● Lecture ● Discussion ● Participative Learning	● Discussion about Knowledge skills for higher education	● To understand INFLIBNET, NICENET and BRNET	Assessment through testpapers

	• INFLIBNET, NICENET and BRNET				
Module IV (15 Hours)	• IT and Society • Cyber Ethics, Cyber Crimes and Cyber Laws • E- Waste and Green Computing	• Lecture • Discussion • Participative Learning	• Collage on e-waste and Green Computing • Slide presentation on Cyber laws and Cyber crimes	• To learn about various cyber laws and cyber crimes • To understand e waste • To study about green computing	Evaluation through viva
Module V (20 Hours)	• LINUX Operating System • GNOME Desktop Environment • Usage of Open Office.org Office Suit	• Lecture • Discussion • Participative Learning	• Assignment on LINUX Software • Slide Presentation on using open office.org office suit	• To study about LINUX Operating System	Evaluation through test papers

BCM3BO3 BUSINESS REGULATIONS

Number of Lecture Hours per week: 5

Number of Credits: 4

Internal: 20, External: 80

Examination Hours : 3

Objectives:

- To familiarize the students with certain statutes concerning and affecting business organizations in their operations

Module I

Business Laws : Introduction - Nature of Business Law - Meaning and definition -Indian Contract Act, 1872: Contract - Definition - Essentials of valid contracts - Classification of contracts - Offer and acceptance - Consideration - Capacity to contract - Free consent -Coercion - Undue influence - Misrepresentation - Fraud - Mistake - Void agreements -Discharge of contract - Breach of contract and remedies - Contingent contracts -Quasi contracts. (25 Hours)

Module II

Special Contracts: Contract of Indemnity: Meaning - Nature - Right of indemnity holder and indemnifier - Contract of Guarantee: Meaning - Nature - Rights and liabilities of surety - Discharge of surety from liability - Contract of Bailment and Pledge: Rights and duties of bailor and bailee, pledger and pledgee - Contract of Agency - Creation of agency - Delegation of authority - Duties and liabilities of principal and agent -Termination of agency. (20 Hours)

Module III

Sale of Goods Act 1930: Contract for sale of goods -Essentials of a contract of sale -Conditions and Warranties - Caveat emptor - Sale by non owners - Rules as to delivery of goods - Unpaid seller and his rights. (10 Hours)

Module IV

The Consumer Protection Act 1986: Objects and scope - Definition of consumer and consumer dispute - Complaint - Goods - Service - Unfair trade practices - Restrictive trade practices - Rights of consumers - Consumer Protection Council - Consumer Disputes Redressal Agencies. (10 Hours)

Module V

The limited liability partnership Act 2008 – Salient features – Distinction with partnership and company – LLP agreement – partners and designated partners – incorporation document – Extent and limitation of liability of LLP and partners. (15 Hours)

Reference Books:

1. Singh Avtar, The Principles of Mercantile Law , Eastern Book Company, Lucknow.
2. Kuchal M.C, Business Law , Vikas Publishing House, New Delhi
3. Kapoor N.D, Business Law , Sultan Chand & Sons, New Delhi.
4. Chandha P.R , Business Law.
5. S.S. Gulshan, Business Laws.
6. B. Sen and Mitra, Business and Commercial Laws.
7. Chandha P.R, Business Law, Galgotia, New Delhi.
8. Balchandani, Business Laws.
9. Desai T.R., Indian Contract Act, Sale of Goods Act and Partnership Act, S.C. Sarkar & Sons Pvt. Ltd. Kolkata.

OBJECTIVES

- To enlighten the students with the legal framework influencing business decisions.

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (25 Hours)	• Contract Act 1872	• Lecture • Discussion • Participative Learning	• Assignments on Indian Contract Act 1872	• To study essentials of a valid Contract • To study capacity to contract	Evaluation through test papers
Module II (20 Hours)	• Contract of Indemnity • Contract of Guarantee • Contract of Agency • Bailment and Pledge	• Lecture • Discussion • Participative Learning	• Seminars on Contract of Guarantee and Indemnity	• To study Contract of Indemnity and Guarantee • To study Bailment and Pledge • To study Bailment and Pledge	Evaluation through test papers
Module III (10 Hours)	• Sale of Goods Act 1930 • Contract for Sales	• Lecture • Discussion • Participative Learning	• Assignment on Essentials of Contract for sales	• To study sale of Goods Act 1930	Evaluation through test papers

	Goods Act				
Module IV (10 Hours)	• Consumer Protection Act	• Lecture • Discussion • Participative Learning	• Peer group discussion on Consumer Disputes Redressal Agencies	• To study consumer protection act • To evaluate Rights of Consumer • To understand unfair trade practices	Assessment through MCQ
Module V (15 Hours)	• LLP Act 2008	• Lecture • Discussion • Participative Learning	• Seminars on Liability of LLP and partners	• To study LLP Agreement • To evaluate difference between partnership and Company	Evaluation through Test papers

BCM3BO4 CORPORATE ACCOUNTING

Number of Lecture Hours per week: 6

Number of Credits: 4

Internal: 20, External: 80

Examination Hours : 3

Objectives:

- To help the students to acquire conceptual knowledge of the fundamentals of the corporate accounting and the techniques of preparing the financial statements

Module I

Accounting Standards for Assets, Liabilities and Revenue: Inventories (IAS 2 and Ind AS 2) - Accounting for tangible non-current assets (IAS 16 and Ind AS 16) -Accounting for intangible assets (IAS 38 and Ind AS 38) - Accounting for impairment of assets (IAS 36 and Ind AS 36) - Accounting for borrowing costs (IAS 23 and IndAS 23) - Investment property (IAS 40 and Ind AS 40) - Revenue from contracts with customers (IFRS 15 and Ind AS 115) - Income tax (IAS 12 and Ind AS 12) -Employee benefits (IAS 19 and Ind AS 19) - Provisions, contingent liabilities and contingent assets (IAS 37 and Ind AS 37). 20 Hours

Module II

Accounting For Joint Stock Companies: Accounting for Government grants (IAS20 and Ind AS 20) - Accounting for leases (IAS 17 and Ind AS 17) - Share based payments (IFRS 2 and Ind AS 102) - Accounting for Bonus and Right issue -Redemption of Preference shares - Redemption of Debentures - Buyback of shares -Alteration of Share capital. 15 Hours

Module III

Presentation of Single Entity Financial Statements Covered by IFRS Convergence(IAS 1 and Ind AS 1): Accounting policies, accounting estimates (IAS 8 and Ind AS 8)- Events after reporting date (IAS 10 and Ind AS 10) - Structure and contents of financial statements - Preparation of financial statements: Statement of Financial Position (SOFP)- Statement of Profit or Loss (SOPL) - Statement of Changes in Equity (SOCE) – Cash Flow Statement (SOCF) (IAS 7 and Ind AS 7). 15 Hours

Module IV

Business Combinations And Consolidated Statements (IFRS 3,10,13 and Ind AS103, Ind AS 27, Ind AS 28): Acquisition method for business combination -Consolidated Statement of Financial Statements - Statement of Financial position

/Balance sheet - Summary of consolidation procedures - Non controlling interests -Goodwill arising on consolidation - Intra group trading - Intra group trading of Non-current assets - Pre-acquisition profits - Fair values in acquisition accounting -Consolidated Statement of Profit or Loss and Other Comprehensive Income – Intra Group dividends. 25 Hours

Module V

Accounting For Electricity Companies: Concept of Double account system -Difference between double entry and double account - Final accounts of electricity companies. 15 Hours

(Theory and Problems may be in the ratio of 40% and 60% respectively)

Reference Books:

1. Chintan Patel, BhupendraMantri, Indian Accounting Standards, TaxmannPublications.
2. T. P, Ghosh, Illustrated Guide To Indian Accounting Standards, TaxmannPublications.
3. B. D, Chatterjee, Illustrated Guide To Indian Accounting Standards, TaxmannPublications.
4. Dolphy D'Souza, Vishal Bansal, Indian Accounting Standards, Snow WhitePublications.
5. ICAI, Study material of ICAI – Financial Reporting (Final level).
6. IASB, IFRS (Red Book).
7. M.C. Shukla, T.S. Grewal and S. C. Gupta, Advanced Accounts, S. Chand &Co., New Delhi.
8. S.N. Maheswari and S.K. Maheswari, Financial Accounting.
9. R.L. Gupta and Radhaswamy, Advanced Accounting, Sultan Chand & Sons,New Delhi.
10. Dr. Goyal V.K., Financial Accounting, Excel Books, New Delhi.
11. Ashok Sehgal and Deepak Sehgal, Advanced Accounting, VolumeI,Taxmann, New Delhi.
12. Jain and Narang, Financial Accounting, Kalyani Publishers.
13. B.S. Raman, Advanced Accountancy,
14. P.C. Tulasian, Introduction to Accounting, Pearson Education.

15. B. D, Chatterjee, Illustrated Guide To Indian Accounting Standards, TaxmannPublications.
16. Dolphy D'Souza, Vishal Bansal, Indian Accounting Standards, Snow WhitePublications.
17. ICAI, Study material of ICAI – Financial Reporting (Final level).
18. IASB, IFRS (Red Book).

OBJECTIVES

- To make the students familiarise with corporate accounting procedures and to understand the accounting for banking companies.

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**
Module I (20 Hours)	● Accounting standards for tangible non-current assets ● Accounting standards	● Lecture ● Discussion ● Participative Learning	● Assignment on accounting standards of various assets	● To learn about various accounting standards ● To understand provisions, contingent liabilities and contingent assets	Evaluation through test papers

	of intangible assets ● Provision, Contingent Liabilities and Contingent Assets				
Module II (15 Hours)	● Accounting of Government grants ● Accounting treatment of Bonus shares ● Buyback of shares ● Alteration of share capital	● Lecture ● Discussion ● Participative Learning	● Assignment on accounting treatment of Bonus Shares and Buyback of shares	● To study about the alteration of share capital ● To understand accounting of Government Grants	Evaluation through MCQs
Module III (15 Hours)	● Structure and contents of Financial statemen	● Lecture ● Discussion ● Participative Learning	● Slide presentation on SOFP, SOPL, SOCE, SOCF	● To study about Preparation of variou statements, like SOFP,	Evaluation through test papers

	ts ● Statement of Financial Position (SOFP) ● Statement of Profit or Loss (SOPL) ● Statement of Changes in Equity (SOCE) ● Statement of Cash Flow Statement (SOCF)			SOPL, SOCE and SOCF	
Module IV (25 Hours)	● Consolidated Statement of Financial Statements ● Intra group trading	● Lecture ● Discussion ● Participative Learning	● Peer learning on preparation of consolidated financial statements	● To study about Intra group trading ● To learn about consolidated financial statements	Evaluation through test papers

Module V (15 Hours)	• Double Account System • Difference between double entry and double account • Final accounts of electricity companies	• Lecture • Discussion • Participative Learning	• Presentation on difference between Double entry system and Double Account	• To learn about double entry system	Assessment through viva

BCM3C03 HUMAN RESOURCE MANAGEMENT

Number of Lecture Hours per week: 5

Number of Credits: 4

Internal: 20, External: 80

Examination Hours: 3

Objectives:

- To familiarize the students with the different aspects of managing human resources in a organization

Module I

Introduction to Human Resource Management—Importance--scope and objectives of HRM. Evolution of the concept of HRM- Approaches to HRM- Personnel management Vs Human Resource Management-HRM and competitive advantage-Traditional Vs Strategic human resource management. (15 Hours)

Module II

Human resource planning, Recruitment and selection—Job analysis---process of job analysis-job description- job specification-- methods of job analysis--Conventional Vs strategic planning—job evaluation—Recruitment--source of recruitment-methods. (20 Hours)

Module III

Placement, Induction and Internal mobility of human resource. Training of employees—need for training-objectives- approaches --methods-training environment- areas of training- Training evaluation. (15 Hours)

Module IV

Performance appraisal and career planning. Need and importance- objectives process- methods and problems of performance appraisal- . Concept of career planning –features- methods –uses career development. (15 Hours)

Module V

Compensation management and grievance redressal. Compensation planning objectives- Wage systems- factors influencing wage system-. Grievance redressal procedure- discipline- approaches punishment- essentials of a good discipline system. Labour participation in management. (15 Hours)

References:

1. Human Resource Management- Text and Cases-- VSP Rao
2. Human Resource Management – Pravin Durai
3. Human Resource Management—Snell, Bohlander
4. Personal Management and Human Resources—VenkataRatnam .Srivasthava.
5. A HandBook of Personnel Management Practice—Dale Yolder

OBJECTIVES

- To equip the students with basic knowledge and skills required for the acquisition,development and retention of human resources

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (15 Hours)	● Introduction to human resource management ● Human resource management and personnel	● Lecture ● Discussion ● Participative Learning	● Seminar on traditional v/s strategic management ● PPT on Personnel Management and HRM	● To study scope and objectives of management ● To evaluate traditional HRM v/s strategic HRM ● To study resource management	● Evaluation through test papers

	management ● Resource management ● Traditional vs Strategic HRM				
Module II (20 Hours)	● Human resource planning ,job analysis ● Recruitment and source of recruitment ● Methods of Job Analysis	● Lecture ● Discussion ● Participative Learning	● Seminar on human resource planning ● Assignment on source of recruitment	● To evaluate human resource planning ● To analyse source of recruitment ● To understand the difference between conventional and strategic planning	Evaluation through test paper
Module III (15 Hours)	● Placement ● Induction ● Training	● Lecture ● Discussion ● Participative Learning	● Online discussion on training method	● To study placement and induction method ● To evaluate training method	Evaluation through test paper

Module IV (15 Hours)	• Performance appraisal and career planning • Career planning concepts and methods	• Lecture • Discussion • Participative Learning	• Online discussion on career development	• To evaluate performance appraisal and career planning	Assessment through case study
Module V (15 Hours)	• Compensation management an grievance redressal • Factors influencing wage system, grievance redressal procedure	• Lecture • Discussion • Participative Learning	• Seminar on grievance redressal proceduresOnline discussion on various methods of compensation management • Seminar on factors influencing wage system	• To evaluate the compensation management and grievance redressalTo study about grievances redressal management • To evaluate factors of wage system	Evaluation through case study Evaluation through test papers

BCM4A13 ENTREPRENEURSHIP DEVELOPMENT

Number of Lecture Hours per week: 5
Number of Credits : 4
Internal: 20, External: 80
Examination Hours: 3

Objectives:

- To familiarize the students with the concept of entrepreneurship

Module I

Entrepreneur and Fundamentals of Entrepreneurship: Entrepreneurial competencies -Factors affecting entrepreneurial growth - Role of entrepreneur in economic development - Challenges of women entrepreneurs. 20 Hours

Module II

Micro, Small and Medium Enterprises: Legal Framework - Licenses - Role of promotional institutions with special reference to KINFRA , KITCO , MSME & DICs - Concessions -Incentives and subsidies. 10 Hours

Module III

Project Management: Feasibility and Viability Analysis-Technical - Financial - Network -Appraisal and evaluation - Project Report preparation. 30 Hours

Module IV

Identification of Business Opportunities in the Context of Kerala: Rate of ED Clubs -Industrial Policies - Skill development for entrepreneurs - Business Incubation : Meaning - Setting up of Business Incubation Centres. 15 Hours

Reference Books:

1. S.S. Kanka , Entrepreneurial Development, Sultan Chand.
2. Prasanna Chandra , Project Planning, Analysis, Selection, Implementation and Review, Tata McGraw Hill.
3. Vasantha Desai , Dynamics of Entrepreneurial Development, Himalaya.
4. C.B.Gupta & N.P. Sreenivasan , Entrepreneurial Development, Sultan Chand.
5. Nirmal K Gupta, Small Industry-Challenges and Perspectives, Anmol Publications.
6. Vasantha Desai, Small scale Industries and Entrepreneurship, Himalaya.

OBJECTIVES

- To identify and develop the entrepreneurial talents of the students.
- To generate innovative business ideas in the emerging industrial scenario.

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**
Module I (20 Hours)	● Concepts of entrepreneur,classi	● Lecture ● Discussion ● Participative Learning	● Experience shared by student entrepreneur	● To study the concepts of entrepreneur ● To evaluate	Assessment through case studyEvaluation through

	fication of entrepreneurs,women entrepreneur,factors affecting entrepreneurial growth,entrepreneurial development growth Concept of Entrepreneur ● Role of entrepreneur in economic development ● Challenges of Women Entrepreneurship		● Online discussion about women entrepreneurship Webinar on entrepreneurship ● Online interactive session with local women entrepreneurs	women entrepreneurship ● To evaluate entrepreneurial development programmeTo study about various concepts of Entrepreneurship ● To encourage them to get into entrepreneurship	test papers

Module II (10 Hours)	• Institutional support and incentive to entrepreneurs,importance -classification of entrepreneurship Institutional support and incentives to Entrepreneurs • Activities of KINFRA, KITCO, MSME and DICs • MSMEs	• Lecture • Discussion • Participative Learning	• Assignment on institutional support and incentive to entrepreneurs • Seminars On various activities of different institutions • Discussion on MSMEs	• To evaluate institutional support and incentive to entrepreneurs • To identify various subsidiesTo study about different incentive schemes and subsidy available for entrepreneurs	Assessment through essay writingAssessment through test papers
Module III (30 Hours)	• Project Management • Project Report	• Lecture • Discussion • Participative Learning	• Assignment on Project report preparation	• To study project management • To learn stages in	Assessment through test papersEvaluation through test

	Preparation			project report preparation	papers
Module IV (15 Hours)	• Identification of Business Operations in the context of Kerala • Business Incubation Centres • Skills development for entrepreneurs	• Lecture • Discussion • Participative Learning	• Debate on business operations in the context of Kerala • Discussion on Business incubation	• To study various business operations • To evaluate skills development for entrepreneurs	Evaluation through test papersAssessment through essay writing

BCM4A14 BANKING AND INSURANCE

Number of Lecture Hours per week: 5
Number of Credits: 4
Internal: 20, External: 80
Examination Hours: 3

Objectives:

- To enable the students to acquire knowledge about basics of Banking and Insurance

Module I

Introduction to Banking : Meaning and definition - Origin and development of banking –Customer of a bank - Structure of banking in India - Banks and economic development -Functions of commercial banks (conventional and innovative functions) - Central bank -RBI – Functions - Emerging trends in banking.
(15 Hours)

Module II

Negotiable Instruments : Definition - Characteristics - Types - Parties to negotiable instruments -Cheques - Types of cheques - Crossing of cheques - Drafts - Cheque vs. Draft - Endorsement -Significance - Regularity of endorsement - Liability of endorser -Electronic payments.(15 Hours)

Module III

E-Banking-centralized online real time electronic banking (CORE)-Electronic Clearing service (ECS) - Electronic Fund Transfer - Real Time Gross settlement (RTGS)—National Electronic Fund transfer(NEFT)-society for worldwide interbank financial telecommunication(SWIFT) - E-cheque - Any Time Money - ATM.s- Credit card - Debit card-smart card - Internet banking - mobile banking - Tele-banking (15 Hours)

Module IV

Introduction to insurance: Concept - need of insurance-insurance as a social security tool - insurance and economic development-principles of insurance - various kinds of insurance - life and general insurance (fire, marine, medical, personal accident, property and motor vehicle insurance) - features-life insurance Vs. general insurance.(15 Hours)

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Module V

Life insurance-law relating to life insurance-general principles of life insurance contract, proposal and policy—Assignment and nomination - title and claims - general insurance - law relating to general Insurance - IRDA - powers and functions - insurance business in India. (15 Hours)

Reference Books:

1. Sheldon H.P : Practice and Law of Banking.
2. Bedi. H.L : Theory and Practice of Banking.
3. Maheshwari. S.N. : Banking Law and Practice.
4. Shekar. K.C : Banking Theory Law and Practice.
5. Pannandikar & Mithami': Banking in India.
6. Radhaswamy & Vasudevan: Text Book of Banking.
7. Indian Institute of Bankers (Pub) Commercial Banking Vol-I/Vol-II (part I& II)Vol- III.
8. Varshaney: Banking Law and Practice.
9. Dr. P. Periasamy: Principles and Practice of Insurance Himalaya Publishing House, Delhi.
10. Inderjit Singh, Rakesh Katyal & Sanjay Arora: Insurance Principles and Practices,Kalyani Publishers, Chennai.
11. M.N. Mishra: Insurance Principles and Practice, S. Chand & Company Ltd, Delhi.
12. G. Krishnaswamy : Principles & Practice of Life Insurance
13. Kothari & Bahl: Principles and Pratices of Insurance
14. B.S. Khubchandani, "Practice and Law of Banking",Mac Millan India Ltd
15. K.C. Nanda," Credit Banking", Response Book, Sage Publication, 1999

OBJECTIVES

- To familiarize the students with the modern trends in banking

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (15 Hours)	Banking meaning and definition,structure of banking in India , functions of commercial banks, RBI functionsIntroduction to banking,structure of banking in India, functions of commercial banks,functions of RBI	● Lecture ● Discussion ● Participative Learning	● Seminar on functions of commercial banks ● assignments on functions of RBIAssignment on functions of central and commercial banks ● List out the names of banks as per their different category ● Procedure for creating an account in a bank	● To study structure of banking in India ● To evaluate the functions of central and commercial banksTo learn the functions of bank ● To evaluate the emerging trends in banking ● To study the structure of banking in India	Assessment through MCQAssessment through MCQ

Module II (15 Hours)	Negotiable instrument, types of cheque. Regularity of endorsement Negotiable instrument, types of cheque,endorsement	• Lecture • Discussion • Participative Learning	• Presentation on different types of chequeWriting of cheque • Writing of challan for demand draft • Procedures for bank loan	• To study negotiable instruments • To evaluate regularity of endorsementTo study the types of cheques • To evaluate the negotiable instrument	Evaluate through test papersAssessment through test papers
Module III (15 Hours)	E-banking.plastic money,financial inclusionEbanking,plastic money, internet banking, financial inclusion, recent initiative in financial inclusion	• Lecture • Discussion • Participative Learning	• Group discussion in recent initiative in financial inclusionChelan filling for RTGS,EFT,and NEFT • Different types of cards,the procedure for application of different cards and procedure for blocking cards • Procedure for	• To study e banking • To study plastic money • To evaluate financial inclusionTo acquire knowledge in e- banking , plastic money, internet banking	• Assessment through test papers Assessment through test papers

			application or activation of net banking , m-banking and tele-banking		
Module IV (15 Hours)	Insurance concept, need of insurance. Principles of insurance,types of insurance. Life insurance V/S general insuranceInsurance , need of insurance , various kinds of insurance principles of insurance, life and general insurance	• Lecture • Discussion • Participative Learning	• Seminar on different type of insuranceList out different names of insurance company • Discussion on different types of insurance	• To evaluate different types of insurance • To study principles of insurance • To analyse general insurance and life insuranceTo study different types of insurance • To evaluate life insurance and general insurance	• Assessment through test paper Assessment through MCQ
Module V (15 Hours)	Life insurance law, general principle of life insurance contract IRDA powers	• Lecture • Discussion • Participative Learning	• Discussion on life insurance contract in IndiaPresentation on general	• To study life insurance law • To study law relating to general insuranceTo evaluate the	Assessment through MCQEvaluation through case study

	and functionsLaw relating to life insurance, general principles of life insurance contract, IRDA , powers and function		principle of life insurance	law relating to life insurance	

BCM4B05 COST ACCOUNTING

Number of Lecturer Hours per week: 6
Number of Credits: 4
Internal: 20, External: 80
Examination Hours : 3

Objectives:

- To familiarize the students with the various concepts and elements of cost

Module I

Introduction : Definition - Meaning and scope - Objectives - Functions -Merits and Demerits - Cost Accounting and Financial Accounting - Cost classification - Elements of cost - Cost units - Cost centre - Types - Methods and Techniques of Costing . (10 Hours)

Module II

Materials : Importance of Material cost control - Purchase Procedure - Store control -Types of Store - Stores Records - Perpetual Inventory-ABC Analysis - VED Analysis-JIT Inventory- Stock levels - EOQ - Issue of materials - FIFO , LIFO , Simple and Weighted Average methods. (20 Hours)

Module III

Labour and Overheads: Importance of Labour cost control - Time Keeping and Time Booking - Idle Time - Overtime - Computation of Labour cost - Remuneration Systems and Incentive Schemes. Overheads : Definition - Overhead Allocation - Apportionment - Reapportionment -Direct distribution - Step Ladder - Reciprocal Service methods - Repeated Distribution and Simultaneous Equation methods - Absorption of overheads - Methods of Absorption - Labour Hour Rate and Machine Hour Rate . (20 Hours)

Module IV

Methods of Costing: Unit Costing - Job Costing - Process Costing - Process Losses- Service costing (only Transport costing) (25 Hours)

Module V

Cost control Techniques: Budgetary Control and Standard Costing: Budget and Budgetary Control- Need and Importance- Types of Budgets- Preparation of Financial Budget- Flexible Budget- ZBB- Programme and Performance Budgets
25 Hours.

(Theory and Problems may be in the ratio of 40% and 60% respectively

Reference Books:

1. N.K. Prasad : Cost Accounting
2. Nigam & Sharma : Cost Accounting
3. Khanna Pandey & Ahuja : Cost Accounting
4. M.L Agarwal : Cost Accounting
5. Jain & Narang : Cost Accounting
6. S.P. lyengar: Cost Accounting
7. S.N. Maheswari : Cost Accounting
8. Horngren : Cost Accounting : A Managerial Emphasis.

9. M.N.Arora: Cost Accounting
10. Dutta: Cost Accounting

OBJECTIVES

- To create cost consciousness among the students

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**
Module I (10 Hours)	● Meaning and scope of cost accounting ● Elements of cost, cost units ● Methods and technique of cost accounting	● Lecture ● Discussion ● Participative Learning	● Assignment on cost classification	● To identify different methods and technique of cost accounting ● To learn about elements of cost and cost units	Evaluation through test papers

Module II (20 Hours)	• Materials, material control techniqu e • ABC ANalysis • VED Analysis • JIT Analysis • EOQ • FIFO and LIFO • Simple and Weighte d Average Methods	• Lecture • Discussion • Participative Learning	• Assignment on exercise questions	• To study on material control techniques	Assessment through test papers
Module III (20 Hours)	• Labour OH • Computa tion on labour cost • OH allocatio n • Methods of absorptio	• Lecture • Discussion • Participative Learning	• Assignment on exercise question	• To study methods of labour cost calculation • To study OH allocation	Assessment through test papers

	n				
Module IV (25 Hours)	• Methods of costing-job costing , unit costing, process costing, service costing	• Lecture • Discussion • Participative Learning	• Assignment on exercise questions	• To study methods of costing	Assessment through test papers
Module V (15 Hours)	• Cost control techniques • Budgetary control • Standard costing	• Lecture • Discussion • Participative Learning	• Assignment on exercise questions	• To study cost control techniques • To evaluate standard costing	Assessment through test papers

BCM4BO6 CORPORATE REGULATIONS

Number of Lecture Hours per week: 4

Number of Credit: 4

Internal: 20, External: 80

Examination Hours : 3

Objectives:

- To familiarise the students with corporate law and to make them aware of the importance of corporate governance in the management of organizations

Module I

`Introduction to Companies Act 2013: Objects of the Act - Salient features of the Act -Meaning and definition of company - Features - Kinds of companies - Private Company -Public company - Associate Company - Dormant Company - One person company -Small Company - Government Company - Lifting of corporate veil. (08 Hours, 10 marks)

Module II

Formation of Companies: Promotion - Role of promoters - Incorporation - Capital subscription - Commencement of business - Pre-incorporation and provisional contracts. Document of companies: Memorandum of Association - Definition - Contents and alteration - Doctrine of Ultravires - Articles of Association - Definition - Contents and alteration - Distinction between Memorandum and Articles - Constructive notice of Memorandum and Articles - Doctrine of Indoor management - Prospectus - Contents -Statement in lieu of prospectus - Liabilities for misstatement. (13 Hours, 18 marks)

Module III

Share Capital : Shares - Kinds of shares - Public issue of shares - Book building -Allotment of shares - Irregular allotment - Issue prices of shares - Listing of shares -Employees stock option scheme - Sweat equity shares - Right shares - Bonus shares -Shares with differential rights - Share certificate and share warrant - Calls - Forfeiture -Surrender of shares - Buyback of shares - De materialization and re materialization of shares - Transfer and transmission of shares - Transfer under Depository system. (13 Hours, 17 marks)

Module IV

Management of Companies : Board and Governance - Directors: Appointment - Position – Powers Rights - Duties and liabilities - Qualification - Disqualification -

Removal of directors - Key Managerial Personnel - Introduction to Corporate Governance - Need and importance of Corporate Governance - Corporate social responsibility. Securities and Exchange Board of India Act 1992 - Object - Establishment and management of SEBI -Powers and functions of SEBI - Securities Appellate Tribunal (SAT). (18 Hours, 20 marks)

Module V

Company Meetings and Winding up : Requisites of a valid meeting - Statutory meeting -Annual general body meeting - Extraordinary meeting - Board meetings - Resolutions -Types - Company Secretary : Qualification - appointment - duties - Winding up : Meaning - Modes of winding up - Winding up by Tribunal - Members' voluntary winding up - Creditors' voluntary winding up - Liquidator: Powers - Duties and liabilities -Consequences of winding up. (12 Hours, 15 marks)

Reference Books:

1. M.C. Shukla & Gulshan :Principles of Company Law.
2. N.D. Kapoor : Company Law and Secretarial Practice.
3. Mannual of Companies Act, Corporate Laws and SEBI Guidelines", Bharat Law House, New Delhi.
4. M.C. Bhandari: Guide to Company Law Procedures.
5. Tuteja :Company Administration and Meetings.`
6. S.C. Kuchal :Company Law and Secretarial Practice.
7. Dr. P.N. Reddy and H.R. Appanaiah : Essentials of Company Law and Secretarial practice, Himalaya Publishers.
8. M.C. Kuchal: Secretarial Practice.
9. Ashok Bagrial: Secretarial Practice.

OBJECTIVES

- To enlighten the students with the management and administration of joint stock companies in India as per Companies Act, 2013

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (05 Hours)	• Introduction of companies Act 2013 • Different types of company	• Lecture • Discussion • Participative Learning	• Assignment on different types of company	• To evaluate introduction of companies Act 2013 • To study different types of company	Assessment through MCQ
Module II (20 Hours)	• Formation of companies • Role of promoters • Commencement of business document of companies	• Lecture • Discussion • Participative Learning	• Seminar on role of promoters • Assignment on prospectus of issue	• To identify how to form a company • To evaluate documents of the company	Assessment through case study

	• Statement in lieu of Prospectus				
Module III (15 Hours)	• Share capital • Kinds of share capital • Employees stock option schemes • Right issue • Bonus issue • Forfeiture of shares • Materialization and dematerialization of shares	• Lecture • Discussion • Participative Learning	• Assignment on different types of shares	• To study share capital • To study right issue , bonus share, forfeiture of shares • To evaluate materialization and dematerialization	Assessment through test papers
Module IV (20 Hours)	• Management of companies board and governan	• Lecture • Discussion • Participative Learning	• Discussion on CSR • Assignment on powers and functions of	• To study management of companies • To evaluate CSR • To study	Assessment through case study

	ce ● Corporate social responsibility ● SEBI Act1992 ● Powers and functions of SEBI		SEBI	SEBI act	
Module V (10 Hours)	● Company meeting and winding up ● Directors appointment-meaning ● Modes of winding up	● Lecture ● Discussion ● Participative Learning	● Seminar on company meeting	● To evaluate company meeting ● To study company secretary ● To evaluate winding up of company	Assessment through test papers

BCM4C04 QUANTITATIVE TECHNIQUES FOR BUSINESS

Number of Lecture Hours per week: 5
Number of Credits: 4
Internal: 20, External: 80
Examination Hours : 3

Objectives:

- To familiarize student with the use quantitative techniques in managerial decision making

Module I

Quantitative Techniques - Introduction - Meaning and definition - Classification of Q.T - QT and other disciplines - Application of QT in business - Limitations.

(05 Hours)

Module II

Correlation and Regression Analysis: Meaning and definition of Correlation - Karl Pearson's coefficient of correlation - Rank correlation - Regression - Types - Determination of simple linear regression - Coefficient of determination.
(20 Hours)

Module III

Set Theory - Probability: Concept of probability - Meaning and definition - Approaches to probability - Theorems of probability - Addition Theorem - Multiplication Theorem -Conditional probability- Inverse probability- Baye'sTheorem. (15 Hours)

Module IV

Theoretical Distribution: Binomial distribution - Basic assumptions and characteristics - Fitting of binomial distribution - Poisson distribution -characteristics - Fitting of Poisson distribution - Normal distribution - Features and properties - Standard normal curve. (15 Hours)

Module V

Statistical Inference : Testing of hypothesis - Procedure - Error in testing - Two tail tests and one tail tests - Non parametric tests (Chi-square test only) - Parametric tests - Z test -Test of significance of large samples-Test for two sample means-Small sample mean tests - Students t test - Analysis of Variance - F test - One way ANOVA . 20 Hours

Reference Books:

1. Richard I. Levin and David S. Rubin, Statistics for Management, Prentice Hall of India, latest edition.
2. S.P.Gupta, Statistical Methods, Sultan Chand, latest edition
3. Sanchetti and Kapoor, Statistics, Sultan Chand.
4. G.C.Beri, "Statistics For Managemet",Tata Me Graw Hill, 2003.
5. J.K. Sharma, "Business Statstics:, Pearson, 2004

6. Anderson Sweeney Williams, "Statistics for Business and Economics", Thomson.
7. R.P.Hooda, "Statistics for Business", Me Millan.
8. Levine Krebiel & Bevenson, "Business Statistics", Pearson edition, Delhi.

OBJECTIVES

- To make students familiarise with basic tools of statistics and quantitative techniques applied.

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (05 Hours)	● Quantitative techniques introduction - meaning and definition ● QT and other disciplines-	● Lecture ● Discussion ● Participative Learning	● Online Group discussion on Application of QT in business	● To study the meaning and concepts of QT ● Application of QT in business	Evaluation through essay writing

	applicati on of QT				
Module II (20 Hours)	• Correlati on and regressio n analysis • Karl pearson's co -efficient of correlati on -regressi on, types	• Lecture • Discussion • Participative Learning	• Assignment on exercise question	• To study correlation and regression • To study karl pearson's efficient of correlation	Evaluation through test papers
Module III (15 Hours)	• Set theory • Probabili ty • Approac hes to Theorem s of probabili ty • Addition theorem • Multiplic ation theorem • Baye's theorem	• Lecture • Discussion • Participative Learning	• Assignment on exercise questions	• To study set theory • To study theorems of probability	Evaluation through test papers

Module IV (15 Hours)	• Theoretical distribution • Basic assumptions and characteristics • Probability distribution • Binomial distribution • Poisson distribution • Normal distribution	• Lecture • Discussion • Participative Learning	• Assignment on exercise questions	• To study theoretical distributions	Evaluation through test papers
Module V (20 Hours)	• Quantitative approaches to decision making • Decision tree models • Model building	• Lecture • Discussion • Participative Learning	• Assignment on exercise question	• To study quantitative approaches to decision making • To evaluate decision tree modes • To study	Assessment through test papers

	steps ● Linear program ming			linear programming	

BCM5B07 ACCOUNTING FOR MANAGEMENT

Number of Lectures Hours per week: 4
Number of Credits: 4
Internal: 20, External: 80
Examination Hours : 3

Objectives:

- To enable the students to understand the concept and relevance of Management Accounting

Module I

Management Accounting: Nature and Scope - Difference between cost Accounting, Financial accounting and Management accounting - Recent trends in Management Reporting. (05 Hours)

Module II

Analysis and Interpretation of Financial Statements: Meaning - Types and Methods of Financial Analysis - Comparative Statements - Trend Analysis - Common size Statements (a general discussion only). (05 Hours)

Module III

Ratio Analysis: Meaning - Nature - uses and limitations of Ratios - Liquidity, Profitability, Turnover, Solvency, Leverage. Market test Ratios. Construction of

Financial Statements from ratios - Judgment of financial stability through ratios - (Focus to be given to problems solving and Interpretation skills) (25 Hours)

Module IV

Fund Flow and Cash Flow Analysis:

A. Fund Flow Statements: Meaning and concept of Fund - Current and Non Current Accounts Flow of fund - Preparation of Fund Flow statement - Uses and Significance.

B. Cash Flow Statement: Difference between Fund flow Statement and Cash flow Statement - Preparation of Cash Flow Statement as per AS - 3 Norms - Direct and Indirect methods (Stress to be given to Problems). (20 hours)

Module-V

Managerial Decision making with the help of CVP Analysis : Marginal Costing - Fixed Cost-Variable Cost - Contribution - P/V Ratio - Break Even Analysis - Algebraic and Graphic presentation - Decision making : Fixation of Selling Price - Exploring new markets - Make or Buy - Key Factor - Product Mix - Operate or Shutdown. (20 Hours)

(Theory and Problems may be in the ratio of 40% and 60% respectively).

Reference Books:

1. Dr. S.N. Maheswari : Management Accounting.
2. Saxena : Management Accounting.
3. Made Gowda : Management Accounting.
4. Dr. S. N. Goyal and Manmohan : Management Accounting.
5. B.S.Raman: Management Accounting.
6. R.S.N. Pillai and Bagavathi : Management Accounting.
7. Sharma and Gupta : Management Accounting.
8. J. Batty : Management Accounting.
9. Foster: Financial Statement Analysis, Pearson Education.
10. P.N. Reddy & Appanaiah : Essentials of Management Accounting.

OBJECTIVES

- To provide the students an understanding about the use of accounting and costing data for planning, control, and decision making

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**
Module I (05 Hours)	• Management accounting, difference between cost accounting • financial accounting and management accounting	• Lecture • Discussion • Participative Learning	• Online peer group discussion on recent trends in management accounting	• To evaluate difference between cost accounting and management accounting • To analyse recent trends in management accounting	Assessment through case study

Module II (05 Hours)	• Analysis and interpretation of financial statement • methods of financial analysis	• Lecture • Discussion • Participative Learning	• Collect final accounts of various companies and make financial analysis	• To develop the skill for financial analysis on financial statement	Assessment trough test papers
Module III (25 Hours)	• Ratio analysis • liquidity ratios • profitability ratios • Solvency • Leverage • judgement of financial stability	• Lecture • Discussion • Participative Learning	• Assignment on exercise questions	• To study judgement analysis on financial statement with the help of ratio analysis	Assessment trough test papers
Module IV (20 Hours)	• Fund flow statement-prep	• Lecture • Discussion • Participative Learning	• Assignment on exercise questions	• To study the preparation of fund flow and cash flow	Assessment through test papers

	aration ● Cash flow statement - direct and indirect method			statement	
Module V (20 Hours)	● Managerial decision making with the help of CVP analysis ● marginal costing ● break even analysis ● Key factor	● Lecture ● Discussion ● Participative Learning	● Assignment on exercise questions	● To study managerial analysis through CVP analysis	Evaluation through case study

BCM5B08 BUSINESS RESEARCH METHODS

Number of Lecture Hours per week: 4

Number of Credits: 4

Internal: 20, External: 80

Examination Hours :3

Objectives:

- To enable students for acquiring basic knowledge in business research methods

Module I

Business Research: – Definition and significance - Features of business research – The research process – Variable - Proposition - Types of research – Exploratory and causal research –Theoretical and empirical research - Basic and applied research - Descriptive research - Phases of business research – Research Hypothesis – Characteristics – Research in an evolutionary perspective – Role of theory in research - Theory building - Induction and Deduction Theory. (10 Hours)

Module II

Research Design – Definition – Types of research design – Exploratory and causal research design - Descriptive and experimental design – Types of experimental design – Validity of findings – Internal and external validity – Variables in research – Measurement and scaling – Different scales –Construction of instrument - Validity and reliability of instrument (15 Hours)

Module III

Data Collection: - Types of data – Primary Vs secondary data – Methods of primary data collection – Survey Vs observation – Experiments – Construction of questionnaire and instrument – Validation of questionnaire – Sampling plan – Sample size – Sampling methods- Determinants of optimal sample size – Sampling techniques – Probability Vs non probability sampling methods. (15 Hours)

Module IV

Data Processing: Processing stages - Editing - Coding and data entry – Validity of data – Qualitative Vs quantitative data analysis – Frequency table - Contingency table - Graphs - Measures of central tendency and index number – Testing of Hypothesis - Bivariate and multivariate statistical techniques – Factor analysis – Discriminant analysis- Cluster analysis – Interpretation. (15 Hours)

Module V

Research Report:Different types – Contents of report – Need of executive summary – Chapterisation – Contents of chapter - Report writing stages – The role of audience – Readability – Comprehension – Tone – Final proof – Report format –

Title of the report – Ethics in research – Subjectivity and objectivity in research. (15 Hours)

Reference Books:

1. Donald R.Cooper and Pamela S, Schindler: Business Research Methods. Latest Edition,Irwin McGraw- Hill International Editions, New Delhi.
2. John Adams, Hafiz T.A. Khan Robert Raeside, David white: Research Methods for Graduate Business and Social Science Students, Response Books. New Delhi-110044.
3. Neresh K. Malhotra: Marketing Research, Latest edition. Pearson Education.
4. William G. Zikmund, Business Research Methods, Thomson
5. Wilkinson T.S. and Bhandarkar P.L.: Methodology and Techniques of Social Research, Himalaya.
6. S N Murthy &. U Bhojanna: Business Research Methods, Excel Books, New Delhi.
7. Jan Brace: Questionnaire Design, Kogan Page India
8. Michael V.P. Research Methodology in Management, Himalaya.
9. Dipak kumar Bhattacharyya. Research Methodology. Excel Books, New Delhi.
10. R. Paneerselvan: Research Methodology, Prentice-Hall of India
11. Ajai S Gaur & Sanjaya S Gaur: Statistical Methods for Practice &. Research, Response Books, New Delhi.
12. Kultar Singh: Quantitative Social Research Methods. Response Books, New Delhi.

OBJECTIVES

- To develop basic skills in them to conduct survey researches and case studies

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (10 Hours)	● Business research - definition, significance ● types of research ● role of theory in research	● Lecture ● Discussion ● Participative Learning	● Seminar on different types of research	● To study business research and its significance ● Evaluate different types of research	Assessment through test papers
Module II (15 Hours)	● Research design ● types of research design ● validity of findings	● Lecture ● Discussion ● Participative Learning	● Discussion on types of research design	● To study research design ● To evaluate different types of research design	Assessment through test paper
Module III (15 Hours)	● Data collection ● types of data ● method	● Lecture ● Discussion ● Participative Learning	● Assignment on sampling technique ● Group	● To study data collection methods ● To study	Assessment through case study

	s of primary data collection, ● sampling plan ● sample size ● sample methods ● sampling techniqueue		discussion on methods of data collection	sampling technique ● To evaluate sample methods	
Module IV (15 Hours)	● Data processing ● qualitative v/s quantitative data analysis ● testing of hypothesis ● bivariate and multivari	● Lecture ● Discussion ● Participative Learning	● Seminar on quantitative v/s qualitative data analysis	● To study data processing ● To study testing of hypothesis ● To study factor analysis	Assessment through test papers

	ate data analysis ● Factor analysis				
Module V (15 Hours)	● Research report ● Contents of report ● report writing stages. ● Report format	● Lecture ● Discussion ● Participative Learning	● Assignment on content of project report	● To study project report content ● To evaluate report format	Assessment through test papers

BCM5B09 INCOME TAX LAW AND ACCOUNTS

Number of Lecture Hours per week: 5

Number of Credits: 4

Internal: 20, External: 80

Examination Hours: 3

Objectives:

- To impart basic knowledge about Income - tax Act, 1961 amended up to date

Module I

Basic Concepts: Income - Agricultural income - Person - Assessee - Assessment Year - Previous Year - Gross total income - Total income - Maximum marginal rate

of tax - Residential status - Scope of total income on the basis of residential status –Exempted incomes. (10 Hours)

Module II

Computation of Income under Different Heads: Salaries - Allowances - Perquisites -Profit in lieu of salary - Gratuity – Pension. (20 Hours)

Module III

Income from house property: Annual Value of House property - Computation under different circumstances - Deduction from annual value.
(15 Hours)

Module IV

Profits and Gains of Business or Profession: Definition - Computation - Allowable expenses and non-allowable expenses - General deductions - Provisions relating to Depreciation. (20 Hours)

Module V

Capital Gains: Definition of Capital Assets - Long term and Short term - Transfers - Cost of acquisition - Cost of improvement - Exempted Capital gains. Income from Other Sources: Definition– Computation. (20 Hours)

(Theory and problems may be in the ratio of 40% and 60%respectively .Only simple problems are to be expected)

Reference Books:

1. Dr. Vinod K. Singhania : Direct Taxes - Law and Practice, Taxman publication.
2. Dr. Mehrotra and Dr. Goyal: Direct Taxes - Law and Practice, Sahitya Bhavan Publication.
3. B.B. Lai: Direct Taxes, Konark Publisher (P) ltd.
4. Bhagwathi Prasad : Direct Taxes - Law and Practice. Wishwa Prakashana.
5. Dinakar Pagare : Law and Practice of Income Tax. Sultan Chand and sons
6. Gaur & Narang : Income Tax

OBJECTIVES

- To equip students with application of principles and provisions of Income - tax Act, 1961 amended up to date

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**
Module I (10 Hours)	• Basic concepts of income • agricultural income • assessment year • previous year • gross total income and total income • residential status • scope of total income	• Lecture • Discussion • Participative Learning	• assignment on residential status • Assignment on exercise questions	• To study concepts of income • To evaluate agricultural income • To study residential status	Assessment through case study

	• exempted income				
Module II (20 Hours)	• Computation of income under different heads- salaries -allowances- perquisites • profit in lieu of salary gratuity- pension	• Lecture • Discussion • Participative Learning	• Assignment on exercise questions	• To study how to compute income from salary	Assessment through test paper
Module III (15 Hours)	• Income from house property - annual value of house property • deduction from house value	• Lecture • Discussion • Participative Learning	• Assignment on exercise questions	• To study computation of income from house property	Assessment through test papers

Module IV (20 Hours)	• Profits and gains of business or profession- definition • Computation of profit and gain of business and profession	• Lecture • Discussion • Participative Learning	• Assignment on exercise questions	• To study computation of income from business or profession	Assessment through test papers
Module V (20 Hours)	• Capital gain - definition of capital asset • long term and short term capital gain • exempted capital gain	• Lecture • Discussion • Participative Learning	• Assignment on exercise questions	• To study computation of income from short term and long term capital gain • To study computation of income from other source	Assessment through test papers

	• income from other source • computation				

BCM5B10 FINANCIAL MARKETS AND SERVICES

Number of Lecture Hours per week: 5

Number of Credits: 4

Internal: 20, External: 80

Examination Hours: 3

Objectives:

- To provide basic knowledge about the structure, organization of financial system in India

Module I

Financial System: Meaning and Significance - Functions of the financial system - Financial concepts - Financial Assets - Financial markets - Classification - Financial instruments - Weakness of Indian Financial system – Financial services – meaning – Types. (15 hours)

Module II

Money Market: Definition - Features - Objectives - Features of a developed .money market - Importance of Money market - Composition of Money market - Operations and Participants - Money market Instruments - Features of Indian money market - Recent developments (15 Hours)

Module III

Capital Market: New issue market - meaning - functions - methods floating new issue - intermediaries in the new issue market - Merchants bankers and their functions - Recent trends in new issue market - Stock Exchanges - Functions - Structure of Stock Exchanges-BSE - NSE - Listing of securities - Advantages of listing - Methods of trading in stock exchanges - Online trading - Stock indices - Venture Capital - Concept and meaning. (25 Hours)

Module IV

Financial Institutions: Commercial banks - Development financial institutions - Non-Banking Financial Corporations - Mutual Funds, Insurance Companies - Objectives and functionsLease Financing-meaning- Factoring and forfaiting (only a brief outline) (15 Hours)

Module V

Regulatory Institutions - RBI - Role and Functions - The Securities and Exchange Board of India: Objectives - Functions - Powers - SEB1 Guidelines for primary and secondary market. (10 Hours)

Reference Books:

1. Kohn, Meir: Financial Institutions and Markets, Tata McGraw Hill.
2. Bhole L.M: Financial Institutions and Markets, Tata McGraw Hill.
3. Desai, Vasantha: The Indian Financial System, Himalaya Publishing House.
4. Machiraju.R.H: Indian Financial System, Vikas Publishing House.
5. Khan M.Y: Indian Financial System, Tata McGraw Hill.
6. Varshney, P.M., & D. K. Mittal, D.K.: Indian Financial System, Sulthan Chand & Sons
7. Gordon E. & Natarajan K.: Financial Markets & Services, Himalaya Publishing House.
8. Pathak. V. Bharati: Indian Financial System. Pearson Education.

OBJECTIVES

- To familiarize the students with financial market operations in India

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (15 Hours)	● Financial system-meaning and significance ● functions of the financial system. ● Financial market ● financial instrument ● weakness of Indian financial system ● financial services	● Lecture ● Discussion ● Participative Learning	● Group discussion on weakness of Indian financial system ● Presentation on financial services	● To study financial system concepts, meaning, significance and importance ● To evaluate weakness of Indian financial system ● To study financial services	Assessment through MCQ

Module II (15 Hours)	• Money market - definition -features - features of developed money market- • operation and participants of money market instrument • features of Indian money market	• Lecture • Discussion • Participative Learning	• Assignments on participants of money market instruments • Presentation on Indian money market	• To study money market definition and features • To evaluate the operations and participants of money market instrument • To evaluate the features of Indian money market	Evaluation through test papers
Module III (25 Hours)	• Capital market-meaning and definition • intermediaries in the new issue market	• Lecture • Discussion • Participative Learning	• Assignment on stock exchange functions • Presentation on method of trading in stock exchanges	• To study capital market • To evaluate the functions of stock exchanges	Assessment through test papers

	• merchant bankers • stock exchanges • listing of securities • Venture capital			• To study the methods of trading in stock exchanges	
Module IV (15 Hours)	• Financial institutions;- commercial banks., non-banking financial corporations • mutual funds • insurance companies • lease financing • Factoring forfaiting	• Lecture • Discussion • Participative Learning	• Assignment on non banking financial institutions	• To study financial institutions	Assessment through essay writing
Module V (10 Hours)	• Regulatory	• Lecture • Discussion	• Assignment on role and	• To study role and functions	Assessment through test

	institutions- RBI. ● SEBI	● Participative Learning	functions of regulatory institutions	of regulatory financial institutions	papers

BCM5B10 COMPUTER APPLICATIONS IN BUSINESS

Number of Lecture Hours per week: 5
Number of Credits: 4
Internal: 20, External: 80
Examination Hours: 3

Objectives:

- To help the students to acquire basic knowledge about computer and its applications in various areas of business

Module I

Computer Systems : Introduction – Features and Parts of new generation Computers-Factors to be considered while selecting computer - Importance of computers in business –Network Types of network, LAN, WAN, MAN, PAN ,BAN,SAN & CAN.Computer applications in various areas of business- Internet, Features and uses in business- Social media & its uses in business. (15 Hours)

Module II

Business and web sites – introduction to web design – concepts – principles involved in developing a website - golden rules of web designing-page design-home page-web standards audience requirement-Role of websites in a business-Cascading Style Sheet-Concept of CSS HTML-HTML documents-Basic structure of an HTML Document-creating an HTML Document-HTML Tags.
(15 Hours)

Module III

Elements of HTML-Introduction-working with text-working with Lists, Tables, Hyperlinks, images and multimedia-web publishing or hosting-creating the website -saving the site working on the web site-themes-publishing websites-website for business growth. (15 Hours)

Module IV

E-Commerce & Digital payments: E-Commerce, Business Models - B2B, B2C, B2G, C2C & B2E– Requirements of e-commerce website – Modes of delivery-Digital payments: USSD, NUUP, AEPS, UPI, Debit card, Credit card, Prepaid cards, Internet Banking, Mobile banking, e-wallets – POS Terminals, M-POS, V-POS. (20 Hours)

Module V

Digital Security – Security threats in Internet & e-Commerce, Virus & Trojan horses, Phishing,Hacking, Spyware – Security Measures, Antivirus, Firewall, Encryption, Biometrics–Precautions while using Internet & epayments - IT Act, Major Provisions of IT Act. (10 Hours)

Reference Books:

1. Rajaraman , Introduction to Information Technology, PHI
2. Jennifer Niederst Robbins, ―Learning web design:A beginner‘s Guide to HTML,CSS,Java script.and web Graphics‖ ,O‘ Reilly Media,Inc
3. John Duckett, ―HTML and CSS Design and build websites‖,John Wiley&Sons
4. Rajaraman , Fundamentals of Computers 4/E, PHI
5. PTSJ Joseph, E-Commerce: An Indian perspective, PHI
6. Ananya Misra, E-Commerce, B.K Publications Pvt.Ltd.
7. P. Mohan , Fundamentals of Computers, Himalaya Publishing House
8. Dennis P. Curtin , Information Technology, McGraw Hill International
9. Behrouz A. Forouzan , Data Communication and Networking 2nd edition ,McGrawHill
10.Avi Silberschatz, Peter Galvin & Greg Gagne Willey, Operating System Concepts

11.Uyless Black , Computer Networks Protocols, Standards and Interface: Prentice Hall India Pvt. Ltd.
12. Alfred Glkossbrenner , Internet 101 Computing MGH
13. Alex Leon & Mathews Leon, Fundamentals of Information Technology, LeonTechworld
14. Suresh Samudrala, Retail Banking Technology, Jaico Puubishing House
15. Indian Institute of Banking & Finance, Digital banking, Taxman
16. Karnika Seth, Computers, Internet and New technology laws, Lexis Nexis
17. Pavan Duggal, A text book on Cyber law, Universal Law Publishing company
18. Harish Chander, Cyber Laws and IT Protection, Prentice Hall India

OBJECTIVES

- To enable the students to understand the modern trends and technologies in computer applications

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (15 Hours)	• Computer systems-features and parts of new generatio	• Lecture • Discussion • Participative Learning	• Pictorial presentation on types of network • Group	• To study computer systems • to evaluate importance of	Assessment through MCQ

	n computer ● importance of computers in business ● types of network ● computer application in various areas of business		discussion on computer application in business	computers in business ● To study type of computer network ● To evaluate application of computers in business	
Module II (15 Hours)	● Business and websites ● introduction to web design ● principles involved in developing a website ● golden rules of web design	● Lecture ● Discussion ● Participative Learning	● Seminar on golden rules of web designing	● To study business and websites ● To study principles involved in developing web design ● To evaluate role website in business	Evaluation trough test papers

	• concepts of CSS, HTML				
Module III (15 Hours)	• Elements of HTML • web publishing • creating website • working on the website • website for business growth	• Lecture • Discussion • Participative Learning	• Assignment on elements of HTML • Presentation on creating website	• To study elements of HTML • To study creating website • To evaluate website for business growth	Evaluation through test papers
Module IV (20 Hours)	• E-commerce and digital payments • Business models • requirement of ecommerce websites • modes of delivery, digital	• Lecture • Discussion • Participative Learning	• Assignment on business models • Debate on for and against digital payment	• To study e-commerce and digital payments	Assessment through test papers

	payments ● internet banking ● e-wallets				
Module V (10 Hours)	● Digital security ● security threats in e commerce and internet ● virus,biometrics - precautions while using internet ● e payments ● IT act	● Lecture ● Discussion ● Participative Learning	● Presentation on virus ● Group discussion on threats in internet and e commerce	● To evaluate digital security ● To study virus	Evaluation through test papers

BCM5B11 FUNDAMENTALS OF INVESTMENTS

Number of Lecture Hours per week: 5
Number of Credits: 4
Internal: 20, External: 80
Examination Hours: 3

Objectives:

- To familiarize the students with the world of investments

Module I

The Investment Environment: The investment decision process - Types of Investments - Commodities, Real Estate and Financial Assets - Security market indices - Sources of financial information - Concept of return and risk 20 Hours

Module II

Fixed Income Securities: Bond - Features - Types of bonds - Estimating bond yields - Types of bond risks - Default risk and credit rating - Bond valuation 10 Hours

Module III

Approaches to Security Analysis: Fundamental Analysis - Technical Analysis and Efficient Market Hypothesis - Dividend capitalization models - Price Earnings Multiple Approach to equity valuation. 20 Hours

Module IV

Portfolio Analysis: Portfolio and Diversification - Portfolio Risk and Return –portfolio with more than two securities. Markowitz model - efficient portfolio – optimal portfolio – single index model – multi index model. 20 Hours

Module V

Investor Protection: SEBI & role of stock exchanges in investor protection - Investor grievances and their redressal system - Insider trading - Investors' awareness and activism. 10 Hours

(Theory and problems may be in the ratio of 50% and 50% respectively)

Reference Books:

1. Donald E. Fisher and Ronald J. Jordan: Securities Analysis and Portfolio Management, Prentice Hall, New Delhi.
2. S. Kevin: Security Analysis and Portfolio Management.
3. Sourain. Harry; Investment Management, Prentice Hall of India.
4. Francis and Archer: Portfolio Management, Prentice Hall of India.
5. Gupta L.C.: Stock Exchange Trading in India, Society for Capital Market Research and Development, Delhi.
6. MachiRaju, H.R.: Working of Stock Exchanges in India, Wiley Eastern Ltd, New Delhi.

OBJECTIVES

- To provide a theoretical framework for the analysis and valuation of investments.

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**
Module I (20 Hours)	● Introduction To investment	● Lecture ● Discussion ● Participative Learning	● Assignment on investment environment	● To study essential features of investment	Assessment through test papers

	• essential features of investment • investment alternatives • investment environment • investment management • source of financial information • calculation of expected return		• Seminar on source of financial information	• To study investment environment • To study investment management process • To study calculation of return on investment and expected return	
Module II (10 Hours)	• Security valuation • Valuation of fixed income	• Lecture • Discussion • Participative Learning	• Assignment on exercise questions	• To study valuation of fixed income securities • To study valuation of equity	Assessment through test papers

	securities ● valuation of security ● Default risk and credit rating ● Bond valuation				
Module III (20 Hours)	● Approach to security analysis ● tools for technical analysis ● Dividend Capitalisation models ● Price earning multiple approach to equity valuation	● Lecture ● Discussion ● Participative Learning	● Pictorial presentation of stock chart ● Seminar on trend and trend reversals	● To study security analysis ● To study leading and lagging indicators	Assessment through test papers

Module IV (20 Hours)	• Portfolio analysis-need and importance • portfolio diversification • calculation of portfolio risk and return • Markowitz Model • Single index and multi index model	• Lecture • Discussion • Participative Learning	• Seminar on portfolio diversification, • Assignment on exercise question	• To study portfolio analysis • To study portfolio diversification • To study calculation of portfolio risk • To study portfolio return	Assessment through test papers
Module V (10 Hours)	• Investor protection • role of SEBI and stock exchange in investor protection • investor grievanc	• Lecture • Discussion • Participative Learning	• Presentation on investors grievances and redressal system • Group discussion on investors education and awareness	• To evaluate role of SEBI and stock exchanges in investor protection • To evaluate investor grievance and redressal	Assessment through case study

	e and their redressal system		measures	system	

BCM5B11 BUSINESS INFORMATION SYSTEMS

Number of Lecture Hours per week: 5
Number of Credits: 4
Internal: 20, External: 80
Examination Hours: 3

Objectives:

- To enable the students to acquire basic knowledge in the information technology

Module I

Management Information System: Data, Information & Knowledge – Information Technology & Communication technology - Role of Information & Communication technology in Business – Management Information System , Meaning , Concepts, Purpose & Features of MIS, Basic structural concepts.
(15 Hours)

Module II

Types of Management Information Systems: Transaction Processing System - Decision Support Systems (DSS) - Characteristics and capabilities of DSS – Components of DSS – Executive Information System - Expert System – Management Reporting System. (15 Hours)

Module III

Database Management Systems : DBMS - Definition - Necessity of a database - Characteristics of database - Database management systems - Types of database management systems - Logical data models - Hierarchical model - Network model - Relational model - Object-oriented model - Object relational model Deductive/inference model - Comparison between various database models.
(20 Hours, 25 marks)

Module IV

Enterprise Resource Planning (ERP) – Meaning - Need for ERP - Benefits of an ERP system – ERP software – Phases in ERP implementation - Issues and challenges in the implementation of ERP. (15 Hours)

Module V

Business Process Reengineering: Meaning and definition of BPR – Reengineer - Need and Objectives of BPR - Process of BPR – Advantages of BPR - Issues and problems of BPR. (10 Hours)

Reference Books:

1. James A O‘brien, George.M.Marakas & Ramesh Behl, Management Information Systems, McGraw Hill Education, 2013
2. D.P Goyal, Management Information Systems: Managerial Perspectives, Vikas Publishing House, 2014
3. A.K Gupta, Management Information System, S.Chand & Company 2010
4. Alexis Leon, Enterprise Resource Planning, McGraw Hill Education 2007
5. Uma G Gupta, Management Information Systems, Galgotia Publications Pvt Ltd, New Delhi, 1993
6. Jyotindra Zaveri, Enterprise Resource Planning, Himalaya Publishing House 2012
7. Rajesh Ray, Enterprise Resource Planning text and cases, McGraw Hill Education 2010.
8. R.Radhakrishnan & S.Balasubramanian, Business Process Reengineering: Text and cases, Prentice Hall India Learning Pvt. Ltd, 2008
9. R.Srinivasan, Business Process Reengineering, McGraw Hill Education 2011
10. B.R Dey, Business Process Reengineering & Change Management , Dreamtech Press 2004.

OBJECTIVES

- To educate the students about the relevance of information technology to various areas of business.

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (15 Hours)	● Management information system ● role of information and communication technology in business ● meaning concepts	● Lecture ● Discussion ● Participative Learning	● Seminar on role of information and communication technology in business	● To study meaning , concepts, and features of MIS ● To evaluate role of information and communication technology in business	Assessment through test papers

	and features of MIS				
Module II (15 Hours)	• Types of management information system • Decision Support System (DSS) • Management Reporting System	• Lecture • Discussion • Participative Learning	• Assignment on transaction processing system	• To study types of management information system	Assessment through test papers
Module III (20 Hours)	• Database management system • necessity of database • types of database management system • logical data model • comparis	• Lecture • Discussion • Participative Learning	• Assignment on types of database management system	• To study definition of database management system • To evaluate necessity of database • To study different types of database management system	Assessment through test papers

	on between various database models				
Module IV (15 Hours)	• Enterprise resource planning -meaning, need , benefits • ERP software • phases in ERP implementation • issues and challenges in the implementation of ERP	• Lecture • Discussion • Participative Learning	• Group discussion on issues and challenges in the implementation of ERP	• To study ERP concepts • To evaluate the phases in ERP implementation • To evaluate the issues and challenges in the implementation of ERP	Assessment through test papers
Module V (10 Hours)	• Business process reengineering • Need and importance of BPR	• Lecture • Discussion • Participative Learning	• Seminar on issues and problems of BPR	• To study the concept of BPR • To evaluate the process of BPR	Assessment through test papers

	• process of BPR • issues and problems of BPR			• To evaluate the issues and problems of BPR	

BC5D01 E-COMMERCE

Number of Lecture Hours per week: 2
Number of Credits : 2
Internal: 10, External: 40
Examination Hours: 1.5

Objectives:

- To enable the students to understand basics of E- Commerce

Module I

Introduction to E-Commerce: Meaning and concept - E-Commerce v/s Traditional Commerce - E-Business &. E-Commerce - History of E- Commerce - EDI - Importance, features & benefits of E- Commerce - Impacts, challenges & limitations of E-Commerce -Supply chain management & E-Commerce - E-Commerce infrastructure - Business Models of E - Commerce: Business to

business - Business to customers -customers to customers - Business to government - Business to employee - E - Commerce strategy - Influencing factors of successful E- Commerce. (15 Hours)

Module II

Marketing Strategies & E - Commerce: Website - Components of website - Concept & designing website for E- Commerce - Corporate website - Portal - Search Engine - Internet advertising - Emergence of the internet as a competitive advertising media - Models of internet advertising - Weakness in internet advertising. (15 Hours)

Module III

Electronic Payment System: Introduction - Online payment systems - prepaid and postpaid payment systems - E-cash - E- cheque - Smart card - Credit card - Debit card -Electronic purse - Security issues on electronic payment system - Solutions to security issues - Biometrics - Types of biometrics. (10 Hours)

Reference Books:

1. Turban, Efraim, David King et. el.: Electronic Commerce: A Managerial Perspective, Pearson Education Asia, Delhi.
2. Kalakota, Ravi: Frontiers of Electronic Commerce, Addison - Wesley, Delhi.
3. Rayport, Jeffrey F and Jaworksi. Bernard J: Introduction to E-Commerce, Tata McGrawHill
4. Smantha Shurety,: E-Business with Net Commerce, Addison - Wesley, Singapore.
5. Rich, Jason R: Stalling an E-Commerce Business, IDG Books, Delhi.
6. Laudon, Kenneth C and Carol Guercio Traver : E-Commerce business. Technology. Society, Pearson Education, Delhi.
7. Stamper David A. and Thomas L.Case: Business Data Communications, Pearson Education, New Delhi.
8. Willam Stallings: Business Data Communications. Pearson Education, New Delhi.

OBJECTIVES

- To Gain a practical orientation to E-Commerce and E- Business management

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**
Module I (15 Hours)	• E commerce -meaning and concept • history of e-commerce • impact , challenges and limitations of e commerce • supply chain management	• Lecture • Discussion • Participative Learning	• Seminar on challenges and limitations of e commerce • Group discussion on influencing factors of successful e commerce	• To know meaning and basic concepts of e-commerce • To evaluate the history of e-commerce • To study supply chain management • To study business models of e-commerce	Assessment through test papers

	• business models of e commerce • influencing factors of successful e-commerce			• To identify the influencing factors of successful e-commerce	
Module II (15 Hours)	• Marketing strategies and e - commerce • Website • components of website • corporate website Portal • search engine • internet advertisi	• Lecture • Discussion • Participative Learning	• Debate on internet advertising • Assignment on corporate website	• To study marketing strategies and e-commerce • To study components of website • To evaluate emergence of the internet as a competitive advertising media	Assessment through MCQ

	ng ● emergence of internet as a competitive advertising media ● models of internet advertising ● weakness in internet advertising			● To evaluate the weakness in internet advertising	
Module III (10 Hours)	● Electronic payment system ● security issues on electronic payment system ● biometrics	● Lecture ● Discussion ● Participative Learning	● Presentation on security issues on electronic payment system ● Assignment on biometrics	● To study electronic payment system ● To evaluate the issues of electronic payment system ● To study bio metric system	Assessment through test papers

BCM6B12 INCOME TAX AND GST

Number of Lecture Hours per week: 6
Number of Credits: 4
Internal: 20, External: 80
Examination Hours : 3

Objectives:

- To impart basic knowledge of Income - tax Act, 1961 and GST Act 2016

Module I

Income Tax Contd: Deemed Incomes and Clubbing of income – Set- off and carry forward of losses - Deductions to be made in computing total income – Computation of total Income of individuals – Computation of Tax liability of individuals – Rebate and relief of tax. (25 hours)

Module II

Income tax authorities – Powers and functions – Provisions of advance payment of tax – Tax payment – Deduction and payment of tax at source – Recovery of tax. Procedure of assessment of income tax – Filing of returns of income – Voluntary return of income – Statutory obligations in filing of returns – Return of loss – Belated returns – Revised returns – Defective returns – PAN – Different types of assessment – Self assessment – Assessment on the basis of return – Best judgment assessment – Regular assessment – Reassessment – Protective assessment.
(15 Hours)

Module III

Goods and Services Tax: Brief history behind the emergence of GST – The scope of GST – Definitions and meaning - Central Goods and Services Tax Act–Integrated Goods and Services Tax Act - State Goods and Services Tax Act - Levy and Collection of Central/State Goods and Services Tax - Taxable person - Power to grant exemption from tax - Time and value of supply of goods - Time of supply of services (15 Hours)

Module IV

Registration - Amendment of registration - Cancellation of registration - Revocation of cancellation of registration - tax invoice, credit and debit notes – Returns - First Return - Annual return - Final return - Tax Return Preparers - Levy of late fee - Notice to return defaulters (15 Hours)

Module V

Payment of tax, interest, penalty and other amounts - Interest on delayed payment of tax - Tax deduction at source - transfer of input tax credit - refund of tax - accounts and records - demands and recovery I - Inspection, search, seizure and arrest - offences and penalties - Audit by tax authorities - Special audit - Power of CAG to call for information. (10 Hours)

(The syllabus of GST will be revised after the rules and regulations relating to GST Act are framed).

OBJECTIVES

- To equip students with application of principles and provisions Income - tax Act, 1961 and GST Act 2016

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (25 Hours)	• Deemed incomes and clubbing of income • set off • carry forward losses • deductions to be made in computing income • computation of total income of individuals, comput	• Lecture • Discussion • Participative Learning	• Seminar on set off and carry forward of losses • Assignment on exercise questions	• To study clubbing of income • To study set off and carry forward • To study computation of total income • To computation of tax liability of individuals	Assessment through test papers

	ation of tax liability of individual ● rebate and relief of tax				
Module II (15 Hours)	● Income tax authorities ● powers and functions ● provisions for advance payment of tax ,TDS, recovery of tax. ● Filing of returns of income ● PAN ● different	● Lecture ● Discussion ● Participative Learning	● Seminar on powers and functions of income tax authorities	● To evaluate the powers and functions of income tax authorities ● To study filing of returns	Assessment through test papers

	types of assessment				
Module III (15 Hours)	• Goods and service tax. • History • Scope of GST definition and meaning	• Lecture • Discussion • Participative Learning	• Seminar on scope of GST	• To study GST	Assessment through test papers
Module IV (15 Hours)	• Registration . amendment of registration • cancellation of registration • Tax invoice, returns	• Lecture • Discussion • Participative Learning	• Assignment on revocation of cancellation of registration	• To study registration and amendment of registration • To study tax return preparer	Assessment through test papers
Module V (10 Hours)	• Payment of tax • interest, penalty and other amounts	• Lecture • Discussion • Participative Learning	• Seminar on demands and recovery of tax	• To study payment of tax , interest, penalty and other amounts	Assessment through test papers

	• TDS, refund of tax • accounts and records • demands and recovery • audit by tax authorities. • Power of CAG to call for information			• To evaluate audit by tax authorities • To study power of CAG to call for information	

BCM6B13 AUDITING AND CORPORATE GOVERNANCE

Number of Lecture Hours per week: 5
Number of Credits: 4
Internal: 20, External: 80
Examination Hours: 3

Objective:

- To provide knowledge of auditing principles and techniques and to familiarize the students with the understanding of issues and practices of corporate governance in the global and Indian context.

Module I:

Auditing – Meaning – Objects - Basic Principles and Techniques – Auditing and investigation - Classification of Audit – Audit Planning – Qualities of an auditor – Advantages and limitations of audit (10 hours)

Module II

Audit Procedures: Vouching - Definition - Features - Examining vouchers -Vouching of cash book - Vouching of trading transactions - Verification and valuation of assets and liabilities: Meaning - Definition and objects - Vouching v/s verification - Verification and Valuation of different assets and liabilities (20 hours)

Module III

Internal Control - Internal Check - Internal Audit --Definitions - Necessity - Difference between internal check and internal control - Fundamental Principles of internal check - Difference between internal check and internal audit - Special Areas of Audit: Tax audit and Management Audit - Recent trends in auditing - Relevant Auditing and Assurance Standards (AASs) - Rights duties and liabilities of auditor - Audit committee - Auditor's Report - Contents and types – Auditors certificate. (20 hours)

Module IV:

Conceptual Framework of Corporate Governance: Meaning, Theories, Models and Benefits of Corporate Governance; Board Committees and their Functions; Insider Trading; Rating Agencies; Green Governance/E-governance; Clause 49 of Listing Agreement; Class Action; Whistle Blowing; Shareholders Activism (20 hours)

Module V

Major Corporate governance failures - BCCI (UK) - Maxwell Communication (UK) - Enron (USA – Satyam Computer Services Ltd - TATA Finance - Kingfisher Airlines - Common Governance Problems Noticed in various Corporate Failures - Codes and Standards on Corporate Governance (10 hours)

Suggested Readings:

1. Institute of Chartered Accountants of India, Auditing and Assurance Standards, ICAI, New Delhi.
2. Relevant Publications of ICAI on Auditing (CARO).
3. Gupta, Kamal and Ashok Arora, Fundamentals of Auditing, Tata Mc-Graw Hill Publishing Co. Ltd., New Delhi.
4. Ghatalia, S.V., Practical Auditing, Allied Publishers Private L td., New Delhi.
5. Singh, A. K. and Gupta Lovleen, Auditing Theory and Practice, Galgotia Publishing Company. `
6. Mallin, Christine A., Corporate Governance (Indian Edition), Oxford University Press, New Delhi.
7. Rani, Geeta D., and R.K. Mishra, Corporate Governance- Theory and Practice, Excel Books, New Delhi.
8. Bob Tricker, Corporate Governance-Principles, Policies, and Practice (Indian Edition), Oxford University Press, New Delhi.
9. Sharma, J.P., Corporate Governance, Business Ethics, and CSR, Ane Books Pvt Ltd, New Delhi

OBJECTIVES

- To establish a relationship between Auditing and Corporate Governance

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (10 Hours)	● Auditing ● basic principles and techniques ● classification of audit ● qualities of an auditor ● advantages and limitations of audit	● Lecture ● Discussion ● Participative Learning	● Seminar on qualities of auditor ● Assignment on different types of audit	● To know the meaning and concepts of auditing ● To evaluate different types of audit ● To evaluate the qualities of auditor ● To evaluate the advantages and disadvantages of audit	Assessment through test papers

Module II (20 Hours)	• Audit procedures • Vouching and Verification and valuation of assets and liabilities • vouching v/s verification	• Lecture • Discussion • Participative Learning	• Assignment on vouching V/S verification	• To study vouching • To study verification • To evaluate vouching v/s verification	Assessment through essay writing
Module III (20 Hours)	• Internal control • internal check • internal audit • special areas of auditing • recent trends in auditing • AASs • rights duties and liabilities of	• Lecture • Discussion • Participative Learning	• Assignment on internal check , internal audit, internal control. • Group discussion on duties and liabilities of auditors	• To study internal check , internal control, internal audit • To evaluate special areas of audit • To evaluate recent trends in auditing • To identify duties and liabilities of	Assessment through descriptive exam

	auditor ● audit committee ● auditors report ● auditors certificate			auditor ● To study auditors report	
Module IV (20 Hours)	● Conceptual framework of corporate governance ● models and benefits of corporate governance ● board committee and their functions ● insider trading ● green governance	● Lecture ● Discussion ● Participative Learning	● Assignment on models and benefits of corporate governance ● Seminar on green governance	● To study corporate governance ● To evaluate insider trading	Assessment through test papers

	• clause 49 • whistle blowing				
Module V (10 Hours)	• Major corporate governance failures • codes and standards on corporate governance	• Lecture • Discussion • Participative Learning	• Presentation on major corporate governance failures	• To evaluate major corporate governance failures • To study codes and standards on corporate governance	Evaluation through test papers

BCM6B14 FINANCIAL DERIVATIVES

Number of Lecture hours per week: 5

Number of Credits: 5
Internal: 20, External: 80
Examination Hours: 3

Objectives:

- To acquire knowledge about financial derivatives and their features

Module I

Financial Derivatives: Introduction - Meaning – Types of financial derivatives: Forwards – Futures – Options – Swaps – Economic functions of derivative contracts. (10 Hours)

Module II

Derivative Markets: History of financial derivative market – Participants in a derivative market – Cash market Vs derivative market – Stock market derivatives in India – Other derivatives in India – The regulatory framework for derivatives trading in India. (15 Hours)

Module III

Forward Contracts : Features – Limitations of forward markets – Introduction to Futures – Meaning and definition - Features of futures – Difference between forwards and futures – Futures - terminology – Types of future contracts - Financial futures – Stock futures – Currency futures - Interest rate futures – Index futures - Commodity futures – Futures pay-offs – Trading strategies in stock futures . (20 Hours)

Module IV

`Options: Meaning – Definition – Need - Difference between options and futures – Fundamental option strategies – Types of options contracts - Call – Put – Options – Intrinsic value Vs Time value of options - Trading strategies in stock options.
(20 Hours)

Module V

Swaps: Meaning – Definition - Features of swaps – Terms used in swaps – Types of swaps: Interest rate swap - Currency swap - Commodity swap - Equity swap – Difference between Swaps and Futures. (15 Hours)

Reference Books:

1. Hull John. C, Options, Futures and Other Derivatives, Pearson Educations Publishers, New Delhi (Latest Edition).
2. S.L.Gupta, Prentice Hall of India Private Ltd, New Delhi.
3. L.M Bhole , Financial Institutions and Markets – Structure, Growth and Innovations , Tata Mc Graw Hill Publishing Co. Ltd. New Delhi.
4. D.C. Patwari&A.Bhargava , Options and Futures, An Indian Perspective , JAICO Publishing

OBJECTIVES

- To know about various risks associated with derivatives

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**
Module I (10 Hours)	• Financial derivatives • Types • economic functions	• Lecture • Discussion • Participative Learning	• Group discussion on functions of derivative contracts • Assignment	• To study financial derivatives • To study types of financial	Assessment through essay writing

	of derivative contracts		on types derivatives	derivatives	
Module II (15 Hours)	• Derivative market • History • participants of the derivative market. • Cash market v/s derivative market • stock market derivatives in India • the regulatory framework	• Lecture • Discussion • Participative Learning	• Seminar on derivative market in India	• To study derivative market • To identify the participants of derivative market • To evaluate cash market v/s derivative market • To evaluate stock market derivatives in India	Evaluation through test papers
Module III (20 Hours)	• Future contracts • trading strategies in stock exchange • Differen	• Lecture • Discussion • Participative Learning	• Assignment on trading strategies in stock futures	• To study forward contracts • To study futures • To evaluate	Assessment through test papers

	ce between futures and forwards			the difference between forwards and `futures ● To evaluate trading strategies in stock exchanges	
Module IV (20 Hours)	● Options ● basic concepts ● types of option contracts ● intrinsic value V/S time value of options ● trading strategies in stock options	● Lecture ● Discussion ● Participative Learning	● Seminar on trading strategies in stock options	● To study options	Assessment through test papers
Module V (15 Hours)	● SWAPS ● meaning, features of swaps ● types of SWAPS ● differenc e	● Lecture ● Discussion ● Participative Learning	● Seminar on difference between SWAPS and Futures	● To study SWAPS, features, types ● To evaluate the difference between swaps and	Assessm ent through MCQ

	between swaps and futures			futures	

BCM6B14 OFFICE AUTOMATION TOOLS

Number of Lecture Hours per week: 5
Number of Credits: 4`
Internal: 20, External: 80
Examination 2.5 Hours

Objectives:

- To enable the students to acquire basic knowledge in the various office automation tools

Module I

MS-Word : Word Basics - Starting word - Creating a new document - Opening pre existing document - The parts of a word window - Typing text - Selecting text - Deleting text -Undo - Redo – Repeat- Inserting text - Replacing text - Formatting text - Cut - Copy -Paste - Formatting Text and Documents - Auto format - Line spacing - Margins - Borders and Shading.Headers and Footers : Definition - Creating basic headers and footers - Tables - Creating table - Adding, changing, deleting rows - Inserting, changing, deleting column - Graphics - Importing graphics - Clipart - Insert picture - Clip Art Gallery - Drawing objects - Text in drawing .Templates : Template types - Using templates - Exploring templates - Modifying templates - Macros : Record in macros - Editing macros - Running a macro - Mail Merge: Mail Merge concept - Main document - Data sources - Merging data source and main document - Overview of word menu options - Word basic toolbar. (Theory 15 Hours and Practical 10 Hours)

Module II

MS EXCEL : Electronic Spreadsheet – Creating and rearranging worksheet - Structure of spreadsheet and its applications to accounting, finance, and marketing functions of business -Creating a dynamic / sensitive worksheet - Concept of absolute and relative cell reference - Using built in functions – Mathematical, statistical and financial functions – Conditional formatting –filters- Charts – Pivot table and pivot chart - Goal seeking and solver tools - Sharing data with other desktop applications - Strategies of creating error free worksheet. (Theory 15 Hours and Practical 10 Hours)

Module III

Ms-Power Point : Powerpoint - Basics - Terminology - Getting started - Views -Creating presentations - Using auto content wizard - Using blank presentation option -Using design template option - Adding slides Deleting a slide - Importing images from the outside world - Drawing in powerpoint - Transition and build effects - Deleting a slide - Numbering a slide - Saving presentation - Closing.(Theory 9 Hours and Practical 6 Hours)

Module IV

The Internet and its Basic Concepts: Internet concept - History - Development in India -Technological foundation of internet - Distributed computing - Client-server computing -Internet protocol suite - Application of distributed computing - Client-server computing. (Theory 7 Hours)

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Module V

Internet protocol suite in the internet environment - Domain Name System (DNS) -Generic Top Level Domain (g TLD) - Country Code Top Level Domain (cc TLD) -Indian - Allocation of second level domains - IP addresses - Internet Protocol Applications of internet in business, Education, Governance, etc.
(Theory 10 Hours)

Reference Books:

1. Ron Mansfield, Working in Microsoft office, Tata Mc Graw Mill (2008)

2. Ed Bott, woody Leonard, Using Microsoft Office 2007, Pearson Education (2007)
3. R.K.Taxali, PC Software Made Simple.
4. Stephen L.Nelson , Office 2000 Complete Reference.
5. Joyce Cox ,Polly Orban, Quick course in Microsoft Office.
6. Gimi Couster , Mastering Office 2000.
7. Rajkamal, Internet and Web Technologies, Tata McGraw Hill (2007).

OBJECTIVES

- To enable students to know the applications of Office Automation Tools in the various areas of business

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**
Module I (15 Hours)	● MS word - starting , creating a new document, headers and footers,	● Lecture ● Discussion ● Participative Learning	● Practical lab ● Assignment on preparing document	● To study creating new document	Assessment through test papers

	templates				
Module II (15 Hours)	• MS EXCEL, creating rearranging spreadsheet, sharing data with other desktop applications	• Lecture • Discussion • Participative Learning	• Practical lab • Assignment on creating worksheet	• To study creating worksheet	Assessment through exam
Module III (9 Hours)	• MS-Powerpoint, basics, terminology, using design template option, adding and deleting slides, importing images, saving	• Lecture • Discussion • Participative Learning	• Practical lab	• To study creating powerpoint slide • To study transitions and build effects	Assessment through presentation competition

	presentation				
Module IV (7 Hours)	• The internet and basic concepts • History • development in India • technological foundation of internet • distributed computing • client server computing • Internet Protocol suit	• Lecture • Discussion • Participative Learning	• Assignment on internet concept	• To study basic concepts of internet • To study technological foundation of internet	Assessment through MCQ
Module V (10 Hours)	• Internet protocol • domain name system • g LTD • ccLTD,	• Lecture • Discussion • Participative Learning	• Seminar on internet protocol applications of internet in business, education,	To study;- • Internet protocol • Domain name	Assessment through test papers

	IP address, internet protocol application in business		governance	• Internet Protocol applications	

BCM6B15 FINANCIAL MANAGEMENT

Number of Lecture Hours per week: 4
Number of credits 4
Internal: 20, External: 80
Examination Hours:3

Objectives:

- To familiarize the students with the concepts, tools and practices of financial practices of Financial management

Module I

Introduction: Nature, scope and objectives of financial management - Time value of money and mathematics of finance - Concept of risk and return. (15 Hours)

Module II

Investment Decision: Capital budgeting process - Estimation of relevant cash flows -Payback Period method - Accounting Rate of Return - Net Present Value - Net

Terminal Value - Internal Rate of Return - Profitability Index - Capital budgeting under risk -Certainty Equivalent Approach and Risk Adjusted Discount Rate.
(20 Hours)

Module III

Financing Decision: Cost of capital and financing decision - Estimation of components of cost of capital : Equity capital - Retained earnings - Debt and Preference capital -Weighted average cost of capital and Marginal cost of capital - Sources of long term financing - Capital structure - Operating and financial leverage - Determinants of capital structure. (20 Hours)

Module IV

Dividend Decision: Relevance and irrelevance of dividend decision - Cash and stock dividends - Dividend policy in practice. (8 Hours, 10 marks)

Module V

Working Capital Management: Meaning and nature of working capital - Determination of working capital requirement - A brief overview of Cash management, Inventory management and Receivables management. (15 Hours)

(Theory and Problems may be in the ratio of 50% and 50% respectively)

Reference Books:

1. Home, J.C. Van: "Financial Management and Policy". Prentice Hall of India , New Delhi.
2. Khan and Jain: "Financial Management Text and Problems", Tata McGraw Hill, New Delhi.
3. Pandey, I.M: "Financial Management", Vikas Publications.
4. Bhalla, V.K.: "Financial Management & Policy," Anmol Publications. Delhi.
5. Chandra, P: "Financial Management - Theory and Practice", Tata Mcgraw Hill.
6. Singh, J.K.: "Financial Management- Text and Problems". Dhanpat Rai and Company. Delhi.
7. R. S. Kulshrestha: Financial Management. Sahitya Bhawan.
8. R. P. Rastogi: Fundamentals of Financial Management, Galgotia Publications. New Delhi.

9. Ravi M Kishore: Fundamentals of Financial Management. Taxmann Publications.).
10 Bhattacharya, Hrishikas: Working Capital Management - Strategies and Techniques, Prentice Hall of India, New Delhi

OBJECTIVES

- To know about various risks associated with derivatives

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (15 Hours)	● Introduction nature and objectives of financial management ● time value of money	● Lecture ● Discussion ● Participative Learning	● Assignment on objectives of financial management ● Assignment on exercise questions	● To study meaning and scope of financial management ● To study time value of money	Assessment through test papers

	and mathematics of finance- ● concepts of risk and return				
Module II (20 Hours)	● Investment decision ● capital budgeting process ● estimation of relevant cash flows ● payback period method ● ARR ● NPV ● NTV ● IRR ● PI ● capital budgeting under risk ● risk adjusted	● Lecture ● Discussion ● Participative Learning	● Assignment on exercise questions ● Seminar on capital budgeting process	● To study capital budgeting process ● To evaluate investment decisions ● To study estimation of relevant cash flows	Assessment through test papers

	discount rate				
Module III (20 Hours)	• Financing decision • cost of capital and financing decision • estimation of components of cost of capital • sources of long term financing • capital structure • operating and financial leverage • determinants of capital structure	• Lecture • Discussion • Participative Learning	• Seminar on source of long term financing • Assignment on exercise questions	• To evaluate financing decisions • To study cost of capital calculation • To evaluate capital structure	Assessment through case study

Module IV (10 Hours)	• Dividend decision • Dividend policy in practice	• Lecture • Discussion • Participative Learning	• Seminar on dividend policy in practice • Assignment on exercise questions	• To study relevance and irrelevance of dividend decision • To evaluate dividend policy in practice	Assessment through test papers
Module V (15 Hours)	• Working capital management • Determination of working capital management • a brief overview of cash management • inventory management and receivables manage	• Lecture • Discussion • Participative Learning	• Seminar on inventory management and receivables management • Assignment on working capital management	• To study working capital management • To evaluate cash management , inventory management. And receivables management	Assessment through test papers

	ment				

BCM6B15 COMPUTERISED ACCOUNTING WITH TALLY

Number of Lecture Hours per week: 5
Number of Credits: 5
Internal: 20, External: 80
Examination Hours: 3

Objectives:

- To enable the students to acquire basic knowledge in the computerized accounting systems

Module I

Introduction to Accounting: Accounting basis and terms -Branches of accounting - Mode of accounting - Manual accounting - Computerized accounting fundamentals. Accounting with Tally : Introduction to Tally - Tally interface - fll features - fl2 configuration - Company creation - Accounting groups - Accounting ledgers - Accounting vouchers - Vouchers entry. (15 Hours)

Module II

Inventory Management with Tally - Stock groups - Stock items - Stock category -Unit of measures - Godown inventory vouchers (Pure inventory and inventory vouchers).Integration of Accounting with Inventory : Bill wise details - Invoicing - Voucher entry -Cost centre - Cost category - Budget and control - Bank reconciliation - Interest calculation – Order Processing - Stock valuation methods - Reorder levels - Tracking numbers - Bill of material - Inventory ageing. (30 Hours)

Module III

Tax Application in Tally - Introduction to GST - GST activation and classification -GST computation - Composite GST - Input Tax credit - Tax Invoice, Credit and

Debit Notes-Returns-Transfer of Input Tax Credit- Time and Value of Supply-Recent features. (15 Hours)

Module IV

Accounting and Inventory Reports - Trading, Profit and loss A/c - Balance Sheet -Ledgers - Cost centre and budget reports - Cash book and bank book - Inventory reports - Decision supporting tools - Ratio analysis - Cash flows - Fund flow - Budgeting system - Printing of reports - Voucher and bill printing etc. (10 Hours)

Module V

Technology Advantage of Tally - Tally audit - Tally vault - Back up, restore, merge and split of database - ODBC interface - Export and import of data - web enabled reporting - On line support of software. (10 Hours)

Reference Books:

1.A.K. Nadhani and K.K. Nadhani,Implementing Tally 6.3, 1/e BPB Publications, NewDelhi.
2.Namrata Agarwal, Tally 6.3 , 2004 Edition , Dream Tech., New Delhi.
3.Sridharan,,Narmadha Publications, May 2003.

OBJECTIVES

- To enable the students to know the applications of computerized accounting systems in the area of business.

(Out of the 80 lecture hours, the ratio between theory and practical hours shall be 3:2)

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (15 Hours)	• Computerised accounting fundamentals • Accounting with tally	• Lecture • Discussion • Participative Learning	• Practical in computer lab • Assignment on company creation	• To know how to create company • To study accounting group and accounting ledgers , accounting vouchers	Assessment through practical exam
Module II (30 Hours)	• Inventory management with tally • integration of accounting with tally	• Lecture • Discussion • Participative Learning	• Practical knowledge in computer lab	• To study inventory management with tally • To study integration of accounting with inventory	Assessment through test papers
Module III (15 Hours)	• Tax application tally • Introduction of	• Lecture • Discussion • Participative Learning	• Assignment on GST activation and classification	• To study tax application in tally	Assessment through test papers

	GST ● Input tax credit				
Module IV (10 Hours)	● Accounting and inventory reports ● decision supporting tools ● printing of reports ● voucher and bill printing	● Lecture ● Discussion ● Participative Learning	● Practical experience in computer lab	● To study accounting and inventory reports in tally	Assessment through test papers

Module V (10 Hours)	• Technology advantage of tally • tally audit • tally vault • ODBC interface • export and import of data	• Lecture • Discussion • Participative Learning	• Assignment on export and import of data	• To study technology advantage of tally	Assessment through test papers

BCM1B01 BUSINESS MANAGEMENT

Number of Lecture Hours per week : 6

Number of Credits : 4

Internal : 20, External :80

Examination Hours :2.5

Objectives:

- To understand the process of business management and its functions.

Module I

Concepts of Management – Characteristics of management – Schools of management thought - Management and administration – Management by objectives – Management by participation – Management by exception – Management by motivation - Functions of management – Planning– Organizing - Departmentation – Delegation (25 Hours, 20 marks)

Module II

Functions of Management:– Motivation: – concept and importance – Contributions of McGregor, Maslow and Herzberg – Leadership – Concept and styles – Leadership traits - Communication – process and barriers – Control – concept - steps – tools – Coordination – Concept, Principles, Techniques. (20 Hours, 15 marks)

Module III

Business Ethics:– Ethics and Morality – Theories of ethics: Teleological theory – Deontological theory –Virtue theory – Types of ethics – Meaning and scope of business ethics - Characteristics – Objectives of Business Ethics - Factors influencing business ethics – Arguments for and against business ethics – Different views of business ethics - The Separatist View, The Unitarian View, The Integration View, Ethical issues in global business. (20 Hours, 20 marks)

Module IV

Corporate Social Responsibility (CSR): Meaning and definition - History of CSR activities – Concept of Corporate citizenship - Need and importance of CSR – Stakeholders of CSR – Steps in the implementation of CSR activities – CSR and business ethics - CSR and corporate governance – CSR initiatives in India. (18 hours, 15 marks)

Module V

Emerging concepts in management – Kaizen – TQM – TPM – MIS – ISO – Change management – Stress management – Fish bone (ISHIKAWA) Diagram – Holacracy - Rank & Yank - 20% time - Gamification - Flexi-working - Business ecosystem – Logistic management. (13 Hours, 10 marks)

Reference Books:

1. Boatwright. John R: Ethics and the Conduct of Business, Pearson Education, New Delhi.
2. Gupta. CB; Business management, Sultan Chand & sons
3 Koontz, H and Wechrick, H: Management, McGraw Hill Inc, New York.
4 Prasad. LM; Principles and Practicd of Management; Sultan Chand & sons
5 Stoner. AF and Freeman RE; Management; Prentice Hall of India
6.Drucker, Peter, F., Management: Tasks, Responsibilities and Practices, Allied Publishers, New Delhi.
7. R.S Davar; Management Process
6. Rustum & Davan, Principles and Practice of Management.

8. Srinivasan & Chunawalla, Management Principles and Practice.
9. S. V. S. Murthy. Essentials of Management.
10. Stoner, Freeman & Gilbert, Jr.: *Management*, Prentice Hall of India Private Limited, New Delhi.
11. Tripathy & Reddy: *Principles of Management*, Tata McGraw-Hill Publications, New Delhi.
12. Stephen P. Robbins: *Organizational Behaviour*, Prentice Hall of India Private Limited, New Delhi.
13. Udai Pareek: *Understanding Organizational Behaviour*, Oxford University Press, New Delhi.
14. S. S. Khanka: *Organizational Behaviour: Text and Cases*, S. Chand & Company Limited, New Delhi.

OBJECTIVES

- To familiarize the students with current management practices
- To understand the importance of ethics in business
- To acquire knowledge and capability to develop ethical practices for effective management.

Lesson plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (25 hours)	Concepts of Management, management and administration, MBO,management by participation, management by motivation	● Lecture ● Discussion ● Participative Learning	● Seminars and Assignments on the topic Management By Objectives (MBO) ● Discussion on Business News	● To understand the concepts of Management ● To evaluate different schools of Management Thoughts ● To identify various functions of Management	● Business Quiz

Module II (20 hours)	Functions of management, Concepts of Motivation, Communication process and barriers Leadership - Concepts and Styles, Control - Tools	• Lecture • Discussion • Participative Learning	• Powerpoint Presentation on Motivation Theories • Group discussion on various communication gadgets available and its importance in business • Leadership games	• To evaluate various motivation theories • Identify communication channels and study communication process and barriers in business • To understand leadership qualities and skills	• Evaluation through test papers
Module III (20 hours)	Business ethics and morality , theories of ethics,factors influencing business ethics, different views of business ethics	• Lecture • Discussion • Participative Learning	• Interaction with local business entrepreneurs	• To understand factors influencing business ethics • To identify different views of business ethics	• Essay writing

Module IV (18 hours)	Corporate social responsibility, Concepts of Corporate citizenships, Steps in implementation of CSR activities, CSR and Corporate Governance	• Lecture • Discussion • Participative Learning	• Group discussion on Corporate Social Responsibility • Debate on relevance of CSR in present scenario	• To study relevance of corporate social responsibility • To identify various steps in implementing CSR	• Evaluation through Viva
Module V (13 hours)	Emerging concepts in Management, Change Management, Stress management, Business Ecosystem, Logistics Management	• Lecture • Discussion • Participative Learning	• Powerpoint presentation on various areas of Stress Management • Collage on Business Ecosystem	• To study the emerging concepts of Business management • To identify various concepts of stress management and logistics management	• Assessment through Descriptive test

BCM1C01 MANAGERIAL ECONOMICS

Number of Lecture Hours per week: 5
Number of Credits: 4
Internal: 20, External: 80
Examination Hours : 2.5

Objectives :

- To enable the students to understand micro and macroeconomic concepts relevant for business decisions.

Module I

Managerial Economics:- – Definition and characteristics – Nature and Scope - Economics Vs Managerial Economics - Decision making and forward planning – Relationship of managerial economics with other disciplines - Basic economic tools in management economics – The role of managerial economist. (10 Hours,10 marks)

Module II

Theory of consumer behaviour: - Cardinal analysis - Law of diminishing marginal utility – consumer surplus; Ordinal approach – indifference curve analysis – consumer equilibrium – income consumption curve and price consumption curve – Hicksian decomposition of price effect in to substitution effect and income effect – Demand curve for normal, inferior and giften goods – concept of elasticity of demand – measurement of various elasticities – Elasticity of supply. (20 Hours,20 marks)

Module III

Market structure:-

a. Perfect competition: – profit maximization and equilibrium of firm and industry – short run and long term supply curves – price and output determination.

b. Monopoly: – Price determination under monopoly – equilibrium of firm – comparison between perfect competition and monopoly – price discrimination.

c. Monopolistic competition: price and output determination – product differentiation – comparison with perfect competition – excess capacity under monopolistic competition.
d. Oligopoly: indeterminate pricing and output – classical models of oligopoly – price leadership - collusive oligopoly – kinked demand curve. (20 Hours,20 marks)

Module IV

An overview of Indian economy - Indian economy since 1991 - Basic characteristics of Indian economy - Factors that led to the opening up of Indian economy - Indian economy under WTO regime - Issues in Indian economy: Problems of growth, unemployment, poverty, inequality in income distribution, inflation – The role of parallel economy – The role of Government in a market economy. (15 Hours,15 marks)

Module V

Structure and direction of India‘s foreign trade and India‘s trade regulation and promotion - Exchange rate policy – Intellectual Property Rights - Foreign capital and MNCs in India, Trade reforms - An overview of Kerala economy - Trade and commerce in Kerala - Industrial development of the state - the role of small scale industries in Kerala economy. (15 Hours, 15 marks)

Reference Books:

1. R.L. Varshney and K.L. Maheswari, Managerial Economics
2. Ahuja. HL; Business Economics, S. Chand & co.
3. D.N. Dwivedi, Managerial Economics
4. Dr. S. Sankaran, Managerial Economics
5. DM Mithani: Business Economics
6. Seth M L Text Book of Economic Theory
7. K K Dewett: Economic Theory
8. Dutt & Sundaram: Indian Economy
9. Petersen &. "Lewis: Managerial Economics
10. Mote V L peul. S & Gupta G S: Managerial Economics
11. H. Craig Petersen & W. Cris lewis: Managerial Economics
12. Dr. P.N. Reddy and H.R, Appanaiah : Essentials of Business Economics

13. Barry Keating and J. Holton Wilson: Managerial Economics

OBJECTIVES

- To help the students to understand the Application of economic principles in business management.

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment

Module I (10 Hours)	Managerial Economics - Definition and nature, The role of managerial economists, Basic economic tools in Managerial Economics	• Lecture • Discussion • Participative Learning	• Powerpoint presentation on Definition and nature of Managerial Economics • Group Discussion on Role of managerial Economists	• To understand nature of managerial economics • To evaluate the role of managerial economists	• Evaluation through Case Study
Module II (10 Hours)	Basic Concepts of Demand and Cost, Law of Variable Proportions, Economies and Diseconomies of scale, Cost Minimization, Profit	• Lecture • Discussion • Participative Learning	• Group Discussion on Economies and Diseconomies of scale • Presentation on Law of Variable Proportions	• To study various concepts of demand and cost • To understand law of variable proportions • To analyze economies and diseconomies of scale	• Evaluation through test papers

	Maximization				
Module III (20 Hours)	Theory of Consumer Behaviour, Law of Diminishing Marginal Utility, Concept of Elasticity of Demand	• Lecture • Discussion • Participative Learning	• Consumer Behaviour Survey on various products • Powerpoint presentation on elasticity of Demand	• To evaluate theories of Consumer Behaviour • To study Law of Diminishing Marginal Utility	• Assessment through Test paper
Module IV (20 Hours)	Perfect Competition, Monopoly, Monopolistic Competition, Oligopoly	• Lecture • Discussion • Participative Learning	• Peer Group Discussion on different types of Market Structure • Powerpoint presentation on difference between perfect competition and	• To evaluate various structure of Market	• Assessment through Essay Writing

			monopolistic competition		
Module V (15 Hours)	Tourism and Environment, Meaning and principles of Sustainable Tourism Development, Environment impact assessment, Eco tourism	• Lecture • Discussion • Participative Learning	• Presentation on influence of tourism in Kerala Economy • Exhibition on Taste of Kerala	• To evaluate scope of eco tourism • To study meaning and principles of sustainable tourism development	• Evaluation through test papers

BCM2B02 FINANCIAL ACCOUNTING

Number of Lecture Hours per week: 6
Number of Credits: 4
Internal: 20, External: 80
Examination Hours : 2.5

Objectives:

- To equip the students with the skills of preparing financial statements for various type of organizations

Module I

Single Entry System of Accounting: Definition – Objectives - Advantages- Limitations- Distinction between Double entry and Single entry- Types of Single entry- Determination of Profit or Loss under single entry- Statement of Affairs/ Capital comparison method- Distinction between Balance Sheet and Statement of Affairs- Distinction between Profit and loss account and Statement of Profit and Loss- Conversion method- Practical Problems. (16 Hours, 15 marks)

Module II

Company Accounts- Issue of Shares:Introduction- Books of accounts maintained by companies- Share Capital- Phases of capital- Difference between Reserve capital and Capital Reserve- Shares and types of shares- Equity and Redeemable Preference shares - Convertible Cumulative Preference Shares (CCP shares) Sweat Equity shares- Employees Stock Option Scheme (Theory only)- Private Placement of shares- Issue of shares- Procedures- Minimum Subscription- Shares issued for consideration- Shares issued for consideration other than cash- Issue of shares at par and premium (issue at discount, not to be taught)- Treatment of Fraction shares- Application, Allotment and Calls on Shares- Share capital allotment- Calls in arrears and calls in advance- Interest on calls in arrears and calls in advance- Difference between calls in arrears and calls in advance- Oversubscription and under subscription- Pro-rata allotment- Forfeiture and reissue of shares-

Annulment of forfeiture- Surrender of shares- Distinction between forfeiture and surrender- Journal entries- Practical problems. (30 Hours,25 marks)

Module III

Accounting for issue of Debentures:Definition – Types of debentures- Issue of Debentures- For cash, for consideration other than cash and issued as collateral security- Fraction debentures- Distinction between share and debenture- Terms of issue of debentures- Interest on debentures- Journal entries- Practical problems. (10 Hours,10 marks)

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Module IV

Convergence to International Financial Reporting Standards: Meaning of Accounting Standards- need and importance of global accounting standards- Role of IASB in developing IFRS – components of IFRS (IAS,IFRS,IFRIC and SIC)- process of setting IFRS –Conceptual Framework and its contents – Definition of elements in financial statements- Criteria or principles of recognition, measurement, presentation and disclosure- convergence to IFRS- Emergence of Ind AS – Standard setting process in India – Role of NFRA –Entities required to adopt Ind AS- Role of FASB in developing US GAAP- Difference between Ind AS and IFRS. (18 Hours, 15 marks)

Module V

Ind. AS / IFRS compiled Financial Statements of Companies (Ind AS1): Preparation of final accounts under new format (SOPL, SOCE and SOFP – excluding SOCF) - Treatment of adjustment items such as Corporate Dividend Tax- Transfer to Reserve- Provision for taxation- TDS on Interest income, implied adjustment of interest on loans and other usual adjustment items such as depreciation, Closing stock, provisions, outstanding, prepaid, accrued, and received in advance - Practical problems. (22 Hours, 15 marks)

(Theory and problems may be in the ratio of 30% and 70% respectively)

Reference Books:

1. S.N. Maheshwari: Financial Accounting.

2. M.C. Shukla, T.S. Grewal and S.C. Gupta, Advanced Accounts, S.Chand& Co., New Delhi.
3. Naseem Ahmed, Nawab Ali Khan and M.L.Gupta: Fundamental of Financial Accounting, Ane Books Pvt. Ltd, New Delhi.
4. Grewal and Gupta: Advanced Accounting
5. Dr Goyal V.K., Financial Accounting, Excel Books, New Delhi.
6. R.L. Gupta and Radhaswamy, Advanced Accounting, Sultan Chand & Sons, New Delhi.
7. R.K.Malhotra: Financial Management in Hotels and Restaurant Industry, Anmol Publishers
8. S.Kr. Paul: Advanced Accounting
9. B.S. Raman, Advanced Accountancy.
10. Jain &Narang: Financial Accounting
11. Ashok Sehgal and Deepak Sehgal: Advanced Accounting, Volume 1, Taxmann, New Delhi.
12. Chintal Patel, Bhupendra Mantri, India Accounting Standards, Taxmann Publications.
13. T.P. Ghosh, Illustrated Guide to India Accounting Standards, Taxmann Publications.

OBJECTIVES

- To enable the students to acquire knowledge about financial reporting standards and to understand corporate accounting methods.

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (16 Hours)	Preparation of financial statements of sole trader, single entry meaning and methods of profit determination ,depreciation accounting	● Lecture ● Discussion ● Participative Learning	● Problem solving ● Participative learning	● To study how to prepare financial statement of sole trader ● To understand the details of single entry ● To understand depreciation accounting	● Assessment through test papers
Module II (30Hours)	Issue of shares and debentures,forfeiture of shares,preparation of financial statements of joint stock company	● Lecture ● Discussion ● Participative Learning	● Assignments on forfeiture of shares ● Seminars on issue of shares and debentures ● problem solving	● To study issue of shares and debentures ● To understand forfeiture of shares ● To study financial statement of joint stock company	Evaluation through test papers

Module III (10 Hours)	Meaning and concepts of banking, non banking asset, preparation of profit and loss account and balance sheet of banking company	● Lecture ● Discussion ● Participative Learning	● Group discussion on meaning and concepts of banking ● Problem solving	● To understand meaning and concepts of banking ● To study non banking asset ● To study how to prepare profit and loss account and balance sheet	Assessment through test papers
Module IV (18 Hours)	Insurance accounts, types of insurance,final accounts of insurance	● Lecture ● Discussion ● Participative Learning	● PPT presentation on types of insurance ● Problem solving	● To identify insurance accounts and type of insurance ● To study the preparation of final accounts	● evaluation through test papers and MCQ

Module V (22 Hours)	Objectives and uses of financial statements,development of accounting standards in India ,requirements of IFRS,international organisations engaged in accounting harmonizations, Ind AS, difference between Ind AS and IFRS	• Lecture • Discussion • Participative Learning	• PPT presentation on difference between Ind AS and IFRS • Peer group discussion on requirement of IFRS	• To evaluate objective and uses of financial statements • To identify the development of accounting standards in India • To study requirements of IFRS • To identify international organisations engaged in accounting harmonizations • Study difference between Ind AS and IFRS	evaluation through descriptive exam

BCM2C02 MARKETING MANAGEMENT

Number of Lecture Hours per week: 5
Number of Credits: 4
Internal: 20, External: 80
Examination Hours : 2.5

Objectives:

- To provide basic knowledge about the concepts, principles, tools and techniques of marketing

Module I

Marketing Management: The value of marketing–Core marketing concepts–The new marketing realities–Philosophy of marketing - Creating long term loyalty relationships – Marketing management tasks –Analyzing consumer markets-Factors influencing consumer behaviour-Buying decision process - market segmentation; bases for segmenting consumer markets – market targeting - marketing of services - rural marketing in India; potential, challenges and strategies. (20 Hours,20marks)

Module II

Creating and Capturing Value: The fundamentals of product management; product levels; customer value hierarchy– Classification of product–Managing brands and brand equity-Product and Services differentiation-Product and brand relationships - Product Life Cycle Marketing Strategies - New product development-Packaging, labeling, Warranties and Guarantees.

Pricing to capture value; setting the price; methods of pricing; pricing strategies; pricing for rural markets. (20 Hours,20 marks)

Module III

Delivering Value: Distribution -marketing channels and value networks-role of marketing channels-channel design and management decision-channel integration and system-conflict, cooperation and competition-Managing retailing, wholesaling and logistics-Direct and online marketing (10 Hours,10 marks)

Module IV

Communicating Value: Integrated Marketing Communications; role of marketing communication; developing effective communication; marketing communication mix - managing advertising; deciding on media and measuring effectiveness ; communicating to rural audience- Sales Promotion-Personal selling; principles of personal selling-Events and experiences-Public relation-Interactive marketing-word of mouth marketing. (15 Hours,15 marks)

Module V

`E-commerce and E-marketing: Concept and nature; Reason for growth of e-marketing - E-commerce marketing practices; types of E-commerce; E-commerce business models; E-commerce marketing strategies - M-commerce marketing practices- Electronic Payment System-Security issues in E commerce. (15 Hours,15 marks)

Reference Books:

1. Philip Kotler, Kevin Lane Keller,"Marketing Management" (15e), Pearson India Education Services Pvt Ltd
2. V S Ramaswamy& S Namakumari,"Marketing Management" (Latest Edition)- McGraw Hill Education (India) Private Limited, New Delhi
3. S.A. Sherlekar, "Marketing Management-Concepts and Cases", Himalaya Publishing House Pvt Ltd
4. William J Stanton,"Fundamentals of Marketing", McGraw Hill Publishing Co, New York
5. Lamb. Hair, McDaniel, ―Marketing", Cengage Learning Inc USA.
6. Rayport, Jeffrey F and Jaworksi. Bernard J, "Introduction to E-Commerce", Tata Mc Graw Hill, New Delhi

OBJECTIVES

- To impart necessary knowledge which helps the student to choose a career in the field of marketing.
- To expose the students to the latest trends in marketing

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**

Module I (20 Hours)	Value of marketing,philosophy of marketing,marketing management tasks,factors influencing buying behaviour,market segmentation, market targeting,marketing of service	• Lecture • Discussion • Participative Learning	• PPT on market segmentation • Seminar presentation on consumer behaviour of various products • Survey of various marketing strategies adopted by service providers	• To study :- 1. Value of marketing and philosophy 2. Marketing management tasks 3. Market segmentation • To evaluate;- 1. Factors influencing buying behaviour 2. Marketing of services	evaluation through case study

Module II (20Hours)	Fundamentals of product management, Classification of products,brand and brand equity, product life cycle ,pricing strategies	● Lecture ● Discussion ● Participative Learning	● Assignment on classification of products ● Seminar on product life cycle	● To study fundamentals of product management ● To evaluate;- 1. Brand and brand equity 2. Product life cycle 3. Pricing strategies	Assesment through descriptive eam
Module III (10 Hours)	Marketing channels,managing retailing,wholesaling and logistics direct and online marketing	● Lecture ● Discussion ● Participative Learning	● Seminars on marketing channels ● Debates on direct and online marketing ● Marketing games	To evaluate:- 1 Marketing channels 2. Management of wholesaling and logistics 3.Direct and online marketing	evaluation through essay writing
Module IV (15 Hours)	Marketing communication, sales promotion, marketing	● Lecture ● Discussion ● Participative Learning	● Peergroup discussion on marketing communication mix	To identify;_ ● Marketing communication mix ● Decision on	evaluation through essay writing

	communication mix, personal selling, interactive marketing		● Presentation on personal selling and interactive marketing	media and effectiveness ● Principles of personal selling	
Module V (15 Hours)	E commerce, e commerce marketing strategies,e commerce marketing practices, m-commerce marketing practices	● Lecture ● Discussion ● Participative Learning	PPT presentation on e commerce marketing strategies	Evaluate:- E commerce marketing strategies M commerce marketing practices	evaluation trough test paper

BCM3A11 BASIC NUMERICAL METHODS

Number of Lecture Hours per week: 5
Number of Credits: 4
Internal: 20, External: 80
Examination Hours : 2.5

Objectives:

- To enable the students to acquire knowledge of Mathematics and Statistics.

Module I

Numerical expressions and Equations: Simultaneous linear equations (up to three variables), Quadratic equations in one variable-factorization and quadratic formula (10 Hours, 10 marks)

Module II

Matrices: introduction - type of matrices – trace and transpose and determinants - matrix operations – adjoint and inverse –rank- solving equations by matrices: Cramer‘s Rule (not more than three variables). (15 Hours, 15 marks)

Module III

Sequence, Series and Progression : Concepts and differences - Arithmetic progression- nth term and sum of n terms of an AP - Insertion of Arithmetic means in AP - Geometric progression- nth term and sum of n terms of an GP - Insertion of Geometric Mean in GP - Harmonic progression. (20 Hours, 15 marks)

Module IV

Interest and Time value: Concept of interest-Types of interest: Simple interest and compound interest – nominal, real and effective rate of interest - Future value and Present Value; Annuity and Perpetuity - Computing future and present values of annuity (regular and immediate) - multi and growing period perpetuity - Compound annual growth rate - computation of Equated Monthly Instalments (EMI). (15 Hours, 15 marks)

Module V

Descriptive Statistics: Measures of Central Tendency – Mean: Arithmetic mean, Geometric mean and Harmonic Mean- Median, Mode and other position values - Measures of Dispersion: mean deviation, quartile deviation, standard deviation and coefficient of variation - Measures of Skewness and Kurtosis. (20 Hours, 25 marks)

Reference Books

1.Business Mathematics and Statistics- N G Das & J K Das (Tata McGraw Hill)
2. Basic Mathematics and its Application in Economics – S. Baruah (Macmillan)
3. Mathematics for Economics and Business – R. S. Bhardwaj (Excel Books)
4. Business Statistics – G. C. Beri (Tata McGraw Hill)
5. Fundamentals of Statistics – S.C.Gupta (Himalaya Publishing House)
6.SP Gupta ,Statistical Methods, Sultan Chand
7.Dinesh Khattar-The Pearson guide to quantitative aptitude for competitive examinations.
8. Dr. Agarwal.R.S – Quantitative Aptitude for Competitive Examinations, S.Chand and Company Limited.
9. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Tata Mcgraw Hill,

(Theory and problems may be in the ratio of 20% and 80% respectively. An overview of the topics is expected and only simple problems shall be given)

OBJECTIVES

- At the end of this course, the students should have understood set operations, matrix and Mathematics of finance, Statistical tools and their applications.

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**
Module I (10 Hours)	Sets and sets operation,matrices,venn diagram,matrix multiplication .solving system of simultaneous linear equations	● Lecture ● Discussion ● Participative Learning	● Presentation on fundamental ideas about matrices and their operational rules ● Problem solving	Study;- ● Sets and sets operations ● Venn diagram ● matrices Solving;- ● Matrix multiplication ● Simultaneous linear equation	Assessment through test papers
Module II (15 Hours)	Theory of equation meaning and type	● Lecture ● Discussion ● Participative Learning	● Assignment on simple linear and simultaneous equations ● Problem solving	Study theory of equation and types	evaluation through test papers
Module III (20 Hours)	Arithmetic progression, geometric progression, mathematics	● Lecture ● Discussion ● Participative Learning	● Problem solving	● Study arithmetic progression and geometric progression	evaluation through test papers

	of finance,simple and compound interest			• Calculate simple and compound interest	
Module IV (15 Hours)	Meaning and definition of statistics , types of enquiries ,presentation of data by diagrammatic and graphical method, formation of frequency distribution	• Lecture • Discussion • Participative Learning	• Presentation on type of enquiries • Presentation of data on diagrammatic and graphical method • Problem solving	Evaluate;- • Meaning and definition of statistics • Types of enquiries Study;- • Presentation of data by diagrammatic and graphical method • Formation of frequency distribution	Assessment through test papers
Module V (20 Hours)	Measures of central tendency, skewness and kurtosis, lorenz curve, time series,index numbers	• Lecture • Discussion • Participative Learning	• Assignment on central tendency • Problem solving	Study;- • Measures of central tendency • Analysis of time series • Trend and seasonal variations • Index number	Test papers

BCM3A12 PROFESSIONAL BUSINESS SKILLS

Number of Lecture Hours per week: 5

Number of Credits 4

Internal: 20, External: 80

Examination 2.5 Hours

Objectives:

- To update and expand basic Informatics skills of the students

Module I

Professionalism: Meaning -Definition – Characteristics - Traits and Qualities of a good professional - Professionalism in business - Professional Skills: important soft skills for business success- Professionalism in Communication: Verbal Communication: Professional Presentation - Different Presentation Postures- Written Communication: Email - Significance of Email in business – Email etiquette: format - rules – dos and don‘ts - Technical Documentation: Standards – Types (15 Hours, 15 marks)

Module II

E-Learning :Introduction of electronic learning - benefits and drawbacks of e-Learning - Online education - Digital age learners - Knowledge resources on internet - E-books, Audio, Video and other means for e-learning- Introduction to e-content development and tools - Online libraries – MOOCs - The e-Learning as a service Industry - major technologies used in e-earning- different approaches for e-Learning delivery - E-learning in India (12 Hours, 12 marks)

Module III

Business Data Analysis : Features of New Generation Computers – Concept of data analysis – Business Data Analysis – Data Analyst – Types of analysts - organisation and source of data, importance of data quality, dealing with missing or incomplete data- Social Networking Analysis – Big Data Analysis - Role of Data Scientist in Business & Society - Role of Artificial Intelligence and Intelligent

Agents in e-business - Ethical and Legal considerations in Business Analytics (18 Hours, 18 marks)

Module IV

Socio - Cyber Informatics: IT and society - Digital Divide – Digital natives-Cyber space- New opportunities and threats - Cyber ethics - Cyber-crimes -Types - Cyber Laws –Organisations related with cyber laws-Cyber addictions - Information overload - Health issues - e-waste and Green Computing –Recent E-governance initiatives in India (15 Hours, 15 marks)

Module V

Digital Marketing : Introduction to Digital marketing Environment –meaning & Concept – Need for digital marketing – Advantages and disadvantages of digital marketing -Trends in digital marketing- Types of digital marketing – Business models in digital marketing Business to Business (B2B), Business to Customer (B2C), Customer to Customer (C2C), Business to Employees (B2E), Business to Government (B2G) - Online advertising - types of online advertising - Top e-commerce websites around the world and its scenario in India. PPC (Pay per Click) advertising – Search engine Analytics – search engine ads – social media channels and ads (20 Hours, 20 marks)

References Books:

1. Professional Business Skills – Lee Pelitz 2nd Edition
2. Peter Norton, Introduction to Computers, Tata McGraw Hill Private Limited, New Delhi, 2009.
3. Alan Evans, ITL ESL, Leslie Lamport, Dolores Etter, Darren George,
Kenneth C Laoudon, Gary Rogers, Rainer Handel, INFORMATICS -Technology in Action, Pearson Education, Delhi, 2009.
4. V.Rajaraman, Introduction To Information Technology, PHI Learning Private Limited,New Delhi, 2009.
5. Daniel Minoli&EmmaMinoli, Web Commerce Technology Hand Book, Tata McGraw Hill, New Delhi, 2009
6. Godfrey Parkin,DigitalMarketing:Strategies for online success,New Holland publishers Ltd,2009

7. Damian Ryan,Understanding Digital marketing:Marketing strategies for Engaging the Digital generation,Kogan page,3rd Edition,2014
7. Jonah Berger,Contagious Why things catch on,Simon&Schuster,2013
8. Turban E, Armson, JE, Liang, TP &Sharda, Decision support and Business Intelligence Systems, 8thEdition, John Wiley & Sons, 2007
9. Frank J. Ohlhorst, Big Data Analytics, 1st Edition, Wiley, 2012.
10. Efraim Turban, Ramesh Sharda, Jay Aronson, David King, Decision Support and Business Intelligence Systems, 9th Edition, Pearson Education, 2009
11. Microsoft Office 2007 Business Intelligence - Reporting, Analysis, and Measurement from the Desktop, Doug Harts, TATA McGraw-Hill Edition, 2008
12. Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with XLMiner, GalitShmueli, Nitin R. Patel, Peter C. Bruce, Wiley Publication, 2010
13. Data Mining: Concepts and Techniques‖, Morgan Kaufmann Publication, 3rd Edition, 2011 Data Science for Business – What you need to know about data mining and data-analytic thinking, Foster Provost, Tom Fawcelt, O‘ Reilly Media Publication, 2013

OBJECTIVES

- To equip the students to effectively utilize the digital knowledge resources for their study

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (15 Hours)	● Professionalism in Communication ● Email in Business ● Technical Documentation	● Lecture ● Discussion ● Participative Learning	● Seminars and Assignments on professionalism in Communication ● Online Group discussion on significance of Email in business	● To evaluate professionalism in Business ● To analyse significance of Email in business ● To evaluate Professionalism in Communication	Assessment through Essay writing Competition
Module II (12 Hours)	● E-Learning - Benefits and Drawbacks ● Online Education ● Introduct	● Lecture ● Discussion ● Participative Learning	● Online Discussion On Inflibnet ● Seminar on Benefits and Drawbacks of E-Learning	● To study Knowledge Resource on Internet ● To evaluate different means of e-learning	Assessment through test papers

	ion to E-Content and Tools ● Online Libraries ● Major Technologies used in E-Learning				
Module III (18 Hours)	● Concept of data analysis ● Social networking Analysis ● Role of Data Scientist in Business and Society ● Role of Artificial Intelligence and Agents in business	● Lecture ● Discussion ● Participative Learning	● Seminars and Assignments on Organisation and Source of data	● To study features of New generation Computers ● To evaluate role of data scientists in Business and Society	Evaluation through Testpapers

Module IV (15 Hours)	• Social cyber Informatics • Cyber Crimes • E- waste and Green Computing • Recent E-Governance initiative in India	• Lecture • Discussion • Participative Learning	• OnlineGroup discussion in Cyber Crimes • Online collage on E-waste and Green Computing	• To study cyber laws • To evaluate e-waste and green computing	Assessment through test papers
Module V (20 Hours)	• Digital Marketing • Social media ads and channels • Business models in marketing	• Lecture • Discussion • Participative Learning	• Experience sharing by student Entrepreneurs on Digital marketing • Debate on advantages and disadvantages of Digital marketing	• To study various Business models • To evaluate advantages and disadvantages of Digital marketing • To evaluate online advertisements	Evaluation through Test papers

BCM3BO3 BUSINESS REGULATIONS

Number of Lecture Hours per week: 5

Number of Credits: 4

Internal: 20, External: 80

Examination Hours : 2.5

Objectives:

- To familiarize the students with certain statutes concerning and affecting business organizations in their operations

Module I

Business Laws : Introduction - Nature of Business Law - Meaning and definition -Indian Contract Act, 1872: Contract - Definition - Essentials of valid contracts - Classification of contracts - Offer and acceptance - Consideration - Capacity to contract - Free consent -Coercion - Undue influence - Misrepresentation - Fraud - Mistake - Void agreements -Discharge of contract - Breach of contract and remedies - Contingent contracts -Quasi contracts. (20 Hours, 30 marks)

Module II

Special Contracts: Contract of Indemnity: Meaning - Nature - Right of indemnity holder and indemnifier - Contract of Guarantee: Meaning - Nature - Rights and liabilities of surety - Discharge of surety from liability - Contract of Bailment and Pledge: Rights and duties of bailor and bailee, pledger and pledgee - Contract of Agency - Creation of agency - Delegation of authority - Duties and liabilities of principal and agent -Termination of agency. (20 Hours. 18 marks)

Module III

Sale of Goods Act 1930: Contract for sale of goods -Essentials of a contract of sale -Conditions and Warranties - Caveat emptor - Sale by non owners - Rules as to delivery of goods - Unpaid seller and his rights. (10 Hours, 12 marks)

Module IV

The Consumer Protection Act 1986: Objects and scope - Definition of consumer and consumer dispute - Complaint - Goods - Service - Unfair trade practices - Restrictive trade practices - Rights of consumers - Consumer Protection Council - Consumer Disputes Redressal Agencies. (7 Hours, 10 marks)

Module V

The limited liability partnership Act 2008 – Salient features – Distinction with partnership and company – LLP agreement – partners and designated partners – incorporation document – Extent and limitation of liability of LLP and partners. (7 Hours, 10 marks)

Reference Books:

1. Singh Avtar, The Principles of Mercantile Law , Eastern Book Company, Lucknow.
2. Kuchal M.C, Business Law , Vikas Publishing House, New Delhi
3. Kapoor N.D, Business Law , Sultan Chand & Sons, New Delhi.
4. Chandha P.R , Business Law.
5. S.S. Gulshan, Business Laws.
6. B. Sen and Mitra, Business and Commercial Laws.
7. Chandha P.R, Business Law, Galgotia, New Delhi.
8. Balchandani, Business Laws.
10. Desai T.R., Indian Contract Act, Sale of Goods Act and Partnership Act, S.C. Sarkar & Sons Pvt. Ltd. Kolkata.

OBJECTIVES

- To enlighten the students with the legal framework influencing business decisions.

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (20 Hours)	• Contract Act 1872	• Lecture • Discussion • Participative Learning	• Seminars and assignments on Capacity to contract	• To study essentials of a valid Contract • To study capacity to contract	Evaluation through test papers
Module II (20 Hours)	• Contract of Indemnity • Contract of Guarantee • Contract of Agency • Bailment and Pledge	• Lecture • Discussion • Participative Learning	• Assignments and Seminars on Contract of Guarantee and Indemnity	• To study Contract of Indemnity and Guarantee • To study Bailment and Pledge • To study Bailment and Pledge	Evaluation through test papers
Module III (10 Hours)	• Sale of Goods Act 1930 • Contract for Sales	• Lecture • Discussion • Participative Learning	• Assignment on Essentials of Contract for sales	• To study sale of Goods Act 1930	Evaluation through test papers

	Goods Act				
Module IV (7 Hours)	• Consumer Protection Act	• Lecture • Discussion • Participative Learning	• Peer group discussion on Unfair trade practices	• To study consumer protection act • To evaluate Rights of Consumer	Assessment through MCQ
Module V (7 Hours)	• LLP Act 2008	• Lecture • Discussion • Participative Learning	• Seminars on LLP	• To study LLP Agreement • To evaluate difference between partnership and Company	Evaluation through Test papers

BCM3BO4 CORPORATE ACCOUNTING

Number of Lecture Hours per week: 6
Number of Credits: 4
Internal: 20, External: 80
Examination Hours : 2.5

Objectives:

- To help the students to acquire conceptual knowledge of the fundamentals of the corporate accounting and the techniques of preparing the financial statements

Module I

a. Redemption of Debentures:

Meaning- Writing off of Discount on issue and loss on issue of debenture- Methods of redemption- Annual drawings out of profit and capital (New regulation to be taught)- Debenture redemption reserve- Lump sum payment- Sinking funds and Insurance Policy (Theory only)- Purchase of own debentures- For cancellation, Investment and Reissue- Ex-interest and Cum-interest- Redemption by conversion- Journal Entries.

b. Redemption of Preference Shares:

Provisions for redemption- Sources used for redemption- Capital redemption reserve- Journal entries

c. Bonus Shares:

Cash Bonus- Capital bonus- provisions for the issue of bonus shares- Sources of bonus issue- Advantages of bonus issue- Journal entries.

d. Buyback of shares:

Meaning- Provisions for issue- Sources of buyback- Advantages of buyback- Book building - Journal entries.

e) Right Issue: Right of pre-emption – Calculation of value of right (30 Hours, 25 marks)

Module II

Banking Companies:

Meaning of banking- Slip system of ledger posting- Important terms used- Revenue recognition in banks- Rebate on bills discounted with problems- Interest on doubtful debts with problems- Non-Performing Assets- Classification- Provisions for NPA(problems) - Final accounts of banking companies in the new form- Practical Problems. (18 Hours, 15 marks)

Module III

Accounts of Life Insurance:

Meaning of life insurance- Features- Types of life insurance- Important terms used- Adjusting entries- Calculation of Life fund with problems- Determination of profit of life business and net bonus payable- Problems- Preparation of final accounts of life business in the new form- Practical Problems. (18 Hours, 15 marks)

Module IV`

Consolidated Financial Statements (Ind AS 110): Group Companies and Group Structures– need for consolidation – Calculation of pre-acquisition Calculation of profit- Post-acquisition profit- Calculation of Non-Controlling Interest – Calculation of Cost of Control (Goodwill) or Capital Reserve- Preparation of Consolidated Balance Sheet without adjustments (simple problems) (20 Hours, 15 marks)

Module V

Important Disclosure based accounting standards: Earnings per share(Basic and Diluted) Ind AS 33 – Segment Reporting Ind AS 108- Events after Reporting Period (Adjusting and Non adjusting) Ind AS 10- Related party transactions Ind AS 24 - Changes in accounting policies, accounting estimates and errors Ind AS 8- Interim Financial Reporting Ind AS 34.

(10 Hours, 10 marks)

(Theory and problems may be in the ratio of 30% and 70% respectively)

Reference Books:

1. Chintal Patel, Bhupendra Mantri, India Accounting Standards, Taxmann Publications.
2. T.P. Ghosh, Illustrated Guide to India Accounting Standards, Taxmann Publications.
3. M.C. Shukla, T.S. Grewal and S.C. Gupta, Advanced Accounts, S.Chand& Co., New Delhi.
4. S.N. Maheshwari and S.K. Maheshwari, Financial Accounting.
5. R.L. Gupta and Radhaswamy, Advanced Accounting, Sultan Chand & Sons, New Delhi.
6. Dr Goyal V.K., Financial Accounting, Excel Books, New Delhi.
7. Ashok Sehgal and Deepak Sehgal, Advanced Accounting, Kalyani Publishers.
8. Jain and Narang, Financial Accounting, Kalyani Publishers.
9. B.S. Raman, Advanced Accountancy.
10. P.C. Tulasian, Introduction to Accounting, Pearson Education.

OBJECTIVES

- To make the students familiarise with corporate accounting procedures and to understand the accounting for banking companies.

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**

Module I (30 Hours)	• Redemption of Debentures • Different methods of Redemption • Redemption of Preference Shares • Bonus Share, Buyback of shares, Right issue	• Lecture • Discussion • Participative Learning	• Seminar on methods of redemption of debentures • Assignment on exercise questions	• To study redemption of debentures • To study redemption of preference shares • To evaluate bonus and right issue	Evaluation through test papers
Module II (18 Hours)	• Accounting of Banking Companies • Preparation of financial statements of banking company	• Lecture • Discussion • Participative Learning	• Assignment on exercise questions	• To study preparation of final accounts of banking companies	

Module III (18 Hours)	• Accounts of Life Insurance • Preparation of Final accounts of Life Insurance	• Lecture • Discussion • Participative Learning	• Group discussion on different types of Life Insurance • Assignment on exercise questions	• To study various type of Life Insurance • To evaluate the methods to determine profit of life business	Evaluation through test papers
Module IV (20 Hours)	• Consolidated financial statements	• Lecture • Discussion • Participative Learning	• Seminar on various consolidated financial statements • Assignment on exercise questions	• To study the preparation of various consolidated financial statements	Assessment through problem solving tests
Module V (10 Hours)	• Indian accounting standards	• Lecture • Discussion • Participative Learning	• Seminars on Indian Accounting standards	• To evaluate Indian Accounting Standards	Assessment through test papers

BCM3C03 HUMAN RESOURCE MANAGEMENT

Number of Lecture Hours per week: 5
Number of Credits: 4
Internal: 20, External: 80
Examination Hours: 2.5

Objectives:

- To familiarize the students with the different aspects of managing human resources in a organization

Module I

Introduction to Human Resource Management—Importance--scope and objectives of HRM. Evolution of the concept of HRM- Approaches to HRM- Personnel management Vs Human Resource Management-HRM and competitive advantage-Traditional Vs Strategic human resource management. E-HRM - Operational E-HRM- Relational E-HRM- Transformational E- HRM (20 Hours, 20 marks)

Module II

Human resource planning, Recruitment and selection—Job analysis---process of job analysis-job description- job specification-- methods of job analysis--Conventional Vs strategic planning—job evaluation—Recruitment--source of recruitment-methods. (18 Hours, 18 marks)

Module III

Placement, Induction and Internal mobility of human resource. Training of employees—need for training-objectives- approaches --methods-training environment- areas of training- Training evaluation. (12 Hours, 12 marks)

Module IV

Performance appraisal and career planning. Need and importance- objectives process- methods and problems of performance appraisal- . Concept of career planning –features- methods –uses career development. (12 Hours, 15 marks)

Module V

Compensation management and grievance redressal. Compensation planning objectives- Wage systems- factors influencing wage system-. Grievance redressal procedure- discipline- approaches punishment- essentials of a good discipline system. Labour participation in management. (18 Hours, 15 marks)

References:

1. Human Resource Management- Text and Cases-- VSP Rao
2. Human Resource Management – Pravin Durai
3. Human Resource Management—Snell, Bohlander
4. Personal Management and Human Resources—VenkataRatnam .Srivasthava.
5. A HandBook of Personnel Management Practice—Dale Yolder

OBJECTIVES

- To equip the students with basic knowledge and skills required for the acquisition,development and retention of human resources

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**

Module I (20 Hours)	• Introduction to human resource management • Human resource management and personnel management • Resource management	• Lecture • Discussion • Participative Learning	• Seminar on traditional v/s strategic management	• To study scope and objectives of management • To evaluate traditional HRM v/s strategic HRM • To study resource management	• Evaluation through test papers
Module II (18 Hours)	• Human resource planning ,job analysis • Recruitment .source of recruitment	• Lecture • Discussion • Participative Learning	• Seminar on human resource planning • Assignment on source of recruitment	• To evaluate human resource planning • To analyse source of recruitment	Evaluation through test paper
Module III (12 Hours)	• Placement • Induction • Training	• Lecture • Discussion • Participative Learning	• Online discussion on training method	• To study placement and induction method • To evaluate	Evaluation through testpaper

				training method	
Module IV (12 Hours)	• Performance appraisal and career planning • Career planning concepts and methods	• Lecture • Discussion • Participative Learning	• Online discussion on career development	• To evaluate performance appraisal and career planning	Assessment through case study
Module V (18 Hours)	• Compensation management an grievance redressal • Factors influencing wage system, grievance redressal procedure	• Lecture • Discussion • Participative Learning	• Seminar on grievence redressel proceduresOnline discussion on various methods of compensation management • Seminar on factors influencing wage system	• To evaluate the compensation management and grievance redressalTo study about grievances redressal management • To evaluate factors of wage system	Evaluation through case study Evaluation through test papers

BCM4A13 ENTREPRENEURSHIP DEVELOPMENT

Number of Lecture Hours per week: 5
Number of Credits : 4
Internal: 20, External: 80
Examination Hours: 2.5

Objectives:

- To familiarize the students with the concept of entrepreneurship

Module I

Concepts of entrepreneur: Entrepreneur- Définitions - Characteristics of entrepreneur-Classification of entrepreneur-Entrepreneurial traits -Entrepreneurial functions - role of entrepreneurs in the economic development - Factor affecting entrepreneurial growth – Entrepreneurship – Meaning – definition - Entrepreneur vs Intrapreneur - Women Entrepreneurs - Recent development – Problems - Entrepreneurial Development Programmes - Objectives of EDP - Methods of training - Phases of EDP. (15 Hours, 15 marks)

Module II

Institutional support and incentives to entrepreneurs- Functions of Department of Industries and Commerce (DIC) - Activities of Small Industrial Development

Corporation (SIDCO)-Functions of National Small Industries Corporation(NSIC)-Functions of Small Industries Development Bank of India (SIDBI) - Khadi Village Industry Commission (KVIC)-Small Industries Service Institute (SISI)- Functions and services of Kerala Industrial Technical Consultancy Organisation (KITCO)-Activities of Science and Technology Entrepreneurship Development Project (STEDP)-Strategies of National entrepreneurship Development Board (NEDB) -Objectives of National Institute for entrepreneurship and small business development (NIESBUD) - Techno park-Functions of techno park Incentives-Importance- Classification of incentives – Subsidy - Types of Subsidy (17 Hours, 15 marks)

Module III

Micro Small and Medium Enterprises- Features- Objectives- Importance- Role of SME in the economic development- MSME Act 2006- Salient features- Credit Guarantee Fund Trust Scheme for MSMEs - Industrial estates-Classification-Benefits- Green channel- Bridge capital- Seed capital assistance-Margin money schemes –Single Window System- Sickness- Causes –Remedies- Registration of SSI (15 Hours, 15 marks)

Module IV

Setting up of Industrial unit-(Only Basic study) Environment for Entrepreneurship – Criteria for selecting particular project- Generating project ideas-Market and demand analysis-Feasibility study- Scope of technical feasibility- Financial feasibility- Social cost benefit analysis-Government regulations for project clearance-Import of capital goods- approval of foreign collaboration-Pollution control clearances- Setting up of micro small and medium enterprises-Location decision- Significance. (18 Hours, 20 marks)

Module V

Project Report - Meaning-Definition - Purpose of project reports-Requirements of good report - Methods of reporting - General principles of a good reporting system - Performa of a project report - Sample project report. (The preparation of sample project report shall be treated as an assignment of this course). (15 Hours, 15 marks)

Books Recommended:

1. Shukla M.B. Entrepreneurship and small Business Management,Kitab Mahal Allahabad.
2. Sangram Keshari Mohanty, Fundamentals of entrepreneurship,PHI,New Delhi.
3. Nandan H. Fundamentals of Entrepreneurship,PHI, NewDelhi.
4. Small-Scale Industries and Entrepreneurship, Himalaya Publishing ,Delhi
5. C.N.Sontakki,Project Management,Kalyani Publishers, Ludhiana.
6. Sangam Keshari Mohanty. Fundamentals of Entrepreneurship, PHI, NewDelhi
7. Peter F. Drucker- Innovation and Entrepreneurship.
8. Vasanth Desai, Small Business Entrepreneurship, Himalaya Publications.
9. MSME Act 2006.

OBJECTIVES

- To identify and develop the entrepreneurial talents of the students.
- To generate innovative business ideas in the emerging industrial scenario.

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**
Module I (1515Hours)	● Concepts of entrepreneur,classification of entrepren	● Lecture ● Discussion ● Participative Learning	● Experience shared by student entrepreneur ● Online discussion about	● To study the concepts of entrepreneur ● To evaluate women entrepreneurship	Assessment through case studyEvaluation through test papers

	eurs,women entrepreneur,factors affecting entrepreneurial growth,entrepreneurial development growthConcept of Entrepreneur ● Role of entrepreneur in economic development ● Women Entrepreneurship		women entrepreneurship Webinar on entrepreneurship ● Online interactive session with local women entrepreneurs	● To evaluate entrepreneurial development programmeTo study about various concepts of Entrepreneurship ● To encourage them to get into entrepreneurship	
Module II (15 Hours)	● Institutional support and incentive to	● Lecture ● Discussion ● Participative Learning	● Assignment on institutional support and incentive to entrepreneur	● To evaluate institutional support and incentive to entrepreneurs ● To identify	● Assessment through essay writin

	entrepreneurs,importance-classification of entrepreneurship Institutional support and incentives to Entrepreneurs ● Activities of SIDCO, NSIC,SIDBI, KVIC, SISI, KITCO, STEDP		s Seminars and Assignments On various activities of different institutions	various subsidiesTo study about different incentive schemes and subsidy available for entrepreneurs	gAssessment through test papers
Module III (15 Hours)	MSME features and objectives.role of SME in economic development, ● Msme act2006,registratio	● Lecture ● Discussion ● Participative Learning	● Assignment on role of MSME in economic development Discussion on role of SME in economic	● To study msme features and objectives ● To evaluate MSME act 2006 To evaluate MSME ACT	● Assessment through test papersEvaluation through test papers

	n of SSI Micro small and medium Enterprises ● MSME Act 2006 ● Seed capital assistance		development	● To study MSME features and objectives ● To identify registration of SSI	
Module IV (18 Hours)	Setting up of industrial unit,generation of project ideas market , demeand , feasibility studySetting up of industrial unit, generating project ideas, feasibility study,sickness , causes , remedies	● Lecture ● Discussion ● Participative Learning	● Seminar On pollution control clearance ● Debate on government regulation for project clearance ● Industrial visitPresentation on project ideas	● To study setting up of industrial unit ● To evaluate government regulation for project clearanceTo evaluate setting up of industrial unit ● Feasibility study	● Evaluation through test papers Assessment through essay writing

Module V (15 hours)	Project report, Methods of reporting.proforma of a project report	• Lecture • Discussion • Participative Learning	• Presentation on the preparation of project report	• To develop the skill on project report preparation • To study the proforma of project report	• Evaluation through test paper
Module V (15 Hours)	Project report, General principles of a good reporting system	• Lecture • Discussion • Participative Learning	• Assignment on preparation of project report	• To acquire the skill of preparing project report	Assessment through test paper

BCM4A14 BANKING AND INSURANCE

Number of Lecture Hours per week: 5
Number of Credits: 4
Internal: 20, External: 80
Examination Hours: 2.5

Objectives:

- To enable the students to acquire knowledge about basics of Banking and Insurance

Module I

Introduction to Banking : Meaning and definition - Origin and development of banking –Customer of a bank - Structure of banking in India - Banks and economic development -Functions of commercial banks (conventional and innovative functions) - Central bank -RBI – Functions - Emerging trends in banking.
Activity: List out the name of banks as per their different category
Assignment: Procedure for creating an account in a bank (15 Hours, 15 marks)

Module II

Negotiable Instruments : Definition - Characteristics - Types - Parties to negotiable instruments -Cheques - Types of cheques - Crossing of cheques - Drafts - Cheque

vs. Draft - Endorsement -Significance - Regularity of endorsement - Liability of endorser -Electronic payments.
Activity / Assignment:

- Writing of cheque , writing of challan for Demand Draft
- Procedures for a Bank Loan. (15 Hours, 15 marks)

Module III

E-Banking-centralized online real time electronic banking (CORE)-Electronic Clearing service (ECS) - Electronic Fund Transfer - Real Time Gross settlement (RTGS)—National Electronic Fund transfer(NEFT)-society for worldwide interbank financial telecommunication(SWIFT) - E-cheque - Any Time Money - ATM.s- Credit card - Debit card-smart card - Internet banking - mobile banking - Tele-banking - financial inclusion - recent initiatives in financial inclusion.
Activity / Assignment:

- Chelan filling for RTGS, EFT and NEFT
- Different types of Cards, the Procedure for application of different cards and the Procedure for blocking cards
- Procedure for application or activation of net banking, m-banking and tele-banking. (20 Hours, 20 marks)

Module IV

Introduction to insurance: Concept - need of insurance-insurance as a social security tool - insurance and economic development-principles of insurance - various kinds of insurance - life and general insurance (fire, marine, medical, personal accident, property and motor vehicle insurance) - features-life insurance Vs. general insurance.
Activity / Assignment: List out different names of insurance companies (15 Hours, 15 marks)
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Module V

Life insurance-law relating to life insurance-general principles of life insurance contract, proposal and policy—Assignment and nomination - title and claims - general insurance - law relating to general Insurance - IRDA - powers and functions - insurance business in India.

Case Study: Preparation of a proposal for life insurance and how to claim insurance in case of any accident, death or damage. (15 Hours, 15 marks)

Reference Books:

1. Sheldon H.P : Practice and Law of Banking.
2. Bedi. H.L : Theory and Practice of Banking.
3. Maheshwari. S.N. : Banking Law and Practice.
4. Shekar. K.C : Banking Theory Law and Practice.
5. Pannandikar & Mithami': Banking in India.
6. Radhaswamy & Vasudevan: Text Book of Banking.
7. Indian Institute of Bankers (Pub) Commercial Banking Vol-I/Vol-II (part I& II)Vol- III.
8. Varshaney: Banking Law and Practice.
9. Dr. P. Periasamy: Principles and Practice of Insurance Himalaya Publishing House, Delhi.
10. Inderjit Singh, Rakesh Katyal & Sanjay Arora: Insurance Principles and Practices,Kalyani Publishers, Chennai.
11. M.N. Mishra: Insurance Principles and Practice, S. Chand & Company Ltd, Delhi.
12. G. Krishnaswamy : Principles & Practice of Life Insurance
13. Kothari & Bahl: Principles and Pratices of Insurance
14. B.S. Khubchandani, "Practice and Law of Banking",Mac Millan India Ltd
15. K.C. Nanda," Credit Banking", Response Book, Sage Publication, 1999

OBJECTIVES

- To familiarize the students with the modern trends in banking

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (15 Hours)	Banking meaning and definition,structure of banking in India , functions of commercial banks, RBI functionsIntroduction to banking,structure of banking in India, functions of commercial banks,functions of RBI	● Lecture ● Discussion ● Participative Learning	● Seminar on functions of commercial banks ● assignments on functions of RBIAssignment on functions of central and commercial banks ● List out the names of banks as per their different category ● Procedure for creating an account in a bank	● To study structure of banking in India ● To evaluate the functions of central and commercial banksTo learn the functions of bank ● To evaluate the emerging trends in banking ● To study the structure of banking in India	Assessment through MCQAssessment through MCQ

Module II (15 Hours)	Negotiable instrument, types of cheque. Regularity of endorsement Negotiable instrument, types of cheque,endorsement	• Lecture • Discussion • Participative Learning	• Presentation on different types of chequeWriting of cheque • Writing of challan for demand draft • Procedures for bank loan	• To study negotiable instruments • To evaluate regularity of endorsementTo study the types of cheques • To evaluate the negotiable instrument	Evaluate through test papersAssessment through test papers
Module III (15 Hours)	E-banking.plastic money,financial inclusionEbanking,plastic money, internet banking, financial inclusion, recent initiative in financial inclusion	• Lecture • Discussion • Participative Learning	• Group discussion in recent initiative in financial inclusionChelan filling for RTGS,EFT,and NEFT • Different types of cards,the procedure for application of different cards and procedure for blocking cards • Procedure for	• To study e banking • To study plastic money • To evaluate financial inclusionTo acquire knowledge in e- banking , plastic money, internet banking	• Assessment through test papers Assessment through test papers

			application or activation of net banking , m-banking and tele-banking		
Module IV (15 Hours)	Insurance concept, need of insurance. Principles of insurance,types of insurance. Life insurance V/S general insuranceInsurance , need of insurance , various kinds of insurance principles of insurance, life and general insurance	• Lecture • Discussion • Participative Learning	• Seminar on different type of insuranceList out different names of insurance company • Discussion on different types of insurance	• To evaluate different types of insurance • To study principles of insurance • To analyse general insurance and life insuranceTo study different types of insurance • To evaluate life insurance and general insurance	• Assessment through test paper Assessment through MCQ
Module V (15 Hours)	Life insurance law, general principle of life insurance contract IRDA powers	• Lecture • Discussion • Participative Learning	• Discussion on life insurance contract in IndiaPresentation on general	• To study life insurance law • To study law relating to general insuranceTo evaluate the	Assessment through MCQEvaluation through case study

	and functionsLaw relating to life insurance, general principles of life insurance contract, IRDA , powers and function		principle of life insurance	law relating to life insurance	

BCM4B05 COST ACCOUNTING

Number of Lecturer Hours per week: 6

Number of Credits: 4

Internal: 20, External: 80

Examination Hours : 2.5

Objectives:

- To familiarize the students with the various concepts and elements of cost

Module I

Introduction : Definition - Meaning and scope - Objectives - Functions -Merits and Demerits - Cost Accounting and Financial Accounting - Cost classification - Elements of cost - Cost units - Cost centre - Types - Methods and Techniques of Costing . (10 Hours, 5 marks)

Module II

Materials : Importance of Material cost control - Purchase Procedure - Store control -Types of Store - Stores Records - Perpetual Inventory-ABC Analysis - VED Analysis-JIT Inventory- Stock levels - EOQ - Issue of materials - FIFO , LIFO , Simple and Weighted Average methods. (18 Hours, 15 marks)

Module III

Labour and Overheads: Importance of Labour cost control - Time Keeping and Time Booking - Idle Time - Overtime - Computation of Labour cost - Remuneration Systems and Incentive Schemes. Overheads : Definition - Overhead Allocation - Apportionment - Reapportionment -Direct distribution - Step Ladder - Reciprocal Service methods - Repeated Distribution and Simultaneous Equation methods - Absorption of overheads - Methods of Absorption - Labour Hour Rate and Machine Hour Rate . (25 Hours, 20 marks)

Module IV

Methods of Costing: Specific order costing: Job costing - Contract costing – Continuous operation costing: Unit Costing - Process Costing (with adjustments of normal and abnormal losses and gains only) - Service costing (only Transport costing) (30 Hours, 30 marks)

Module V

Cost control Techniques:

A. Budgetary Control: – Budget – Budgeting – Budgetary control - Importance – Need for the preparation of budgets - Types of budgets –Preparation of Cash budget only – ZBB

B. Standard costing – Standard cost and actual cost – Variance analysis– Types of variances – Cost control by the use of standard costing (only theory – no problems expected). (13 hours, 10 marks)

(Theory and Problems may be in the ratio of 40% and 60% respectively

Reference Books:

1. Jain & Narang : Cost Accounting
2. Nigam & Sharma : Cost Accounting
3. Khanna Pandey & Ahuja : Cost Accounting
4. M.L Agarwal : Cost Accounting
5. N.K. Prasad : Cost Accounting
6. S.P. lyengar: Cost Accounting
7. S.N. Maheswari : Cost Accounting
8. Horngren : Cost Accounting : A Managerial Emphasis.
9. M.N.Arora: Cost Accounting
10. Dutta: Cost Accounting

OBJECTIVES

- To create cost consciousness among the students

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**

Module I (10 Hours)	Meaning and scope of cost accounting, elements of cost , cost units , methods and technique of cost accounting	● Lecture ● Discussion ● Participative Learning	● Assignment on cost classification	● To identify different methods and technique of cost accounting	Evaluation through test papers
Module II (20 Hours)	Materials, material control technique	● Lecture ● Discussion ● Participative Learning	● Assignment on exercise questions	To study on material control techniques	Assessment through test papers
Module III (20 Hours)	Labour OH,computation on labour cost, OH allocation, methods of absorption	● Lecture ● Discussion ● Participative Learning	● Assignment on exercise question	● To study methods of labour cost calculation ● To study OH allocation	Assessment through test papers
Module IV (25 Hours)	Methods of costing-job costing , unit costing, process costing, service costing	● Lecture ● Discussion ● Participative Learning	● Assignment on exercise questions	● To study methods of costing	Assessment through test papers

Module V (15 Hours)	Cost control techniques- budgetary control Standard costing	● Lecture ● Discussion ● Participative Learning	● Assignment on exercise questions	● To study cost control techniques ● To evaluate standard costing	Asses sment throug h test papers

BCM4BO6 CORPORATE REGULATIONS

Number of Lecture Hours per week: 4

Number of Credit: 4

Internal: 20, External: 80

Examination Hours : 2.5

Objectives:

- To familiarise the students with corporate law and to make them aware of the importance of corporate governance in the management of organizations

Module I

`Introduction to Companies Act 2013: Objects of the Act - Salient features of the Act -Meaning and definition of company - Features - Kinds of companies - Private Company -Public company - Associate Company - Dormant Company - One person company -Small Company - Government Company - Lifting of corporate veil. (08 Hours, 10 marks)

Module II

Formation of Companies: Promotion - Role of promoters - Incorporation - Capital subscription - Commencement of business - Pre-incorporation and provisional contracts. Document of companies: Memorandum of Association - Definition -

Contents and alteration - Doctrine of Ultravires - Articles of Association - Definition - Contents and alteration - Distinction between Memorandum and Articles - Constructive notice of Memorandum and Articles - Doctrine of Indoor management - Prospectus - Contents -Statement in lieu of prospectus - Liabilities for misstatement. (13 Hours, 18 marks)

Module III

Share Capital : Shares - Kinds of shares - Public issue of shares - Book building -Allotment of shares - Irregular allotment - Issue prices of shares - Listing of shares -Employees stock option scheme - Sweat equity shares - Right shares - Bonus shares -Shares with differential rights - Share certificate and share warrant - Calls - Forfeiture -Surrender of shares - Buyback of shares - De materialization and re materialization of shares - Transfer and transmission of shares - Transfer under Depository system. (13 Hours, 17 marks)

Module IV

Management of Companies : Board and Governance - Directors: Appointment - Position – Powers Rights - Duties and liabilities - Qualification - Disqualification - Removal of directors - Key Managerial Personnel - Introduction to Corporate Governance - Need and importance of Corporate Governance - Corporate social responsibility. Securities and Exchange Board of India Act 1992 - Object - Establishment and management of SEBI -Powers and functions of SEBI - Securities Appellate Tribunal (SAT). (18 Hours, 20 marks)

Module V

Company Meetings and Winding up : Requisites of a valid meeting - Statutory meeting -Annual general body meeting - Extraordinary meeting - Board meetings - Resolutions -Types - Company Secretary : Qualification - appointment - duties - Winding up : Meaning - Modes of winding up - Winding up by Tribunal - Members' voluntary winding up - Creditors' voluntary winding up - Liquidator: Powers - Duties and liabilities -Consequences of winding up. (12 Hours, 15 marks)

Reference Books:

1. M.C. Shukla & Gulshan :Principles of Company Law.
2. N.D. Kapoor : Company Law and Secretarial Practice.

3. Mannual of Companies Act, Corporate Laws and SEBI Guidelines", Bharat Law House, New Delhi.
4. M.C. Bhandari: Guide to Company Law Procedures.
5. Tuteja :Company Administration and Meetings.`
6. S.C. Kuchal :Company Law and Secretarial Practice.
7. Dr. P.N. Reddy and H.R. Appanaiah : Essentials of Company Law and Secretarial practice, Himalaya Publishers.
8. M.C. Kuchal: Secretarial Practice.
9. Ashok Bagrial: Secretarial Practice.

OBJECTIVES

- To enlighten the students with the management and administration of joint stock companies in India as per Companies Act, 2013

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**
Module I (05 Hours)	Introduction of companies Act 2013, different types of company	● Lecture ● Discussion ● Participative Learning	● Assignment on different types of company	● To evaluate introduction of companies Act 2013 ● To study different types	Assessment through MCQ

				of company	
Module II (20 Hours)	Formation of companies,role of promoters,commencement of business document of companies,prospectus	• Lecture • Discussion • Participative Learning	• Seminar on role of promoters • Assignment on prospectus of issue	• To identify how to form a company • To evaluate documents of the company	Assessment through case study
Module III (15 Hours)	Share capital,kinds of share capital.employees stock option schemes , right issue , bonus issue , forfeiture of shares, materialization and dematerialization of shares	• Lecture • Discussion • Participative Learning	Assignment on different types of shares	• To study share capital • To study right issue , bonus share, forfeiture of shares • To evaluate materialization and dematerialization	Assessment through test paprers
Module IV (20 Hours)	Management of companies ; board and governance.corporate social responsibility,	• Lecture • Discussion • Participative Learning	• Discussion on CSR • Assignment on powers and functions of SEBI	• To study management of companies • To evaluate CSR • To study SEBI act	Assessment through case study

	SEBI Act1992. Powers and functions of SEBI				
Module V (10 Hours)	Company meeting and winding up Directors appointment-meaning and modes of winding up	● Lecture ● Discussion ● Participative Learning	● Seminar on company meeting	● To evaluate company meeting ● To study company secretary ● To evaluate winding up of company	Assessment through test papers

BCM4C04 QUANTITATIVE TECHNIQUES FOR BUSINESS

Number of Lecture Hours per week: 5
Number of Credits: 4
Internal: 20, External: 80
Examination Hours : 2.5

Objectives:

- To familiarize student with the use quantitative techniques in managerial decision making

Module I

Quantitative Techniques - Introduction - Meaning and definition - Classification of Q.T - QT and other disciplines - Application of QT in business - Limitations. (10 Hours, 10 Marks)

Module II

Correlation and Regression Analysis: Meaning and definition of Correlation - Karl Pearson's coefficient of correlation - Rank correlation - Regression - Types - Determination of simple linear regression - Coefficient of determination. (20 Hours, 20 Marks)

Module III

Set Theory - Venn Diagrams - Probability: Concept of probability - Meaning and definition - Approaches to probability - Theorems of probability - Addition Theorem - Multiplication Theorem -Conditional probability- Inverse probability- Baye'sTheorem. (15 Hours, 15 Marks)

Module IV

Theoretical Distribution: Basic assumptions and characteristics - Probability distribution - Fitting of probability distribution - Binomial distribution - Fitting of binomial distribution - Poisson distribution - Fitting of Poisson distribution - Normal distribution - Features and properties - Standard normal curve. (20 Hours, 20 Marks)

Module V

Quantitative approach to decision making- Types and steps in decision making-Decision tree analysis-Different types of models-Model building steps - Linear programming-concepts - Mathematical formulation - Solution of LPP using graphic method (15 Hours, 15 Marks)

Reference Books:

1. Richard I. Levin and David S. Rubin, Statistics for Management, Prentice Hall of India, latest edition.
2. S.P.Gupta, Statistical Methods, Sultan Chand, latest edition
3. Sanchetti and Kapoor, Statistics, Sultan Chand.
4. G.C.Beri, "Statistics For Managemet",Tata Me Graw Hill, 2003.
5. J.K. Sharma, "Business Statstics:, Pearson, 2004
6. Anderson Sweeney Williams, "Statistics for Business and Economics", Thomson.
7. R.P.Hooda, "Statistics for Business", Me Millan.
8. Levine Krebiel & Bevenson, "Business Statistics", Pearson edition, Delhi.
9. J K Sharma,Quantitative Methods- Theory and applications, Mac Millan
10. P.C. Tulsian &Vishal Pandey,Quantitative techniques-Theory and Problems,Pearson
11. V.K Kapoor and Sumant Kapoor- OR Techniques for management- Sultan Chand & Sons

OBJECTIVES

- To make students familiarise with basic tools of statistics and quantitative techniques applied.

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (05 Hours)	Quantitative techniques introduction - meaning and definition QT and other disciplines- application of QT	● Lecture ● Discussion ● Participative Learning	● Online Group discussion Application of QT in business	● To study the meaning and concepts of QT ● Application of QT in business	Evaluation through essay writing
Module II (20 Hours)	Correlation and regression analysis , karl pearson's co -efficient of correlation -regression, types	● Lecture ● Discussion ● Participative Learning	Assignment on exercise question	To study correlation and regression To study karl pearson's efficient of correlation	Evaluation through test papers

Module III (15 Hours)	Set theory , venn diagram, probability,approaches to probability addition theorem, multiplication theorem bayes theorem	• Lecture • Discussion • Participative Learning	Assignment on exercise questions	To study set theory To study theorems of probability	Evaluation through test papers
Module IV (15 Hours)	Theoretical distribution , basic assumptions and characteristics , probability distribution , binomial distribution poisson distribution normal distribution	• Lecture • Discussion • Participative Learning	Assignment on exercise questions	To study theoretical distributions	Evaluation through test papers
Module V (20 Hours)	Quantitative approaches to decision making, decision tree models, model building	• Lecture • Discussion • Participative Learning	Assignment on exercise question	To study quantitative approaches to decision making To evaluate decision tree modes	Assessment through test papers

	steps,linear programming			To study linear programming	

BCM5B07 ACCOUNTING FOR MANAGEMENT

Number of Lectures Hours per week: 4
Number of Credits: 4
Internal: 20, External: 80
Examination Hours : 2.5

Objectives:

- To enable the students to understand the concept and relevance of Management Accounting

Module I

Management Accounting: Nature and Scope - Difference between cost Accounting, Financial accounting and Management accounting - Recent trends in Management Reporting. (05 Hours, 5 marks)

Module II

Analysis and Interpretation of Financial Statements: Meaning - Types and Methods of Financial Analysis - Comparative Statements - Trend Analysis - Common size Statements (a general discussion only). (10 Hours, 10 marks)

Module III

Ratio Analysis: Meaning - Nature - uses and limitations of Ratios - Liquidity, Profitability, Turnover, Solvency, Leverage. Market test Ratios. Construction of Financial Statements from ratios - Judgment of financial stability through ratios -

(Focus to be given to problems solving and Interpretation skills) (25 Hours, 25 marks)

Module IV

Fund Flow and Cash Flow Analysis:

A. Fund Flow Statements: Meaning and concept of Fund - Current and Non Current Accounts Flow of fund - Preparation of Fund Flow statement - Uses and Significance.

B. Cash Flow Statement: Difference between Fund flow Statement and Cash flow Statement - Preparation of Cash Flow Statement as per AS - 3 Norms - Direct and Indirect methods (Stress to be given to Problems). (25 hours, 25 marks)

Module-V

Managerial Decision making with the help of CVP Analysis : Marginal Costing - Fixed Cost-Variable Cost - Contribution - P/V Ratio - Break Even Analysis - Algebraic and Graphic presentation - Decision making : Fixation of Selling Price - Exploring new markets - Make or Buy - Key Factor - Product Mix - Operate or Shutdown. (15 Hours, 15 marks)

(Theory and Problems may be in the ratio of 40% and 60% respectively).

Reference Books:

1. Dr. S.N. Maheswari : Management Accounting.
2. Saxena : Management Accounting.
3. Made Gowda : Management Accounting.
4. Dr. S. N. Goyal and Manmohan : Management Accounting.
5. B.S.Raman: Management Accounting.
6. R.S.N. Pillai and Bagavathi : Management Accounting.
7. Sharma and Gupta : Management Accounting.
8. J. Batty : Management Accounting.
9. Foster: Financial Statement Analysis, Pearson Education.
10. P.N. Reddy & Appanaiah : Essentials of Management Accounting.

OBJECTIVES

- To provide the students an understanding about the use of accounting and costing data for planning, control, and decision making

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**
Module I (05 Hours)	Management accounting, difference between cost accounting , financial accounting and management accounting	● Lecture ● Discussion ● Participative Learning	Online peer group discussion on recent trends in management accounting	To evaluate difference between cost accounting and management accounting To analyse recent trends in management accounting	Assessment through case study
Module II (05 Hours)	Analysis and interpretation of financial statement,methods of financial	● Lecture ● Discussion ● Participative Learning	Collect final accounts of various companies and make financial analysis	To develop the skill for financial analysis on financial statement	Assesment trough test papers

	analysis				
Module III (25 Hours)	Ratio analysis , liquidity ratios, profitability ratios.solvency , leverage, judgement of financial stability	• Lecture • Discussion • Participative Learning	Assignment on exercise questions	To study judgement analysis on financial statement with the help of ratio analysis	Assessment trough test papers
Module IV (20 Hours)	Fund flow statement-preparation Cash flow statement - direct and indirect method	• Lecture • Discussion • Participative Learning	Assignment on exercise questions	To study the preparation of fund flow and cash flow statement	Assessment through test papers
Module V (20 Hours)	Managerial decision making with the help of CVP analysis-marginal costing,break even analysis	• Lecture • Discussion • Participative Learning	Assignment on exercise questions	To study managerial analysis through CVP analysis	Evaluation through case study

BCM5B08 BUSINESS RESEARCH METHODS

Number of Lecture Hours per week: 4

Number of Credits: 4

Internal: 20, External: 80

Examination Hours :2.5

Objectives:

- To enable students for acquiring basic knowledge in business research methods

Module I

Business Research: – Definition and significance - Features of business research – The research process – Variable - Proposition - Types of research – Exploratory and causal research –Theoretical and empirical research - Basic and applied research - Descriptive research - Phases of business research – Research Hypothesis – Characteristics – Research in an evolutionary perspective – Role of theory in research - Theory building - Induction and Deduction Theory. (10 Hours, 15 marks)

Module II

Research Design – Definition – Types of research design – Exploratory and causal research design - Descriptive and experimental design – Types of experimental design – Validity of findings – Internal and external validity – Variables in research – Measurement and scaling – Different scales –Construction of instrument - Validity and reliability of instrument (15 Hours, 15 marks)

Module III

Data Collection: - Types of data – Primary Vs secondary data – Methods of primary data collection – Survey Vs observation – Experiments – Construction of questionnaire and instrument – Validation of questionnaire – Sampling plan – Sample size – Sampling methods- Determinants of optimal sample size – Sampling techniques – Probability Vs non probability sampling methods. (15 Hours, 20 marks)

Module IV

Data Processing: Processing stages - Editing - Coding and data entry – Validity of data – Qualitative Vs quantitative data analysis – Frequency table - Contingency table - Graphs - Measures of central tendency and index number – Testing of

Hypothesis - Bivariate and multi variate statistical techniques – Factor analysis – Discriminant analysis- Cluster analysis – Interpretation. (15 Hours, 20 marks)

Module V

Research Report:Different types – Contents of report – Need of executive summary – Chapterisation – Contents of chapter - Report writing stages – The role of audience – Readability – Comprehension – Tone – Final proof – Report format – Title of the report – Ethics in research – Subjectivity and objectivity in research. (09 Hours, 10 marks)

Reference Books:

1. Donald R.Cooper and Pamela S, Schindler: Business Research Methods. Latest Edition,Irwin McGraw- Hill International Editions, New Delhi.
2. John Adams, Hafiz T.A. Khan Robert Raeside, David white: Research Methods for Graduate Business and Social Science Students, Response Books. New Delhi-110044.
3. Neresh K. Malhotra: Marketing Research, Latest edition. Pearson Education.
4. William G. Zikmund, Business Research Methods, Thomson
5. Wilkinson T.S. and Bhandarkar P.L.: Methodology and Techniques of Social Research, Himalaya.
6. S N Murthy &. U Bhojanna: Business Research Methods, Excel Books, New Delhi.
7. Jan Brace: Questionnaire Design, Kogan Page India
8. Michael V.P. Research Methodology in Management, Himalaya.
9. Dipak kumar Bhattacharyya. Research Methodology. Excel Books, New Delhi.
10. R. Paneerselvan: Research Methodology, Prentice-Hall of India
11. Ajai S Gaur & Sanjaya S Gaur: Statistical Methods for Practice &. Research, Response Books, New Delhi.
12. Kultar Singh: Quantitative Social Research Methods. Response Books, New Delhi.

OBJECTIVES

- To develop basic skills in them to conduct survey researches and case studies

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (10 Hours)	Business research - definition, significance.types of research, role of theory in research	● Lecture ● Discussion ● Participative Learning	Seminar on different types of research	● To study business research and its significance ● Evaluate different types of research	Assessment through test papers
Module II (15 Hours)	Research design , types of research design,validity of findings	● Lecture ● Discussion ● Participative Learning	Discussion on types of research design	● To study research design ● To evaluate different types of research design	Assessment through test paper
Module III (15 Hours)	Data collection.types of data,methods of primary data collection,	● Lecture ● Discussion ● Participative Learning	Assignment on sampling technique Group discussion on methods of data collection	To study data collection methods To study sampling technique	Assessment through case study

	sampling plan sample size, sample methods,sampling technique			To evaluate sample methods	
Module IV (15 Hours)	Data processing, qualitative v/s quantitative data analysis.testing of hypothesis, bivariate and multivariate data analysis. Factor analysis	● Lecture ● Discussion ● Participative Learning	Seminar on quantitative v/s qualitative data analysis	To study data processing To study testing of hypothesis To study factor analysis	Assessment through test papers
Module V (15 Hours)	Research report. Contents of report, report writing stages. Report format	● Lecture ● Discussion ● Participative Learning	Assignment on content of project report	To study project report content To evaluate report format	Assessment through test papers

BCM5 B09 INCOME TAX LAW AND ACCOUNTS

Number of Lecture Hours per week: 5
Number of Credits: 4
Internal: 20, External: 80
Examination Hours: 2.5

Objectives:

- To impart basic knowledge about Income - tax Act, 1961 amended up to date

Module I

Basic Concepts: Income - Agricultural income - Person - Assessee - Assessment Year - Previous Year - Gross total income - Total income - Maximum marginal rate of lax - Residential status - Scope of total income on the basis of residential status –Exempted incomes. (10 Hours, 15 marks)

Module II

Computation of Income under Different Heads: Salaries - Allowances - Perquisites -Profit in lieu of salary - Gratuity – Pension. (20 Hours, 20 marks)

Module III

Income from house property: Annual Value of House property - Computation under different circumstances - Deduction from annual value.
(15 Hours, 15 marks)

Module IV

Profits and Gains of Business or Profession: Definition - Computation - Allowable expenses and non-allowable expenses - General deductions - Provisions relating to Depreciation. (17 Hours, 15 Marks)

Module V

Capital Gains: Definition of Capital Assets - Long term and Short term - Transfers - Cost of acquisition - Cost of improvement - Exempted Capital gains. Income from Other Sources: Definition– Computation. (18 Hours, 15marks)

(Theory and problems may be in the ratio of 40% and 60%respectjvely .Only simple problems are to be expected)

Reference Books:

1. Dr. Vinod K. Singhania : Direct Taxes - Law and Practice, Taxman publication.
2. Dr. Mehrotra and Dr. Goyal: Direct Taxes - Law and Practice, Sahitya Bhavan Publication.
3. B.B. Lai: Direct Taxes, Konark Publisher (P) ltd.
4. Bhagwathi Prasad : Direct Taxes - Law and Practice. Wishwa Prakashana.
5. Dinakar Pagare : Law and Practice of Income Tax. Sultan Chand and sons
6. Gaur & Narang : Income Tax

OBJECTIVES

- To equip students with application of principles and provisions of Income - tax Act, 1961 amended up to date

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (10 Hours)	Basic concepts of income, agricultural income,	• Lecture • Discussion • Participative Learning	assignment on residential status Assignment on	To study concepts of income To evaluate agricultural income	Assessment through case study

	assessment year, previous year, gross total income,, total income ,residential status, scope of total income, exempted income		exercise questions	To study residential status	
Module II (20 Hours)	Computation of income under different heads- salaries -allowances- perquisites- profit in lieu of salary gratuity- pension	● Lecture ● Discussion ● Participative Learning	Assignment on exercise questions	To study how to compute income from salary	Assessment through test paper
Module III (15 Hours)	Income from house property - annual value of house property, deduction from house value	● Lecture ● Discussion ● Participative Learning	Assignment on exercise questions	To study computation of income from house property	Assessment through test papers

Module IV (20 Hours)	Profits and gains of business or profession-definition-computation	• Lecture • Discussion • Participative Learning	Assignment on exercise questions	To study computation of income from business or profession	Assessment through test papers
Module V (20 Hours)	Capital gain - definition of capital asset - long term and short term capital gain-exempted capital gain, income from other source-computation	• Lecture • Discussion • Participative Learning	Assignment on exercise questions	To study computation of income from short term and long term capital gain To study computation of income from other source	Assessment through test papers

BCM5B10 FINANCIAL MARKETS AND SERVICES

Number of Lecture Hours per week: 5

Number of Credits: 4

Internal: 20, External: 80

Examination Hours: 2.5

Objectives:

- To provide basic knowledge about the structure, organization of financial system in India

Module I

Financial System: Meaning and Significance - Functions of the financial system - Financial concepts - Financial Assets - Financial markets - Classification - Financial instruments - Weakness of Indian Financial system – Financial services – meaning – Types. (10 hours, 12 marks)

Module II

Money Market: Definition - Features - Objectives - Features of a developed .money market - Importance of Money market - Composition of Money market - Operations and Participants - Money market Instruments - Features of Indian money market - Recent developments (15 Hours, 20 marks)

Module III

Capital Market: New issue market - meaning - functions - methods floating new issue - intermediaries in the new issue market - Merchants bankers and their functions - Recent trends in new issue market - Stock Exchanges - Functions - Structure of Stock ExchangesBSE - NSE - Listing of securities - Advantages of listing - Methods of trading in stock exchanges - On line trading - Stock indices - Venture Capital - Concept and meaning. (20 Hours, 23 marks)

Module IV

Financial Institutions: Commercial banks - Development financial institutions - Non-Banking Financial Corporations - Mutual Funds, Insurance Companies - Objectives and functionsLease Financing-meaning- Factoring and forfeiting (only a brief outline) (14 Hours, 15 marks)

Module V

Regulatory Institutions - RBI - Role and Functions - The Securities and Exchange Board of India: Objectives - Functions - Powers - SEB1 Guidelines for primary and secondary market. (5 Hours, 10 marks))

Reference Books:

1. Kohn, Meir: Financial Institutions and Markets, Tata McGraw Hill. 2. Bhole L.M: Financial Institutions and Markets, Tata McGraw Hill. 3. Desai, Vasantha: The Indian Financial System, Himalaya Publishing House. 4. Machiraju.R.H: Indian Financial System, Vikas Publishing House. 5. Khan M.Y: Indian Financial System, Tata McGraw Hill. 6. Varshney, P.M., & D. K. Mittal, D.K.: Indian Financial System, Sulthan Chand & Sons 7. Gordon E. & Natarajan K.: Financial Markets & Services, Himalaya Publishing House. 8. Pathak. V. Bharati: Indian Financial System. Pearson Education.

(Theory and problems may be in the ratio of 50% and 50% respectively)

Reference Books:

1. Home, J.C. Van: "Financial Management and Policy". Prentice Hall of India , New Delhi.
2. Khan and Jain: "Financial Management Text and Problems", Tata McGraw Hill, New Delhi.
3. Pandey, I.M: "Financial Management", Vikas Publications.
4. Bhalla, V.K.: "Financial Management & Policy," Anmol Publications. Delhi.
5. Chandra, P: "Financial Management - Theory and Practice", Tata Me Graw Hill.
6. Singh, J.K.: "Financial Management- Text and Problems". Dhanpat Rai and Company. Delhi.
7. R. S. Kulshrestha: Financial Management. Sahitya Bhawan.
8. R. P. Rastogi: Fundamentals of Financial Management, Galgotia Publications. New Delhi.
9. Ravi M Kishore: Fundamentals of Financial Management. Tax man Publications.).
10. Battacharya, Hrishikas: Working Capital Management - Strategies and Techniques, Prentice Hall of India, New Delhi.

OBJECTIVES

- To familiarize the students with financial market operations in India

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (15 Hours)	Financial system- meaning and significance . functions of the financial system. Financial market, financial instrument, weakness of Indian financial system, financial services	● Lecture ● Discussion ● Participative Learning	Group discussion on weakness of Indian financial system Presentation on financial services	To study financial system concepts, meaning, significance and importance To evaluate weakness of Indian financial system To study financial services	Assessment through MCQ
Module II (15 Hours)	Money market - definition -features- features of developed money market-	● Lecture ● Discussion ● Participative Learning	Assignments on participants of money market instruments Presentation on Indian money	To study money market definition and features To evaluate the operations and participants of money market	Evaluation through test papers

	operation and participants of money market instrument, features of Indian money market		market	instrument To evaluate the features of Indian money market	
Module III (25 Hours)	Capital market- meaning and definition, intermediaries in the new issue market, merchant bankers, stock exchanges, listing of securities. Venture capital	● Lecture ● Discussion ● Participative Learning	Assignment on stock exchange functions Presentation on method of trading in stock exchanges	To study capital market To evaluate the functions of stock exchanges To study the methods of trading in stock exchanges	Assessment through test papers
Module IV (15 Hours)	Financial institutions;- commercial banks., non banking financial corporations, mutual funds, insurance companies, lease	● Lecture ● Discussion ● Participative Learning	Assignment on non banking financial institutions	To study financial institutions	Assessment through essay writing

	financing. Factoring forfaiting				
Module V (10 Hours)	Regulatory institutions-RBI.SEBI	● Lecture ● Discussion ● Participative Learning	Assignment on role and functions of regulatory institutions	To study role and functions of regulatory financial institutions	Assessment through test papers

BCM5B10 COMPUTER APPLICATIONS IN BUSINESS

Number of Lecture Hours per week: 5

Number of Credits: 4

Internal: 20, External: 80

Examination Hours: 2.5

Objectives:

- To help the students to acquire basic knowledge about computer and its applications in various areas of business

Module I

Computer Systems : Introduction – Features and Parts of new generation Computers-Factors to be considered while selecting computer - Importance of computers in business –NetworkTypes of network, LAN, WAN, MAN, PAN ,BAN,SAN&CAN.Computer applications in various areas of business- Internet, Features and uses in business- Social media & its uses in business. (12 Hours, 15 marks)

Module II

Business and web sites – introduction to web design – concepts – principles involved in developing a website - golden rules of web designing-page design-home page-web standardsaudience requirement-Role of websites in a business-Cascading Style Sheet-Concept of CSSHTML-HTML documents-Basic structure of an HTML Document-creating an HTML Document-HTML Tags. (14 Hours, 20 marks)

Module III

Elements of HTML-Introduction-working with text-working with Lists, Tables, Hyperlinks, images and multimedia-web publishing or hosting-creating the website -saving the siteworking on the web site-themes-publishing websites-website for business growth. (13 Hours, 15 marks)

Module IV

E-Commerce & Digital payments: E-Commerce, Business Models - B2B, B2C, B2G, C2C & B2E– Requirements of e-commerce website – Modes of delivery-Digital payments: USSD, NUUP, AEPS, UPI, Debit card, Credit card, Pre-paid cards, Internet Banking, Mobile banking, e-wallets – POS Terminals, M-POS, V-POS. (15 Hours, 15 marks) `

Module V

Digital Security – Security threats in Internet & e-Commerce, Virus & Trojan horses, Phishing,Hacking, Spyware – Security Measures, Antivirus, Firewall, Encryption, Bio-metrics–Precautions while using Internet & epayments - IT Act, Major Provisions of IT Act. (10 Hours, 15 marks)

Reference Books:

1. Rajaraman , Introduction to Information Technology, PHI
2. Jennifer Niederst Robbins, ―Learning web design:A beginner‘s Guide to HTML,CSS,Java script.and web Graphics‖ ,O‘ Reilly Media,Inc
3. John Duckett, ―HTML and CSS Design and build websites‖,John Wiley&Sons
4. Rajaraman , Fundamentals of Computers 4/E, PHI
5. PTSJ Joseph, E-Commerce: An Indian perspective, PHI
6. Ananya Misra, E-Commerce, B.K Publications Pvt.Ltd.
7. P. Mohan , Fundamentals of Computers, Himalaya Publishing House

8. Dennis P. Curtin , Information Technology, McGraw Hill International
9. Behrouz A. Forouzan , Data Communication and Networking 2nd edition ,McGrawHill
10. Avi Silberschatz, Peter Galvin & Greg Gagne Willey, Operating System Concepts
11. Uyless Black , Computer Networks Protocols, Standards and Interface: Prentice Hall India Pvt. Ltd.
12. Alfred Glkossbrenner , Internet 101 Computing MGH
13. Alex Leon & Mathews Leon, Fundamentals of Information Technology, LeonTechworld
14. Suresh Samudrala, Retail Banking Technology, Jaico Puubishing House
15. Indian Institute of Banking & Finance, Digital banking, Taxman
16. Karnika Seth, Computers, Internet and New technology laws, Lexis Nexis
17. Pavan Duggal, A text book on Cyber law, Universal Law Publishing company
18. Harish Chander, Cyber Laws and IT Protection, Prentice Hall India

OBJECTIVES

- To enable the students to understand the modern trends and technologies in computer applications

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**

Module I (15 Hours)	Computer systems,features and parts of new generation computer , importance of computers in business, types of network, computer application in various areas of business	● Lecture ● Discussion ● Participative Learning	Pictorial presentation on types of network Group discussion on computer application in business	To study computer systems to evaluate importance of computers in business To study type of computer network To evaluate application of computers in business	Assessment through MCQ
Module II (15 Hours)	Business and websites, introduction to web design, principles involved in developing a website, golden rules of web design, concepts of CSS, HTML	● Lecture ● Discussion ● Participative Learning	Seminar on golden rules of web designing	To study business and websites To study principles involved in developing web design To evaluate role website in business	Evaluation trough test papers

Module III (15 Hours)	Elements of HTML, web publishing , creating website,working on the website, website for business growth	● Lecture ● Discussion ● Participative Learning	Assignment on elements of HTML Presentation on creating website	To study elements of HTML To study creating website To evaluate website for business growth	
Module IV (20 Hours)	E-commerce and digital payments. Business models,requirement of ecommerce websites, modes of delivery, digital payments, internet banking, e-wallets	● Lecture ● Discussion ● Participative Learning	Assignment on business models Debate on for and against digital payment	To study e-commerce and digital payments	Assessment through test papers
Module V (10 Hours)	Digital security, security threats in e commerce and internet,virus, biometrics -	● Lecture ● Discussion ● Participative Learning	Presentation on virus Group discussion on threats in internet and e commerce	To evaluate digital security To study virus	Evaluation through test papers

	precautions while using internet and e payments, IT act				

BCM5 B11 FINANCIAL MANAGEMENT

Number of Lecture Hours per week: 4
Number of credits 4
Internal: 20, External: 80
Examination 2.5 Hours

Objectives:

- To familiarize the students with the concepts, tools and practices of financial practices of Financial management

Module I

Introduction: Nature, scope and objectives of financial management - Time value of money and mathematics of finance - Concept of risk and return. (10 Hours, 15 marks)

Module II

Investment Decision: Capital budgeting process - Estimation of relevant cash flows -Payback Period method - Accounting Rate of Return - Net Present Value - Net Terminal Value - Internal Rate of Return - Profitability Index - Capital budgeting under risk -Certainty Equivalent Approach and Risk Adjusted Discount Rate. (18 Hours, 20 marks)

Module III

Financing Decision: Cost of capital and financing decision - Estimation of components of cost of capital : Equity capital - Retained earnings - Debt and Preference capital -Weighted average cost of capital and Marginal cost of capital - Sources of long term financing - Capital structure - Operating and financial leverage - Determinants of capital structure. (18 Hours, 20 marks)

Module IV

Dividend Decision: Relevance and irrelevance of dividend decision - Cash and stock dividends - Dividend policy in practice. (8 Hours, 10 marks) Module V Working Capital Management: Meaning and nature of working capital - Determination of working capital requirement - A brief overview of Cash management, Inventory management and Receivables management. (10 Hours, 15 marks)

Reference Books:

1. Home, J.C. Van: "Financial Management and Policy". Prentice Hall of India , New Delhi.
2. Khan and Jain: "Financial Management Text and Problems", Tata McGraw Hill, New Delhi.
3. Pandey, I.M: "Financial Management", Vikas Publications.
4. Bhalla, V.K.: "Financial Management & Policy," Anmol Publications. Delhi.
5. Chandra, P: "Financial Management - Theory and Practice", Tata Me Graw Hill.
6. Singh, J.K.: "Financial Management- Text and Problems". Dhanpat Rai and Company. Delhi.
7. R. S. Kulshrestha: Financial Management. Sahitya Bhawan.
8. R. P. Rastogi: Fundamentals of Financial Management, Galgotia Publications. New Delhi.
9. Ravi M Kishore: Fundamentals of Financial Management. Tax man Publications.).
10 Battacharya, Hrishikas: Working Capital Management - Strategies and Techniques, Prentice Hall of India, New Delhi

OBJECTIVES

- To know about various risks associated with derivatives

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (20 Hours)	Introduction nature and objectives of financial management,time value of money and mathematics of finance-concepts of risk and return	● Lecture ● Discussion ● Participative Learning	Assignment on objectives of financial management Assignment on exercise questions	To study meaning and scope of financial management To study time value of money	Assessment through test papers

Module II (10 Hours)	Investment decisions , capital budgeting process, estimation of relevant cash flows, payback period method .ARR, NPV,NTV.IRR,PI, capital budgeting under risk , risk adjusted discount rate	● Lecture ● Discussion ● Participative Learning	Assignment on exercise questions Seminar on capital budgeting process	Tpo study capital budgeting process To evaluate investment decisions To study estimation of relevant cash flows	Assessment through test papers
Module III (20 Hours)	Financing decisions, cost of capital and financing decisions, estimation of components of cost of capital, sources of long term financing, capital structure, operating and	● Lecture ● Discussion ● Participative Learning	Seminar on source of long term financing Assignment on exercise questions	To evaluate financing decisions To study cost of capital calculation To evaluate capital structure	Assessment through case study

	financial leverage, determinants of capital structure				
Module IV (20 Hours)	Dividend decision. Dividend policy in practice	• Lecture • Discussion • Participative Learning	Seminar on dividend policy in practice Assignment on exercise questions	To study relevance and irrelevance of dividend decision To evaluate dividend policy in practice	Assessment through test papers
Module V (10 Hours)	Working capital management. Determination of working capital management, a brief overview of cash management, inventory management and receivables management	• Lecture • Discussion • Participative Learning	Seminar on inventory management and receivables management Assignment on working capital management	To study working capital management To evaluate cash management , inventory management. And receivables management	Assessment through test papers

BCM5B11 BUSINESS INFORMATION SYSTEMS

Number of Lecture Hours per week: 5
Number of Credits: 4
Internal: 20, External: 80
Examination Hours: 2.5

Objectives:

- To enable the students to acquire basic knowledge in the information technology

Module I

Management Information System: Data, Information & Knowledge – Information Technology & Communication technology - Role of Information & Communication technology in Business – Management Information System , Meaning , Concepts, Purpose & Features of MIS, Basic structural concepts. (12 Hours, 15 marks) `

Module II

Types of Management Information Systems: Transaction Processing System - Decision Support Systems (DSS) - Characteristics and capabilities of DSS – Components of DSS – Executive Information System - Expert System – Management Reporting System. (12 Hours, 15 marks)

Module III

Data Base Management Systems : DBMS - Definition - Necessity of a database - Characteristics of database - Database management systems - Types of database management systems - Logical data models - Hierarchical model - Network model - Relational model - Object-oriented model - Object relational model Deductive/inference model - Comparison between various database models. (20 Hours, 25 marks)

Module IV

Enterprise Resource Planning (ERP) – Meaning - Need for ERP - Benefits of an ERP system – ERP software – Phases in ERP implementation - Issues and challenges in the implementation of ERP. (12 Hours, 15 marks)

Module V

Business Process Reengineering: Meaning and definition of BPR – Reengineer - Need and Objectives of BPR - Process of BPR – Advantages of BPR - Issues and problems of BPR. (8 Hours, 10 marks)

Reference Books:

1. James A O'brien, George.M.Marakas & Ramesh Behl, Management Information Systems, McGraw Hill Education, 2013
2. D.P Goyal, Management Information Systems: Managerial Perspectives, Vikas Publishing House, 2014
3. A.K Gupta, Management Information System, S.Chand & Company 2010
4. Alexis Leon, Enterprise Resource Plannning, McGraw Hill Education 2007
5. Uma G Gupta, Management Information Systems, Galgotia Publications Pvt Ltd, New Delhi, 1993
6. Jyotindra Zaveri, Enterprise Resource Planning, Himalaya Publishing House 2012
7. Rajesh Ray, Enterprise Resource Planning text and cases, McGraw Hill Education 2010.
8. R.Radhakrishnan & S.Balasubrahmanian, Business Process Reengineering: Text and cases, Prentice Hall India Learning Pvt. Ltd, 2008
9. R.Srinivasan, Business Process Reengineering, McGraw Hill Education 2011
10. B.R Dey, Business Process Reengineering & Change Management , Dreamtech Press 2004.

OBJECTIVES

- To educate the students about the relevance of information technology to various areas of business.

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**
Module I (15 Hours)	Management information system, role of information and communication technology in business, meaning concepts and features of MIS	● Lecture ● Discussion ● Participative Learning	Seminar on role of information and communication technology in business	To study meaning , concepts, and features of MIS To evaluate role of information and communication technology in business	Assessment through test papers
Module II (15 Hours)	Types of management information system	● Lecture ● Discussion ● Participative Learning	Assignment on transaction processing system	To study types of management information system	Assessment through test papers

Module III (20 Hours)	Database management system, necessity of database, types of database management system, logical data model, comparison between various database models	• Lecture • Discussion • Participative Learning	Assignment on types of database management system	To study definition of database management system To evaluate necessity of database To study different types of database management system	Assessment through test papers
Module IV (15 Hours)	Enterprise resource planning -meaning , need , benefits- ERP software, phases in ERP implementation . issues and challenges in the implementation of ERP	• Lecture • Discussion • Participative Learning	Group discussion on issues and challenges in the implementation of ERP	To study ERP concepts To evaluate the phases in ERP implementation To evaluate the issues and challenges in the implementation of ERP	Assessment through test papers

Module V (10 Hours)	Business process reengineering . Need and importance of BPR, process of BPR, issues and problems of BPR	● Lecture ● Discussion ● Participative Learning	Seminar on issues and problems of BPR	To study the concept of BPR To evaluate the process of BPR To evaluate the issues and problems of BPR	Assessment through test papres

BC5D01 E-COMMERCE

Number of Lecture Hours per week: 2

Number of Credits : 2

Internal: 10, External: 40

Examination Hours: 2

Objectives:

- To enable the students to understand basics of E- Commerce

Module I

Introduction to E-Commerce: Meaning and concept - E-Commerce v/s Traditional Commerce - E-Business &. E-Commerce - History of E- Commerce - EDI - Importance, features & benefits of E- Commerce - Impacts, challenges & limitations of E-Commerce -Supply chain management & E-Commerce - E-Commerce infrastructure - Business Models of E - Commerce: Business to business - Business to customers -customers to customers - Business to government - Business to employee - E - Commerce strategy - Influencing factors of successful E- Commerce. (20 Hours, 20 marks)

Module II

Marketing Strategies & E - Commerce: Website - Components of website - Concept & designing website for E- Commerce - Corporate website - Portal - Search Engine - Internet advertising - Emergence of the internet as a competitive advertising media - Models of internet advertising - Weakness in internet advertising. (18 Hour, 10 marks)

Module III

Electronic Payment System: Introduction - Online payment systems - prepaid and postpaid payment systems - E-cash - E- cheque - Smart card - Credit card - Debit card -Electronic purse - Security issues on electronic payment system - Solutions to security issues - Biometrics - Types of biometrics. (10 Hours, 10 marks)

Reference Books:

1. Turban, Efraim, David King et. el.: Electronic Commerce: A Managerial Perspective, Pearson Education Asia, Delhi.
2. Kalakota, Ravi: Frontiers of Electronic Commerce, Addison - Wesley, Delhi.
3. Rayport, Jeffrey F and Jaworksi. Bernard J: Introduction to E-Commerce, Tata McGrawHill
4. Smantha Shurety,: E-Business with Net Commerce, Addison - Wesley, Singapore.
5. Rich, Jason R: Stalling an E-Commerce Business, IDG Books, Delhi.
6. Laudon, Kenneth C and Carol Guercio Traver : E-Commerce business. Technology. Society, Pearson Education, Delhi.
7. Stamper David A. and Thomas L.Case: Business Data Communications, Pearson Education, New Delhi.

8. Willam Stallings: Business Data Communications. Pearson Education, New Delhi.

OBJECTIVES

- To Gain a practical orientation to E-Commerce and E- Business management

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I (15 Hours)	E commerce -meaning and concept,history of e-commerce, impact , challenges and limitations of e commerce, supply chain management, business models of ecommerce, influencing	● Lecture ● Discussion ● Participative Learning	Seminar on challenges and limitations of e commerce Group discussion on influencing factors of successful e commerce	To know meaning and basic concepts of e-commerce To evaluate the history of e-commerce To study supply chain management To study business models of e-	Assessment through test papers

	factors of successful e-commerce			commerce To identify the influencing factors of successful e-commerce	
Module II (15 Hours)	Marketing strategies and e - commerce, website,components of website, corporate website, portal , search engine, internet advertising,emergence of internet as a competitive advertising media, models of internet advertising, weakness in internet advertising	● Lecture ● Discussion ● Participative Learning	Debate on internet advertising Assignment on corporate website	To study marketing strategies and e-commerce To study components of website To evaluate emergence of the internet as a competitive advertising media To evaluate the weakness in internet advertising	Assessment through MCQ

Module III (10 Hours)	Electronic payment system, security issues on electronic payment system,biometrics	● Lecture ● Discussion ● Participative Learning	Presentation on security issues on electronic payment system Assignment on biometrics	To study electronic payment system To evaluate the issues of electronic payment system To study bio metric system	Assessment through test papers

BCM6B12 INCOME TAX AND GST

Number of Lecture Hours per week: 6

Number of Credits: 4

Internal: 20, External: 80

Examination Hours : 2.5

Objectives:

- To impart basic knowledge of Income - tax Act, 1961 and GST Act 2016

Module I

Income Tax Contd: Deemed Incomes and Clubbing of income – Set- off and carry forward of losses - Deductions to be made in computing total income – Computation of total Income of individuals – Computation of Tax liability of individuals – Rebate and relief of tax. (25 hours, 25 marks)

Module II

Income tax authorities – Powers and functions – Provisions of advance payment of tax – Tax payment – Deduction and payment of tax at source – Recovery of tax. Procedure of assessment of income tax – Filing of returns of income – Voluntary return of income – Statutory obligations in filing of returns – Return of loss – Belated returns – Revised returns – Defective returns – PAN – Different types of assessment – Self assessment – Assessment on the basis of return – Best judgment assessment – Regular assessment – Reassessment – Protective assessment. (20 Hours 20 marks)

Module III

Goods and Services Tax: Brief history behind the emergence of GST – The scope of GST – Definitions and meaning - Central Goods and Services Tax Act–Integrated Goods and Services Tax Act - State Goods and Services Tax Act - Levy and Collection of Central/State Goods and Services Tax - Taxable person - Power to grant exemption from tax - Time and value of supply of goods - Time of supply of services (17 Hours, 15 hours)

Module IV

Registration - Amendment of registration - Cancellation of registration - Revocation of cancellation of registration - tax invoice, credit and debit notes – Returns - First Return - Annual return - Final return - Tax Return Preparers - Levy of late fee - Notice to return defaulters (17 Hours, 10 marks)

Module V

Payment of tax, interest, penalty and other amounts - Interest on delayed payment of tax - Tax deduction at source - transfer of input tax credit - refund of tax - accounts and records - demands and recovery I - Inspection, search, seizure and arrest - offences and penalties - Audit by tax authorities - Special audit - Power of CAG to call for information. (17 Hours, 10 marks)

(The syllabus of GST will be revised after the rules and regulations relating to GST Act are framed).

OBJECTIVES

- To equip students with application of principles and provisions Income - tax Act, 1961 and GST Act 2016

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**
Module I (25 Hours)	Deemed incomes and clubbing of income, set off carry forward losses, deductions to be made in computing income, computation of total income of individuals, computation of tax liability of individuals rebate and relief of tax	• Lecture • Discussion • Participative Learning	Seminar on set off and carry forward of losses Assignment on exercise questions	To study clubbing of income To study set off and carry forward To study computation of total income To computation of tax liability of individuals	Assessment through test papers

Module II (15 Hours)	Income tax authorities, powers and functions, provisions for advance payment of tax ,TDS, recovery of tax. Filing of returns of income. PAN. different types of assessment	● Lecture ● Discussion ● Participative Learning	Seminar on powers and functions of income tax authorities	To evaluate the powers and functions of income tax authorities To study filing of returns	Assessment through test papers
Module III (15 Hours)	Goods and service tax. History. Scope of GST,definitio n and meaning	● Lecture ● Discussion ● Participative Learning	Collage Seminar on scope of GST	To study GST	Assessment through test papers
Module IV (15 Hours)	Registration . amendment of registration . cancellation of registration. Tax invoice, returns	● Lecture ● Discussion ● Participative Learning	Assignment on revocation of cancellation of registration	To study registration and amendment of registration To study tax return preparer	Assessment through test papers

Module V (10 Hours)	Payment of tax ,interest, penalty and other amounts,TDS , refund of tax, accounts and records , demands and recovery, audit by tax authorities. Power of CAG to call for information	• Lecture • Discussion • Participative Learning	Seminar on demands and recovery of tax	To study payment of tax , interest, penalty and other amounts To evaluate audit by tax authorities To study power of CAG to call for information	Assessment through test papers

BCM6B13 AUDITING AND CORPORATE GOVERNANCE

Number of Lecture Hours per week: 5
Number of Credits: 4
Internal: 20, External: 80
Examination Hours: 2.5

Objective:

- To provide knowledge of auditing principles and techniques and to familiarize the students with the understanding of issues and practices of corporate governance in the global and Indian context.

Module I:

Auditing – Meaning – Objects - Basic Principles and Techniques – Auditing and investigation - Classification of Audit – Management audit – Proprietary audit – Performance audit – Tax audit – Social audit – Environmental audit - Audit Planning – Qualities of an auditor – Advantages and limitations of audit (10 hours, 10 marks)

Module II

Audit Procedures: Vouching - Definition - Features - Examining vouchers -Vouching of cash book - Vouching of trading transactions - Verification and valuation of assets and liabilities: Meaning - Definition and objects - Vouching v/s verification - Verification and Valuation of different assets and liabilities (20 hours, 20 marks)

Module III

Internal Control - Internal Check - Internal Audit --Definitions - Necessity - Difference between internal check and internal control - Fundamental Principles of internal check - Difference between internal check and internal audit - Special Areas of Audit: Tax audit and Management Audit - Recent trends in auditing - Relevant Auditing and Assurance Standards (AASs) - Rights duties and liabilities of auditor - Audit committee - Auditor's Report - Contents and types – Auditors certificate. (20 hours, 25 marks)

Module IV:

Conceptual Framework of Corporate Governance: Meaning, Theories, Models and Benefits of Corporate Governance; Board Committees and their Functions; Insider Trading; Rating Agencies; Green Governance/E-governance; Clause 49 of Listing Agreement; Class Action; Whistle Blowing; Shareholders Activism (20 hours, 15 marks)

Module V

Major Corporate governance failures - BCCI (UK) - Maxwell Communication (UK) - Enron (USA – Satyam Computer Services Ltd - TATA Finance - Kingfisher Airlines - Common Governance Problems Noticed in various Corporate Failures - Codes and Standards on Corporate Governance (10 hours, 10 marks)

Suggested Readings:

1. Institute of Chartered Accountants of India, Auditing and Assurance Standards, ICAI, New Delhi.
2. Relevant Publications of ICAI on Auditing (CARO).
3. Gupta, Kamal and Ashok Arora, Fundamentals of Auditing, Tata Mc-Graw Hill Publishing Co. Ltd., New Delhi.
4. Ghatalia, S.V., Practical Auditing, Allied Publishers Private L td., New Delhi.
5. Singh, A. K. and Gupta Lovleen, Auditing Theory and Practice, Galgotia Publishing Company. `
6. Mallin, Christine A., Corporate Governance (Indian Edition), Oxford University Press, New Delhi.
7. Rani, Geeta D., and R.K. Mishra, Corporate Governance- Theory and Practice, Excel Books, New Delhi.
8. Bob Tricker, Corporate Governance-Principles, Policies, and Practice (Indian Edition), Oxford University Press, New Delhi.
9. Sharma, J.P., Corporate Governance, Business Ethics, and CSR, Ane Books Pvt Ltd, New Delhi

OBJECTIVES

- To establish a relationship between Auditing and Corporate Governance

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**
Module I (10 Hours)	Auditing, basic principles and techniques, classification of audit, qualities of an auditor advantages and limitations of audit	● Lecture ● Discussion ● Participative Learning	Seminar on qualities of auditor Assignment on different types of audit	To know the meaning and concepts of auditing To evaluate different types of audit To evaluate the qualities of auditor To evaluate the advantages and disadvantages of audit	Assessment through test papers

Module II (20 Hours)	Audit procedures, vouching. Verification and valuation of assets and liabilities, vouching v/s verification	• Lecture • Discussion • Participative Learning	Assignment on vouching V/S verification	To study vouching To study verification To evaluate vouching v/s verification	Assessment through essay writing
Module III (20 Hours)	Internal control , internal check, internal audit, special areas of auditing, recent trends in auditing,AASs, rights duties and liabilities of auditor, audit committee , auditors report, auditors certificate	• Lecture • Discussion • Participative Learning	Assignment on internal check , internal audit, internal control. Group discussion on duties and liabilities of auditors	To study internal check , internal control, internal audit To evaluate special areas of audit To evaluate recent trends in auditing To identify duties and liabilities of auditor To study auditors report	Assessment through descriptive exam
Module IV (20 Hours)	Conceptual framework of corporate governance, models and	• Lecture • Discussion • Participative Learning	Assignment on models and benefits of corporate governance	To study corporate governance To evaluate insider	Assessment through test papers

	benefits of corporate governance, board committee and their functions, insider trading, green governance, clause 49, whistle blowing		Seminar on green governance	trading	
Module V (10 Hours)	Major corporate governance failures, codes and standards on corporate governance	● Lecture ● Discussion ● Participative Learning	Presentation on major corporate governance failures	To evaluate major corporate governance failures To study codes and standards on corporate governance	Evaluation through test papers

BCM6B14 FUNDAMENTALS OF INVESTMENTS

Number of Lecture Hours per week: 5

Number of Credits: 4

Internal: 20, External: 80
Examination 2.5 Hours

Objectives:

- To familiarize the students with the world of investments

Module I

Introduction to Investment - Meaning of Investment – essential features of Investment-Investment Alternatives- Investment Environment (brief description on elements such as Financial Securities, Financial Markets, Financial Services, Financial Intermediaries, Regulators, and Investors) –Investment Management Process –Sources of Financial Information- Calculation of return on investment and expected return-Calculation of expected return under CAPM- Types of risk-Calculation of Standard deviation- calculation of beta under correlation and regression methods (Simple Problems). (15 Hours, 18 marks)

Module II

Security Valuation:

a) Valuation of Fixed Income Securities: Bonds- Essential Features- Types of Bonds- Types of bond risks- estimating Bond Yields-Bond valuation (redeemable and irredeemable)-Valuation of Preference Shares (redeemable and irredeemable).

b) Valuation of Equity- Dividend Yield Method- Dividend Yield plus growth method (single-stage growth and multi-stage growth) - Discounted Cash Flow method-P/E multiple approach. (20 Hours, 20 Marks)

Module III

Approach to Security Analysis:

Security Analysis- Fundamental Analysis – EIC analysis – Tools for company analysis- Technical Analysis- stock charts(line, bar, candle stick and point and figure charts)- Support and Resistance levels- Trends and Trend Reversals – Patterns -continuation patterns(Triangles, Rectangles, Flags and Pennants) -reversal patterns(head and shoulders, double tops and double bottom, wedges)- Indicators -a brief description on leading and lagging indicators)- brief description of DOW theory and Elliot Wave theory. (20 Hours, 20 Marks)

Module IV

Portfolio Analysis: Concept of portfolio – need and importance- portfolio diversification- a brief description of Markowitz model, Random Walk Theory, Efficient Market Hypothesis, Efficient Portfolio -Calculation of Portfolio Risk with two securities (Covariance, Correlation, Standard deviation)- Portfolio Return (15 Hours, 12 Marks)

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Module V

Investor Protection: Role of SEBI & Stock Exchanges in investor protection – Investor Education & Awareness Measures- Investor grievances and their redressal system – SCORES – Prohibition of Insider trading practices - UPSI-Rights and Duties of Investors - Investor activism. (10 Hours, 10 marks)

(Theory and problems may be in the ratio of 50% and 50% respectively)

Reference Books:

1. Donald E. Fisher and Ronald J. Jordan: Securities Analysis and Portfolio Management, Prentice Hall, New Delhi.
2. S. Kevin: Security Analysis and Portfolio Management.
3. Sourain. Harry; Investment Management, Prentice Hall of India.
4. Francis and Archer: Portfolio Management, Prentice Hall of India.
5. Gupta L.C.: Stock Exchange Trading in India, Society for Capital Market Research and Development, Delhi.
6. MachiRaju, H.R.: Working of Stock Exchanges in India, Wiley Eastern Ltd, New Delhi.

OBJECTIVES

- To provide a theoretical framework for the analysis and valuation of investments.

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I	Introduction To investment, essential features of investment, investment alternatives, investment environment, investment management , source of financial information,calculation of expected return	● Lecture ● Discussion ● Participative Learning	Assignment on investment environment Seminar on source of financial information	To study essential features of investment To study investment environment To study investment management process To study calculation of return on investment and expected return	Assessment through test papers
Module II	Security valuation; Valuation of fixed income securities, valuation of	● Lecture ● Discussion ● Participative Learning	Assignment on exercise questions	To study valuation of fixed income securities To study valuation of equity	Assessment through test papers

	security, valuation of equity				
Module III	Approach to security analysis, security analysis, EIC analysis, tools for company analysis,technical analysis, indicators, brief description of DOW theory and Elliott Wave theory	• Lecture • Discussion • Participative Learning	Pictorial presentation of stock chart Seminar on trend and trend reversals	To study security analysis To study leading and lagging indicators	Assessment through test papers
Module IV	Portfolio analysis-need and importance, portfolio diversification , calculation of portfolio risk , portfolio return	• Lecture • Discussion • Participative Learning	Seminar on portfolio diversification, Assignment on exercise question	To study portfolio analysis To study portfolio diversification To study calculation of portfolio risk To study portfolio return	Assessment through test papers

Module V	Investor protection, role of SEBI and stock exchange in investor protection, investor education and awareness measures, investor grievance and their redressal system, SCORES, prohibition of insider trading practices, rights and duties of investors	● Lecture ● Discussion ● Participative Learning	Presentation on investors grievances and redressal system Group discussion on investors education and awareness measures	To evaluate role of SEBI and stock exchanges in investor protection To evaluate investor grievance and redressal system	Assessment through case study

BCM6B14 OFFICE AUTOMATION TOOLS

Number of Lecture Hours per week: 5

Number of Credits: 4`

Internal: 20, External: 80
Examination 2.5 Hours

Objectives:

- To enable the students to acquire basic knowledge in the various office automation tools

Module I

MS-Word : Word Basics - Starting word - Creating a new document - Opening pre existing document - The parts of a word window - Typing text - Selecting text - Deleting text -Undo - Redo – Repeat- Inserting text - Replacing text - Formatting text - Cut - Copy -Paste - Formatting Text and Documents - Auto format - Line spacing - Margins - Borders and Shading.

Headers and Footers : Definition - Creating basic headers and footers - Tables - Creating table - Adding, changing, deleting rows - Inserting, changing, deleting column - Graphics - Importing graphics - Clipart - Insert picture - Clip Art Gallery - Drawing objects - Text in drawing .

Templates : Template types - Using templates - Exploring templates - Modifying templates - Macros : Record in macros - Editing macros - Running a macro - Mail Merge: Mail Merge concept - Main document - Data sources - Merging data source and main document - Overview of word menu options - Word basic toolbar. (Theory 15 Hours and Practical 10 Hours, 20 marks)

Module II

MS EXCEL : Electronic Spreadsheet – Creating and rearranging worksheet - Structure of spreadsheet and its applications to accounting, finance, and marketing functions of business -Creating a dynamic / sensitive worksheet - Concept of absolute and relative cell reference - Using built in functions – Mathematical, statistical and financial functions – Conditional formatting –filters- Charts – Pivot table and pivot chart - Goal seeking and solver tools - Sharing data with other desktop applications - Strategies of creating error free worksheet. (Theory 15 Hours and Practical 10 Hours, 20 marks)

Module III

Ms-Power Point : Power point - Basics - Terminology - Getting started - Views -Creating presentations - Using auto content wizard - Using blank presentation option -Using design template option - Adding slides Deleting a slide - Importing images from the outside world - Drawing in power point - Transition and build effects - Deleting a slide - Numbering a slide - Saving presentation - Closing.(Theory 9 Hours and Practical 6 Hours, 20 marks)

Module IV

The Internet and its Basic Concepts: Internet concept - History - Development in India -Technological foundation of internet - Distributed computing - Client-server computing -Internet protocol suite - Application of distributed computing - Client-server computing. (7 Hours, 10 marks)

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Module V

Internet protocol suite in the internet environment - Domain Name System (DNS) -Generic Top Level Domain (g TLD) - Country Code Top Level Domain (cc TLD) -Indian - Allocation of second level domains - IP addresses - Internet Protocol Applications of internet in business, Education, Governance, etc. (Theory 10 Hours, 10 marks)

Reference Books:

1. Ron Mansfield, Working in Microsoft office, Tata Me Graw Mill (2008)
2. Ed Bott, woody Leonard, Using Microsoft Office 2007, Pearson Education (2007)
3. R.K.Taxali, PC Software Made Simple.
4. Stephen L.Nelson , Office 2000 Complete Reference.
5. Joyce Cox ,Polly Orban, Quick course in Microsoft Office.
6. Gimi Couster , Mastering Office 2000.
7. Rajkamal, Internet and Web Technologies, Tata McGraw Hill (2007).

OBJECTIVES

- To enable students to know the applications of Office Automation Tools in the various areas of business

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**
Module I	MS word, starting , creating a new document, headers and footers, templates	● Lecture ● Discussion ● Participative Learning	Practical lab Assignment on preparing document	To study creating new document	Assessment through test papers
Module II	MS EXCEL, creating rearranging spreadsheet, sharing data with other desktop applications	● Lecture ● Discussion ● Participative Learning	Practical lab Assignment on creating worksheet	To study creating worksheet	Assessment through exam

Module III	MS-Powerpoint, basics, terminology, using design template option, adding and deleting slides, importing images, saving presentation	• Lecture • Discussion • Participative Learning	Practical lab	To study creating powerpoint slide To study transitions and build effects	Assessment through presentation competition
Module IV	The internet and basic concepts, history , development in India, technological foundation of internet, distributed computing, client server computing. Internet Protocol suit	• Lecture • Discussion • Participative Learning	Assignment on internet concept	To study basic concepts of internet To study technological foundation of internet	Assessment through MCQ
Module V	Internet protocol, domain name system, g	• Lecture • Discussion • Participative Learning	Seminar on internet protocol applications of internet in business,	To study;- Internet protocol	Assessment through test papers

	LTD, ccLTD, IP address, internet protocol application in business		education, governance	Domain name Internet Protocol applications	

BCM6B15 FINANCIAL DERIVATIVES

Number of Lecture hours per week: 5
Number of Credits: 5
Internal: 20, External: 80
Examination 2.5 Hours

Objectives:

- To acquire knowledge about financial derivatives and their features

Module I

Financial Derivatives: Introduction - Meaning – Types of financial derivatives: Forwards – Futures – Options – Swaps – Economic functions of derivative contracts. (12 Hours, 10 marks)

Module II

Derivative Markets: History of financial derivative market – Participants in a derivative market – Cash market Vs derivative market – Stock market derivatives in India – Other derivatives in India – The regulatory frame work for derivatives trading in India. (15 Hours, 20 marks)

Module III

Forward Contracts : Features – Limitations of forward markets – Introduction to Futures – Meaning and definition - Features of futures – Difference between forwards and futures – Futures - terminology – Types of future contracts - Financial futures – Stock futures – Currency futures - Interest rate futures – Index futures - Commodity futures – Futures pay-offs – Trading strategies in stock futures . (20 Hours, 20 marks)

Module IV

`Options: Meaning – Definition – Need - Difference between options and futures – Fundamental option strategies – Types of options contracts - Call – Put – options – Intrinsic value Vs Time value of options - Trading strategies in stock options. (20 Hours, 20 marks)

Module V

Swaps: Meaning – Definition - Features of swaps – Terms used in swaps – Types of swaps: Interest rate swap - Currency swap - Commodity swap - Equity swap – Difference between Swaps and Futures. (13 Hours, 10 marks)

Reference Books:

1. Hull John. C, Options, Futures and Other Derivatives, Pearson Educations Publishers, New Delhi (Latest Edition).
2. S.L.Gupta, Prentice Hall of India Private Ltd, New Delhi.
3. L.M Bhole , Financial Institutions and Markets – Structure, Growth and Innovations , Tata Mc Graw Hill Publishing Co. Ltd. New Delhi.
4. D.C. Patwari&A.Bhargava , Options and Futures, An Indian Perspective , JAICO Publishing

OBJECTIVES

- To know about various risks associated with derivatives

Lesson Plan

Unit /session/ hours (time required)	Topics to be taught(input)	Procedure(process)students centric method of teaching	Activity	Learning Outcome	Assessment
Module I	Financial derivatives, types, economic functions of derivative contracts	● Lecture ● Discussion ● Participative Learning	Group discussion on functions of derivative contracts Assignment on types derivatives	To study financial derivatives To study types of financial derivatives	Assessment through essay writing
Module II	Derivative market, history, participants of derivative market. Cash market v/s derivative market, stock market derivatives in India, the regulatory framework	● Lecture ● Discussion ● Participative Learning	Seminar on derivative market in India	To study derivative market To identify the participants of derivative market To evaluate cash market v/s derivative market To evaluate stock market derivatives in India	Evaluation through test papers
Module III	Ure contracts, trading strategies in stock exchange	● Lecture ● Discussion ● Participative Learning	Assignment on trading strategies in stock futures	To study forward contracts To study futures To evaluate the	Assessment through test papers

				difference between forwards and `futures To evaluate trading strategies in stock exchanges	
Module IV	Options , basic concepts, types of option contracts, intrinsic value V/S time value of options , trading strategies in stock options	● Lecture ● Discussion ● Participative Learning	Seminar on trading strategies in stock options	To study options	Assessment through test papers
Module V	SWAPS; meaning, features of swaps, types of SWAPS , difference between swaps and futures	● Lecture ● Discussion ● Participative Learning	Seminar on difference between SWAPS and Futures	To study SWAPS, features, types To evaluate the difference between swaps and futures	Assessment through MCQ

BCM6B15 COMPUTERISED ACCOUNTING WITH TALLY

Number of Lecture Hours per week: 5

Number of Credits: 5

Internal: 20, External: 80

Examination 2.5 Hours

Objectives:

- To enable the students to acquire basic knowledge in the computerized accounting systems

Module I

Introduction to Accounting: Accounting basis and terms -Branches of accounting - Mode of accounting - Manual accounting - Computerized accounting fundamentals.

Accounting with Tally : Introduction to Tally - Tally interface - fll features - fl2 configuration - Company creation - Accounting groups - Accounting ledgers - Accounting vouchers - Vouchers entry. (15 Hours, 15 marks)

Module II

Inventory Management with Tally - Stock groups - Stock items - Stock category -Unit of measures - Godown inventory vouchers (Pure inventory and inventory vouchers).Integration of Accounting with Inventory : Bill wise details - Invoicing - Voucher entry -Cost centre - Cost category - Budget and control - Bank reconciliation - Interest calculation – Order Processing - Stock valuation methods - Reorder levels - Tracking numbers - Bill of material - Inventory ageing. (25 Hours, 25 marks)

Module III

Tax Application in Tally - Introduction to GST - GST activation and classification -GST computation - Composite GST - Input Tax credit - Tax Invoice, Credit and Debit Notes-Returns-Transfer of Input Tax Credit- Time and Value of Supply-Recent features. (15 Hours, 15 marks)

Module IV

Accounting and Inventory Reports - Trading, Profit and loss A/c - Balance Sheet -Ledgers - Cost centre and budget reports - Cash book and bank book - Inventory reports - Decision supporting tools - Ratio analysis - Cash flows - Fund flow - Budgeting system - Printing of reports - Voucher and bill printing etc. (15 Hours, 15 marks)

Module V

Technology Advantage of Tally - Tally audit - Tally vault - Back up, restore, merge and split of database - ODBC interface - Export and import of data - web enabled reporting - On line support of software. (10 Hours, 10 marks)

Reference Books:

1.A.K. Nadhani and K.K. Nadhani,Implementing Tally 6.3, 1/e BPB Publications, NewDelhi.
2.Namrata Agarwal, Tally 6.3 , 2004 Edition , Dream Tech., New Delhi.
3.Sridharan,,Narmadha Publications, May 2003.

OBJECTIVES

- To enable the students to know the applications of computerized accounting systems in the area of business.

(Out of the 80 lecture hours, the ratio between theory and practical hours shall be 3:2)

Lesson Plan

Unit /session/ hours (time required)	**Topics to be taught(input)**	**Procedure(process)students centric method of teaching**	**Activity**	**Learning Outcome**	**Assessment**
Module I	Computerised accounting fundamentals Accounting with tally	● Lecture ● Discussion ● Participative Learning	Practical in computer lab Assignment on company creation	To know how to create company To study accounting group and accounting ledgers , accounting vouchers	Assessment through practical exam
Module II	Inventory management with tally, integration of accounting with tally	● Lecture ● Discussion ● Participative Learning	Practical knowledge in computer lab	To study inventory management with tally To study integration of accounting with inventory	Assessment through test papers
Module III	Tax application in tally	● Lecture ● Discussion ● Participative Learning	Assignment on GST activation and classification	To study tax application in tally	Assessment through test papers
Module IV	Accounting and inventory reports, decision supporting	● Lecture ● Discussion ● Participative Learning	Practical experience in computer lab	To study accounting and inventory reports in tally	Assessment through test papers

	tools, printing of reports, voucher and bill printing				
Module V	Technology advantage of tally,tally audit , tally vault, ODBC interface, export and import of data	● Lecture ● Discussion ● Participative Learning	Assignment on export and import of data	To study technology advantage of tally	Assessment through test papers

Department of Mathematics

MAT 1C01 – MATHEMATICS(Complementary Course)

Number of hours of lectures per week : 4 hrs

Number of credits : 3

OBJECTIVE

To understand concepts of limit, Continuity, derivatives and integration.

MODULE I

Limits and Continuity: Rules for finding limits. Target values and formal definitions of limits. Extensions of limit concept, Continuity, Tangent lines

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MODULE II

Derivatives: The derivative of a function, a quick review of differentiation rules, rate of Change.

MODULE III

Application of derivatives: Extreme values of a function. The mean value theorem, First derivative test, Graphing with y' and y''. Limits as x approaches infinity. Asymptotes and dominant terms, Linearization and differentials. The L'Hopital's Rule.

MODULE IV

Integration: Riemann sums and Definite integrals; properties, areas and the Mean value theorem. The Fundamental theorem. Application of Integrals: Areas between curves, Finding Volumes by slicing.

TEXTBOOKS

George B. Thomas Jr. and Ross L. Finney : Calculus, LPE, Ninth edition, Pearson Education.

REFERENCES

[1] S.S. Sastry, Engineering Mathematics, Volume 1, 4th Edition PHI.

[2] Muray R Spiegel, Advanced Calculus, Schaum's Outline series.

OBJECTIVES

- To understand the basics of limits and continuity.
- To learn derivatives and differentiation rules
- To learn about applications of derivatives
- To understand L'Hospital's rule.
- To study in detail Riemann sums and integration.

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I (20 hours)	Limits and Continuity Epsilon – delta definitions	• Discussion • Participative learning • Problem solving	Discussions Lectures and Quizzes	Limits, Sandwich theorem,	Evaluation through test paper.
MODULE II (12 hours)	Derivatives and differentiation rukes	• Lecture • Discussion • Participative learning • Problem solving	. Discussion about differentiation rules.	Derivatives and rate of Change.	Evaluation through test paper.
MODULE III (24 hours)	Applications of derivatives, Graphing of functions	• Lecture • Discussion • Participative learning • Problem solving	Discussion Maximum minimum points	Plot graphs of a function by finding maximum and minimum points using derivatives	Evaluation through MCQ.
MODULE IV (16 hours)	Riemann Sums and integration and applications of integration	• Lecture • Discussion • Participative learning • Problem solving	Discussion on integration concepts	Integration concept using Riemann sums, area of surfaces	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about limit continuity and derivatives
CO2	To learn application of derivatives To study about plotting function graphs
CO3	To know about integration and its origin To learn about applications of integration

Faculty in Charge

Sr. Mercy Mathew

MAT 2C02 – MATHEMATICS(Complementary Course)

Number of hours of lectures per week : 4 hrs

Number of credits : 3

OBJECTIVE

To understand concepts of hyperbolic functions, improper integrals, partial differentiation, infinite series and polar coordinates.

MODULE I

Hyperbolic Functions - Definitions and Identities, Derivatives and Integrals, Inverse Hyperbolic , functions - Derivatives and Integrals, Application of Integrals :, Volumes of Solids of Revolution (Disk method only), Lengths of plane curves. Areas of surfaces of revolution Improper Integrals, Convergence and Divergence, Tests for Convergence and Divergence, Direct Comparison Test and Limit Comparison Test

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MODULE II

Limit of Sequences of Number, Theorems for calculating limits of sequences (Excluding Picard's Method), Infinite series, The ratio and root test for series of non negative terms, alternating series, Absolute and conditional convergence, Power Series, Taylor and Maclaurin Series.

MODULE III

Polar coordinates, Graphing in Polar Coordinates, Polar equations for conic sections, integration in Polar coordinates, Cylindrical and Spherical Coordinates.

MODULE IV

Functions of Several Variables, Limits and Continuity, Partial Derivatives, differentiability, Chain rule

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TEXTBOOKS

George B. Thomas Jr. and Ross L. Finney : Calculus, LPE, Ninth edition, Pearson Education.

REFERENCES

[1] S.S. Sastry, Engineering Mathematics, Volume 1, 4th Edition PHI.

[2] Muray R Spiegel, Advanced Calculus, Schaum's Outline series.

OBJECTIVES

- To understand the Hyperbolic functions and improper integrals.
- To learn about sequences and series.
- To learn about polar coordinates and is graphing.
- To understand functions of several variables.
- To study partial differntiaition .

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I (20 hours)	Hyperbolic functions, Applications of integrals, improper integrals.	• Discussion • Participative learning • Problem solving	Discussions Lectures and Quizzes	Integrats and derivatives of Hyperbolic functions, Improper integrals, Volume and area of integrals	Evaluation through test paper.
MODULE II (28 hours)	Sequences and series of real numbers	• Lecture • Discussion • Participative learning • Problem solving	.Discussion about convergence of various series.	Convergence and divergence of series. Taylor and Maclaurin series.	Evaluation through test paper.
MODULE III (10 hours)	Polar Coordinates, Graphing, Cylindrical and Spherical coordinates.	• Lecture • Discussion • Participative learning • Problem solving	Discussion on cylindrical and spherical coordinates	Plot graphs of polar coordinates	Evaluation through MCQ.
MODULE IV (14 hours)	Functions of several variables, partial derivatives	• Lecture • Discussion • Participative learning • Problem solving	Discussion on partial derivatives	Partial differentiation	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about Infinite series and its convergence.
CO2	To learn hyperbolic functions and improper integrals. To study about Taylor series and Maclaurain series.
CO3	To know about polar coordinates and its plotting. To learn about partial differentiation.

Faculty in Charge

Sr Mercy Mathew

MAT 3C03 – MATHEMATICS(Complementary Course)

Number of hours of lectures per week : 5 hrs

Number of credits : 3

OBJECTIVE

To understand concepts of Ordinary differential equations, matrices and vector calculus.

MODULE I

Basic concepts and ideas, Geometrical meaning of y' = f(x,y). Direction Fields, Separable Differential Equations. Exact Differential Equations; Integrating Factors, Linear Differential Equations; Bernoulli Equation, Orthogonal Trajectories of Curves.

MODULE II

Rank of a Matrix, Non-Singular and Singular matrices, Elementary Transformations, Inverse of an elementary Transformations, Row Canonical form, Normal form. Systems of Linear equations: Homogeneous and Non Homogenoeus Equations, Characteristic equation of a matrix; Characteristic roots and characteristic vectors. Cayley-Hamilton Theorem (statement only) and simple applications.

MODULE III

A quick Review of vector algebra, Inner product and vector product in R^2 and R^3 . Vector and scalar functions and Fields, Derivatives, Curves, Tangents, Arc Length, Velocity and acceleration, Gradient of a scalar field; Directional Derivative, Divergence of a vector field, Curl of a Vector Field.

MODULE IV

Line Integrals, Independence of path, Green's Theorem in the Plane (without proof), surfaces for Surface Integrals, Surface Integrals, Triple Integrals, Divergence theorem of Gauss and Stoke's theorem (without proofs).

TEXTBOOKS

1. Erwin Kreyszig : Advanced Engineering Mathematics, Eighth Edition, Wiley, India.

2. Frank Ayres JR : Matrices, Schaum's Outline Series, TMH Edition.

REFERENCES

[1] S.S. Sastry, Engineering Mathematics, Volume 1, 4th Edition PHI.

[2] Muray R Spiegel, Vector Analysis, Schaum's Outline series, Asian Student Edition.

[3] Shanthi Narayanan & P.K. Mittal, A Text Book of Matrices, S. Chand

[4] Harry F. Davis & Arthur David Snider, Introduction to Vector Analysis, 6th ed., Universal Book Stall, New Delhi.

OBJECTIVES

- To understand the concepts in ordinary differential equations
- To learn about matrices and its properties
- To learn about Cayley Hamilton theorem
- To understand vectors
- To study in detail Vector Calculus

LESSON PLAN

Unit/Session (hours required)	Topics to be taught (input)	Procedure(process) Student centric method of teaching	Activity	Learning Outcome (output)	Assessment
MODULE I (20 hours)	Modeling of differential equations, methods to solve first order differential equations.	• Discussion • Participative learning • Problem solving	Discussions Lectures and Quizzes	Geometrical meaning of ODE, solving I order ODEs	Evaluation through test paper.
MODULE II (20 hours)	Rank of a matrix, solution of system of linear equations, Cayley- Hamilton theorem	• Lecture • Discussion • Participative learning • Problem solving	. Discussion about Eigen values and vectors	Normal and Echoleon form of matrices, Solution of linear system of equations, Eigen values and vectors	Evaluation through test paper.
MODULE III (25 hours)	Introduction to vectors and vector differential calculus	• Lecture • Discussion • Participative learning • Problem solving	Discussion on derivatives of vector functions	Know gradient, divergence, curl of a vector function	Evaluation through MCQ.
MODULE IV (25 hours)	Vector integral calculus	• Lecture • Discussion • Participative learning • Problem solving	Discussion on surface integrals	Greens theorem, Stoke's theorem, Gauss divergence theorem	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about I order ordinary differential equations
CO2	To learn solution of system of linear equations To study about eigen values and eigen vectors.
CO3	To know about vector differential calculus To learn about vector integral calculus

Faculty in Charge

Sr Mercy Mathew

MAT 4C04 – MATHEMATICS(Complementary Course)

Number of hours of lectures per week : 5 hrs

Number of credits : 3

OBJECTIVE

To understand concepts of Second order differential equations, Laplace tranforms, Fourier series, Numerical methods

MODULE I

Linear Differential equations of Second and Higher order: Differential Operators, Euler-Cauchy Equation, Wronskian, Nonhomogeneous Equations, Solutions by Undetermined Coefficients, Solution by variation of Parameters.

MODULE II

Laplace Transforms: Laplace Transform, Inverse Transform, Linearity, Shifting, Transforms of Derivatives of Integrals, Differential Equations. Unit step Function, Second Shifting Theorem, Dirac Delta Function, Differentiation and integration of Transforms, Convolution, Integral Equations, Partial Fractions, Differential Equations.

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MODULE III

Fourier Series : Periodic Functions, Trigonometric Series, Fourier Series, Even and Odd functions, Half-range Expansions, Partial differential Equations: Basic Concepts, Vibrating String, Wave Equation, Separation of Variables, Use of Fourier Series

MODULE IV

Numerical Methods: Methods of First-order Differential Equations, Picard's iteration for initial Value Problems. Numerical Integration: Trapezoidal Rule, Simpson's Rule.

TEXTBOOKS

1. Erwin Kreyszig, Advanced Engineering Mathematics, Eighth Edition, Wiley, India.
2. George B. Thomas Jr. and Ross L. Finney : Calculus, LPE, Ninth edition, Pearson Education.

REFERENCES

[1] S.S. Sastry, Engineering Mathematics, Volume 1, 4th Edition PHI.
[2] Muray R Spiegel, Advanced Calculus, Schaum's Outline series.

[3] Murray R. Spiegel, Laplace Transforms, Schaum's Outline Series.

OBJECTIVES

- To understand the methods to solve II and higher order derivatives
- To learn Laplace and inverse Laplace equations
- To learn about Fourier series and Half range expansions
- To understand classical partial differential equations
- To study in detail some numerical methods for integration and ODEs.

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I (20 hours)	Solution of II and higher order differential equations	• Discussion • Participative learning • Problem solving	Discussions Lectures on wronskian	Euler-Cauchy equations, various methods for solving II order DEs	Evaluation through test paper.
MODULE II (20 hours)	Laplace transforms, Inverse Laplace transforms, Shifting theorems	• Lecture • Discussion • Participative learning • Problem solving	. Discussion about laplace and inverse Laplace transforms	Solution of differential equations using Laplace transforms	Evaluation through test paper.
MODULE III (30 hours)	Fourier series and its half range expansions	• Lecture • Discussion • Participative learning • Problem solving	Discussion on Fourier series expansions of periodic functions	Solution of heat and wave equations using Fourier series	Evaluation through test paper.
MODULE IV (20 hours)	Numerical methods for integration and solving differential equations	• Lecture • Discussion • Participative learning • Problem solving	Discussion on various numerical methods	Runge – Kutta, Euler methods, Trapeziodal, Simpson’s rule.	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about Euler- Cauchy equations, method of undetermined coefficients and method of variation of parameters
CO2	To learn Solving differential equations using Laplace transforms To study about Fourier series
CO3	To know about solution of Heat and Wave Equations To learn about various numerical methods.

Faculty in Charge

Sr Mercy Mathew

MTH1C01: ALGEBRA I
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the basic concepts of abstract algebra.

MODULE I

Plane Isometries, Direct products & finitely generated Abelian Groups, Factor Groups, Factor-Group Computations and Simple Groups, Group action on a set, Applications of G-set to counting

MODULE II

Isomorphism theorems, Series of groups, (Omit Butterfly Lemma and proof of the Schreier Theorem), Sylow theorems, Applications of the Sylow theory, Free Groups

MODULE III

Group Presentations, Rings of polynomials, Factorization of polynomials over a field, Non Commutative examples, Homomorphism and factor rings

TEXT:

JOHN B. FRALEIGH, A FIRST COURSE IN ABSTRACT ALGEBRA(7th Edn.), Pearson Education Inc., 2003.

REFERENCES :

[1] N. Bourbaki: Elements of Mathematics: Algebra I, Springer; 1998.

[2] Dummit and Foote: Abstract algebra(3rd edn.); Wiley India; 2011.

[3] P.A. Grillet: Abstract algebra(2nd edn.); Springer; 2007

[4] I.N. Herstein: Topics in Algebra(2nd Edn); John Wiley & Sons, 2006.

[5] T.W. Hungerford: Algebra; Springer Verlag GTM 73(4th Printing); 1987.

[6] N. Jacobson: Basic Algebra-Vol. I; Hindustan Publishing Corporation(India), Delhi; 1991.

[7] T.Y. Lam: Exercises in classical ring theory(2nd edn); Springer; 2003.

[8] C. Lanski: Concepts in Abstract Algebra; American Mathematical Society; 2010.

[9] N.H. Mc Coy: Introduction to modern algebra, Literary Licensing, LLC; 2012.

[10] S. M. Ross: Topics in Finite and Discrete Mathematics; Cambridge; 2000.

[11] J. Rotman: An Introduction to the Theory of Groups(4th edn.); Springer, 1999.

OBJECTIVES

a) **To understand the basic concepts of groups, factor groups, simple groups and group action on a set.**

b) **To get familiarize with Isomorphism theorems and its properties.**

c) **To understand the concept of sylow theorems and its applications.**

d) **To study more about rings of polynomials and factorization of polynomials over a field.**

e) **To understand homomorphism and factor ring.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (30 hours)	Plane Isometries, Abelian groups, Factor groups, Simple groups, group action on a set	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on groups and its properties	To understand: • the basics of different types of groups • notion of group action on a set	Evaluation Through MCQ
Module I1 (30 hours)	Isomorphism theorems, Sylow theorems and its applications	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain the properties of Isomprhism • Peer group discussion on Sylow theorems	To understand: • Isomorphism theorems and their significance • Sylow theorems and its applications	Evaluation Through test paper
Module III (30 Hours)	Ring of polynomials, factorization of a polynomial over a field, homomorphism and factor rings	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on properties of homomorphism and factor rings	To understand: • homomorphism and factor rings • factorization of a polynomial over a field convergence	Evaluation through test paper

Course Outcomes

CO1	To get the idea of different types of groups and group action on a set
CO2	To understand the concept of isomorphism theorems and their significance, Sylow theorems and its applications
CO3	To understand factorization of a polynomial over a field, homomorphism and factor rings

Faculty in charge:
Ms. Geethu Simon

MT1C03: REAL ANALYSIS I
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the basic concepts of real analysis.

MODULE I

Basic Topololgy, Finite, Countable and Uncountable sets Metric Spaces, Compact Sets, Perfect Sets, Connected Sets. Continuity - Limits of function, Continuous functions, Continuity and compactness, continuity and connectedness, Discontinuities, Monotonic functions, Infinite limits and Limits at Infinity

MODULE II

Differentiation The derivative of a real function, Mean Value theorems, The continuity of Derivatives, L Hospitals Rule, Derivatives of Higher Order, Taylors Theorem, Differentiation of Vector valued functions. The Riemann Stieltjes Integral, - Definition and Existence of the integral, properties of the integral, Integration and Differentiation

MODULE III

The Riemann Stieltjes Integral (Continued) - Integration of Vector vector-valued Functions, Rectifiable curves. Sequences and Series of Functions - Discussion of Main problem, Uniform convergence, Uniform convergence and continuity, Uniform convergence and Integration, Uniform convergence and Differentiation. Equicontinuous Families of Functions, The Stone Weierstrass

TEXT:

RUDIN W., PRINCIPLES OF MATHEMATICAL ANALYSIS (3rd Edn.), Mc. Graw-Hill, 1986.

REFERENCES :

[1] H. Amann and J. Escher: Analysis-I; Birkhuser; 2006.

[2] T. M. Apostol: Mathematical Analysis(2nd Edn.); Narosa; 2002.

[3] R. G. Bartle: Elements of Real Analysis(2nd Edn.); Wiley International Edn.; 1976.

[4] R. G. Bartle and D.R. Sherbert: Introduction to Real Analysis; John Wiley Bros; 1982.

[5] J. V. Deshpande: Mathematical Analysis and Applications- an Introduction; Alpha Science International; 2004.

OBJECTIVES

a) **To understand the basic concepts of Topology: Finite, Countable and Uncountable sets, Metric spaces, Compact sets, Perfect sets, Connected sets.**

b) **To develop the notion of continuity of functions in R^K.**

c) **To understand the concept of differentiation of real valued and complex valued functions.**

d) **To study about Riemann Stieltjes Integral and Rectifiable curves.**

e) **To understand the convergence of sequence and series of functions.**

f) **To understand the relation between uniform convergence and continuity, uniform convergence and differentiation, uniform convergence and integration**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (35 hours)	Basic topology, Continuous functions, continuity and compactness, continuity and connectedness, discontinuities	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on basic topology and continuity of functions	To understand: • the basics of topology • notion of continuity • difference between continuity and uniform continuity	Evaluation Through MCQ
Module I1 (30 hours)	Differentiation, derivatives of higher order, differentiation of	• Lecture • Discussion • Participative	• Student seminars to explain the	To understand: • differentiation of vector valued	Evaluation Through test paper

	vector valued functions, Riemann Stieltjes Integral	learning • Problem solving	properties of differentiation and integration	functions • integration of vector valued functions	
Module III (25 Hours)	Convergence of sequence and series of functions, uniform convergence and continuity, uniform convergence and differentiation, uniform convergence and integration	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on properties of convergence of functions	To understand: • Convergence of sequence and series of functions • Differentiate between convergence and uniform convergence	Evaluation through test paper

Course Outcomes

CO1	To introduce the concept of basic topology, difference between continuous and uniformly continuous functions and its properties.
CO2	To understand the concept of differentiation of vector valued functions and integration of functions.
CO3	To understand the difference between pointwise convergence and uniform convergence of sequence of functions, convergence of series of functions

Faculty in charge:
M D Varghese

MTH1C02: LINEAR ALGEBRA
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the basic concepts of Linear Algebra.

MODULE I

Vector Spaces & Linear Transformations

MODULE II

Linear Transformations (continued) and Elementary Canonical Forms

MODULE III

Elementary Canonical Forms (continued), Inner Product Spaces

TEXT:

HOFFMAN K. and KUNZE R., LINEAR ALGEBRA (2nd Edn.), Prentice Hall of India, 199

REFERENCES :

[1] P. R. Halmos: Finite Dimensional Vector spaces; Narosa Pub House, New Delhi; 1980.

[2] A. K. Hazra: Matrix: Algebra, Calculus and generalised inverse- Part I; Cambridge International Science Publishing; 2007.

[3] I. N. Herstein: Topics in Algebra; Wiley Eastern Ltd Reprint; 1991.

[4] S. Kumaresan: Linear Algebra-A Geometric Approach; Prentice Hall of India; 2000.

[5] S. Lang: Linear Algebra; Addison Wesley Pub.Co.Reading, Mass; 1972.

[6] S. Maclane and G. Bikhrkhoff: Algebra; Macmillan Pub Co NY; 1967.

[7] N. H. McCoy and R. Thomas: Algebra; Allyn Bacon Inc NY; 1977.

[8] R. R. Stoll and E.T.Wong: Linear Algebra; Academic Press International Edn; 1968.

[9] G. Strang: linear algebra and its applications(4th edn.); Cengage Learning; 2006.

OBJECTIVES

a) **To understand the concept of vector spaces, basis and dimension.**

b) **To study about linear transformations and its properties.**

c) **To understand the concept of functionals and dual space**

d) **To study the relation between linear transformations and corresponding matrices.**

e) **To study about inner product spaces.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (30 hours)	Vector spaces, subspace, basis, dimension, properties, linear transformations	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on properties of vector spaces	To understand: • the basics of vector spaces, basis • notion of linear transformation • properties of linear transformation	Evaluation through test papers and interaction with students
Module I1 (35 hours)	linear transformations, functionals, dual space and elementary canonical transformations	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain the properties of linear transformations	To understand: • More about linear transformation • Significance of dual space	Evaluation through test paper
Module III (25 Hours)	canonical transformations inner product spaces,	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on inner product spaces	To understand: • Inner product spaces and their relevance • Orthogonal compliment and direct sums of vector spaces	Evaluation through test paper

Course Outcomes

CO1	To understand the concept of vector spaces, their basis, dimension and linear transformations
CO2	To understand more about linear transformations and some of its important properties, elementary canonical forms
CO3	To introduce the concept of Inner product spaces, orthogonal compliment and direct sums of vector spaces

Faculty in charge:
Ms Nikita P B

MTH1C05: NUMBER THEORY

Number of hours of Lectures per week: 5

Number of Credits: 4

Objectives

To understand the basic concepts of Number Theory.

Module 1

Arithmetical functions and Dirichlet multiplication; Averages of arithmetical functions

Module 2

Some elementary theorems on the distribution of prime numbers

Module 3

Quadratic residues and quadratic reciprocity law ,Cryptography, Public key.

TEXT 1 : APOSTOL T.M., INTRODUCTION TO ANALYTIC NUMBER THEORY, Narosa Publishing House, New Delhi, 1990.

TEXT 2: KOBLITZ NEAL A., COURSE IN NUMBER THEROY AND CRYPTOGRAPHY, SpringerVerlag, NewYork, 1987.

References

[1] A. Beautelspacher: Cryptology; Mathematical Association of America (Incorporated); 1994

[2] H. Davenport: The higher arithmetic(6th Edn.); Cambridge Univ.Press; 1992

[3] G. H. Hardy and E.M. Wright: Introduction to the theory of numbers; Oxford International Edn; 1985

[4] A. Hurwitz & N. Kritiko: Lectures on Number Theory; Springer Verlag ,Universitext; 1986

[5] T. Koshy: Elementary Number Theory with Applications; Harcourt / Academic Press; 2002

[6] D. Redmond: Number Theory; Monographs & Texts in Mathematics No: 220; Marcel Dekker Inc.; 1994

[7] P. Ribenboim: The little book of Big Primes; Springer-Verlag, New York; 1991

[8] K.H. Rosen: Elementary Number Theory and its applications(3rd Edn.); Addison Wesley Pub Co.; 1993

[9] W. Stallings: Cryptography and Network Security-Principles and Practices; PHI; 2004

[10] D.R. Stinson: Cryptography- Theory and Practice(2nd Edn.); Chapman & Hall / CRC (214. Simon Sing : The Code Book The Fourth Estate London); 1999

[11] J. Stopple: A Primer of Analytic Number Theory-From Pythagorus to Riemann; Cambridge Univ Press; 2003

[12] S.Y. Yan: Number Theroy for Computing(2nd Edn.); Springer-Verlag; 2002

OBJECTIVES

a) **To understand the basic arithmetical functions and its averages.**

b) **To get familiarize with theorems on the distribution of prime numbers.**

c) **To understand quadratic residues, quadratic reciprocity law.**

d) **To study about basics of cryptography .**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (30 hours)	Arithmetical functions and Dirichlet multiplication; Averages of arithmetical functions	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on various arithmetic functions.	To understand: • Arithmetical functions • Dirichlet multiplication and derivatives of arithmetical functions • Averages of arithmetical functions.	Evaluation Through Test paper
Module I1	Some elementary theorems on the	• Lecture • Discussion • Participative	• Student seminars to	To understand: • Equivalent	Evaluation Through test paper

(30 hours)	distribution of prime numbers	learning • Problem solving	explain theorems on distribution of prime numbers.	forms of prime number theorem. • Partial sums of Mobius function.	
Module III (30 Hours)	Quadratic residues and quadratic reciprocity law, Cryptography, Public key	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on legendre's symbol, its properties and Gauss lemma.	To understand: • Quadratic Residues and Quadratic reciprocity law,jacobi's symbol. • Basics of cryptography, types of crypto-system and its cryptanalysis.	Evaluation through test paper

Course Outcomes

CO1	To introduce the Arithmetical functions,Dirichlet multiplication and derivatives of arithmetical functions,Averages of arithmetic.
CO2	To understand the Equivalent forms of prime number theorem, Partial sums of Mobius function.
CO3	To understand the quadratic residues and quadratic reciprocity law, jacobi's symbol , basics of cryptography, types of cryptosystem and its cryptanalysis.

Faculty in charge:
Ms. Mariya Jose

MTH1C05 – DISCRETE MATHEMATICS

Number of hours of lectures per week : 5 hrs

Number of credits : 4

OBJECTIVE

To understand concepts in graph theory, lattices and automata.

MODULE I

Order Relations, Lattices; Boolean Algebra Definition and Properties, Boolean Functions.

MODULE II

Basic concepts, Subgraphs, Degree of vertices, Paths and connectedness, Automorphism of a simple graph, Operations on graphs, Vertex cuts and Edge cuts, Connectivity and Edge connectivity, Trees-Definition, Characterization and Simple properties, Eulerian graphs, Planar and Non planar graphs, Euler formula and its consequences, K5 and K3,3 are non planar graphs, Dual of a plane graph.

MODULE III

Automata and Formal Languages: Introduction to the theory of Computation, Finite Automata.

TEXTBOOKS

TEXT 1: R. BALAKRISHNAN and K. RANGANATHAN, A TEXT BOOK OF GRAPH THEORY, Springer-Verlag New York, Inc., 2000.

TEXT 2: K. D JOSHI, FOUNDATIONS OF DISCRETE MATHEMATICS, New Age International(P) Limited, New Delhi, 1989.

TEXT 3: PETER LINZ, AN INTRODUCTION TO FORMAL LANGUAGES AND AUTOMATA (2nd Edn.), Narosa Publishing House, New Delhi, 1997.

REFERENCES

[1] J. C. Abbot: Sets, lattices and Boolean Algebras; Allyn and Bacon, Boston; 1969.

[2] J. A. Bondy, U.S.R. Murty: Graph Theory; Springer; 2000.

[3] S. M. Cioaba and M.R. Murty: A First Course in Graph Theory and Combinatorics; Hindustan Book Agency; 2009.

[4] J. A. Clalrk: A first look at Graph Theory; World Scientific; 1991.

OBJECTIVES

- To understand the definition of Boolean algebra and Boolean functions along with various properties.
- To study graph and its types with suitable examples.
- To learn about connectivity of graphs.
- To understand the definition of trees and learn various theorems related to it.
- To study about language, grammar and types of acceptors.

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I	Lattices; Boolean Algebra Definition and Properties, Boolean Functions	• Discussion • Participative learning • Problem solving	Seminars by students	To study about Boolean algebra and Boolean functions.	Evaluation through test paper.
MODULE II	Graph definition with examples, isomorphism, connected graphs, planar graphs, trees and eulerian graphs	• Lecture • Discussion • Participative learning • Problem solving	Assignments on isomorphism of graphs. Discussion about various definitions.	To learn basics about graphs and trees. To study about planarity and connectivity.	Evaluation through test paper.
MODULE III	Definition of automata. Languages and Grammars. DFA and NFA	• Lecture • Discussion • Participative learning • Problem solving	Discussion on applications of automata. Working out exercise problems on DFA and NFA	To know the basic about automata. To learn about DFA and NFA	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about Boolean algebra and Boolean functions.
CO2	To learn basics about graphs and trees. To study about planarity and connectivity.
CO3	To know the basic about automata. To learn about DFA and NFA

Faculty in Charge
Ms Mariya Jose

MTH2C06: ALGEBRA II
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the ideas and concepts of insolvability of the quintic.

MODULE I

Prime and Maximal Ideals, Introduction to Extension Fields, Algebraic Extensions (Omit Proof of the Existence of an Algebraic Closure), Geometric Constructions. [27, 29, 31, 32]

MODULE II

Finite Fields, Automorphisms of Fields, the Isomorphism Extension Theorem, Splitting Fields, Separable Extensions. [33, 48, 49, 50, 51]

MODULE III

Galois Theory, Illustration of Galois Theory, Cyclotomic Extensions, Insolvability of the Quintic. [53, 54, 55, 56]

TEXT: John B. Fraleigh: A FIRST COURSE IN ABSTRACT ALGEBRA (7th Edn), Pearson Education Inc., 2003.

REFERENCES :

[1] N. Bourbaki: Elements of Mathematics: Algebra I, Springer; 1998

[2] Dummit and Foote: Abstract algebra (3rd Edn); Wiley India; 2011

[3] M.H. Fenrick: Introduction to the Galois correspondence (2nd Edn); Birkhuser; 1998

[4] P.A. Grillet: Abstract algebra (2nd Edn); Springer; 2007

[5] I.N. Herstein: Topics in Algebra (2nd Edn); John Wiley & Sons, 2006.

[6] T.W. Hungerford: Algebra; Springer Verlag GTM 73 (4th Printing); 1987

[7] C. Lanski: Concepts in Abstract Algebra; American Mathematical Society; 2010

[8] R. Lidl and G. Pilz Applied abstract algebra(2nd edn.); Springer; 1998

[9] N.H. Mc Coy: Introduction to modern algebra, Literary Licensing, LLC; 2012

[10] J. Rotman: An Introduction to the Theory of Groups (4th Edn); Springer; 1999

[11] I. Stewart: Galois theory(3rd edn.); Chapman & Hall/CRC; 2003

OBJECTIVES

a) **To understand the basic concepts of Prime and Maximal Ideals.**

b) **To get familiarize with Algebraic Extensions.**

c) **To understand the Automorphisms of fields, Separable Extensions and Splitting Fields.**

d) **To study about the Galois Theory, Cyclotomic Extensions and the Insolvability of the Quintic.**

LESSON PLAN

Unit/ session/ hours (time required)	**Topics to be taught (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module 1 (30 hours)	Prime and Maximal Ideals, Introduction to Extension Fields, Algebraic Extensions, Geometric Constructions.	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on prime and maximal ideals and algebraic extensions	To understand: • the basics of extension fields • geometric constructions	Evaluation through MCQ
Module I1 (30 hours)	Finite Fields, Automorphisms of Fields, the Isomorphism Extension Theorem, Splitting Fields, Separable Extensions.	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain about separable extensions	To understand: • Isomorphism Extension Theorem Splitting and Separable Extensions	Evaluation through test paper
Module III (30 hours)	Galois Theory, Illustration of Galois Theory, Cyclotomic Extensions, Insolvability of the Quintic.	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on Cyclotomic Extensions	To understand: • Galois Theory • Insolvability of the Quintic	Evaluation through test paper

Course Outcomes

CO1	To introduce the concept of finite and extension fields, geometric constructions etc.
CO2	To understand the concept of Isomorphism Extension Theorem, Splitting and Separable Extensions.
CO3	To understand Galois theory and the Insolvability of the Quintic

Faculty in charge:
Ms. Geethu Simon

MT2C08: REAL ANALYSIS - II
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the advanced concepts of real analysis.

MODULE I

Lebesgue outer measure, measurable sets, regularity, measurable functions, Borel and Lebesgue measurability, Integration of non-negative functions, the general integral, integration of series Reimann and Lebesgue integrals

MODULE II

Differentiation, continuous non-differentiable functions, functions of bounded variation, Lebesgue's differentiation theorem, differentiation and integration, Lebegues set, Measures and outer measures, extension of a measure, uniqueness of the extension, completion of a measure, measure spaces, integration with respect to a measure

MODULE III

Signed measures and the Hahn decomposition, Jordan decompositon, Radon– Nikodym theorem, some applications of Radon Nikodym Theorem, bounded linear functionals on L^p, Lebesgue stieltjes measure, absolutely continuous functions, integration by parts, change of variable, Riesz Representation theorem for C(I).

TEXT:

G.de Barra, Measure Theory and Integration, New Age International Ltd. Publishers, New Delhi, 2006.

REFERENCES :

[1] K. B. Athreya and S. N. Lahiri, Measure Theory, Hindustan Book Agency, New Delhi, 2006.

[2] R. G. Bartle, The Element of Integration, John Wiley, 1964.

[3] S. K. Berberian, Measure and Integration, The McMillan Company, NewYork, 1965.

[4] P. R. Halmos, Measure Theory, Springer verlag.

[5] H. L. Royden, Real Analysis, Prentice Hall India, 1988 (3rd edition).

[6] W. Rudin, Real and Complex Analysis, Tata McGraw Hill, New Delhi, 2006.

[7] I. K. Rana, An Introduction to Measure and Integration, Narosa Publishing company, New York,

Analysis,Tata McGraw Hill,New Delhi,2006

[7] I K Rana:,An Introduction to Measure and Integration,Narosa Publishing Company,New York.

[8] Terence Tao: ,An Introduction to Measure Theory,Graduate Studies in Mathematics,Vol 126 AMS

OBJECTIVES

a) **To understand the basic concepts of Outer measure and measurable functions**

b) **To study about Reimann and Lebesgue Integrals**

c) **To understand Lebesgue Measure and Lebesgue Measurable Functions and its properties**

d) **To understand the concept of bounded linear functionals on L^p**

e) **To perform differentiation and Integration**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (30 hours)	Lebesgue outer measure, measurable sets, regularity, measurable functions, Integration of non-negative functions, Reimann and Lebesgue integrals Measure, Lebesgue Measurable Functions	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on Lebesgue measure and Lebesgue measurable functions	To understand: • the basics of sigma algebra • notion of Lebesgue measure and measurable functions	Evaluation through interaction with students and test papers
Module I1 (30 hours)	Differentiation,Lebesgue's differentiation theorem, differentiation and integration, Lebegues set, Measures and outer measures, measure spaces, integration with respect to a measure	• Lecture • Discussion • Participative learning • Problem solving	Student seminars on some topics Differentiation and Integration	To understand: • Concepts of Lebesgue integration and Differentiation	Evaluation through test papers and interaction with students
Module II1 (30 hours)	Signed measures and the Hahn decomposition, Jordan decompositon, Radon–Nikodym theorem, Riesz Representation theorem for C(I).	• Lecture • Discussion • Participative learning	• Peer group discussion on theorems	To understand: • Concepts of signed measures	Evaluation through test paper

Course Outcomes

CO1	To introduce the concept of Sigma Algebra, Borel sets, Lebesgue Measure, Lebesgue Measurable Functions
CO2	To understand the concept of differentiation and integration.
CO3	To understand the concept of signed measures, bounded linear functionals on $L^{p.}$

Faculty in charge:
M D Varghese

MTH2C08: TOPOLOGY
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the motivation and concepts of topology.

MODULE I

A Quick Revision of Chapter 1,2 and 3. Topological space, basic concepts [Chapter 4 and Chapter5 Section 1, Section 2(excluding 2.11 and 2.12) and Section 3 only]

MODULE II

Making Functions Continuous, quotient spaces, spaces with special properties [Chapter 5 Section 4 and Chapter 6]

MODULE III

Separation axioms: Hierarchy of separation axioms, Compactness and separation axioms, The Urysohn characterization of normality, Tietze characterization of normality.[Chapter 7 Section 1 to 3 and Section 4 up to and including 4.6]

TEXT:

JOSHI K D, INTRODUCTION TO GENERAL TOPOLOGY (Revised Edn.), New Age International (P) Ltd., New Delhi, 1983

Inc., 2003.

REFERENCES :

[1] M A Armstrong: Basic Topology, Springer- Verlag New York; 1983.

[2] J Dugundji: Topology; Prentice hall of India; 1975.

[3] M Gemignani: Elementary Topology; Addison Wesley Pub Co Reading Mass, 1971

[4] M G Murdeshwar: General Topology(2nd Edn);Wiley Eastern Ltd, 1990

[5] G F Simmons: Introduction to Topology and modern analysis; McGraw-Hill international student

Edn;1963.

OBJECTIVES

a) **To understand the basic concepts of Topological Spaces.**

b) **To get familiarize with making functions continuous, Quotient Spaces.**

c) **To understand the separation axioms, Hierarchy of separation axioms, compactness and separation axioms.**

d) **To study the Urysohn characterization of normality, Tietze characterization of normality.**

LESSON PLAN

Unit/ session/ hours (time required)	**Topics to be taught (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module 1 (30 hours)	Topological Spaces, Basic concepts	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on basic topology and topological space	To understand: • the basics of topology • topological spaces • different types of topologies	Evaluation Through MCQ
Module I1 (30 hours)	Making functions continuous, quotient spaces, spaces with special properties	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain about making functions continuous	To understand: • Compact Lindeloff spaces • Connectedness Local Connectedness Path Connectedness	Evaluation Through test paper

Module III (30 Hours)	Separation axioms: Hierarchy of separation axioms, compactness and separation axioms, The Urysohn characterization of normality, Tietze characterization of normality	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on separation axioms	To understand: • Separation axioms • Urysohn characterization of normality	Evaluation through test paper

Course Outcomes

CO1	To introduce the concept of basic topology, topological space, different types of topologies.
CO2	To understand the concept of making functions continuous, quotient spaces
CO3	To understand the separation axioms, the Urysohn characterization of normality, Tietz characterization of normality

Faculty in charge:
Ms. Nikita P B

MT2C10: ODE AND CALCULUS OF VARIATIONS
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the basic concepts of ordinary differential equations and its applications.

MODULE I

Power Series Solutions and Special functions; Some Special Functions of Mathematical Physics.

MODULE II

Some special functions of Mathematical Physics (continued), Systems of First Order Equations; Non linear Equations

MODULE III

Oscillation Theory of Boundary Value Problems, The Existence and Uniqueness of Solutions, The Calculus of Variations.

TEXT:

SIMMONS, G.F., DIFFERENTIAL EQUATIONS WITH APPLICATIONS AND HISTORICAL NOTES (3rd Edn.), New Delhi, 1974.

REFERENCES :

[1] G. Birkhoff and G.C. Rota: Ordinary Differential Equations(3rd Edn.); Edn. Wiley & Sons; 1978
[2] W.E. Boyce and R.C. Diprima: Elementary Differential Equations and boundary value problems (2nd Edn.); John Wiley & Sons, NY; 1969
[3] A. Chakrabarti: Elements of ordinary Differential Equations and special functions; Wiley Eastern Ltd., New Delhi; 1990
[4] E.A. Coddington: An Introduction to Ordinary Differential Eqution; Printice Hall of India, New Delhi; 1974
[5] R.Courant and D. Hilbert: Methods of Mathematical Physics- vol I; Wiley Eastern Reprint; 1975
[6] P. Hartman: Ordinary Differential Equations; John Wiley & Sons; 1964 [7] L.S. Pontriyagin : A course in ordinary Differential Equations Hindustan Pub. Corporation, Delhi; 1967

[8] I. Sneddon: Elements of Partial Differential Equations; McGraw-Hill International, Edn.;1957

OBJECTIVES

a) **To study how to compute power series solution of first order ODE.**

b) **To get familiarize with some special functions of Mathematical Physics.**

c) **To study the methods to solve systems of first order equations.**

d) **To study more about qualitative properties of solutions.**

e) **To understand the concept of calculus of variations.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (35 hours)	Power series solutions of first order ODEs, special functions in Mathematical Physics	• Lecture • Discussion • Participative learning • Problem solving	• Problem solving sessions in groups. • Discussing the solutions obtained	To understand: • the basics of solutions of ODE • significance of special functions	Evaluation Through test papers
Module I1 (30 hours)	Solve systems of first order and nonlinear equations	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain nonlinear equations	To understand: • the method to solve systems of first order equations • theory of solutions of nonlinear equations	Evaluation through test paper
Module III (25 Hours)	Existence and uniqueness of solutions, calculus of variations	• Lecture • Discussion • Participative learning • Problem solving	• Assignment on existence and uniqueness of solutions • Discussion in peer groups on Calculus of Variations	To understand: • the applications in Calculus of variations • the qualitative nature of solutions	Evaluation through test paper

Course Outcomes

CO1	To understand the power series solutions of ordinary differential equations and the significance of special functions.
CO2	To know more about special functions, systems of first order equations and nonlinear equations
CO3	To understand the qualitative nature of solutions and calculus of variation.

Faculty in charge:
Ms Sruthy V

MTH2C10 – OPERATIONS RESEARCH

Number of hours of lectures per week : 5 hrs

Number of credits : 4

OBJECTIVE

To learn various methods to solve an LPP and study about game theory and networking.

MODULE I

Convex Functions; Linear Programming

MODULE II

Linear Programming (contd.); Transportation Problem

MODULE III

Integer Programming; Sensitivity Analysis; Flow and Potential in Networks; Theory of Games

TEXTBOOK

K.V. MITAL; C. MOHAN., OPTIMIZATION METHODS IN OPERATIONS RESEARCH AND SYSTEMS ANALYSIS(3rd. Edn.), New Age International(P) Ltd., 1996.

REFERENCES

[1] R.L. Ackoff and M.W. Sasioni: Fundamentals of Operations Research; Wiley Eastern Ltd. New Delhi; 1991

[2] C.S. Beightler, D.T. Philiphs and D.J. Wilde: Foundations of optimization(2nd Edn.); Prentice Hall of India, Delhi; 1979

[3] G. Hadley: Linear Programming; Addison-Wesley Pub Co Reading, Mass; 1975

[4] G. Hadley: Non-linear and Dynamic Programming; Wiley Eastern Pub Co. Reading, Mass; 1964

OBJECTIVES

- To learn about convex function and few theorems related to it.
- To study LPP and simplex method to solve it.
- Understand and solve transportation problems.

- ❖ To study about the sensitivity analysis.
- ❖ To learn flow and networks.
- ❖ To understand the problems related to game theory.

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I	Convex functions. Definition of LPP.	• Discussion • Participative learning • Problem solving • Lecture	Assignments on LPP	To study about convex functions and definition of LPP	Evaluation through test paper.
MODULE II	Simplex method to solve LPP. Transportation problem. VAM and MODI method to solve transportation problem.	• Lecture • Discussion • Participative learning • Problem solving	Assignments on simplex method and solving of transportation method	To learn to solve LPP using simplex method. To solve Transportation problem.	Evaluation through test paper.
MODULE III	Integer programming and sensitivity analysis. Networking. Introduction to Game theory.	• Lecture • Discussion • Participative learning • Problem solving	Seminar by students on sensitivity analysis. Methods to solve flow and network. Game theory problem solving.	Discussion on sensitivity analysis. To solve networks and problems on game theory.	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about convex functions
CO2	To learn about methods to solve LPP and transportation problems
CO3	To know about sensitivity in LPP and methods to solve networks. To understand game theory.

Faculty in charge: Ms. Rossflower

MAT 3C03 – MATHEMATICS(Complementary Course)

Number of hours of lectures per week : 5 hrs

Number of credits : 3

OBJECTIVE

To understand concepts of Ordinary differential equations, matrices and vector calculus.

MODULE I

Basic concepts and ideas, Geometrical meaning of y' = f(x,y). Direction Fields, Separable Differential Equations. Exact Differential Equations; Integrating Factors, Linear Differential Equations; Bernoulli Equation, Orthogonal Trajectories of Curves.

MODULE II

Rank of a Matrix, Non-Singular and Singular matrices, Elementary Transformations, Inverse of an elementary Transformations, Row Canonical form, Normal form. Systems of Linear equations: Homogeneous and Non Homogenoeus Equations, Characteristic equation of a matrix; Characteristic roots and characteristic vectors. Cayley-Hamilton Theorem (statement only) and simple applications.

MODULE III

A quick Review of vector algebra, Inner product and vector product in R^2 and R^3 . Vector and scalar functions and Fields, Derivatives, Curves, Tangents, Arc Length, Velocity and acceleration, Gradient of a scalar field; Directional Derivative, Divergence of a vector field, Curl of a Vector Field.

MODULE IV

Line Integrals, Independence of path, Green's Theorem in the Plane (without proof), surfaces for Surface Integrals, Surface Integrals, Triple Integrals, Divergence theorem of Gauss and Stoke's theorem (without proofs).

TEXTBOOKS

1. Erwin Kreyszig : Advanced Engineering Mathematics, Eighth Edition, Wiley, India.

2. Frank Ayres JR : Matrices, Schaum's Outline Series, TMH Edition.

REFERENCES

[1] S.S. Sastry, Engineering Mathematics, Volume 1, 4th Edition PHI.

[2] Muray R Spiegel, Vector Analysis, Schaum's Outline series, Asian Student Edition.

[3] Shanthi Narayanan & P.K. Mittal, A Text Book of Matrices, S. Chand

[4] Harry F. Davis & Arthur David Snider, Introduction to Vector Analysis, 6th ed., Universal Book Stall, New Delhi.

OBJECTIVES

- To understand the concepts in ordinary differential equations
- To learn about matrices and its properties
- To learn about Cayley Hamilton theorem
- To understand vectors
- To study in detail Vector Calculus

LESSON PLAN

Unit/Session (hours required)	Topics to be taught (input)	Procedure(process) Student centric method of teaching	Activity	Learning Outcome (output)	Assessment
MODULE I (20 hours)	Modeling of differential equations, methods to solve first order differential equations.	• Discussion • Participative learning • Problem solving	Discussions Lectures and Quizzes	Geometrical meaning of ODE, solving I order ODEs	Evaluation through test paper.
MODULE II (20 hours)	Rank of a matrix, solution of system of linear equations, Cayley- Hamilton theorem	• Lecture • Discussion • Participative learning • Problem solving	. Discussion about Eigen values and vectors	Normal and Echoleon form of matrices, Solution of linear system of equations, Eigen values and vectors	Evaluation through test paper.
MODULE III (25 hours)	Introduction to vectors and vector differential calculus	• Lecture • Discussion • Participative learning • Problem solving	Discussion on derivatives of vector functions	Know gradient, divergence, curl of a vector function	Evaluation through MCQ.
MODULE IV (25 hours)	Vector integral calculus	• Lecture • Discussion • Participative learning • Problem solving	Discussion on surface integrals	Greens theorem, Stoke's theorem, Gauss divergence theorem	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about I order ordinary differential equations
CO2	To learn solution of system of linear equations To study about eigen values and eigen vectors.
CO3	To know about vector differential calculus To learn about vector integral calculus

Faculty in Charge

Sr Mercy Mathew

MT 3C 12: COMPLEX ANALYSIS
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the ideas and concepts of analytic functions and singularities..

MODULE I

Conformality, Linear Transformations, Fundamental Theorems, Cauchy's Integral Formula.

MODULE II

Local Properties of Analytical Functions, The General Form of Cauchy's Theorem, The Calculus of Residues, Harmonic Functions.

MODULE III

Power Series Expansions, Simply Periodic Functions, Doubly Periodic Functions, The Weierstrass Theory.

TEXT: LARS V. AHLFORS : Complex Analysis, 3rd edn. Mc Graw Hill (1979)

REFERENCES :

1. Cartan, H. : Elementary Theory of Analytic Functions of one or Several . Variables, Addison - Wesley Pub. Co. (1973)
2. Conway, J.B. : Functions of One Complex Variable, Narosa Pub. Co., New Delhi. . (1973)
3. Moore T.O. &Hadlock E.H. : Complex Analysis, Series in Pure Mathematics - Vol. 9. World Scientific . (1991)
4. Pennisi, L. : Elements of Complex Variables, Holf, Rinehart & Winston, 2nd Edn. . (1976)
5. Rudin, W. : Real and Complex Analysis, 3rd Edn. McGraw - Hill International . Edn. (1987)
6. Silverman, H. : Compex Variables, Houghton Mifflin Co. Boston (1975)
7. Remmert, R. : Theory of Complex Functions, UTM, Springer- Verlag, NY, (1991)

OBJECTIVES

a) **To understand the basic concepts of** Power series, Analytic functions, Analytic functions as mappings and Mobius transformations.

b) **To get familiarize with** Conformal mappings, Weistrass theory

c) **To understand the** Power series representation of analytic functions, Zeros of an analytic function, The index of a closed curve, Cauchy's Theorem and Integral Formula and the classification of singularities.

LESSON PLAN

Unit/ session / hours (time required)	**Topics to be taught (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module 1 (30 hours)	Conformal mappings, Cauchy Integral formula	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on Power series and Analytic functions	To understand: • Conformal mappings • Fundamental theorems	Evaluation through MCQ
Module I1 (30 hours)	Analytic functions, Harmonic funcions	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain about Power series representation of analytic functions	To understand: • Residue theorem • Calculus of residue.	Evaluation through test paper
Module III (30 hours)	Entire functions Wiestrass Theory	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on classification of singularities	To understand: • Simply periodic doubly periodic functions	Evaluation through test paper

Course Outcomes

CO1	To introduce the concept of Power series and Analytic functions
CO2	To understand the concept of Cauchy's Theorem and Integral Formula, Open Mapping Theorem and Goursat's Theorem.
CO3	To understand the Argument Principle, the Maximum Principle and Schwarz's Lemma.

Faculty in charge:
Ms.Nikita P B

MT3C14 – ADVANCED FUNCTIONAL ANALYSIS

Number of hours of lectures per week : 5 hrs

Number of credits : 4

OBJECTIVE

To learn about metric spaces, normed spaces, Banach spaces and Inner product spaces.

MODULE I

Metric spaces and Continuous Functions, Lp spaces , Fourier series and Integrals, Normed spaces Continuity of linear maps

MODULE II

Hahn-Banach Theorems, Banach spaces, Uniform Boundedness Principle

MODULE III

Closed Graph and Open Mapping Theorems, Bounded Inverse Theorem, Inner product spaces, Orthonormal sets

TEXTBOOK

LIMAYE , B.V, FUNCTIONAL ANALYSIS, (2nd Edn.) New Age International Ltd, Publishers, New Delhi, Bangalore (1996)

REFERENCES

[1]R. Bhatia, Notes on Functional Analysis TRIM series, Hindustan Book Agency

[2]KesavanS, Functional Analysis TRIM series, Hindustan Book Agency

[3] S David Promislow, A First Course in Functional Analysis Wiley Interscience, John wiley & Sons, INC., (2008)

[4]E.Kreyszig, Introductory Functional Analysis with Applications John Wiley & Sons (1978)

OBJECTIVES

- To define Metric spaces along with examples.
- To study normed spaces and its continuity.
- To learn Hahn Banach theorems.
- To understand Banach spaces.
- To study about Inner product spaces and orthonormality.

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I	Metric spaces.L_p spaces. Normed spaces. Continuity of linear maps	• Discussion • Participative learning • Problem solving • Lecture	Assignments on examples of metric spaces and normed spaces.	To study about metric spaces and its properties. To learn normed spaces.	Evaluation through test paper.
MODULE II	Hahn Banach Theorems. Banach spaces.	• Lecture • Discussion • Participative learning • Problem solving	Assignments on corollaries of Hahn Banach theorems.	To learn Hahn Banach theorem and study about Banach spaces	Evaluation through test paper.
MODULE III	Closed graph theorem. Open mapping theorem. Inner products. Orthonormality.	• Lecture • Discussion • Participative learning • Problem solving	Seminar by students	To study important theorems. To learn about Inner products and orthonormal space.	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about metric space and normed space along with its continuity
CO2	To study Hahn Banach theorem and Uniform Boundedness principle
CO3	To learn about inner products and orthonormal spaces.

Faculty in charge:
Krishnamol Ravindran

MTH3C11 – MULTIVARIABLE CALCULUS AND GEOMETRY

Number of hours of lectures per week : 5 hrs

Number of credits : 4

OBJECTIVE

To understand concepts in Differential Geometry

MODULE I

Functions of Several Variables Linear Transformations, Differentiation, The Contraction Principle, The Inverse Function Theorem, the Implicit Function Theorem.

MODULE II

What is a curve? Arc-length, Reparametrization, Closed curves, Level curves versus parametrized curves. Curvature, Plane curves, Space curves What is a surface, Smooth surfaces, Smooth maps, Tangents and derivatives, Normals and orientability.

MODULE III

Level surfaces, Ruled surfaces and surfaces of revolution, Applications of the inverse function theorem, Lengths of curves on surfaces, Equiareal maps and a theorem of Archimedes, The second fundamental form, The Gauss and Weingarten maps, Normal and geodesic curvatures. Gaussian and mean curvatures, Principal curvatures of a surface.

TEXTBOOKS

TEXT 1 : RUDIN W., PRINCIPLES OF MATHEMATICAL ANALYSIS, (3rd Edn.), Mc. Graw Hill, 1986.

TEXT 2: ANDREW PRESSLEY, ELEMENTARY DIFFERENTIAL GEOMETRY(2nd Edn.), Springer-Verlag, 2010.

REFERENCES

[1] M. P. do Carmo: Differential Geometry of Curves and Surfaces;

[2] W. Klingenberg: A course in Differential Geometry;

[3] J. R. Munkres: Analysis on Manifolds; Westview Press; 1997

[4] C. C. Pugh: Real Mathematical Analysis, Springer; 2010

[5] M. Spivak: A Comprehensive Introduction to Differential Geometry-Vol. I; Publish

or Perish, Boston; 1970

[6] M. Spivak: Calculus on Manifolds; Westview Press; 1971

[7] V.A. Zorich: Mathematical Analysis-I; Springer; 2008

OBJECTIVES

- To understand functions of several variables and its differentiation
- To study curves, level curves and curvature.
- To learn about surfaces and its properties as normal, orientablity and tangents.
- To understand the definition Guass Weingarten maps
- To study about Guassian, mean curvatures

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I	The Contraction Principle, The Inverse Function Theorem, the Implicit Function Theorem.	• Discussion • Participative learning • Problem solving	Seminars by students	To study about Functions of Several Variables Linear Transformations and its properties	Evaluation through test paper.
MODULE II	Arc-length, Reparametrization, Level curves versus parametrized curves. Curvature, Tangents and derivatives, Normals and orientability.	• Lecture • Discussion • Participative learning • Problem solving	Assignments on Tangents and derivatives. Discussion about various definitions.	To learn basics about Curves, Level curves, curvature, Smooth maps,Tangents, Normals.	Evaluation through MCQ
MODULE III	Level surfaces, Applications of the inverse function theorem, Normal and geodesic curvatures. Gaussian and mean curvatures, Principal curvatures of a surface.	• Lecture • Discussion • Participative learning • Problem solving	Discussion on Surfaces and its properties.	To know the about Level, ruled surfaces, Guassian, mean, principal curvatures. The Gauss and Weingarten maps,	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about functions of several variables
CO2	To learn about the analytical and geometric concepts of curves and its variations To study about cuvature and sufaces
CO3	To know The Gauss and Weingarten maps, To learn Guassian and mean curvature.

Faculty in Charge

Ms. Sruthy V

MT3C15: PDE and Integral Equations
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the basic theory of PDE and Integral Equations.

MODULE I

First Order PDE .

MODULE II

Second Order PDE .

MODULE III

Integral Equations

TEXTS : 1. AMARNATH, M., : PARTIAL DIFFERENTIAL EQUATIONS, Narosa , New Delhi (1997)

2. HILDEBRAND, F.B.: METHODS OF APPLIED MATHEMATICS, (2 nd Edn.) Prentice-Hall of India, New Delhi, 1972

REFERENCES :

1. G. Birkhoff & G.C. Rota : Ordinary Differential Equations, Edn. Wiley & Sons 3rd Edn (1978)
2. E.A. Coddington : An Introduction to Ordinary Differential Equations, Printice Hall of India, New Delhi (1974)
3. P. Hartman : Ordinary Differential Equations, John Wiley & Sons (1964)
4. L.S. Pontriyagin : A Course in Ordinary Differential Equations, Hindustan Pub. Corporation, Delhi (1967)
5. F. John : Partial Differential Equations, Narosa Pub. House New Delhi (1986)
6. Phoolan Prasad & : Partial Differential Equations, Renuka Ravindran Wiley Eastern Ltd New Delhi (1985)
7. R. Courant and D.Hilbert : Methods of Mathematical Physics , Vol I, Wiley Eastern Reprint (1975) 8. W.E. Boyce & R.C. Deprima : Elementary Differential Equations, and Boundary Value Problems John Wiley & Sons, NY, 9th Edition

OBJECTIVES

a) **To study the basic methods of solving partial differential equations.**

b) **To study different methods for solving second order linear and nonlinear pde.**

c) **To study the classification of PDE and to obtain the canonical forms.**

d) **To understand the relation between integral equations and differential equations and to study different methods to solve integral equations.**

LESSON PLAN

Unit/ session/ hours (time required)	**Topics to be taught (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module 1 (35 hours)	Linear equations of first order,Quasilinear equations, method of characteristics, the Lagrange method, Charpit method, Jacobi method, Cauchy problem	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on different methods of solving first order pde	To understand: • Different types of PDE • methods to solve pde • solving non linear problem	Evaluation through test paper and interaction with students

Module I1 (30 hours)	Classification of second order pde, solving wave, heat and Laplace equations, Separation of variables, canonical form, Cauchy problem for second order pde	• Lecture • Discussion • Participative learning • Problem solving	Student seminars to understand the method of solving wave, heat and Laplace equations	To understand: • Methods to solve second order PDE • Solutions of heat, wave and Laplace equations	Evaluation through test paper
Module III (25 Hours)	Integral equations, Fredholm and Volterra equations, Resolvent kernel,Neumann series, Fredholm Schmidt theory	• Lecture • Discussion • Participative learning • Problem solving	• Assignment and problem solving sessions on Integral equations	To understand: • Relation between integral equation and differential equation • Methods to solve integral equations of different kinds	Evaluation through test paper

Course Outcomes

CO1	To study different types of PDE and methods for solving them.
CO2	To study methods of solving second order PDE, heat, wave and Laplace equation, Cauchy problem
CO3	To understand the relation between differential equation and integral equations, also different methods to solve integral equations.

Faculty in charge:
Ms Rossflower

MTH4E06: Algebraic Number Theory
Number of hours of Lectures per week: 5
Number of Credits: 3

Objectives

To understand the concepts of Algebraic Number Theory.

MODULE I

Symmetric polynomials, Modules, Free abelian groups, Algebraic Numbers, Conjugates and Discriminants, Algebraic Integers, Integral Bases, Norms and Traces, Rings of Integers, Quadratic Fields, Cyclotomic Fields

MODULE II

Historical background, Trivial Factorizations, Factorization into Irreducibles, Examples of Nonunique Factorization into Irreducibles, Prime Factorization, Euclidean Domains, Euclidean Quadratic fields Ideals Historical background, Prime Factorization of Ideals, The norm of an ideal

MODULE III

Lattices, The Quotient Torus, Minkowski theorem, The Space Lst, The Class-Group An Existence Theorem, Finiteness of the Class-Group, Factorization of a Rational Prime, Fermats Last Theorem Some history, Elementary Considerations, Kummers Lemma, Kummers Theorem.

TEXT : I. N. STEWART & D.O. TALL, ALGEBRAIC NUMBER THEORY, (2nd Edn.), Chapman &

Hall, (1987)

REFERENCES :

[1] P. Samuel : Theory of Algebraic Numbers, Herman Paris Houghton Mifflin, NY, (1975)
[2] S. Lang : Algebraic Number Theory, Addison Wesley Pub Co., Reading, Mass, (1970)
[3] bf D. Marcus : Number Fields, Universitext, Springer Verlag, NY, (1976)
[4] 4T.I.FR. Pamphlet No: 4 : Algebraic Number Theory (Bombay, 1966)
[5] Harvey Cohn : Advanced Number Theory, Dover Publications Inc., NY, (1980)
[6] Andre Weil : Basic Number Theory, (3rd Edn.), Springer Verlag, NY, (1974)
[7] G.H. Hardy and E.M. Wright : An Introduction to the Theory of Numbers, Oxford University

Press.
[8] Z.I. Borevich & I.R.Shafarevich : Number Theory, Academic Press, NY 1966.
[9] Esmonde & Ram Murthy : Problems in Algebraic Number Theory, Springer Verlag 2000

OBJECTIVES

a) **To study the basic concepts of numberfield, quadratic field, Guassian field and their properties.**

b) **To study how factorization into irreducibles hold in different fields.**

c) **To understand the concepts of lattices, the quotient torus and geometric representation of algebraic numbers.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (35 hours)	Factorization into Irreducibles, Examples of Nonunique Factorization into Irreducibles, Prime Factorization, Euclidean Domains, Euclidean Quadratic fields Ideals, Prime Factorization of Ideals,	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on numberfields and its properties	To understand: • the factorization into irreducibles • different types of numberfields • the factorization of ideals • properties of ideals	Evaluation through test paper and interaction with students

Module I1 (30 hours)	Examples of Nonunique Factorization into Irreducibles, Prime Factorization, Euclidean Domains, Euclidean Quadratic fields Ideals Historical background, Prime Factorization of Ideals, The norm of an ideal	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to understand prime factorization and quadratic fields	To understand: • Nonunique Factorization into Irreducibles • Factorization of Ideals and norm of an ideal	Evaluation Through test paper
Module III (25 Hours)	Lattices, The Quotient Torus, Minkowski theorem, The Space Lst, The Class-Group An Existence Theorem, Finiteness of the Class-Group, Factorization of a Rational Prime, Kummers Lemma, Kummers Theorem	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion and assignments to understand geometric representation of algebraic numbers	To understand: • The Quotient Torus • The class group	Evaluation through test paper

Course Outcomes

CO1	Awareness about different types of numberfield and their properties
CO2	Able to check unique factorization in fields and also can provide examples of nonunique factorizations
CO3	To understand the geometric representation of algebraic numbers

Faculty in charge:
Ms. Nikita P B

MT4E11 – ADVANCED FUNCTIONAL ANALYSIS

Number of hours of lectures per week : 5 hrs

Number of credits : 4

OBJECTIVE

To learn about duality, compactness and boundedness of spaces.

MODULE I

Duals and Transposes, Duals of Lp [a,b] and C[a,b], weak and weak* convergence, Reflexivity

MODULE II

Definition of Compact Linear Map, spectrum of a compact operator, Riesz Representation Theorems

MODULE III

Bounded Operators and Adjoints , Normal, Unitary and Self Adjoint Operators , Spectrum and Numerical Range , Compact self Adjoint Operator

TEXTBOOK

LIMAYE , B.V, FUNCTIONAL ANALYSIS, (2nd Edn.) New Age International Ltd, Publishers, New Delhi, Bangalore (1996)

REFERENCES

[1]R. Bhatia, Notes on Functional Analysis TRIM series, Hindustan Book Agency

[2]KesavanS, Functional Analysis TRIM series, Hindustan Book Agency

[3] S David Promislow, A First Course in Functional Analysis Wiley Interscience, John wiley & Sons, INC., (2008)

[4]E.Kreyszig, Introductory Functional Analysis with Applications John Wiley & Sons (1978)

OBJECTIVES

- To understand the concept of duality and reflexivity.
- To study spectrum of compact operators.
- To understand the concept of Bounded linear operators and its types.

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I	Dual spaces. Weak convergence Reflexivity	• Discussion • Participative learning • Problem solving • Lecture	Assignments on examples of dual spaces	To study about duality and weak convergence. To learn reflexivity.	Evaluation through test paper.
MODULE II	Compact operators and its spectrum. Riesz Representation theorems.	• Lecture • Discussion • Participative learning • Problem solving	Assignments on compact operators and examples	To learn about spectrum of compact operators	Evaluation through test paper.
MODULE III	Bounded operators. Adjoint, normal, unitary and self adjoint operators. Compact self adjoint operator.	• Lecture • Discussion • Participative learning • Problem solving	Seminar by students	To study Self adjoint operators and compactness.	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about duality and the concept of reflexivity
CO2	To learn about compact operators
CO3	To learn about Bounded linear operators and self adjoint operators

Faculty in charge: Ms. Krishnamol Ravindran

MTH4C11: GRAPH THEORY
Number of hours of Lectures per week: 5
Number of Credits: 3

Objectives

To understand the basic concepts of Graph theory.

Module 1

Basic concepts of Graph. Trees, Cut edges and Bonds, Cut vertices, Cayleys Formula, The Connector Problem, Connectivity, Blocks, Construction of Reliable Communication Networks, Euler Tours, Hamilton Cycles, The Chineese Postman Problem, The Travelling Salesman Problem.

Module 2

Matchings, Matchings and Coverings in Bipartite Graphs, Perfect Matchings, The Personnel Assignment Problem, Edge Chromatic Number, Vizings Theorem, The Timetabling Problem, Independent Sets, Ramseys Theorem

Module 3

Vertex Colouring-Chromatic Number, Brooks Theorem, Chromatic Polynomial, Girth and Chromatic Number, A Storage Problem, Plane and Planar Graphs, Dual Graphs, Eulers Formula, Bridges, Kuratowskis Theorem, The Five-Colour Theorem, Directed Graphs, Directed Paths, Directed Cycles.

TEXT : J.A. Bondy and U.S.R.Murty : Graph Theory with applications. Macmillan

References

[1] F. Harary : Graph Theory, Narosa publishers, Reprint 2013.
[2] Geir Agnarsson, Raymond Greenlaw: Graph Theory Modelling, Applications and Algorithms, Pearson Printice Hall, 2007.
[3] John Clark and Derek Allan Holton : A First look at Graph Theory, World Scientific (Singapore) in 1991 and Allied Publishers (India) in 1995
[4] R. Balakrishnan & K. Ranganathan : A Text Book of Graph Theory, Springer Verlag, 2nd edition 2012.

OBJECTIVES

a) **To understand the basic concepts of graphs, Trees, Cut edges and Bonds, Cut vertices, Euler Tours, Hamilton Cycles**

b) **To get familiarize with Matchings and Coverings in Bipartite Graphs, Perfect Matching, Independent Sets, Ramseys Theorem**

c) **To understand the concept of Vertex Colouring-Chromatic Number, Edge Chromatic Number , The Five-Colour Theorem, Directed Graphs.**

d) **To study more about Chromatic Polynomial, Girth and Chromatic Number**

e) **To understand The Five-Colour Theorem, Directed Graphs, Directed Paths, Directed Cycles.**

LESSON PLAN

Unit/ session/ hours (time required)	**Topics to be taught (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module 1 (30 hours)	Basic concepts of graph, Trees, Cut edges and Bonds, Cut vertices, Connectivity, Blocks, Euler Tours, Hamilton Cycles	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on basic concepts of graph	To understand: • the basics of graph, trees • Concepts of cut edges, cut vertices, Euler tour and Hamilton cycles	Evaluation Through MCQ
Module I1 (30 hours)	Matchings and Coverings, Perfect Matchings, Edge Chromatic Number, Vizings Theorem, Independent Sets, Edge colouring,Ramseys Theorem	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain the Personnel Assignment Problem and The Timetabling Problem	To understand: • differentiation of matchings and covering • Concepts of edge colouring and Ramseys theorem	Evaluation Through test paper
Module III (30 Hours)	Vertex Colouring-Chromatic Number, Brooks Theorem, , Plane and Planar Graphs, Dual Graphs, Eulers Formula, Bridges, Kuratowskis Theorem, The Five-Colour Theorem, Directed Graphs,	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on Storage Problem	To understand: • Vertex colouring and it's important results • Planar graphs, dual graphs and it's important result	Evaluation through test paper

Course Outcomes

CO1	To introduce the concept of basic graph theory, trees, cut vertices and cut edges, Euler tour and Hamilton cycles
CO2	To understand the concept of matchings and covering, Edge colouring.
CO3	To understand the concepts of vertex colouring and it's important results. Planar graphs and dual graphs.

Faculty in charge:
Ms Mariya Jose

MTH4E09: DIFFERENTIAL GEOMETRY
Number of hours of Lectures per week: 5
Number of Credits: 3

Objectives

To understand the basic concepts of differential geometry.

MODULE I

Graphs and Level Set, Vector fields, The Tangent Space, Surfaces, Vector Fields on Surfaces, Orientation. The Gauss Map .

MODULE II

Geodesics, Parallel Transport, The Weingarten Map, Curvature of Plane Curves, Arc Length and Line Integrals.

MODULE III

Curvature of Surfaces, Parametrized Surfaces, Local Equivalence of Surfaces and Parametrized Surfaces.

TEXT:

J.A.THORPE : ELEMENTARY TOPICS IN DIFFERENTIAL GEOMETRY

REFERENCES :

1) M. de Carmo : Differential Geometry of Curves and Surfaces, Prentice Hall Inc Englewood Cliffs NJ (1976).
2) V. Grilleman and A. Pollack : Differential Topology, Prentice Hall Inc Englewood Cliffs NJ (1974)
3) B. O'Neil : Elementary Differential Geometry, Academic Press NY (1966)
4) M. Spivak : A Comprehensive Introduction to Differential, Geometry, (Volumes 1 to 5), Publish or Perish, Boston (1970, 75)
5) R. Millmen and G. Parker : Elements of Differential Geometry, Prentice Hall Inc Englewood Cliffs NJ (1977)
6) I. Singer and J.A. Thorpe : Lecture Notes on Elementary Topology and Geometry, UTM, Springer Verlag, NY (1967)
7) W.L.Burke: Applied Differential Geometry , Cambridge University Press (1985).

OBJECTIVES

a) **To understand the basic concepts of level sets, surfaces and its curvature, geodesics,and parametrized surfaces .**

b) **To get familiarize with covariant derivatives and its properties.**

c) **To understand the concept of local and global parametrization.**

d) **To study more about parametrized surfaces and local equivalence of surface and parametrized surfaces.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I (30 hours)	Level sets,vector fields, the tangent space, surfaces and the gauss map.	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on vector fields and level sets.	To understand: • the basics of surfaces • notion of tangent space and the gauss map	Evaluation Through MCQ
Module II (30 hours)	Geodesics, Parallel transport, The Weingarten map, Arc length and line integrals.	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain the properties of derivatives of smooth vector field and covariant derivative.	To understand: • Local and global parametrization. • Concept of parallel transport.	Evaluation Through test paper
Module III	Curvature of surfaces, First and second fundamental	• Lecture • Discussion • Participative	• Seminar and assignment on local	To understand: • Principal, Gaussian, Gauss	Evaluation through test paper

(30 Hours)	forms,Parametrized surfaces and its local equivalence with surfaces.	learning • Problem solving	equivalence of surfaces and parametrized surfaces.	Kronecker and Mean curvature • Inverse function theorems.	

Course Outcomes

CO1	To introduce the concept of graphs and level sets, basics of surfaces and notion of tangent space anf gauss map.
CO2	To understand the concept of parallel transport, local and global parametrization, arc length and line integral.
CO3	To understand the principal ,Gaussian ,Gauss Kronecker and Mean curvature, and parametrized surfaces.

Faculty in charge:
Ms. Rossflower

MAT1B01: FOUNDATIONS OF MATHEMATICS

Lecture Hours per week: 4, Credits: 4

Internal: 20, External: 80, Examination 3 Hours

Objectives

To get introduced to many mathematical terms.

Module I (16 hrs)

Set operations: Difference and Symmetric difference, Algebra of sets, Duality, Classes of sets, Powersets Relations: Product set, Relations, Composition of relations, Types of relations, Partitions, Equivalence relations with example of congruence modulo relation, Partial ordering relations, n- ary relations.

Module II (16 hrs)

Functions : Identity function, constant functions, product (composition) of functions, theorems on one-one and onto functions, Mathematical functions, Recursively defined functions, Indexed collection of sets, Operations on indexed collection of sets, Equipotent sets, Denumerable and countable sets, Cardinal numbers.

Module III (20 hrs)

Function quick review, Shifting graphs , Limit and continuity , The Sandwich theorem, Target values and formal definition of limits, Extensions of limit concept, Continuity.

Module IV (20 hrs)

Basic Logic: Introduction, propositions, truth table, negation, conjunction and disjunction. Implications, biconditional propositions, converse, contra positive and inverse propositions and precedence of logical operators, Propositional equivalence, Logical equivalences, Predicates and quantifiers: Introduction, Quantifiers, Binding variables and Negations.

Textbooks:

1) **S. Lipschutz**: Set Theory and related topics (Second Edition), Schaum Outline Series, TataMcGraw- Hill Publishing Company, New Delhi.

2) **Thomas /Finney** : Calculus, 9th ed., LPE, Pearson Education.
3) **K.H. Rosen**: Discrete Mathematics and its Applications (sixth edition), Tata McGraw Hill Publishing Company.

Reference Books:

1) P.R. Halmos: Naive Set Theory, Springer.
2) E. Kamke, Theory of Sets, Dover Publishers.
3) Anton : Calculus, Wiley.
4) R.P. Grimaldi: Discrete and Combinatorial Mathematics, Pearson Education.

OBJECTIVES

1) To get familiarized with different set operations.
2) To learn about different kind of functions and sets.
3) To understand concepts like limit and continuity.
4) To introduce basic logic.

LESSON PLAN

Unit/ Hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **16 Hours**	Set operations, Relations.	• Lecture • Discussion • Participative learning • Problem solving	Seminar on Set Operations.	To master in Set Operations.	Evaluation through test paper

Module II **16 Hours**	Functions, Different kinds of Sets.	• Lecture • Discussion • Participative learning • Problem solving	Assignment on One-one and Onto functions.	To understand different kinds of functions and sets.	Evaluation through test paper
Module III **20 Hours**	Shifting Graphs, Limit and Continuity.	• Lecture • Discussion • Participative learning • Problem solving	Peer discussion on Limits.	To get introduced to Limit and Continuity.	Evaluation through testpaper and Viva
Module IV **20 Hours**	Logical equivalences, Quantifiers.	• Lecture • Discussions • Problem solving	Assignment on Logical equivalences.	To understand Logical equivalences.	Evaluation through testpaper

Course Outcomes

CO1	Get introduced to new mathematical terms.
CO2	Understand set properties and set functions.
CO3	Learn about functions and know about limit and continuity
CO4	To appreciate the beauty of logical arguments.

Teacher in Charge:

Geethu Simon

MAT2B02: CALCULUS

Lecture Hours per week: 4, Credits: 4

Internal: 20, External: 80, Examination 3 Hours

Objectives

To introduce students to the fundamental ideas of differentiability and integrability and also to some basic theorems of differential calculus.

Module I (20 hrs)

Extreme value of functions, The mean value theorem, The first derivative test for local extremum values , Graphing with y' and y'', Limit as x, Assymptotes and dominant terms.

Module II (20 hrs)

Optimization, Linearization and differentials, Riemann sums and definite – integrals, Properties, area and the mean value theorem, The fundamental theorem, Substitution in Definite Integrals.

Module III (20 hrs)

Areas between curves, Finding volumes by slicing ,Volumes of solids of revolution, Lengths of plane curves, Areas of surface of revolution.

Module IV (12 hrs)

Moments and centres of mass, Work

Textbooks:

1) **Thomas / Finney**: Calculus, 9th ed., LPE, Pearson Education.

Reference Books:

1) Anton : Calculus, Wiley.
2) S.K. Stein : Calculus with Analytic Geometry, McGraw Hill.

OBJECTIVES

1) To get an idea of sketching of curves.
2) To see different applications of derivatives and integrals.
3) To solve some optimization problems of interest in real life.
4) To establish the close connection between the two branches of Calculus: Differential and Integral Calculus.

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **20 Hours**	Extreme value of functions, The mean value theorem, The first derivative test for local extremum values , Graphing with y' and y", Limit as x, Assymptotes and dominant terms.	• Lecture • Discussion • Participative learning • Problem solving	Group discussion on Curve Sketching	To understand several techniques of sketching curves and learning limits.	Evaluation through test paper and group discussion
Module II **20 Hours**	Optimization, Linearization and differentials, Riemann sums and definite – integrals, Properties, area and the mean value	• Lecture • Discussion • Participative learning • Problem solving	Assignment to find integrals of functions	To deal with real life problems in Physics, Chemistry etc.	Evaluation through test paper

	theorem, The fundamental theorem, Substitution in Definite Integrals.				
Module III **20 Hours**	Areas between curves, Finding volumes by slicing, Volumes of solids of revolution, Lengths of plane curves, Areas of surface of revolution	• Lecture • Discussion • Participative learning • Problem solving	Assignment to find volume of some familiar objects	To explore relationship between Surfaces and Curves	Evaluation through testpaper
Module IV **12 Hours**	Moments and centres of mass, Work	• Lecture • Problem solving • Participative learning • Videos	Seminars related to Centre of Mass	To understand concepts like Work and Moment.	Evaluation through test paper and viva

Course Outcomes

CO1	To explore the relationship between moving/changing objects
CO2	To master integrals which is a powerful tool in solving problems in Physics, Chemistry, Biology, Engineering, Economics and other fields.
CO3	To deal with real life optimization problems.
CO4	To learn the practical way of evaluating the definite integral.

Teacher in Charge:
Geethu Simon

MAT3B03 CALCULUS AND ANALYTIC GEOMETRY

Lecture Hours per week: 5, Credits: 4

Internal: 20, External: 80, Examination 3 Hours

Objectives

To introduce fundamentals of calculus and geometry

Module I (15 hrs)

Natural logarithms, The Exponential function, and log , Growth and decay ,
L'Hopital's Rule, Relative rates of growth, Hyperbolic functions

Module II (25 hrs)

Limits of sequence of numbers,Theorems for calculating limits of sequences, Infinite series, Integral test for series of non-
negative terms,Comparison test for series of non negativeterms,Ratio and root test for series of non negati veterms, Alternating series, Absolute and conditional convergence.

Module III (15 hrs)

Power series, Taylor and Maclaurin's series, Convergence of Taylor series ,Error estimate

Module IV (35 hrs)

Conic section and quadratic equations, Classifying conic section by eccentricity ,Quadratic equations and rota tions, Parametrisation of plane curves, Calculus with parametrisedcurves,Polar coordinates, Graphing in polar co- ordinates, Polar equations for conic sections, Integration in polar coordinates.

Textbooks :

1) Thomas / Finney: Calculus, 9th ed., LPE, Pearson Education.

Reference Books:

1) Anton : Calculus, Wiley.

2) S.K. Stein : Calculus and Analytic Geometry, McGraw Hill

Department of Mathematics

OBJECTIVES

1) To know transcendental functions such as natural logarithmic and exponential function.
2) To study a related notion of convergence of series
3) To study Power series, Taylor series , Maclaurin's series and their convergence
4) To understand parametrisation of plane curves

LESSON PLAN

Unit/ session/ hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **15 Hours**	Natural logarithms , The Exponential function, and log , Growth and decay ,L'Hopital's Rule, Relative rate of growth, Hyper-bolic functions.	• Lecture • Discussion • Participative learning • Problem solving	• Group discussion on Growth and decay functions	To understand transcendental functions	Evaluation through test paper
Module II **25 Hours**	Limits of sequence of numbers, Infinite series, Integral test for series,Comparison test ,Ratio and root test , Alternating series, Absolute and co	• Lecture • Discussion • Participative learning • Problem solving	• Assignments related to convergence tests of infinite series	To understand convergence of sequences and series	Evaluation through test paper

	nditional converg ence.				
Module III **15 Hours**	Power series, Tay lor and Maclaurin's series, Convergence of Taylor series , Error estimate	• Lecture • Discussion • Participative learning • Problem solving	• Group discussion on power series	To study power series and convergence	Evaluation through test paper and group discussion
Module IV **35 Hours**	Conic section and quadratic equations ,Quadratic equation and rotations, Para metrisation of plane curves,Polar coordinates, Graph ing in polar co-ordinates, Polar eq uations for conic se ctions, Integration in polar coordinate s	• Lecture • Discussions • Problem solving	• Student seminars in connection with polar coordinates	To understand parametrisation of plane curves	Evaluation through test paper

Course Outcomes

CO1	To understand transcendental functions such as natural logarithmic and exponential function
CO2	To handle the convergence of series with different tests.
CO3	To learn Power series, Taylor series , Maclaurin’s series and their convergence
CO4	To understand parametrisation of plane curves

Department of Mathematics

Teacher in Charge:

Krishnamol Ravindran

MAT4B04: THEORY OF EQUATIONS, MATRICES AND VECTOR CALCULUS

Lecture Hours per week: 5, Credits: 4

Internal: 20, External: 80, Examination 3 Hours

Objectives

Develops a new and fundamental ideas of calculus for the simple, but important case of polynomials. Also uses the matrices to solve system of linear equations.

Module I (30 hrs)

Polynomial Equations and Fundamental Theorem of Algebra(without proof). Applications of the Fundamental theorem to equations having one or more complex roots, Rational roots or multiple roots. Relations between roots and co-efficients of a polynomial equation and computation of symmetric functions of roots.Finding equations whose roots are functions of the roots of a given equation. Reciprocal equation and method of finding its roots. Analytical methods for solving polynomial equations of order up to four - quadratic formula.Cardano's method for solving cubic equations.Ferrari's method (for quadratic equations). Remarks about the insolvability of equations of degree five or more.Finding the nature of roots without solving Descartes' rule of signs.

Module II (16 hrs)

Elementary transformation, reduction to normal form, row reduced echelon form.Computing the inverse of a non singular matrix using elementary row transformation.

Module III (20 hrs)

System of linear homogeneous equations.Null space and nullity of matrix. Sylvester's law of nullity.Range of a matrix.Systems of linear non homogeneous equations. Characteristic roots and characteristic vectors of a square matrix. Some fundamental theorem.Characteristic roots of Hermitian, Skew Hermitian and Unitary matrices.Characteristic equation of a matrix, Cayley- Hamilton theorem

Module IV (24 hrs)

Lines and planes in space. Cylinders and Quadric surfaces, Cylindrical and spherical coordinates, Vector valued functions and space curves, Arc length and Unit tangent vector , Curvature, torsion and TNB frame

Textbooks :

1. Bernard and Child: Higher Algebra, Macmillan

2.Shanti Narayanan &Mittal : A Text Book of Matrices, Revised edn., S. Chand

3. Thomas /Finney : Calculus, 9th ed., LPE, Pearson Education

Reference Books:

1.Kenneth Hoffman & Ray Kunze : Linear Algebra, Pearson Education.

2.ManicavachagomPillai, Natarajan, Ganapathy- Algebra

3.Dickson: First Course in Theory of Equation

4. Frank Ayres, Jr. : Matrices, Schaum's Outline Series, Asian Student edition.

5. Devi Prasad : Elementary Linear Algebra, Narosa Pub. House.

6. Kreyszig : Advanced Engineering Mathematics, 8th ed., Wiley.

7. H.F. Davis and A.D. Snider: Introduction to Vector Analysis, 6th ed.,

OBJECTIVE

- Learn to find the roots of polynomial equations up to degree 4, insolvability of equations of degree 5 or more.
- To compute the inverse of a non singular matrix using elementary row transformations.
- To understand about the characteristic equation and characteristic root of a matrix.
- Learn to use matrix to solve system of linear equations.
- Understand the basics of vector algebra
- Learn inner product, vector product and scalar triple product.
- Understand the concept of cylindrical and spherical coordinates.
- Learn about the plane and curves in space.

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **30 Hours**	Polynomial Equations and Fundamental Theorem of Algebra. Applications of the Fundamental theorem to equations having one or more complex roots, Rational roots or multiple roots. Relations between roots and co-efficients of a	• Lecture • Discussion • Participative learning • Problem solving	• Assignments to find roots of polynomial equations. • Seminar on the topic Transformat	• Learned to solve polynomials using cardan's method, Ferrari methods etc	Evaluation through test paper.

	polynomial equation and computation of symmetric functions of roots.Finding equations whose roots are functions of the roots of a given equation. Reciprocal equation and method of finding its roots. Analytical methods for solving polynomial equations of order up to four - quadratic formula.Cardano's method for solving cubic equations.Ferrari's method (for quadratic equations). Remarks about the insolvability of equations of degree five or more.Finding the nature of roots without solving Descartes' rule of signs.		ion of equations.		
Module II **16 Hours**	Elementary transformation, reduction to normal form, row reduced echelon form.Computing the inverse of a non singular matrix using elementary row transformation.	• Lecture • Discussion • Participative learning • Problem solving	• Assignments to find the inverse of a non singular matrix using elementary row transformation .	• Learn to determine wether a matrix is singular or non singular • Learn to find out the rank of a matrix.	Evaluation through test paper.
Module III **20 Hours**	System of linear homogeneous equations.Null space	• Lecture • Discussion • Participative	• Seminar on the topic related to	• Understand to solve system of equation	Evaluation through Test paper

	and nullity of matrix. Sylvester's law of nullity. Range of a matrix.Systems of linear non homogeneous equations. Characteristic roots and characteristic vectors of a square matrix. Some fundamental theorem. Characteristic roots of Hermitian, Skew Hermitian and Unitary matrices. Characteristic equation of a matrix, Cayley- Hamilton theorem	learning • Problem solving	vector space of n-tuples. • Assignments to solve system of equations.	using matrix • Learn about characteristic roots and vectors.	
Module IV **24 Hours**	Lines and planes in space. Cylinders and Quadric surfaces, Cylindrical and spherical coordinates, Vector valued functions and space curves, Arc length and Unit tangent vector , Curvature, torsion and TNB frame	• Lecture • Discussions • Problem solving	• Group discussion on Cylindrical and spherical coordinates.	• Learn basic results in vector algebra.	Evaluation through test paper

Course Outcomes

CO1	Learned to find out the roots of polynomial equations.
CO2	Computed the inverse of a non singular matrix using elementary row transformations.
CO3	Understand about the characteristic equation and characteristic root of a matrix.
CO4	Understand the method of Gauss-Jordan elimination to find the solutions of systems of simultaneous linear equations and Learned to solve a system of linear equations by row-reduced echelon form.
CO5	Understand the basic concepts in vector algebra.

Teacher in Charge:

Krishnamol Ravindran

ST1CO1 BASIC STATISTICS AND PROBABILITY

Lecture Hours per week: 4, Credits: 3

Internal: 20, External: 80, Examination 3 Hours

Objectives

Introduce basic concepts of statistics and to understand various approaches to probability and compute probabilities.

Module I (20 hrs)

Population, sample, measures of central tendency - arithmetic mean, weighted arithmetic mean, geometric mean, harmonic mean, median, mode, partition values - quartile, percentile, measures of deviations - variance, standard deviation, mean deviation about mean, quartile deviation, co-efficient of variation

Module II (15 hrs)

Fitting of straight line, parabola, exponential, polynomial, (least square method), correlation, regression, two regression lines, regression coefficients, properties - rank correlation, partial and multiple correlation

Module III (25 hrs)

Random experiment, Sample space, event, classical definition of probability, statistical regularity, relative frequency definition, field, sigma field, axiomatic definition of probability and simple properties, concept of probability measure, addition theorem(two and three events), conditional probability of two events, multiplication theorem, independence of events(pair wise and mutual), Bayes theorem. –numerical problems

Module IV (12 hrs)

Random variable- discrete and continuous, probability mass function (pmf) and probability density function (pdf) properties and examples, Cumulative Distribution function and its properties , change of variable (univariate case)

Reference Books:

1) V. K. Rohatgi, An Introduction to Probability Theory and Mathematical

Statistics, Wiley Eastern.

2) S.C.Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chan and Sons

3) A.M. Mood, F.A. Graybill and D C Bose, Introduction to Theory of Statistics, McGraw Hill

4) John E Freund, Mathematical Statistics (6th edn), Pearson Edn, NewDelhi

OBJECTIVES

1) To understand the basic concepts of population and sample
2) To summarize the data in a diagrammatic and graphical way, obtain descriptive statistics and make possible and appropriate interpretations
3) To understand various approaches to probability and compute probabilities.

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **20 Hours**	Population, sample, measures of central tendency, measures of deviations	• Lecture • Discussion • Participative learning • Problem solving	• Group discussion on methods of sampling	To understand advantages and limitations of sampling	Evaluation through test paper
Module II **15 Hours**	Fitting of straight line , parabola, exponential, polynomial, correlation, regression, two regression lines,	• Lecture • Discussion • Participative learning • Problem solving	• Students seminar related to curve fitting	To solve problems related to curve fitting	Evaluation through test paper

	regression coefficients, properties - rank correlation, partial and multiple correlation				
Module III **25 Hours**	Random experiment, Sample space, event, classical definition of probability, axiomatic definition of probability and simple properties, addition theorem, conditional probability of two events, multiplication theorem, independence of events, Bayes theorem	• Lecture • Discussion • Participative learning • Problem solving	• Assignments to compute probabilities	To understand basic definition and properties of probability	Evaluation through test paper and viva
Module IV **12 Hours**	Random variable- discrete and continuous, probability mass function and	• Lecture • Discussions • Problem solving	• Student seminars on probability mass function , probability	To understand discrete and continuous random variables	Evaluation through test paper

	probability density function , Cumulative Distribution Function and its properties change of variable		density function and their properties		

Course Outcomes

CO1	To understand advantages and limitations of sampling
CO2	To summarize the data in a diagrammatic and graphical way, obtain descriptive statistics and make possible and appropriate interpretations
CO3	To understand various approaches to probability and compute probabilities
CO4	To understand discrete and continuous random variables and their probability functions

Teacher in Charge:

Ms. Ross Flower

ST2CO2 : PROBABILITY DISTRIBUTIONS

Lecture Hours per week: 4, Credits: 3

Internal: 20, External: 80, Examination 3 Hours

Objectives

To introduce the idea about mathematical expectation and conditional probability of univariate, Bivariate random variable, Also the standard distribution and its properties.

Module I (15 hrs)

Mathematical expectations (univariate): Definition, raw and central moments (definition and relationships), moment generating function and properties, characteristic function (definition and use only), Skewness and kurtosis (using moments)

Module II (15 hrs)

Bivariate random variable: joint pmf and joint pdf, marginal and conditional probability, independence of random variables, function of random variable. Bivariate Expectations, conditional mean and variance, covariance, Karl Pearson Correlation coefficient, independence of random variables based on expectation.

Module III (30 hrs)

Standard distributions: Discrete type Bernoulli, Binomial, Poisson, Geometric, negative binomial (definition, properties and applications), Uniform (mean, variance and mgf), Continuous typeUniform, exponential, gamma, Beta, Normal (definition, properties and applications), Lognormal, Pareto and Cauchy (Definition only).

Module IV (12 hrs)

Chebyshev's inequality, variables, Convergence in probability weak law of large numbers (iid case), Bernoulli law of large numbers, example only), Central limit theorem (Lindberg Levyiid case).

Reference Books:

1. V. K. Rohatgi, An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern.
2. S.C.Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons
3. A.M. Mood, F.A. Graybill and D C Bose, Introduction to Theory of Statistics, McGraw Hill
4. John E Freund, Mathematical Statistics (6th edn), Pearson Edn, NewDelhi

OBJECTIVES

1. Discribe the moments, mgf, expectations, characteristic function, Skewness , kurtosis of univariate and bivariate random variable.
2. Give the knowledge of important discrete and continuous distributions such as Binomial, Poisson,

   Geometric, Negative Binomial and Hyper-geometric, normal, uniform, exponential, beta and gamma distributions
3. Understand the Concept of law large numbers and their uses.
4. Understand the Concept of central limit theorem and its uses.

LESSON PLAN

Unit/ session/ hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **15 Hours**	Mathematical expectations (univariate): Definition, raw and central moments (definition and relationships), moment generating function and properties, characteristic function (definition and use only), Skewness and kurtosis (using moments)	• Lecture • Discussion • Participative learning • Problem solving	• Assignments related to mathematical expectation, raw and cenral moments, mgf	• Understand the definition of moments, mgf , characteristic function, Skewness and kurtosis	Evaluation through test paper
Module II **15 Hours**	Bivariate random variable: joint pmf and joint pdf, marginal and conditional probability, independence of random variables, function of random variable. Bivariate Expectations, conditional mean and variance, covariance, Karl Pearson Correlation coefficient, independence of random variables based on expectation.	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars on the topic bivariate Expectations, conditional mean variance, and covariance.	• Give knowledge related to the concept of Bivariate random variable including expectation moments and mgf.	Evaluation through test paper

Module III 30 Hours	Standard distributions: Discrete type Bernoulli, Binomial, Poisson, Geometric, negative binomial, Uniform, Continuous typeUniform, exponential, gamma, Beta, Normal, Lognormal, Pareto and Cauchy.	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on discrete and Continuous distribution.	• Enable to understand different type of distribution.	Evaluation through test paper
Module IV 12 Hours	Chebyshev's inequality, variables, Convergence in probability weak law of large numbers (iid case), Bernoulli law of large numbers, example only), Central limit theorem (Lindberg Levyiid case).	• Lecture • Discussion • Participative learning • Problem solving	• Assignment on the topic sample mean and variance.	• Understand the weak law of large numbers, Bernoulli law of large numbers, Central limit theorem and its applications	Evaluation through test paper and viva

Course Outcomes

CO1	Understand the concept of uni variate, Bivariate Discrete and continuous random variable including expectation, moments and mgf.
CO2	Enable one to identify and classify different type of standard distribution.
CO3	Understand the weak law of large numbers, Bernoulli law of large numbers, Central limit theorem and its applications.

Teacher in Charge:

Ms Mariya

ST3CO3: STATISTICAL INFERENCE
Lecture Hours per week: 5, Credits: 3

Internal: 20, External: 80, Examination 3 Hours

Objectives

Introduce different type of sampling distributions and the concept of testing hypotheses.

Module I (25 hrs)

Sampling distributions: Statistic, Sampling distribution of a statistic, Standard error, Sampling from normal distribution, distribution of sample mean, sample variance, chisquare distribution, t distribution, and F distribution (definition, derivations and relationships only).

Module II (20 hrs)

Theory of Estimation: Point Estimation, desirable properties of a good estimator, unbiasedness, consistency, sufficiency, Fisher Neyman factorization theorem, efficiency. Methods of Estimation: Method of maximum likelihood, method of moments

Module III (15 hrs)

Interval Estimation: Interval estimates of mean, difference of means, variance, proportions and difference of proportions. Derivation of exact confidence intervals for means, variance and ratio of variances based on normal, t, chi square and F distributions

Module IV (30 hrs)

Testing of Hypotheses: concept of testing hypotheses, simple and composite hypotheses, null and alternative hypotheses, type I and II errors, critical region, level of significance and power of a test. Neyman Pearson approach: Large sample tests concerning mean equality of means, proportions, equality of proportions, Small sample tests based on t distribution for mean, equality of means and paired t test. Tests based on Fdistribution for ratio of variances. Tests based on Chi square distribution for variance, goodness of fit and for independence of attributes.

Reference Books:

1. V. K. Rohatgi, An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern.
2. S.C.Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons
3. A.M. Mood, F.A. Graybill and D C Bose, Introduction to Theory of Statistics, McGraw Hill
4. John E Freund, Mathematical Statistics (6th edn), Pearson Edn, NewDelhi

OBJECTIVES

- Introduce different type of sampling distributions.

- Introduce the concept of random sample from a distribution, sampling distribution of a statistic, standard error of important estimates such as mean and proportions
- knowledge about important inferential aspects such as point estimation, test of hypotheses and associated concepts
- Introduce Neyman Pearson approach in testing of hypotheses.

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **25 Hours**	Statistic, Sampling distribution of a statistic, Standard error, Sampling from normal distribution, distribution of sample mean, sample variance, chisquare distribution, t distribution, and F distribution	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on chisquare distribution, t distribution, and F distribution.	• Understand different type of sampling distributions.	Evaluation through test paper
Module II **20 Hours**	Point Estimation, desirable properties of a good estimator, unbiasedness, consistency, sufficiency, Fisher Neyman factorization theorem, Method of maximum likelihood,	• Lecture • Discussion • Participative learning • Problem solving	• Seminar on the topic Method of maximum likelihood and method of moments.	• Understand point estimation methods.	Evaluation through test paper.

	method of moments.				
Module III **15 Hours**	Interval estimates of mean, difference of means, variance, proportions and difference of proportions. Derivation of exact confidence intervals for means, variance and ratio of variances based on normal, t, chi square and F distributions	• Lecture • Discussion • Participative learning • Problem solving	• Seminar related to the topic difference of means, variance, and difference of proportions.	• Understand Interval estimation methods	Evaluation through Group Discussion.
Module IV **30 Hours**	concept of testing hypotheses, simple and composite hypotheses, null and alternative hypotheses, type I and II errors, critical region, level of significance and power of a test. Large sample tests, proportions, equality of proportions, Small sample tests based on t distribution for mean, equality of means and paired t test. Tests based on Fdistribution for ratio	• Lecture • Discussions • Problem solving	• Student seminars in connection with type I and II errors.	• Become familiar with the concept of testing hypotheses and different sample tests.	Evaluation through test paper

	of variances. Tests based on Chi square distribution for variance, goodness of fit and for independence of attributes.				

Course Outcomes

CO1	Understnd different sampling distribution and its properties.
CO2	Understand the tecniques of estimation and testing hypotheses for mean, variance, proportions, correlation coefficient, association and goodness of fit.
CO3	Knowledge of point and interval estimation proceduers and different method of point estimation.

Teacher in Charge:

Ms Sruthy V

ST4CO4 APPLIED STATISTICS

Lecture Hours per week: 5, Credits: 3

Internal: 20, External: 80, Examination 3 Hours

Objectives

To introduce sampling techniques and statistical quality control

Module I (20 hrs)

Census and Sampling, Principal steps in a sample survey, different types of sampling, Organisation and execution of large scale sample surveys, errors in sampling(sampling and non sampling errors), preparation of questionnaire, simple random sampling with and without replacement, Systematic, stratified and cluster sampling

Module II (15 hrs)

Analysis of variance; one way, two way classifications. Null hypothesis, total, between and within sum of squares. Assumptions - ANOVA table..

Module III (30 hrs)

Time series : Components of time series additive and multiplicative models , measurement of trend , moving averages, seasonal indicessimple averageratio to moving average., Index numbers: meaning and definition uses and types - problems in the construction of index numbers -different types of simple and weighted index numbers. Test for an ideal index number - time and factor reversal test.

Module IV (25 hrs)

Statistical Quality Control: Concept of statistical quality control, assignable causes and chance causes, process control, Construction of control charts, 3sigma limits, Control chart for variables -Mean chart and Range chart, Control chart for attributes - pchart, d or np chart and c chart

Reference Books:

1) S.C.Gupta and V. K. Kapoor, Fundamentals of Applied Statistics, Sultan Chand and Sons

2) Grant E L, Statistical quality control, McGraw Hill

3) Duncan A J, Quality Control and Industrial Statistics, Taraporewala and sons

4) Montegomery D C, Introduction to Statistical Quality Control, John Wiley and sons

5) S.P.Gupta: statistical methods

OBJECTIVES

1) To equip students with sampling techniques used in conducting sample surveys.
2) To understand the concepts of ANOVA model
3) To expose the area of time series and index numbers.
4) To provide an insight into quality assessment techniques.

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **20 Hours**	Census and Sampling, Principal steps in a sample survey, different types of sampling, Organisation and execution of large scale sample surveys, sampling and non sampling errors, simple random sampling with and without replacement, Systematic,	• Lecture • Discussion • Participative learning • Problem solving	• Group discussion on sampling and sample survey	To understand sampling techniques used in conducting sample surveys	Evaluation through test paper

	stratified and cluster sampling				
Module II **15 Hours**	Analysis of variance; one way, two way classifications, Null hypothesis, Assumptions - ANOVA table..	• Lecture • Discussion • Participative learning • Problem solving	• Assignments in finding variance between the samples	To understand the concepts of ANOVA model	Evaluation through test paper and viva
Module III **30 Hours**	Time series, Components of time series, measurement of trend, moving averages, seasonal indices, Index numbers, different types of simple and weighted index numbers, time and factor reversal test.	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars related to components of time series	To understand time series, seasonal indices and index numbers	Evaluation through MCQ and Group Discussion
Module IV **25 Hours**	Statistical Quality Control, assignable causes and chance causes, process control, Construction of	• Lecture • Discussions • Problem solving	• Assignment to construct control charts	To understand statistical quality control and its uses	Evaluation through test paper

	control charts, 3sigma limits, Control chart for variables- Mean chart and Range chart,Control chart for attributes- pchart, d or np chart and c chart				

Course Outcomes

CO1	To understand sampling techniques used in conducting sample surveys
CO2	To understand the concepts of ANOVA model
CO3	To learn the concepts of time series and index numbers
CO4	To provide an insight into quality assessment techniques.

Teacher in Charge:

Ms. Rossflower

MAT5B06 : ABSTRACT ALGEBRA

Lecture Hours per week: 5, Credits: 5

Internal: 30, External: 120, Examination 3 Hours

Objectives

To introduce the basic concept of the nature of abstract algebra also gives the idea of group and ring.

Module I (20 hrs)

Binary operations, Isomorphic binary structures, Groups, Sub groups

Module II (25 hrs)

Cyclic groups, Groups and permutations, Orbits, cycles and Alternating groups

Module III (15 hrs)

Cosets and Theorem of Lagrange, Homomorphisms

Module IV (30hrs)

Rings and Fields, Integral Domains, The Field of Quotients of an Integral Domain

Textbooks :

John B. Fraleigh : A First Course in Abstract Algebra, 7th Ed., Pearson.

Reference Books:

1. Joseph A. Gallian : Contemporary Abstract Algebra. Narosa Pub. House.
2. P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul: Basic Abstract Algebra, 2nded., Cambridge University
3. Artin : Algebra, PHI.
4. Durbin : Modern Algebra : An Introduction, 5th ed., Wiley.

OBJECTIVES

1) To enable one to determine whether the given binary operation on a given set forms a group.
2) To understand the concept of subgroups.
3) To describe all elements of a cyclic group using generators.
4) To enable one to understand the homomorphism and Theorem of Lagrange.
5) To understand the concept of rings, fields and integral domains.

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **20 Hours**	Binary operations, Isomorphic binary structures, Groups; Sub groups	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on Binary operation.	• Enable to understand the concept of Groups.	Evaluation through test paper
Module II **25 Hours**	Cyclic groups, Groups and permutations, Orbits, cycles and Alternating groups	• Lecture • Discussion • Participative learning • Problem solving	• Assignments on permutation and orbits.	• enable one to compute the expression of permutation and permutation multiplication • Enable to understand different type of groups.	Evaluation through test paper
Module III **15 Hours**	Cosets and Theorem of Lagrange, Homomorphism	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on properties of homomorphism • Peer group discussion on	• Understand the theorem Lagrange and homomorphism.	Evaluation through test paper

			Cosets.		
Module IV **30 Hours**	Rings and Fields, Integral Domains, The Field of Quotients of an Integral Domain	• Lecture • Discussion • Participative learning • Problem solving	• Seminar on the topic Rings and fields.	• To understand the concept of rings and fields • Learn the concept of Integral domain.	Evaluation through test paper and viva

Course Outcomes

CO1	Understand the concept of binary operation on a given set.
CO2	To get the idea of groups, rings, fields and integral domain.
CO3	Understand different type of groups like cyclic and alternating groups
CO4	Understand the homomorphism and Theorem of Lagrange

Teacher in Charge:

Geethu simon

MAT5B07: BASIC MATHEMATICAL ANALYSIS

Lecture Hours per week: 6, Credits: 5

Internal: 30, External: 120, Examination 3 Hours

Objectives

To develop ability to analyze and prove statements of mathematics using logical arguments.

Module I (20 hrs)

A quick review of sets and functions, Mathematical induction, Finite and infinite sets, Real Numbers, The algebraic property of real numbers.

Module II (24 hrs)

Absolute value and real line, The completeness property of R, Applications of supremum property, Intervals, Nested interval property and uncountability of R.

Module III (30 hrs)

Sequence of real numbers, Sequence and their limits, Limit theorems, Monotone sequences, Subsequence and Bolzano – Weirstrass theorem, Cauchy criterio,Properly divergent sequences, Open and closed sets.

Module IV (34 hrs)

COMPLEX NUMBERS: Sums and Products, Basic Algebraic properties, Further properties, Vectors and Moduli, Complex Conjugates, Exponential form, Product and powers in exponential form, Arguments of products and quotients, Roots of complex numbers, Regions in the complex plane, Functions of complex variable, Limits, Theorems on limits, Limits involving the points at infinity, Continuity.

Textbooks:

1) **Robert G. Bartle & Donald R. Sherbert**: Introduction to Real Analysis, 3rded., Wiley.
2) **J.W. Brown and Ruel V. Churchill**: Complex Variables and Applications, 8th Ed., McGraw Hill.

Reference Books:

1) J.M. Howie : Real Analysis, Springer 2007.

2) Ghorpade and Limaye : A Course in Calculus and Real Analysis, Springer, 2006.
3) K.A. Ross : Elementary Real Analysis : The Theory of Calculus, Springer Indian Reprint.
4) J.V. Deshpande : Mathematical Analysis and Applications, Narosh Pub. House.
5) M.R. Spiegel : Complex Variables, Schaum's Outline Series.

OBJECTIVES

1) To learn to prove Archimedean property, density theorem, existence of a positive square root for positive numbers and so on and the learning will help them to appreciate the beauty of logical arguments.
2) To learn how monotone convergence theorem can be used in establishing the divergence of the harmonic series, how it helps in the calculation of square root of positive numbers and how it establishes the existence of the transcendental number e.
3) To understand the concept of open and closed sets, their properties, their characterization and so on.
4) To familiarize the use of geometry, comparison between real and complex calculus-areas

LESSON PLAN

Unit/ Hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **20 Hours**	A quick review of sets and functions ,Mathematical induction, Finite and infinite sets Real Numbers, The algebraic property of	• Lecture • Discussion • Participative learning • Problem solving	Group discussion on Algebraic properties of R.	To generate the ability to analyze and prove statements of Mathematics.	Evaluation through test paper

	real numbers.				
Module II **24 Hours**	Absolute value and real line, The completeness property of R, Applications of supremum property Intervals, Nested interval property and uncountability of R.	• Lecture • Discussion • Participative learning • Problem solving	Student seminars related to Completeness Property of R.	To master different techniques of finding limits.	Evaluation through test paper
Module III **30 Hours**	Sequence of real numbers, Sequence and their limits, Limit theorems, Monotone sequences, Subsequence and Bolzano – Weirstrass theorem, Cauchy criterio, Properly divergent sequences, Open and closed sets.	• Lecture • Discussion • Participative learning • Problem solving	• Assignment in Limit Theorems. • Discussion on Open and Closed Sets.	To familiarize with different kinds of sequences.	Evaluation through testpaper and Viva
Module IV **34 Hours**	Sums and Products, Basic Algebraic properties, Further properties, Vectors and Moduli, Complex Conjugates, Exponential form, Product and powers in exponential form, Arguments of products and quotients, Roots of	• Lecture • Discussions • Problem solving	Student seminars to familiarize properties of Complex Numbers.	To understand areas where real and complex calculus agree and where they differ.	Evaluation through testpaper

	complex numbers, Regions in the complex plane, Functions of complex variable, Limits, Theorems on limits, Limits involving the points at infinity, Continuity.				

Course Outcomes

CO1	To appreciate the beauty of logical arguments and embolden them to apply it in similar and unknown problems.
CO2	To establish the divergence and convergence of different sequences and series.
CO3	To understand some basic topological properties of real number system.
CO4	To demystify student's belief that complex variable theory is incomprehensible.

Teacher in Charge:

M D Varghese

MAT5B08: DIFFERENTIAL EQUATIONS

Lecture Hours per week: 5, Credits: 4

Internal: 30, External: 120, Examination 3 Hours

Objectives

To find out ways and means for solving differential equations.

Module I (24 hrs)

Some Basic Mathematical Models: Direction Fields, Solutions of some Differential equations, Classification of Differential Equations, Historical Remarks, First order differential equations: Linear equations with variable coefficients, Separable equations, Modeling with first order equations, Differences between linear and non linear equations, Exact equations and integrating factors, The existence and uniqueness theorem.

Module II (29 hrs)

Second Order Linear Differential Equations: Homogeneous equation with constant coefficients, Fundamental solutions of Linear Homogeneous equations, Linear independence and Wronskian, Complex roots of characteristic equations, Repeated roots Reduction of order, Non homogeneous equations, Method of Undetermined coefficients, Variation of parameters, Mechanical and Electrical vibrations, Systems of First Order Linear equations: Introduction, Basic theory of systems of first order Linear Equations.

Module III (17 hrs)

Definition of Laplace Transforms , Solution of Initial Value Problem , Step functions , Impulse functions, The Convolution Integral.

Module IV (20 hrs)

Two point Boundary value problems , Fourier Series, The Fourier Convergence Theorem, Even and odd functions , Separation of variables; Heat conduction in a rod , The Wave equation, Vibrations of an elastic string.

Textbooks:

1) Thomas / Finney : Calculus, 9th ed., LPE, Pearson Education.

Reference Books:

1) Kreyszig : Advanced Engineering Mathematics, 8th ed., Wiley.
2) H.F. Davis and A.D. Snider: Introduction to Vector Analysis, 6th ed.,Universal Book Stall, New Delhi.

OBJECTIVES

1) To learn to solve DEs that are in linear, separable and in exact forms and also to analyze the solution.
2) To be familiar with the theory and method of solving a second order linear homogeneous and nonhomogeneous equation with constant coefficients.
3) To acquire the knowledge of solving a differential equation using Laplace method.
4) To get familiarized with Fourier series and its applications.

LESSON PLAN

Unit/ Hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **24 Hours**	Some Basic Mathematical Models, First order differential equations	• Lecture • Discussion • Participative learning • Problem solving	Assignment on solving first order differential equations.	To learn to solve DEs that are in linear, separable and in exact forms and also to analyze the solution.	Evaluation through test paper

Module II **29 Hours**	Second Order Linear Differential Equations, Systems of First Order Linear equations	• Lecture • Discussion • Participative learning • Problem solving	Student seminars related to Completeness Property of R.	To be familiar with the theory and method of solving a second order linear homogeneous and nonhomogeneous equation with constant coefficients.	Evaluation through test paper
Module III **17 Hours**	Laplace Transforms	• Lecture • Discussion • Participative learning • Problem solving	Assignment in solving Differential equations using Laplace transforms.	To acquire the knowledge of solving a differential equation using Laplace method.	Evaluation through testpaper and Viva
Module IV **20 Hours**	Partial Differential Equations and Fourier Series	• Lecture • Discussions • Problem solving	Student seminars in applications of Fourier Series.	To get familiarized with Fourier series and its applications.	Evaluation through testpaper

Course Outcomes

CO1	Students could identify a number of areas where the modelling process results in a differential equation.
CO2	They will realize the basic differences between linear and non linear DEs and also basic results that guarantees a solution in each case.
CO3	They will become familiar with the theory and method of solving a second order linear homogeneous and nonhomogeneous equation with constant coefficients.
CO4	Students acquire the knowledge of solving a differential equation using Laplace method which is especially suitable to deal with problems arising in engineering field.

Teacher in Charge:

Sruthy V

MAT5D02: MATHEMATICS FOR NATURAL SCIENCES

Lecture Hours per week: 2 Credits: 2

Internal: 10, External: 40, Examination 2 Hours

Objectives

To get introduced to statistical measures and analysis.

Module I (20 hrs)

The idea of sets, Operation on sets, Relations and functions, Variables and graphs, Frequency distributions, The Mean, Median, Mode and other measures of central tendency, Dispersion or variation, The Range, The Mean deviation, The Semi- inter quartile range, The 10- 90 Percentile range.

Module II (16 hrs)

The standard deviation, Properties of Standard Deviation, The variance, Short methods of computing standard deviation, Moments, Moments for grouped data, relation between moments, Computation of moment for grouped data. Skewness and Kurtosis.

Textbooks :

Murray R. Spiegel : Statistics, 2nd Edn., Schaum's Outline Series.

Reference Books:

1) Hogg & Craig: Introduction to Mathematical Statistics.
2) Freund & Walpole: Mathematical Statistics

OBJECTIVES

1) To understand different measures of tendency.
2) To analyse data using measures like SD, Skewness and Kurtosis.

LESSON PLAN

Unit/ Hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **18 Hours**	Sets, Frequency Distribution, Measures of Tendency	• Lecture • Discussion • Participative learning • Problem solving	Assignment on different measures of tendency.	To understand which measure is better for different kinds of data.	Evaluation through test paper and viva
Module II **12 Hours**	Standard Deviation, Moments, Skewness and Kurtosis.	• Lecture • Discussion • Participative learning • Problem solving	Student seminars on Skewness and Kurtosis on different datas.	To visualize how the data behaves.	Evaluation through test paper

Course Outcomes

CO1	Students get an understanding about the use of some statistical tools.
CO2	They learn to analyze data using different measures.

Teacher in Charge:

Rossflower

MAT5B05: VECTOR CALCULUS

Lecture Hours per week: 5, Credits: 4

Internal: 30, External: 120, Examination 3 Hours

Objectives

To Provide skils to visualize and manipulate multivariable and vector values functions. Also enable students to evaluate multiple integrals.

Module I (15 hrs)

Functions of several variables, Limits and Continuity, Partial derivatives, Differentiability linearization and differentials, Chain rule, Partial derivatives with constrained variables.

Module II (20 hrs)

Directional derivatives, gradient vectors and tangent planes, Extreme value and saddle points, Lagrange multipliers, Taylor's formula, Double Integrals, Double integrals in polar form.

Module III (25 hrs)

Triple integrals in Rectangular Coordinates, Triple integrals in cylindrical and spherical coordinates, Substitutions in multiple integrals, Line integrals, Vector fields, work circulation and flux, Path independence, potential functions and conservative fields.

Module IV (30hrs)

Green's theorem in the plane, Surface area and surface integrals, Parametrized surfaces, Stokes' theorem (statement only), Divergence theorem and unified theory (no proof).

Textbooks :

Thomas / Finney : Calculus, 9th ed., LPE, Pearson Education.

Reference Books:

1. Kreyszig : Advanced Engineering Mathematics, 8th ed., Wiley.
2. H.F. Davis and A.D. Snider: Introduction to Vector Analysis, 6th ed.,

OBJECTIVES

1) To enable one to apply the basic concepts of partial derivatives.
2) To learn to find multiple integrals.
3) To understand concept of the integrals of the functions and vector fields over parametrized surfaces and compute them in simple examples.
4) To calculate directional derivatives and gradients.
5) To learn application of greens theorem and stokes theorem.

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **15 Hours**	Functions of several variables, Limits and Continuity, Partial derivatives, Differentiability linearization and differentials, Chain rule, Partial derivatives with constrained variables.	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on Partial derivatives.	• Enable to find partial derivatives.	Evaluation through test paper
Module II **20 Hours**	Directional derivatives, gradient vectors and tangent planes, Extreme value and saddle points, Lagrange multipliers, Taylor's formula, Double Integrals, Double integrals in polar	• Lecture • Discussion • Participative learning • Problem solving	• Assignments in finding Directional derivatives and double integrals.	• Enable to evaluate double integrals.	Evaluation through test paper

	form.				
Module III **25 Hours**	Triple integrals in Rectangular Coordinates, Triple integrals in cylindrical and spherical coordinates, Substitutions in multiple integrals, Line integrals, Vector fields, work circulation and flux, Path independence, potential functions and conservative fields.	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain vector fields, work and circulation	Understand triple integrals and vector fields.	Evaluation through MCQ and Group Discussion
Module IV **30 Hours**	Green's theorem in the plane, Surface area and surface integrals, Parametrized surfaces, Stokes' theorem (statement only), Divergence theorem and unified theory (no proof).	• Lecture • Discussion • Participative learning • Problem solving	• Assignments related to Surface integrals.	Learn the application of greens theorem and stokes theorem in multiple integrals.	Evaluation through test paper

Course Outcomes

CO1	Understand the basic concept of partial derivatives.
CO2	Enable to calculate multiple integrals.
CO3	Understand the concept of a conservative vector field
CO4	Learn the application of greens theorem and stokes theorem in multiple integrals and understand how they are generalizations of the Fundamental theorem of calculus.

Teacher in Charge:

Ms. Mariya

MAT6B10 : COMPLEX ANALYSIS

Lecture Hours per week: 5, Credits: 5

Internal: 30, External: 120, Examination 3 Hours

Objectives

To learn basic concepts of complex analysis and its applications.

Module I : Analytic Functions (15 hrs)

Derivatives, Differentiation formula, Cauchy-
Riemann Equations, Polar coordinates, Analytic functions, Harmonic functions , Elementary functions , The exponential function, Logarithmic function, Complex exponents, Trigonometric functions, Hyperbolic f unctions, Inverse Trigonometric and Hyperbolic functions.

Module II : Integrals (25 hrs)

Derivatives of functions $\omega(t)$; Indefinite integral of $\omega(t)$; Contours, Contour integrals, Antiderivatives, Cauchy -
Goursat theorem (without proof), Simply and multiply connected domains, Cauchy's integral formula and its e xtension, Liouville's theorem and fundamental theorem of algebra, Maximum modulus principle.

Module III : Series (25 hrs)

A quick review of convergence of sequence and series of complex numbers,Taylor series, Laurents series (wi thoutproof), Applications,Power series: Absolute and uniform convergence,Continuity of sum of powerseries, Differentiation and integration of power series, Multiplication and division of power series.

Module IV : Residues (25 hrs)

Isolated singular points, Residues, Cauchy's residue theorem, Residue at infinity, Three types of isolated

singular points, Residues at poles, Zeroes of analytic functions, Zeroes and poles,Applications of residues, E valuation of improper integrals, Jordan's Lemma (statement only), Definite integrals involving sines and cosi nes.

Textbooks :

1) **James Ward Brown and Ruel V. Churchill** : Complex Variables and Applications (8th Edn.), McGraw Hill.

Reference Books:

1) Mark J.Ablowitz and Anthanassios S. Fokas: Complex Variables, Cambridge Text, 2nd Edn

2) S. Ponnusamy : Foundation of Complex Analysis : Narosa.

3) Murray R. Spiegel: Complex Variables, Schaum's Outline series.

4) J.M. Howie: Complex Analysis: Springer India Reprint

5) Stewart & Tall: Complex Analysis, CUP

OBJECTIVES

1) To develop differentiability and analyticity of complex valued functions
2) To develop complex integration
3) To represent an analytic function as power series.
4) To classify the singular points using Laurent series and develop the concept of residues and its applications.

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **15 Hours**	Derivatives, Cauchy- Riemann Equations,Analytic functions,Harmonic functions ,	• Lecture • Discussion • Participative learning • Problem solving	• Assignments in finding harmonic conjugates	To understand the difference between differentiability and analyticity	Evaluation through test paper

	Exponential , Logarithmic, Trigonometric , Hyperbolic , Inverse Trigonometric and Hyperbolic functions				
Module II **25 Hours**	Derivatives ofω(t), Indefinite integral of ω(t); Contours, Contour integrals, Antiderivatives, Cauchy-Goursat theorem , Simplyandmultiply connected domains, Cauchy's integralformula and its extension, Liouville's theorem and fundamental theorem of algebra, Maximum modulus principle.	• Lecture • Discussion • Participative learning • Problem solving	• Group discussion on contour integrals	To understand integration of complex functions and related theorems	Evaluation through test paper and viva
Module III **25 Hours**	Convergence of sequence and series of complex numbers ,Taylor series, Laurents series , Absolute and Uniform convergence,	• Lecture • Discussion • Participative learning • Problem solving	• Student seminar to explain absolute and uniform convergence of power series	To understand Taylor series and Laurent series	Evaluation through Test paper and Group Discussion

	Continuity of sum of powerseries, Differentiation and integration of power series, Multiplication and division of power series.				
Module IV **25 Hours**	Isolated singular points, Residues, Cauchy's residue theorem, Residue at infinity, Three types of isolated singular points, Residues at poles, Zeroes of analytic functions, Zeroes and poles, Applications of residues, Evaluation of improper integrals, Jordan's Lemma , Definite integral involving sines and cosines.	• Lecture • Discussions • Problem solving	• Assignments in finding isolated singular points and residues	To understand isolated singular points, residues and applications of residues	Evaluation through test paper

Course Outcomes

CO1	To understand difference between differentiability and analyticity of complex valued functions.
CO2	To learn indefinite integrals of complex valued functions.
CO3	Learn to express an analytic function as a power series.
CO4	To understand the concepts of singular points, residues, and applications of residues.

Teacher in Charge:

Geethu Simon

MAT6B13(E02) : LINEAR PROGRAMMING

Lecture Hours per week: 3, Credits: 2

Internal: 20, External: 80, Examination 3 Hours

Objectives

Formulate our real life problem into a mathematical model also different techniques to solve LPP are introduced.

Module I (16 hrs)

Formulation, Convex sets, General LLP

Module II (14 hrs)

Simplex Method, Duality

Module III (18 hrs)

The transportation problem, The assignment Problems

Textbooks :

Gupta and Manmohan - Linear Programming And Theory of Games

Reference Books:

1. . K. V. Mital&Manmohan: Optimization methods in Operations Research and Systems Analysis, 3rdEdn., New Age International publishers.
2. DipakChatterjee: Linear Programming and Game Theory, Prentice Hall of India.

OBJECTIVE

1. Enable to formulate LPP from real life problem
2. Conceptulize the feasible region, feasible solution, optimal solution etc.
3. Solve the LPP with two variables using graphical method
4. Solve the LPP using simplex method
5. Formulate the dual problem from primal
6. Solve transportation problem and the assignment Problems which are relevent in daily life.

LESSON PLAN

Unit/ session/ hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **16 Hours**	Formulation, Convex sets, General LLP	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on formulation of lpp. • Seminar on the topic convex sets.	• Understand to formulate lpp.	Evaluation through test paper
Module II **14 Hours**	Simplex Method, Duality	• Lecture • Discussion • Participative learning • Problem solving	• Assignments in solving LPP using simplex method.	• Understand to solve lpp in finite number of steps using simplex method.	Evaluation through test paper and viva
Module III **18 Hours**	The transportation problem, The assignment Problems	• Lecture • Discussion • Participative learning • Problem solving	• Assignments related to solve transportation problems and assignment problems	• Enable one to solve transportation problem and the assignment Problems which are relevent in daily life.	Evaluation through Test paper and Group Discussion

Course Outcomes

Course Outcomes

CO1	Enable one to formulate LPP from real life problem.

CO2	Solve the LPP with two variables using graphical method
CO3	Solve the LPP using simplex method
CO4	Solve transportation problem and the assignment Problems which are relevent in daily life.

Teacher in Charge:

Ms Nikita PB

MAT6B12 : NUMBER THEORY AND LINEAR ALGEBRA

Lecture Hours per week: 5, Credits: 4

Internal: 30, External: 120, Examination 3 Hours

Objectives

To study about the integers and integer valued functions. Also introduce the concept of vector fields and linear transformations.

Module I (30 hrs)

Divisibility theory in the integers – the division algorithm, the greatest common divisor, the Euclidean algorithm, the Diophantine equation ax + by = c. Primes and their distribution. The fundamental theorem of arithmetic.The sieve of Eratosthenes. The theory of congruences.Basic properties of congruence.Binary and decimal representation of integers. Linear congruences and Chinese remainder theorem

Module II (25 hrs)

Fermat's little theorem and pseudoprimes Wilson's theorem. The sum and number of divisors.The greatest integer function.Euler's phi-function.Euler's generalization of Fermat's theorem.Properties of the phi-function.

Module III (15 hrs)

Vectorspaces-examples, linearcombinations, spanning, linearindependence, base, finite dimensional vector spaces.

Module IV (20 hrs)

Linear mappings- Linear transformations, examples, nullspace, rank –nullity theorem, linear isomorphism

Textbooks :

1. David M. Burton : Elementary Number Theory, Sixth Edn., TMH.

2. T. S. Blynth and E.F. Robertson: Basic Linear Algebra, second Edn springer under graduate mathematics series 2009

Reference Books:

1. C.Y. Hsiung : Elementary Theory of Numbers. Allied Publishers.

2. Neville Robbins : Beginning Number Theory, Second Ed. Narosa.
3. George E. Andrews : Number Theory, HPC.
4. Kenneth Hoffman & Ray Kunze : Linear Algebra, Pearson Education.
5. Frank Ayres, Jr. : Matrices, Schaum's Outline Series, Asian Student edition.
6. Devi Prasad : Elementary Linear Algebra, Narosa Pub. House

OBJECTIVE

1. Enable to find gcd using Euclidean algorithm.
2. To understand the solution of diophantine equations.
3. Enable to solve system of congruence using chinese remainder theorem.
4. To learn Wilson's theorem, Fermat's little theorem and Euler's theorem
5. Understand the concept of vector space and its basis.
6. Understand the concept of linear transformation and application of rank nullity theorem.

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I 30 Hours	The division algorithm, Gcd, the Euclidean algorithm, the Diophantine equation. Primes and their distribution. The fundamental theorem of arithmetic. The sieve of Eratosthenes. The theory of congruences. Basic	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on gcd and euclidean algorithm. • Assignment in finding solution of system of congruence using chinese remainder theorem	• Understand the linear congruence and the method for finding its solutions.	Evaluation through test paper

	properties of congruence. Binary and decimal representation of integers. Linear congruences and Chinese remainder theorem.				
Module II **25 Hours**	Fermat's little theorem and pseudoprimes Wilson's theorem. The sum and number of divisors. The greatest integer function. Euler's phi-function. Euler's generalization of Fermat's theorem. Properties of the phi-function.	• Lecture • Discussion • Participative learning • Problem solving	• Assignments in finding sum and number of divisors • Seminar on the topic Euler's phi-function and Properties of the phi-function.	• Understand fermat's theorem, wilson's theorem, euler's theorem and its applications.	Evaluation through test paper and viva
Module III **15 Hours**	Vectorspaces- examples, linearcombinations, spanning, linearindependence, base, finite dimensional vector spaces.	• Lecture • Discussion • Participative learning • Problem solving	• Assignments related to vector space and its example.	• Understand the definition of vector space and its basis.	Evaluation through MCQ and Group Discussion
Module IV **20 Hours**	Linear mappings- Linear transformations, examples, nullspace, ranknullity theorem, linear isomorphism.	• Lecture • Discussions • Problem solving	• Student seminars inconnection with Linear transformation and its example.	• Become familiar with the concept of Linear transformations and rank nullity theorem.	Evaluation through test paper

Course Outcomes

CO1	To prove results involving divisibility, greatest common divisor, least commonmultiple and a few applications.
CO2	Enable to solve system of congruence and diophantine equation
CO3	To learn the theorems viz. Wilson's theorem, Fermat's little theorem and Euler's theorem and its applications.
CO4	To Lean if a set of vectors is a vector space or a basis for a vetor space.
CO5	Understand the concept of linear transformation and application of rank nullity theorem.

Teacher in Charge:

Ms. Mariya

MAT6B11 : NUMERICAL METHODS

Lecture Hours per week: 5, Credits: 4

Internal: 30, External: 120, Examination 3 Hours

Objectives

To provide techniques and algorithms to find approximate numerical solution to problems in several areas of mathematics.

Module I : Solution of Algebraic and Transcendental Equation (23 hrs)

Introduction, Bisection Method, Method of false position, Iteration method, Newton- Raphson Method, Ramanujan's method, The Secant Method, Finite Differences, Forward differences, Backward differences, Central differences, Symbolic relations and separation of symbols, Differences of a Polynomial.

Module II : Interpolation (23 hrs)

Newton's formulae for intrapolation, Central difference interpolation formulae, Gauss' Central Difference Formulae, Interpolation with unevenly spaced points, Langrange's interpolation formula, Divided differences and their properties, Newton's General interpolation formula, Inverse interpolation, Numerical Differentiation and Integration, Introduction, Numerical differentiation (using Newton's forward and backward formulae), Numerical Integration, Trapizoidal Rule, Simpson's 1/3- Rule , Simpson's 3/8- Rule.

Module III : Matrices and Linear Systems of equations (22 hrs)

Solution of Linear Systems – Direct Methods, Gauss elimination, Gauss- Jordan Method, Modification of Gauss method to compute the inverse, LU Decomposition, LU Decomposition from Gauss elimination, Solution of Linear Systems – Iterative methods, The eigen value problem, Eigen values of Symmetric Tridiazonal matrix.

Module IV : Numerical Solutions of Ordinary Differential Equations (22 hrs)

Introduction, Solution by Taylor's series, Picard's method of successive approximations, Euler's method, Modified Euler's Method, Runge- Kutta method, Predictor- Corrector Methods, Adams- Moulton Method, Milne's method.

Textbooks:

1) **S.S. Sastry** : Introductory Methods of Numerical Analysis, Fourth Edition, PHI.

Reference Books:

1) S. SankaraRao : Numerical Methods of Scientists and Engineer, 3rd ed., PHI.
2) F.B. Hidebrand : Introduction to Numerical Analysis, TMH.
3) J.B. Scarborough : Numerical Mathematical Analysis, Oxford and IBH

OBJECTIVES

1) To understand several methods such as bisection method, fixed point iteration method, regula falsi method etc.
2) To understand the concept of interpolation.
3) To solve system of linear equations using matrices.
4) To learn to find numerical approximations to solutions of initial value problems.

LESSON PLAN

Unit/ Hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **23 Hours**	Solution of Algebraic and Transcendental Equation, Finite differences	• Lecture • Discussion • Participative learning • Problem solving	• Assignment in different methods to solve equations	To learn to solve equations using different techniques.	Evaluation through test paper

			• Seminars in Finite differences		
Module II **23 Hours**	Interpolation, Numerical Differentiation, Numerical Integration	• Lecture • Discussion • Participative learning • Problem solving	Assignments in different techniques.	To find derivatives and integrals at a point using numerical techniques.	Evaluation through test paper
Module III **22 Hours**	Matrices and Linear Systems of equations	• Lecture • Discussion • Participative learning • Problem solving	Seminar on which technique is better and easier.	To learn to use matrices to solve system of linear equations.	Evaluation through testpaper and Viva
Module IV **22 Hours**	Numerical Solutions of Ordinary Differential Equations	• Lecture • Discussions • Problem solving	Assignment related to IVP	To find out numerical approximations to solutions of initial value problems.	Evaluation through testpaper

Course Outcomes

CO1	Understand several methods such as bisection method, fixed point iteration method, regula falsi method etc. to find out the approximate numerical solutions of algebraic and transcendental equations with desired accuracy.
CO2	Understand the concept of interpolation and also learn some well known interpolation techniques.
CO3	Understand a few techniques for numerical differentiation and integration and also realize their merits and demerits.
CO4	Find out numerical approximations to solutions of initial value problems and also to understand the efficiency of various methods.
CO5	Learn to solve system of linear equations using matrices.

Teacher in Charge:

Ms. Sruthy V

MAT6B09: REAL ANALYSIS

Lecture Hours per week: 5, Credits: 5

Internal: 30, External: 120, Examination 3 Hours

Objectives

To teach one how to combine different definitions, theorems and techniques to solve problems.

Module I : Continuous Functions (25 hrs)

Continuous functions, Continuous functions on intervals, Uniform continuity

Module II : Riemann Integral (25 hrs)

Riemann Integral, Riemann Integrable Functions, The fundamental theorem, Substitution theorem and application, Approximate Integration

Module III : Sequence and series of functions (20 hrs)

A quick review of series of real numbers, Pointwise and uniform convergence, Interchange of limit and continuity, Series of functions .

Module IV (20 hrs)

Improper Integrals : Improper integrals of the first kind, Improper integrals of the second kind,Cauchy Principal value, Improper Integrals of the third kind.

Beta and Gamma functions : Beta Functions, Gamma Functions, Relation between Beta and Gamma Functions

Textbooks:

1) **G. Bartle, Donald R. Sherbert** : Introduction to Real Analysis (3rd Edn.)
2) **R.R. Goldberg** : Methods of Real Analysis.
3) **Narayanan & Manicavachagom Pillay** : Calculus, Vol. II

Reference Books:

1) J.V. Deshpande: Mathematical Analysis and Applications, Narosa Pub. House.
2) Torence Tao : Analysis I, TRIM 37, Hindustan Book Agency.
3) K.A. Ross: Elementary Real Analysis : Theory of Calculus, Springer.
4) K.G. Binmore: Mathematical Analysis, CUP

OBJECTIVES

1) To state the definition of continuous functions, formulate sequential criteria for continuity and prove or disprove continuity of functions using this criteria.
2) To develop the notion of Riemann integrability of a function using the idea of tagged partitions and calculate the integral value of some simple functions using the definition.
3) To prove convergence and divergence of sequences of functions and series.
4) To learn the properties of and relationship among two important improper integrals.

LESSON PLAN

Unit/ Hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **25 Hours**	Continuous Functions, Uniform Continuity	• Lecture • Discussion • Participative learning • Problem solving	Assignment regarding difference in Continuity and Uniform Continuity.	To understand several deep and fundamental results of continuous functions on intervals.	Evaluation through test paper

Module II **25 Hours**	Riemann Integral	• Lecture • Discussion • Participative learning • Problem solving	Student seminars related to Riemann Intregrability.	To understand a few basic and fundamental results of integration theory.	Evaluation through test paper
Module III **20 Hours**	Sequence and series of functions	• Lecture • Discussion • Participative learning • Problem solving	Assignment on convergence of series and sequences of functions.	To understand the difference between pointwise and uniform convergence of sequences and series of functions.	Evaluation through testpaper and Viva
Module IV **20 Hours**	Improper Integrals, Beta and Gamma functions	• Lecture • Discussions • Problem solving	Seminars related to Improper Integrals and Principal Value.	To understand the notion of improper integrals, their convergence, principal value and evaluation.	Evaluation through testpaper

Course Outcomes

CO1	To understand several deep and fundamental results of continuous functions on intervals such as boundedness theorem, maximum-minimum theorem, intermediate value theorem, preservation of interval theorem and so on.
CO2	To develop the notion of Riemann integrability of a function using the idea of tagged partitions and calculate the integral value of some simple functions using the definition.
CO3	To learn and find out examples/counter examples to prove or disprove the validity of several mathematical statements that arise naturally in the process/context of learning.
CO4	To learn the properties of and relationship among two important improper integrals namely beta and gamma functions that frequently appear in mathematics, statistics, science and engineering.

Teacher in Charge:

M D Varghese

MAT 1C01 – MATHEMATICS(Complementary Course)

Number of hours of lectures per week : 4 hrs

Number of credits : 3

OBJECTIVE

To understand concepts of limit, Continuity, derivatives and integration.

MODULE I

Limits and Continuity: Rules for finding limits. Target values and formal definitions of limits. Extensions of limit concept, Continuity, Tangent lines

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MODULE II

Derivatives: The derivative of a function, a quick review of differentiation rules, rate of Change.

MODULE III

Application of derivatives: Extreme values of a function. The mean value theorem, First derivative test, Graphing with y' and y''. Limits as x approaches infinity. Asymptotes and dominant terms, Linearization and differentials. The L'Hopital's Rule.

MODULE IV

Integration: Riemann sums and Definite integrals; properties, areas and the Mean value theorem. The Fundamental theorem. Application of Integrals: Areas between curves, Finding Volumes by slicing.

TEXTBOOKS

George B. Thomas Jr. and Ross L. Finney : Calculus, LPE, Ninth edition, Pearson Education.

REFERENCES

[1] S.S. Sastry, Engineering Mathematics, Volume 1, 4th Edition PHI.

[2] Muray R Spiegel, Advanced Calculus, Schaum's Outline series.

OBJECTIVES

- To understand the basics of limits and continuity.
- To learn derivatives and differentiation rules
- To learn about applications of derivatives
- To understand L'Hospital's rule.
- To study in detail Riemann sums and integration.

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I (20 hours)	Limits and Continuity Epsilon – delta definitions	• Discussion • Participative learning • Problem solving	Discussions Lectures and Quizzes	Limits, Sandwich theorem,	Evaluation through test paper.
MODULE II (12 hours)	Derivatives and differentiation rukes	• Lecture • Discussion • Participative learning • Problem solving	. Discussion about differentiation rules.	Derivatives and rate of Change.	Evaluation through test paper.
MODULE III (24 hours)	Applications of derivatives, Graphing of functions	• Lecture • Discussion • Participative learning • Problem solving	Discussion Maximum minimum points	Plot graphs of a function by finding maximum and minimum points using derivatives	Evaluation through MCQ.
MODULE IV (16 hours)	Riemann Sums and integration and applications of integration	• Lecture • Discussion • Participative learning • Problem solving	Discussion on integration concepts	Integration concept using Riemann sums, area of surfaces	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about limit continuity and derivatives
CO2	To learn application of derivatives To study about plotting function graphs
CO3	To know about integration and its origin To learn about applications of integration

Faculty in Charge

Ms. Meera V

MAT 2C02 – MATHEMATICS(Complementary Course)

Number of hours of lectures per week : 4 hrs

Number of credits : 3

OBJECTIVE

To understand concepts of hyperbolic functions, improper integrals, partial differentiation, infinite series and polar coordinates.

MODULE I

Hyperbolic Functions - Definitions and Identities, Derivatives and Integrals, Inverse Hyperbolic , functions - Derivatives and Integrals, Application of Integrals :, Volumes of Solids of Revolution (Disk method only), Lengths of plane curves. Areas of surfaces of revolution Improper Integrals, Convergence and Divergence, Tests for Convergence and Divergence, Direct Comparison Test and Limit Comparison Test

.

MODULE II

Limit of Sequences of Number, Theorems for calculating limits of sequences (Excluding Picard's Method), Infinite series, The ratio and root test for series of non negative terms, alternating series, Absolute and conditional convergence, Power Series, Taylor and Maclaurin Series.

MODULE III

Polar coordinates, Graphing in Polar Coordinates, Polar equations for conic sections, integration in Polar coordinates, Cylindrical and Spherical Coordinates.

MODULE IV

Functions of Several Variables, Limits and Continuity, Partial Derivatives, differentiability, Chain rule

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TEXTBOOKS

George B. Thomas Jr. and Ross L. Finney : Calculus, LPE, Ninth edition, Pearson Education.

REFERENCES

[1] S.S. Sastry, Engineering Mathematics, Volume 1, 4th Edition PHI.

[2] Muray R Spiegel, Advanced Calculus, Schaum's Outline series.

OBJECTIVES

- To understand the Hyperbolic functions and improper integrals.
- To learn about sequences and series.
- To learn about polar coordinates and is graphing.
- To understand functions of several variables.
- To study partial differntiaition .

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I (20 hours)	Hyperbolic functions, Applications of integrals, improper integrals.	• Discussion • Participative learning • Problem solving	Discussions Lectures and Quizzes	Integrats and derivatives of Hyperbolic functions, Improper integrals, Volume and area of integrals	Evaluation through test paper.
MODULE II (28 hours)	Sequences and series of real numbers	• Lecture • Discussion • Participative learning • Problem solving	.Discussion about convergence of various series.	Convergence and divergence of series. Taylor and Maclaurin series.	Evaluation through test paper.
MODULE III (10 hours)	Polar Coordinates, Graphing, Cylindrical and Spherical coordinates.	• Lecture • Discussion • Participative learning • Problem solving	Discussion on cylindrical and spherical coordinates	Plot graphs of polar coordinates	Evaluation through MCQ.
MODULE IV (14 hours)	Functions of several variables, partial derivatives	• Lecture • Discussion • Participative learning • Problem solving	Discussion on partial derivatives	Partial differentiation	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about Infinite series and its convergence.
CO2	To learn hyperbolic functions and improper integrals. To study about Taylor series and Maclaurain series.
CO3	To know about polar coordinates and its plotting. To learn about partial differentiation.

Faculty in Charge

Ms. Smitha Davis

Ms. Amala Mary George

MAT 3C03 – MATHEMATICS(Complementary Course)

Number of hours of lectures per week : 5 hrs

Number of credits : 3

OBJECTIVE

To understand concepts of Ordinary differential equations, matrices and vector calculus.

MODULE I

Basic concepts and ideas, Geometrical meaning of y' = f(x,y). Direction Fields, Separable Differential Equations. Exact Differential Equations; Integrating Factors, Linear Differential Equations; Bernoulli Equation, Orthogonal Trajectories of Curves.

MODULE II

Rank of a Matrix, Non-Singular and Singular matrices, Elementary Transformations, Inverse of an elementary Transformations, Row Canonical form, Normal form. Systems of Linear equations: Homogeneous and Non Homogenoeus Equations, Characteristic equation of a matrix; Characteristic roots and characteristic vectors. Cayley-Hamilton Theorem (statement only) and simple applications.

MODULE III

A quick Review of vector algebra, Inner product and vector product in R^2 and R^3 . Vector and scalar functions and Fields, Derivatives, Curves, Tangents, Arc Length, Velocity and acceleration, Gradient of a scalar field; Directional Derivative, Divergence of a vector field, Curl of a Vector Field.

MODULE IV

Line Integrals, Independence of path, Green's Theorem in the Plane (without proof), surfaces for Surface Integrals, Surface Integrals, Triple Integrals, Divergence theorem of Gauss and Stoke's theorem (without proofs).

TEXTBOOKS

1. Erwin Kreyszig : Advanced Engineering Mathematics, Eighth Edition, Wiley, India.

2. Frank Ayres JR : Matrices, Schaum's Outline Series, TMH Edition.

REFERENCES

[1] S.S. Sastry, Engineering Mathematics, Volume 1, 4th Edition PHI.

[2] Muray R Spiegel, Vector Analysis, Schaum's Outline series, Asian Student Edition.

[3] Shanthi Narayanan & P.K. Mittal, A Text Book of Matrices, S. Chand

[4] Harry F. Davis & Arthur David Snider, Introduction to Vector Analysis, 6th ed., Universal Book Stall, New Delhi.

OBJECTIVES

- To understand the concepts in ordinary differential equations
- To learn about matrices and its properties
- To learn about Cayley Hamilton theorem
- To understand vectors
- To study in detail Vector Calculus

LESSON PLAN

Unit/Session (hours required)	Topics to be taught (input)	Procedure(process) Student centric method of teaching	Activity	Learning Outcome (output)	Assessment
MODULE I (20 hours)	Modeling of differential equations, methods to solve first order differential equations.	• Discussion • Participative learning • Problem solving	Discussions Lectures and Quizzes	Geometrical meaning of ODE, solving I order ODEs	Evaluation through test paper.
MODULE II (20 hours)	Rank of a matrix, solution of system of linear equations, Cayley- Hamilton theorem	• Lecture • Discussion • Participative learning • Problem solving	. Discussion about Eigen values and vectors	Normal and Echoleon form of matrices, Solution of linear system of equations, Eigen values and vectors	Evaluation through test paper.
MODULE III (25 hours)	Introduction to vectors and vector differential calculus	• Lecture • Discussion • Participative learning • Problem solving	Discussion on derivatives of vector functions	Know gradient, divergence, curl of a vector function	Evaluation through MCQ.
MODULE IV (25 hours)	Vector integral calculus	• Lecture • Discussion • Participative learning • Problem solving	Discussion on surface integrals	Greens theorem, Stoke's theorem, Gauss divergence theorem	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about I order ordinary differential equations
CO2	To learn solution of system of linear equations To study about eigen values and eigen vectors.
CO3	To know about vector differential calculus To learn about vector integral calculus

Faculty in Charge

Ms. Rossflower

MAT 4C04 – MATHEMATICS(Complementary Course)

Number of hours of lectures per week : 5 hrs

Number of credits : 3

OBJECTIVE

To understand concepts of Second order differential equations, Laplace tranforms, Fourier series, Numerical methods

MODULE I

Linear Differential equations of Second and Higher order: Differential Operators, Euler-Cauchy Equation, Wronskian, Nonhomogeneous Equations, Solutions by Undetermined Coefficients, Solution by variation of Parameters.

MODULE II

Laplace Transforms: Laplace Transform, Inverse Transform, Linearity, Shifting, Transforms of Derivatives of Integrals, Differential Equations. Unit step Function, Second Shifting Theorem, Dirac Delta Function, Differentiation and integration of Transforms, Convolution, Integral Equations, Partial Fractions, Differential Equations.

.

MODULE III

Fourier Series : Periodic Functions, Trigonometric Series, Fourier Series, Even and Odd functions, Half-range Expansions, Partial differential Equations: Basic Concepts, Vibrating String, Wave Equation, Separation of Variables, Use of Fourier Series

MODULE IV

Numerical Methods: Methods of First-order Differential Equations, Picard's iteration for initial Value Problems. Numerical Integration: Trapezoidal Rule, Simpson's Rule.

TEXTBOOKS

1. Erwin Kreyszig, Advanced Engineering Mathematics, Eighth Edition, Wiley, India.
2. George B. Thomas Jr. and Ross L. Finney : Calculus, LPE, Ninth edition, Pearson Education.

REFERENCES

[1] S.S. Sastry, Engineering Mathematics, Volume 1, 4th Edition PHI.
[2] Muray R Spiegel, Advanced Calculus, Schaum's Outline series.

[3] Murray R. Spiegel, Laplace Transforms, Schaum's Outline Series.

OBJECTIVES

- To understand the methods to solve II and higher order derivatives
- To learn Laplace and inverse Laplace equations
- To learn about Fourier series and Half range expansions
- To understand classical partial differential equations
- To study in detail some numerical methods for integration and ODEs.

LESSON PLAN

Unit/Session (hours required)	Topics to be taught (input)	Procedure(process) Student centric method of teaching	Activity	Learning Outcome (output)	Assessment
MODULE I (20 hours)	Solution of II and higher order differential equations	• Discussion • Participative learning • Problem solving	Discussions Lectures on wronskian	Euler-Cauchy equations, various methods for solving II order DEs	Evaluation through test paper.
MODULE II (20 hours)	Laplace transforms, Inverse Laplace transforms, Shifting theorems	• Lecture • Discussion • Participative learning • Problem solving	. Discussion about laplace and inverse Laplace transforms	Solution of differential equations using Laplace transforms	Evaluation through test paper.
MODULE III (30 hours)	Fourier series and its half range expansions	• Lecture • Discussion • Participative learning • Problem solving	Discussion on Fourier series expansions of periodic functions	Solution of heat and wave equations using Fourier series	Evaluation through test paper.
MODULE IV (20 hours)	Numerical methods for integration and solving differential equations	• Lecture • Discussion • Participative learning • Problem solving	Discussion on various numerical methods	Runge – Kutta, Euler methods, Trapeziodal, Simpson’s rule.	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about Euler- Cauchy equations, method of undetermined coefficients and method of variation of parameters
CO2	To learn Solving differential equations using Laplace transforms To study about Fourier series
CO3	To know about solution of Heat and Wave Equations To learn about various numerical methods.

Faculty in Charge

Ms. Smitha Davis

Ms. Linet Roslin Antony

Dr. Nidhin T J

MAT1B01: FOUNDATIONS OF MATHEMATICS

Lecture Hours per week: 4, Credits: 4

Internal: 20, External: 80, Examination 3 Hours

Objectives

To get introduced to many mathematical terms.

Module I (16 hrs)

Set operations: Difference and Symmetric difference, Algebra of sets, Duality, Classes of sets, Powersets Relations: Product set, Relations, Composition of relations, Types of relations, Partitions, Equivalence relations with example of congruence modulo relation, Partial ordering relations, n-ary relations.

Module II (16 hrs)

Functions : Identity function, constant functions, product (composition) of functions, theorems on one-one and onto functions, Mathematical functions, Recursively defined functions, Indexed collection of sets, Operations on indexed collection of sets, Equipotent sets, Denumerable and countable sets, Cardinal numbers.

Module III (20 hrs)

Function quick review, Shifting graphs , Limit and continuity , The Sandwich theorem, Target values and formal definition of limits, Extensions of limit concept, Continuity.

Module IV (20 hrs)

Basic Logic: Introduction, propositions, truth table, negation, conjunction and disjunction. Implications, biconditional propositions, converse, contra positive and inverse propositions and precedence of logical operators, Propositional equivalence, Logical equivalences, Predicates and quantifiers: Introduction, Quantifiers, Binding variables and Negations.

Textbooks:

1) **S. Lipschutz**: Set Theory and related topics (Second Edition), Schaum Outline Series, TataMcGraw-Hill Publishing Company, New Delhi.

2) **Thomas /Finney** : Calculus, 9th ed., LPE, Pearson Education.
3) **K.H. Rosen**: Discrete Mathematics and its Applications (sixth edition), Tata McGraw Hill Publishing Company.

Reference Books:

1) P.R. Halmos: Naive Set Theory, Springer.
2) E. Kamke, Theory of Sets, Dover Publishers.
3) Anton : Calculus, Wiley.
4) R.P. Grimaldi: Discrete and Combinatorial Mathematics, Pearson Education.

OBJECTIVES

1) To get familiarized with different set operations.
2) To learn about different kind of functions and sets.
3) To understand concepts like limit and continuity.
4) To introduce basic logic.

LESSON PLAN

Unit/ Hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **16 Hours**	Set operations, Relations.	• Lecture • Discussion • Participative learning • Problem solving	Seminar on Set Operations.	To master in Set Operations.	Evaluation through test paper

Module II **16 Hours**	Functions, Different kinds of Sets.	• Lecture • Discussion • Participative learning • Problem solving	Assignment on One-one and Onto functions.	To understand different kinds of functions and sets.	Evaluation through test paper
Module III **20 Hours**	Shifting Graphs, Limit and Continuity.	• Lecture • Discussion • Participative learning • Problem solving	Peer discussion on Limits.	To get introduced to Limit and Continuity.	Evaluation through testpaper and Viva
Module IV **20 Hours**	Logical equivalences, Quantifiers.	• Lecture • Discussions • Problem solving	Assignment on Logical equivalences.	To understand Logical equivalences.	Evaluation through testpaper

Course Outcomes

CO1	Get introduced to new mathematical terms.
CO2	Understand set properties and set functions.
CO3	Learn about functions and know about limit and continuity
CO4	To appreciate the beauty of logical arguments.

Teacher in Charge:

Geethu Simon

MAT2B02: CALCULUS

Lecture Hours per week: 4, Credits: 4

Internal: 20, External: 80, Examination 3 Hours

Objectives

To introduce students to the fundamental ideas of differentiability and integrability and also to some basic theorems of differential calculus.

Module I (20 hrs)

Extreme value of functions, The mean value theorem, The first derivative test for local extremum values , Graphing with y' and y'', Limit as x, Assymptotes and dominant terms.

Module II (20 hrs)

Optimization, Linearization and differentials, Riemann sums and definite – integrals, Properties, area and the mean value theorem, The fundamental theorem, Substitution in Definite Integrals.

Module III (20 hrs)

Areas between curves, Finding volumes by slicing ,Volumes of solids of revolution, Lengths of plane curves, Areas of surface of revolution.

Module IV (12 hrs)

Moments and centres of mass, Work

Textbooks:

1) **Thomas / Finney**: Calculus, 9th ed., LPE, Pearson Education.

Reference Books:

1) Anton : Calculus, Wiley.
2) S.K. Stein : Calculus with Analytic Geometry, McGraw Hill.

OBJECTIVES

1) To get an idea of sketching of curves.
2) To see different applications of derivatives and integrals.
3) To solve some optimization problems of interest in real life.
4) To establish the close connection between the two branches of Calculus: Differential and Integral Calculus.

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **20 Hours**	Extreme value of functions, The mean value theorem, The first derivative test for local extremum values , Graphing with y' and y'', Limit as x, Assymptotes and dominant terms.	• Lecture • Discussion • Participative learning • Problem solving	Group discussion on Curve Sketching	To understand several techniques of sketching curves and learning limits.	Evaluation through test paper and group discussion
Module II **20 Hours**	Optimization, Linearization and differentials, Riemann sums and definite – integrals, Properties, area and the mean value	• Lecture • Discussion • Participative learning • Problem solving	Assignment to find integrals of functions	To deal with real life problems in Physics, Chemistry etc.	Evaluation through test paper

	theorem, The fundamental theorem, Substitution in Definite Integrals.				
Module III **20 Hours**	Areas between curves, Finding volumes by slicing, Volumes of solids of revolution, Lengths of plane curves, Areas of surface of revolution	• Lecture • Discussion • Participative learning • Problem solving	Assignment to find volume of some familiar objects	To explore relationship between Surfaces and Curves	Evaluation through testpaper
Module IV **12 Hours**	Moments and centres of mass, Work	• Lecture • Problem solving • Participative learning • Videos	Seminars related to Centre of Mass	To understand concepts like Work and Moment.	Evaluation through test paper and viva

Course Outcomes

CO1	To explore the relationship between moving/changing objects
CO2	To master integrals which is a powerful tool in solving problems in Physics, Chemistry, Biology, Engineering, Economics and other fields.
CO3	To deal with real life optimization problems.
CO4	To learn the practical way of evaluating the definite integral.

Teacher in Charge:
Prof. M D Vargehese

MAT3B03 CALCULUS AND ANALYTIC GEOMETRY

Lecture Hours per week: 5, Credits: 4

Internal: 20, External: 80, Examination 3 Hours

Objectives

To introduce fundamentals of calculus and geometry

Module I (15 hrs)

Natural logarithms, The Exponential function, and log , Growth and decay ,
L'Hopital's Rule, Relative rates of growth, Hyperbolic functions

Module II (25 hrs)

Limits of sequence of numbers,Theorems for calculating limits of sequences, Infinite series, Integral test for series of non-
negative terms,Comparison test for series of non negativeterms,Ratio and root test for series of non negati veterms, Alternating series, Absolute and conditional convergence.

Module III (15 hrs)

Power series, Taylor and Maclaurin's series, Convergence of Taylor series ,Error estimate

Module IV (35 hrs)

Conic section and quadratic equations, Classifying conic section by eccentricity ,Quadratic equations and rota tions, Parametrisation of plane curves, Calculus with parametrisedcurves,Polar coordinates, Graphing in polar co-ordinates, Polar equations for conic sections, Integration in polar coordinates.

Textbooks :

1) Thomas / Finney: Calculus, 9th ed., LPE, Pearson Education.

Reference Books:

1) Anton : Calculus, Wiley.

2) S.K. Stein : Calculus and Analytic Geometry, McGraw Hill

OBJECTIVES

1) To know transcendental functions such as natural logarithmic and exponential function.
2) To study a related notion of convergence of series
3) To study Power series, Taylor series , Maclaurin's series and their convergence
4) To understand parametrisation of plane curves

LESSON PLAN

Unit/ session/ hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **15 Hours**	Natural logarithms , The Exponential function, and log , Growth and decay ,L'Hopital's Rule, Relative rate of growth, Hyper-bolic functions.	• Lecture • Discussion • Participative learning • Problem solving	• Group discussion on Growth and decay functions	To understand transcendental functions	Evaluation through test paper
Module II **25 Hours**	Limits of sequence of numbers, Infinite series, Integral test for series,Comparison test ,Ratio and root test , Alternating series, Absolute and co	• Lecture • Discussion • Participative learning • Problem solving	• Assignments related to convergence tests of infinite series	To understand convergence of sequences and series	Evaluation through test paper

	nditional converg ence.				
Module III **15 Hours**	Power series, Tay lor and Maclaurin's series, Convergence of Taylor series , Error estimate	• Lecture • Discussion • Participative learning • Problem solving	• Group discussion on power series	To study power series and convergence	Evaluation through test paper and group discussion
Module IV **35 Hours**	Conic section and quadratic equations ,Quadratic equation and rotations, Para metrisation of plane curves,Polar coordinates, Graph ing in polar co-ordinates, Polar eq uations for conic se ctions, Integration in polar coordinate s	• Lecture • Discussions • Problem solving	• Student seminars in connection with polar coordinates	To understand parametrisation of plane curves	Evaluation through test paper

Course Outcomes

CO1	To understand transcendental functions such as natural logarithmic and exponential function
CO2	To handle the convergence of series with different tests.
CO3	To learn Power series, Taylor series , Maclaurin's series and their convergence
CO4	To understand parametrisation of plane curves

Department of Mathematics

Teacher in Charge:

Krishnamol Ravindran

MAT4B04: THEORY OF EQUATIONS, MATRICES AND VECTOR CALCULUS

Lecture Hours per week: 5, Credits: 4

Internal: 20, External: 80, Examination 3 Hours

Objectives

Develops a new and fundamental ideas of calculus for the simple, but important case of polynomials. Also uses the matrices to solve system of linear equations.

Module I (30 hrs)

Polynomial Equations and Fundamental Theorem of Algebra(without proof). Applications of the Fundamental theorem to equations having one or more complex roots, Rational roots or multiple roots. Relations between roots and co-efficients of a polynomial equation and computation of symmetric functions of roots.Finding equations whose roots are functions of the roots of a given equation. Reciprocal equation and method of finding its roots. Analytical methods for solving polynomial equations of order up to four - quadratic formula.Cardano's method for solving cubic equations.Ferrari's method (for quadratic equations). Remarks about the insolvability of equations of degree five or more.Finding the nature of roots without solving Descartes' rule of signs.

Module II (16 hrs)

Elementary transformation, reduction to normal form, row reduced echelon form.Computing the inverse of a non singular matrix using elementary row transformation.

Module III (20 hrs)

System of linear homogeneous equations.Null space and nullity of matrix. Sylvester's law of nullity.Range of a matrix.Systems of linear non homogeneous equations. Characteristic roots and characteristic vectors of a square matrix. Some fundamental theorem.Characteristic roots of Hermitian, Skew Hermitian and Unitary matrices.Characteristic equation of a matrix, Cayley- Hamilton theorem

Module IV (24 hrs)

Lines and planes in space. Cylinders and Quadric surfaces, Cylindrical and spherical coordinates, Vector valued functions and space curves, Arc length and Unit tangent vector , Curvature, torsion and TNB frame

Textbooks :

1. Bernard and Child: Higher Algebra, Macmillan

2.Shanti Narayanan &Mittal : A Text Book of Matrices, Revised edn., S. Chand

3. Thomas /Finney : Calculus, 9th ed., LPE, Pearson Education

Reference Books:

1.Kenneth Hoffman & Ray Kunze : Linear Algebra, Pearson Education.

2.ManicavachagomPillai, Natarajan, Ganapathy- Algebra

3. Dickson: First Course in Theory of Equation

4. Frank Ayres, Jr. : Matrices, Schaum's Outline Series, Asian Student edition.

5. Devi Prasad : Elementary Linear Algebra, Narosa Pub. House.

6. Kreyszig : Advanced Engineering Mathematics, 8th ed., Wiley.

7. H.F. Davis and A.D. Snider: Introduction to Vector Analysis, 6th ed.,

OBJECTIVE

- Learn to find the roots of polynomial equations up to degree 4, insolvability of equations of degree 5 or more.
- To compute the inverse of a non singular matrix using elementary row transformations.
- To understand about the characteristic equation and characteristic root of a matrix.
- Learn to use matrix to solve system of linear equations.
- Understand the basics of vector algebra
- Learn inner product, vector product and scalar triple product.
- Understand the concept of cylindrical and spherical coordinates.
- Learn about the plane and curves in space.

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **30 Hours**	Polynomial Equations and Fundamental Theorem of Algebra. Applications of the Fundamental theorem to equations having one or more complex roots, Rational roots or multiple roots. Relations between roots and co-efficients of a polynomial equation	• Lecture • Discussion • Participative learning • Problem solving	• Assignments to find roots of polynomial equations. • Seminar on the topic Transformation of	• Learned to solve polynomials using cardan's method, Ferrari methods etc	Evaluation through test paper.

	and computation of symmetric functions of roots.Finding equations whose roots are functions of the roots of a given equation. Reciprocal equation and method of finding its roots. Analytical methods for solving polynomial equations of order up to four - quadratic formula.Cardano's method for solving cubic equations.Ferrari's method (for quadratic equations). Remarks about the insolvability of equations of degree five or more.Finding the nature of roots without solving Descartes' rule of signs.		equations.		
Module II **16 Hours**	Elementary transformation, reduction to normal form, row reduced echelon form.Computing the inverse of a non singular matrix using elementary row transformation.	• Lecture • Discussion • Participative learning • Problem solving	• Assignments to find the inverse of a non singular matrix using elementary row transformation .	• Learn to determine wether a matrix is singular or non singular • Learn to find out the rank of a matrix.	Evaluation through test paper.
Module III **20 Hours**	System of linear homogeneous equations.Null space and nullity of matrix.	• Lecture • Discussion • Participative learning	• Seminar on the topic related to vector space	• Understand to solve system of equation using matrix	Evaluation through Test paper

	Sylvester's law of nullity. Range of a matrix.Systems of linear non homogeneous equations. Characteristic roots and characteristic vectors of a square matrix. Some fundamental theorem. Characteristic roots of Hermitian, Skew Hermitian and Unitary matrices. Characteristic equation of a matrix, Cayley- Hamilton Theorem	• Problem solving	of n-tuples. • Assignments to solve system of equations.	• Learn about characteristic roots and vectors.	
Module IV **24 Hours**	Lines and planes in space. Cylinders and Quadric surfaces, Cylindrical and spherical coordinates, Vector valued functions and space curves, Arc length and Unit tangent vector , Curvature, torsion and TNB Frame	• Lecture • Discussions • Problem solving	• Group discussion on Cylindrical and spherical coordinates.	• Learn basic results in vector algebra.	Evaluation through test paper

Course Outcomes

CO1	Learned to find out the roots of polynomial equations.
CO2	Computed the inverse of a non singular matrix using elementary row transformations.
CO3	Understand about the characteristic equation and characteristic root of a matrix.
CO4	Understand the method of Gauss-Jordan elimination to find the solutions of systems of simultaneous linear equations and Learned to solve a system of linear equations by row-reduced echelon form.
CO5	Understand the basic concepts in vector algebra.

Teacher in Charge:

Dr Vijitha Mukundan

Prof. M D Varghese

MAT5B06 : ABSTRACT ALGEBRA

Lecture Hours per week: 5, Credits: 5

Internal: 30, External: 120, Examination 3 Hours

Objectives

To introduce the basic concept of the nature of abstract algebra also gives the idea of group and ring.

Module I (20 hrs)

Binary operations, Isomorphic binary structures, Groups, Sub groups

Module II (25 hrs)

Cyclic groups, Groups and permutations, Orbits, cycles and Alternating groups

Module III (15 hrs)

Cosets and Theorem of Lagrange, Homomorphisms

Module IV (30hrs)

Rings and Fields, Integral Domains, The Field of Quotients of an Integral Domain

Textbooks :

John B. Fraleigh : A First Course in Abstract Algebra, 7th Ed., Pearson.

Reference Books:

1. Joseph A. Gallian : Contemporary Abstract Algebra. Narosa Pub. House.
2. P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul: Basic Abstract Algebra, 2nded., Cambridge University
3. Artin : Algebra, PHI.
4. Durbin : Modern Algebra : An Introduction, 5th ed., Wiley.

OBJECTIVES

1) To enable one to determine whether the given binary operation on a given set forms a group.
2) To understand the concept of subgroups.
3) To describe all elements of a cyclic group using generators.
4) To enable one to understand the homomorphism and Theorem of Lagrange.
5) To understand the concept of rings, fields and integral domains.

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **20 Hours**	Binary operations, Isomorphic binary structures, Groups; Sub groups	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on Binary operation.	• Enable to understand the concept of Groups.	Evaluation through test paper
Module II **25 Hours**	Cyclic groups, Groups and permutations, Orbits, cycles and Alternating groups	• Lecture • Discussion • Participative learning • Problem solving	• Assignments on permutation and orbits.	• enable one to compute the expression of permutation and permutation multiplication • Enable to understand different type of groups.	Evaluation through test paper
Module III **15 Hours**	Cosets and Theorem of Lagrange, Homomorphism	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on properties of homomorphism • Peer group discussion on	• Understand the theorem Lagrange and homomorphism.	Evaluation through test paper

			Cosets.		
Module IV **30 Hours**	Rings and Fields, Integral Domains, The Field of Quotients of an Integral Domain	• Lecture • Discussion • Participative learning • Problem solving	• Seminar on the topic Rings and fields.	• To understand the concept of rings and fields • Learn the concept of Integral domain.	Evaluation through test paper and viva

Course Outcomes

CO1	Understand the concept of binary operation on a given set.
CO2	To get the idea of groups, rings, fields and integral domain.
CO3	Understand different type of groups like cyclic and alternating groups
CO4	Understand the homomorphism and Theorem of Lagrange

Teacher in Charge:

Geethu simon

MAT5B07: BASIC MATHEMATICAL ANALYSIS

Lecture Hours per week: 6, Credits: 5

Internal: 30, External: 120, Examination 3 Hours

Objectives

To develop ability to analyze and prove statements of mathematics using logical arguments.

Module I (20 hrs)

A quick review of sets and functions, Mathematical induction, Finite and infinite sets, Real Numbers, The algebraic property of real numbers.

Module II (24 hrs)

Absolute value and real line, The completeness property of R, Applications of supremum property, Intervals, Nested interval property and uncountability of R.

Module III (30 hrs)

Sequence of real numbers, Sequence and their limits, Limit theorems, Monotone sequences, Subsequence and Bolzano – Weirstrass theorem, Cauchy criterio,Properly divergent sequences, Open and closed sets.

Module IV (34 hrs)

COMPLEX NUMBERS: Sums and Products, Basic Algebraic properties, Further properties, Vectors and Moduli, Complex Conjugates, Exponential form, Product and powers in exponential form, Arguments of products and quotients, Roots of complex numbers, Regions in the complex plane, Functions of complex variable, Limits, Theorems on limits, Limits involving the points at infinity, Continuity.

Textbooks:

1) **Robert G. Bartle & Donald R. Sherbert**: Introduction to Real Analysis, 3rded., Wiley.
2) **J.W. Brown and Ruel V. Churchill**: Complex Variables and Applications, 8th Ed., McGraw Hill.

Reference Books:

1) J.M. Howie : Real Analysis, Springer 2007.

2) Ghorpade and Limaye : A Course in Calculus and Real Analysis, Springer, 2006.
3) K.A. Ross : Elementary Real Analysis : The Theory of Calculus, Springer Indian Reprint.
4) J.V. Deshpande : Mathematical Analysis and Applications, Narosh Pub. House.
5) M.R. Spiegel : Complex Variables, Schaum's Outline Series.

OBJECTIVES

1) To learn to prove Archimedean property, density theorem, existence of a positive square root for positive numbers and so on and the learning will help them to appreciate the beauty of logical arguments.
2) To learn how monotone convergence theorem can be used in establishing the divergence of the harmonic series, how it helps in the calculation of square root of positive numbers and how it establishes the existence of the transcendental number e.
3) To understand the concept of open and closed sets, their properties, their characterization and so on.
4) To familiarize the use of geometry, comparison between real and complex calculus-areas

LESSON PLAN

Unit/ Hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **20 Hours**	A quick review of sets and functions ,Mathematical induction, Finite and infinite sets Real Numbers, The algebraic property of	• Lecture • Discussion • Participative learning • Problem solving	Group discussion on Algebraic properties of R.	To generate the ability to analyze and prove statements of Mathematics.	Evaluation through test paper

	real numbers.				
Module II **24 Hours**	Absolute value and real line, The completeness property of R, Applications of supremum property Intervals, Nested interval property and uncountability of R.	• Lecture • Discussion • Participative learning • Problem solving	Student seminars related to Completeness Property of R.	To master different techniques of finding limits.	Evaluation through test paper
Module III **30 Hours**	Sequence of real numbers, Sequence and their limits, Limit theorems, Monotone sequences, Subsequence and Bolzano – Weirstrass theorem, Cauchy criterio, Properly divergent sequences, Open and closed sets.	• Lecture • Discussion • Participative learning • Problem solving	• Assignment in Limit Theorems. • Discussion on Open and Closed Sets.	To familiarize with different kinds of sequences.	Evaluation through testpaper and Viva
Module IV **34 Hours**	Sums and Products, Basic Algebraic properties, Further properties, Vectors and Moduli, Complex Conjugates, Exponential form, Product and powers in exponential form, Arguments of products and quotients, Roots of	• Lecture • Discussions • Problem solving	Student seminars to familiarize properties of Complex Numbers.	To understand areas where real and complex calculus agree and where they differ.	Evaluation through testpaper

	complex numbers, Regions in the complex plane, Functions of complex variable, Limits, Theorems on limits, Limits involving the points at infinity, Continuity.				

Course Outcomes

CO1	To appreciate the beauty of logical arguments and embolden them to apply it in similar and unknown problems.
CO2	To establish the divergence and convergence of different sequences and series.
CO3	To understand some basic topological properties of real number system.
CO4	To demystify student's belief that complex variable theory is incomprehensible.

Teacher in Charge:

M D Varghese

MAT5B08: DIFFERENTIAL EQUATIONS

Lecture Hours per week: 5, Credits: 4

Internal: 30, External: 120, Examination 3 Hours

Objectives

To find out ways and means for solving differential equations.

Module I (24 hrs)

Some Basic Mathematical Models: Direction Fields, Solutions of some Differential equations, Classification of Differential Equations, Historical Remarks, First order differential equations: Linear equations with variable coefficients, Separable equations, Modeling with first order equations, Differences between linear and non linear equations, Exact equations and integrating factors, The existence and uniqueness theorem.

Module II (29 hrs)

Second Order Linear Differential Equations: Homogeneous equation with constant coefficients, Fundamental solutions of Linear Homogeneous equations, Linear independence and Wronskian, Complex roots of characteristic equations, Repeated roots Reduction of order, Non homogeneous equations, Method of Undetermined coefficients, Variation of parameters, Mechanical and Electrical vibrations, Systems of First Order Linear equations: Introduction, Basic theory of systems of first order Linear Equations.

Module III (17 hrs)

Definition of Laplace Transforms , Solution of Initial Value Problem , Step functions , Impulse functions, The Convolution Integral.

Module IV (20 hrs)

Two point Boundary value problems , Fourier Series, The Fourier Convergence Theorem, Even and odd functions , Separation of variables; Heat conduction in a rod , The Wave equation, Vibrations of an elastic string.

Textbooks:

1) Thomas / Finney : Calculus, 9th ed., LPE, Pearson Education.

Reference Books:

1) Kreyszig : Advanced Engineering Mathematics, 8th ed., Wiley.
2) H.F. Davis and A.D. Snider: Introduction to Vector Analysis, 6th ed.,Universal Book Stall, New Delhi.

OBJECTIVES

1) To learn to solve DEs that are in linear, separable and in exact forms and also to analyze the solution.
2) To be familiar with the theory and method of solving a second order linear homogeneous and nonhomogeneous equation with constant coefficients.
3) To acquire the knowledge of solving a differential equation using Laplace method.
4) To get familiarized with Fourier series and its applications.

LESSON PLAN

Unit/ Hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **24 Hours**	Some Basic Mathematical Models, First order differential equations	• Lecture • Discussion • Participative learning • Problem solving	Assignment on solving first order differential equations.	To learn to solve DEs that are in linear, separable and in exact forms and also to analyze the solution.	Evaluation through test paper

Module II **29 Hours**	Second Order Linear Differential Equations, Systems of First Order Linear equations	• Lecture • Discussion • Participative learning • Problem solving	Student seminars related to Completeness Property of R.	To be familiar with the theory and method of solving a second order linear homogeneous and nonhomogeneous equation with constant coefficients.	Evaluation through test paper
Module III **17 Hours**	Laplace Transforms	• Lecture • Discussion • Participative learning • Problem solving	Assignment in solving Differential equations using Laplace transforms.	To acquire the knowledge of solving a differential equation using Laplace method.	Evaluation through testpaper and Viva
Module IV **20 Hours**	Partial Differential Equations and Fourier Series	• Lecture • Discussions • Problem solving	Student seminars in applications of Fourier Series.	To get familiarized with Fourier series and its applications.	Evaluation through testpaper

Course Outcomes

CO1	Students could identify a number of areas where the modelling process results in a differential equation.
CO2	They will realize the basic differences between linear and non linear DEs and also basic results that guarantees a solution in each case.
CO3	They will become familiar with the theory and method of solving a second order linear homogeneous and nonhomogeneous equation with constant coefficients.
CO4	Students acquire the knowledge of solving a differential equation using Laplace method which is especially suitable to deal with problems arising in engineering field.

Teacher in Charge:

Ms. Krishnamol Ravindran

MAT5D02: MATHEMATICS FOR NATURAL SCIENCES

Lecture Hours per week: 2 Credits: 2

Internal: 10, External: 40, Examination 2 Hours

Objectives

To get introduced to statistical measures and analysis.

Module I (20 hrs)

The idea of sets, Operation on sets, Relations and functions, Variables and graphs, Frequency distributions, The Mean, Median, Mode and other measures of central tendency, Dispersion or variation, The Range, The Mean deviation, The Semi-inter quartile range, The 10-90 Percentile range.

Module II (16 hrs)

The standard deviation, Properties of Standard Deviation, The variance, Short methods of computing standard deviation, Moments, Moments for grouped data, relation between moments, Computation of moment for grouped data. Skewness and Kurtosis.

Textbooks :

Murray R. Spiegel : Statistics, 2nd Edn., Schaum's Outline Series.

Reference Books:

1) Hogg & Craig: Introduction to Mathematical Statistics.
2) Freund & Walpole: Mathematical Statistics

OBJECTIVES

1) To understand different measures of tendency.
2) To analyse data using measures like SD, Skewness and Kurtosis.

LESSON PLAN

Module I **18 Hours**	Sets, Frequency Distribution, Measures of Tendency	• Lecture • Discussion • Participative learning • Problem solving	Assignment on different measures of tendency.	To understand which measure is better for different kinds of data.	Evaluation through test paper and viva
Module II **12 Hours**	Standard Deviation, Moments, Skewness and Kurtosis.	• Lecture • Discussion • Participative learning • Problem solving	Student seminars on Skewness and Kurtosis on different datas.	To visualize how the data behaves.	Evaluation through test paper

Course Outcomes

CO1	Students get an understanding about the use of some statistical tools.
CO2	They learn to analyze data using different measures.

Teacher in Charge:

Ms. Rossflower

MAT5B05: VECTOR CALCULUS

Lecture Hours per week: 5, Credits: 4

Internal: 30, External: 120, Examination 3 Hours

Objectives

To Provide skils to visualize and manipulate multivariable and vector values functions. Also enable students to evaluate multiple integrals.

Module I (15 hrs)

Functions of several variables, Limits and Continuity, Partial derivatives, Differentiability linearization and differentials, Chain rule, Partial derivatives with constrained variables.

Module II (20 hrs)

Directional derivatives, gradient vectors and tangent planes, Extreme value and saddle points, Lagrange multipliers, Taylor's formula, Double Integrals, Double integrals in polar form.

Module III (25 hrs)

Triple integrals in Rectangular Coordinates, Triple integrals in cylindrical and spherical coordinates, Substitutions in multiple integrals, Line integrals, Vector fields, work circulation and flux, Path independence, potential functions and conservative fields.

Module IV (30hrs)

Green's theorem in the plane, Surface area and surface integrals, Parametrized surfaces, Stokes' theorem (statement only), Divergence theorem and unified theory (no proof).

Textbooks :

Thomas / Finney : Calculus, 9th ed., LPE, Pearson Education.

Reference Books:

1. Kreyszig : Advanced Engineering Mathematics, 8th ed., Wiley.
2. H.F. Davis and A.D. Snider: Introduction to Vector Analysis, 6th ed.,

OBJECTIVES

1) To enable one to apply the basic concepts of partial derivatives.
2) To learn to find multiple integrals.
3) To understand concept of the integrals of the functions and vector fields over parametrized surfaces and compute them in simple examples.
4) To calculate directional derivatives and gradients.
5) To learn application of greens theorem and stokes theorem.

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **15 Hours**	Functions of several variables, Limits and Continuity, Partial derivatives, Differentiability linearization and differentials, Chain rule, Partial derivatives with constrained variables.	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on Partial derivatives.	• Enable to find partial derivatives.	Evaluation through test paper
Module II **20 Hours**	Directional derivatives, gradient vectors and tangent planes, Extreme value and saddle points, Lagrange multipliers, Taylor's formula, Double Integrals, Double integrals in polar	• Lecture • Discussion • Participative learning • Problem solving	• Assignments in finding Directional derivatives and double integrals.	• Enable to evaluate double integrals.	Evaluation through test paper

	form.				
Module III **25 Hours**	Triple integrals in Rectangular Coordinates, Triple integrals in cylindrical and spherical coordinates, Substitutions in multiple integrals, Line integrals, Vector fields, work circulation and flux, Path independence, potential functions and conservative fields.	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain vector fields, work and circulation	Understand triple integrals and vector fields.	Evaluation through MCQ and Group Discussion
Module IV **30 Hours**	Green's theorem in the plane, Surface area and surface integrals, Parametrized surfaces, Stokes' theorem (statement only), Divergence theorem and unified theory (no proof).	• Lecture • Discussion • Participative learning • Problem solving	• Assignments related to Surface integrals.	Learn the application of greens theorem and stokes theorem in multiple integrals.	Evaluation through test paper

Course Outcomes

CO1	Understand the basic concept of partial derivatives.
CO2	Enable to calculate multiple integrals.
CO3	Understand the concept of a conservative vector field
CO4	Learn the application of greens theorem and stokes theorem in multiple integrals and understand how they are generalizations of the Fundamental theorem of calculus.

Teacher in Charge:

Ms. Meera V

MAT6B10 : COMPLEX ANALYSIS

Lecture Hours per week: 5, Credits: 5

Internal: 30, External: 120, Examination 3 Hours

Objectives

To learn basic concepts of complex analysis and its applications.

Module I : Analytic Functions (15 hrs)

Derivatives, Differentiation formula, Cauchy-
Riemann Equations, Polar coordinates, Analytic functions, Harmonic functions , Elementary functions , The exponential function, Logarithmic function, Complex exponents, Trigonometric functions, Hyperbolic f unctions, Inverse Trigonometric and Hyperbolic functions.

Module II : Integrals (25 hrs)

Derivatives of functions ω(t); Indefinite integral of ω(t); Contours, Contour integrals, Antiderivatives, Cauchy -
Goursat theorem (without proof), Simply and multiply connected domains, Cauchy's integral formula and its e xtension, Liouville's theorem and fundamental theorem of algebra, Maximum modulus principle.

Module III : Series (25 hrs)

A quick review of convergence of sequence and series of complex numbers,Taylor series, Laurents series (wi thoutproof), Applications,Power series: Absolute and uniform convergence,Continuity of sum of powerseries, Differentiation and integration of power series, Multiplication and division of power series.

Module IV : Residues (25 hrs)

Isolated singular points, Residues, Cauchy's residue theorem, Residue at infinity, Three types of isolated

singular points, Residues at poles, Zeroes of analytic functions, Zeroes and poles,Applications of residues, E valuation of improper integrals, Jordan's Lemma (statement only), Definite integrals involving sines and cosi nes.

Textbooks :

1) **James Ward Brown and Ruel V. Churchill** : Complex Variables and Applications (8th Edn.), McGraw Hill.

Reference Books:

1) Mark J.Ablowitz and Anthanassios S. Fokas: Complex Variables, Cambridge Text, 2nd Edn

2) S. Ponnusamy : Foundation of Complex Analysis : Narosa.

3) Murray R. Spiegel: Complex Variables, Schaum's Outline series.

4) J.M. Howie: Complex Analysis: Springer India Reprint

5) Stewart & Tall: Complex Analysis, CUP

OBJECTIVES

1) To develop differentiability and analyticity of complex valued functions
2) To develop complex integration
3) To represent an analytic function as power series.
4) To classify the singular points using Laurent series and develop the concept of residues and its applications.

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **15 Hours**	Derivatives, Cauchy-Riemann Equations,Analytic functions,Harmonic functions , Exponential ,	• Lecture • Discussion • Participative learning • Problem solving	• Assignments in finding harmonic conjugates	To understand the difference between differentiability and analyticity	Evaluation through test paper

	Logarithmic, Trigonometric , Hyperbolic , Inverse Trigonometric and Hyperbolic functions				
Module II **25 Hours**	Derivatives ofω(t), Indefinite integral of ω(t); Contours, Contour integrals, Antiderivatives, Cauchy-Goursat theorem , Simplyand multiply connected domains, Cauchy's integralformula and its extension, Liouville's theorem and fundamental theorem of algebra, Maximum modulus principle.	• Lecture • Discussion • Participative learning • Problem solving	• Group discussion on contour integrals	To understand integration of complex functions and related theorems	Evaluation through test paper and viva
Module III **25 Hours**	Convergence of sequence and series of complex numbers ,Taylor series, Laurents series , Absolute and Uniform convergence, Continuity of sum of powerseries,	• Lecture • Discussion • Participative learning • Problem solving	• Student seminar to explain absolute and uniform convergence of power series	To understand Taylor series and Laurent series	Evaluation through Test paper and Group Discussion

	Differentiation and integration of power series, Multiplication and division of power series.				
Module IV **25 Hours**	Isolated singular points, Residues, Cauchy's residue theorem, Residue at infinity, Three types of isolated singular points, Residues at poles, Zeroes of analytic functions, Zeroes and poles, Applications of residues, Evaluation of improper integrals, Jordan's Lemma , Definite integral involving sines and cosines.	• Lecture • Discussions • Problem solving	• Assignments in finding isolated singular points and residues	To understand isolated singular points, residues and applications of residues	Evaluation through test paper

Course Outcomes

CO1	To understand difference between differentiability and analyticity of complex valued functions.

CO2	To learn indefinite integrals of complex valued functions.
CO3	Learn to express an analytic function as a power series.
CO4	To understand the concepts of singular points, residues, and applications of residues.

Teacher in Charge:

Ms. Nikita P B

MAT6B13(E02) : LINEAR PROGRAMMING

Lecture Hours per week: 3, Credits: 2

Internal: 20, External: 80, Examination 3 Hours

Objectives

Formulate our real life problem into a mathematical model also different techniques to solve LPP are introduced.

Module I (16 hrs)

Formulation, Convex sets, General LLP

Module II (14 hrs)

Simplex Method, Duality

Module III (18 hrs)

The transportation problem, The assignment Problems

Textbooks :

Gupta and Manmohan - Linear Programming And Theory of Games

Reference Books:

1. . K. V. Mital&Manmohan: Optimization methods in Operations Research and Systems Analysis, 3rdEdn., New Age International publishers.
2. DipakChatterjee: Linear Programming and Game Theory, Prentice Hall of India.

OBJECTIVE

1. Enable to formulate LPP from real life problem
2. Conceptulize the feasible region, feasible solution, optimal solution etc.
3. Solve the LPP with two variables using graphical method
4. Solve the LPP using simplex method
5. Formulate the dual problem from primal
6. Solve transportation problem and the assignment Problems which are relevent in daily life.

LESSON PLAN

Unit/ session/ hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **16 Hours**	Formulation, Convex sets, General LLP	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on formulation of lpp. • Seminar on the topic convex sets.	• Understand to formulate lpp.	Evaluation through test paper
Module II **14 Hours**	Simplex Method, Duality	• Lecture • Discussion • Participative learning • Problem solving	• Assignments in solving LPP using simplex method.	• Understand to solve lpp in finite number of steps using simplex method.	Evaluation through test paper and viva
Module III **18 Hours**	The transportation problem, The assignment Problems	• Lecture • Discussion • Participative learning • Problem solving	• Assignments related to solve transportation problems and assignment problems	• Enable one to solve transportation problem and the assignment Problems which are relevent in daily life.	Evaluation through Test paper and Group Discussion

Course Outcomes

Course Outcomes

CO1	Enable one to formulate LPP from real life problem.

CO2	Solve the LPP with two variables using graphical method
CO3	Solve the LPP using simplex method
CO4	Solve transportation problem and the assignment Problems which are relevent in daily life.

Teacher in Charge:

Ms Nikita PB

MAT6B12 : NUMBER THEORY AND LINEAR ALGEBRA

Lecture Hours per week: 5, Credits: 4

Internal: 30, External: 120, Examination 3 Hours

Objectives

To study about the integers and integer valued functions. Also introduce the concept of vector fields and linear transformations.

Module I (30 hrs)

Divisibility theory in the integers – the division algorithm, the greatest common divisor, the Euclidean algorithm, the Diophantine equation ax + by = c. Primes and their distribution. The fundamental theorem of arithmetic.The sieve of Eratosthenes. The theory of congruences.Basic properties of congruence.Binary and decimal representation of integers. Linear congruences and Chinese remainder theorem

Module II (25 hrs)

Fermat's little theorem and pseudoprimes Wilson's theorem. The sum and number of divisors.The greatest integer function.Euler's phi-function.Euler's generalization of Fermat's theorem.Properties of the phi-function.

Module III (15 hrs)

Vectorspaces-examples, linearcombinations, spanning, linearindependence, base, finite dimensional vector spaces.

Module IV (20 hrs)

Linear mappings- Linear transformations, examples, nullspace, rank –nullity theorem, linear isomorphism

Textbooks :

1. David M. Burton : Elementary Number Theory, Sixth Edn., TMH.

2. T. S. Blynth and E.F. Robertson: Basic Linear Algebra, second Edn springer under graduate mathematics series 2009

Reference Books:

1. C.Y. Hsiung : Elementary Theory of Numbers. Allied Publishers.

2. Neville Robbins : Beginning Number Theory, Second Ed. Narosa.
3. George E. Andrews : Number Theory, HPC.
4. Kenneth Hoffman & Ray Kunze : Linear Algebra, Pearson Education.
5. Frank Ayres, Jr. : Matrices, Schaum's Outline Series, Asian Student edition.
6. Devi Prasad : Elementary Linear Algebra, Narosa Pub. House

OBJECTIVE

1. Enable to find gcd using Euclidean algorithm.
2. To understand the solution of diophantine equations.
3. Enable to solve system of congruence using chinese remainder theorem.
4. To learn Wilson's theorem, Fermat's little theorem and Euler's theorem
5. Understand the concept of vector space and its basis.
6. Understand the concept of linear transformation and application of rank nullity theorem.

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I 30 Hours	The division algorithm, Gcd, the Euclidean algorithm, the Diophantine equation. Primes and their distribution. The fundamental theorem of arithmetic. The sieve of Eratosthenes. The theory of congruences. Basic	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on gcd and euclidean algorithm. • Assignment in finding solution of system of congruence using chinese remainder theorem	• Understand the linear congruence and the method for finding its solutions.	Evaluation through test paper

	properties of congruence. Binary and decimal representation of integers. Linear congruences and Chinese remainder theorem.				
Module II **25 Hours**	Fermat's little theorem and pseudoprimes Wilson's theorem. The sum and number of divisors. The greatest integer function. Euler's phi-function. Euler's generalization of Fermat's theorem. Properties of the phi-function.	• Lecture • Discussion • Participative learning • Problem solving	• Assignments in finding sum and number of divisors • Seminar on the topic Euler's phi-function and Properties of the phi-function.	• Understand fermat's theorem, wilson's theorem, euler's theorem and its applications.	Evaluation through test paper and viva
Module III **15 Hours**	Vectorspaces-examples, linearcombinations, spanning, linearindependence, base, finite dimensional vector spaces.	• Lecture • Discussion • Participative learning • Problem solving	• Assignments related to vector space and its example.	• Understand the definition of vector space and its basis.	Evaluation through MCQ and Group Discussion
Module IV **20 Hours**	Linear mappings-Linear transformations, examples, nullspace, ranknullity theorem, linear isomorphism.	• Lecture • Discussions • Problem solving	• Student seminars inconnection with Linear transformation and its example.	• Become familiar with the concept of Linear transformations and rank nullity theorem.	Evaluation through test paper

Course Outcomes

CO1	To prove results involving divisibility, greatest common divisor, least commonmultiple and a few applications.
CO2	Enable to solve system of congruence and diophantine equation
CO3	To learn the theorems viz. Wilson's theorem, Fermat's little theorem and Euler's theorem and its applications.
CO4	To Lean if a set of vectors is a vector space or a basis for a vetor space.
CO5	Understand the concept of linear transformation and application of rank nullity theorem.

Teacher in Charge:

Ms. Geethu Simon

MAT6B11 : NUMERICAL METHODS

Lecture Hours per week: 5, Credits: 4

Internal: 30, External: 120, Examination 3 Hours

Objectives

To provide techniques and algorithms to find approximate numerical solution to problems in several areas of mathematics.

Module I : Solution of Algebraic and Transcendental Equation (23 hrs)

Introduction, Bisection Method, Method of false position, Iteration method, Newton-Raphson Method, Ramanujan's method, The Secant Method, Finite Differences, Forward differences, Backward differences, Central differences, Symbolic relations and separation of symbols, Differences of a Polynomial.

Module II : Interpolation (23 hrs)

Newton's formulae for intrapolation, Central difference interpolation formulae, Gauss' Central Difference Formulae, Interpolation with unevenly spaced points, Langrange's interpolation formula, Divided differences and their properties, Newton's General interpolation formula, Inverse interpolation, Numerical Differentiation and Integration, Introduction, Numerical differentiation (using Newton's forward and backward formulae), Numerical Integration, Trapizoidal Rule, Simpson's 1/3-Rule , Simpson's 3/8-Rule.

Module III : Matrices and Linear Systems of equations (22 hrs)

Solution of Linear Systems – Direct Methods, Gauss elimination, Gauss-Jordan Method, Modification of Gauss method to compute the inverse, LU Decomposition, LU Decomposition from Gauss elimination, Solution of Linear Systems – Iterative methods, The eigen value problem, Eigen values of Symmetric Tridiazonal matrix.

Module IV : Numerical Solutions of Ordinary Differential Equations (22 hrs)

Introduction, Solution by Taylor's series, Picard's method of successive approximations, Euler's method, Modified Euler's Method, Runge-Kutta method, Predictor-Corrector Methods, Adams-Moulton Method, Milne's method.

Textbooks:

1) **S.S. Sastry** : Introductory Methods of Numerical Analysis, Fourth Edition, PHI.

Reference Books:

1) S. SankaraRao : Numerical Methods of Scientists and Engineer, 3rd ed., PHI.
2) F.B. Hidebrand : Introduction to Numerical Analysis, TMH.
3) J.B. Scarborough : Numerical Mathematical Analysis, Oxford and IBH

OBJECTIVES

1) To understand several methods such as bisection method, fixed point iteration method, regula falsi method etc.
2) To understand the concept of interpolation.
3) To solve system of linear equations using matrices.
4) To learn to find numerical approximations to solutions of initial value problems.

LESSON PLAN

Unit/ Hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **23 Hours**	Solution of Algebraic and Transcendental Equation, Finite differences	• Lecture • Discussion • Participative learning • Problem solving	• Assignment in different methods to solve equations	To learn to solve equations using different techniques.	Evaluation through test paper

			• Seminars in Finite differences		
Module II **23 Hours**	Interpolation, Numerical Differentiation, Numerical Integration	• Lecture • Discussion • Participative learning • Problem solving	Assignments in different techniques.	To find derivatives and integrals at a point using numerical techniques.	Evaluation through test paper
Module III **22 Hours**	Matrices and Linear Systems of equations	• Lecture • Discussion • Participative learning • Problem solving	Seminar on which technique is better and easier.	To learn to use matrices to solve system of linear equations.	Evaluation through testpaper and Viva
Module IV **22 Hours**	Numerical Solutions of Ordinary Differential Equations	• Lecture • Discussions • Problem solving	Assignment related to IVP	To find out numerical approximations to solutions of initial value problems.	Evaluation through testpaper

Course Outcomes

CO1	Understand several methods such as bisection method, fixed point iteration method, regula falsi method etc. to find out the approximate numerical solutions of algebraic and transcendental equations with desired accuracy.
CO2	Understand the concept of interpolation and also learn some well known interpolation techniques.
CO3	Understand a few techniques for numerical differentiation and integration and also realize their merits and demerits.
CO4	Find out numerical approximations to solutions of initial value problems and also to understand the efficiency of various methods.
CO5	Learn to solve system of linear equations using matrices.

Teacher in Charge:

Ms. Geethu Simon

MAT6B09: REAL ANALYSIS

Lecture Hours per week: 5, Credits: 5

Internal: 30, External: 120, Examination 3 Hours

Objectives

To teach one how to combine different definitions, theorems and techniques to solve problems.

Module I : Continuous Functions (25 hrs)

Continuous functions, Continuous functions on intervals, Uniform continuity

Module II : Riemann Integral (25 hrs)

Riemann Integral, Riemann Integrable Functions, The fundamental theorem, Substitution theorem and application, Approximate Integration

Module III : Sequence and series of functions (20 hrs)

A quick review of series of real numbers, Pointwise and uniform convergence, Interchange of limit and continuity, Series of functions .

Module IV (20 hrs)

Improper Integrals : Improper integrals of the first kind, Improper integrals of the second kind,Cauchy Principal value, Improper Integrals of the third kind.

Beta and Gamma functions : Beta Functions, Gamma Functions, Relation between Beta and Gamma Functions

Textbooks:

1) **G. Bartle, Donald R. Sherbert** : Introduction to Real Analysis (3rd Edn.)
2) **R.R. Goldberg** : Methods of Real Analysis.
3) **Narayanan & Manicavachagom Pillay** : Calculus, Vol. II

Reference Books:

1) J.V. Deshpande: Mathematical Analysis and Applications, Narosa Pub. House.
2) Torence Tao : Analysis I, TRIM 37, Hindustan Book Agency.
3) K.A. Ross: Elementary Real Analysis : Theory of Calculus, Springer.
4) K.G. Binmore: Mathematical Analysis, CUP

OBJECTIVES

1) To state the definition of continuous functions, formulate sequential criteria for continuity and prove or disprove continuity of functions using this criteria.
2) To develop the notion of Riemann integrability of a function using the idea of tagged partitions and calculate the integral value of some simple functions using the definition.
3) To prove convergence and divergence of sequences of functions and series.
4) To learn the properties of and relationship among two important improper integrals.

LESSON PLAN

Unit/ Hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **25 Hours**	Continuous Functions, Uniform Continuity	• Lecture • Discussion • Participative learning • Problem solving	Assignment regarding difference in Continuity and Uniform Continuity.	To understand several deep and fundamental results of continuous functions on intervals.	Evaluation through test paper

Module II **25 Hours**	Riemann Integral	• Lecture • Discussion • Participative learning • Problem solving	Student seminars related to Riemann Intregrability.	To understand a few basic and fundamental results of integration theory.	Evaluation through test paper
Module III **20 Hours**	Sequence and series of functions	• Lecture • Discussion • Participative learning • Problem solving	Assignment on convergence of series and sequences of functions.	To understand the difference between pointwise and uniform convergence of sequences and series of functions.	Evaluation through testpaper and Viva
Module IV **20 Hours**	Improper Integrals, Beta and Gamma functions	• Lecture • Discussions • Problem solving	Seminars related to Improper Integrals and Principal Value.	To understand the notion of improper integrals, their convergence, principal value and evaluation.	Evaluation through testpaper

Course Outcomes

CO1	To understand several deep and fundamental results of continuous functions on intervals such as boundedness theorem, maximum-minimum theorem, intermediate value theorem, preservation of interval theorem and so on.
CO2	To develop the notion of Riemann integrability of a function using the idea of tagged partitions and calculate the integral value of some simple functions using the definition.
CO3	To learn and find out examples/counter examples to prove or disprove the validity of several mathematical statements that arise naturally in the process/context of learning.
CO4	To learn the properties of and relationship among two important improper integrals namely beta and gamma functions that frequently appear in mathematics, statistics, science and engineering.

Teacher in Charge:

Prof. M D Varghese

MTH1C01: ALGEBRA I
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the basic concepts of abstract algebra.

MODULE I

Plane Isometries, Direct products & finitely generated Abelian Groups, Factor Groups, Factor- Group Computations and Simple Groups, Group action on a set, Applications of G-set to counting

MODULE II

Isomorphism theorems, Series of groups, (Omit Butterfly Lemma and proof of the SchreierTheorem), Sylow theorems, Applications of the Sylow theory, Free Groups

MODULE III

Group Presentations, Rings of polynomials, Factorization of polynomials over a field, NonCommutative examples, Homomorphism and factor rings

TEXT:

JOHN B. FRALEIGH, A FIRST COURSE IN ABSTRACT ALGEBRA(7th Edn.), Pearson Education Inc., 2003.

REFERENCES :

[1] N. Bourbaki: Elements of Mathematics: Algebra I, Springer; 1998.

[2] Dummit and Foote: Abstract algebra(3rd edn.); Wiley India; 2011.

[3] P.A. Grillet: Abstract algebra(2nd edn.); Springer; 2007

[4] I.N. Herstein: Topics in Algebra(2nd Edn); John Wiley & Sons, 2006.

[5] T.W. Hungerford: Algebra; Springer Verlag GTM 73(4th Printing); 1987.

[6] N. Jacobson: Basic Algebra-Vol. I; Hindustan Publishing Corporation(India), Delhi; 1991.

[7] T.Y. Lam: Exercises in classical ring theory(2nd edn); Springer; 2003.

[8] C. Lanski: Concepts in Abstract Algebra; American Mathematical Society; 2010.

[9] N.H. Mc Coy: Introduction to modern algebra, Literary Licensing, LLC; 2012.

[10] S. M. Ross: Topics in Finite and Discrete Mathematics; Cambridge; 2000.

[11] J. Rotman: An Introduction to the Theory of Groups(4th edn.); Springer, 1999.

OBJECTIVES

a) **To understand the basic concepts of groups, factor groups, simple groups and group action on a set.**

b) **To get familiarize with Isomorphism theorems and its properties.**

c) **To understand the concept of sylow theorems and its applications.**

d) **To study more about rings of polynomials and factorization of polynomials over a field.**

e) **To understand homomorphism and factor ring.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (30 hours)	Plane Isometries, Abelian groups, Factor groups, Simple groups, group action on a set	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on groups and its properties	To understand: • the basics of different types of groups • notion of group action on a set	Evaluation Through MCQ
Module I1 (30 hours)	Isomorphism theorems, Sylow theorems and its applications	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain the properties of Isomprhism • Peer group discussion on Sylow theorems	To understand: • Isomorphism theorems and their significance • Sylow theorems and its applications	Evaluation Through test paper
Module III (30 Hours)	Ring of polynomials, factorization of a polynomial over a field, homomorphism and factor rings	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on properties of homomorphism and factor rings	To understand: • homomorphism and factor rings • factorization of a polynomial over a field convergence	Evaluation through test paper

Course Outcomes

CO1	To get the idea of different types of groups and group action on a set
CO2	To understand the concept of isomorphism theorems and their significance, Sylow theorems and its applications
CO3	To understand factorization of a polynomial over a field, homomorphism and factor rings

Faculty in charge:
Ms. Geethu Simon

MTH1C05 – DISCRETE MATHEMATICS

Number of hours of lectures per week : 5 hrs

Number of credits : 4

OBJECTIVE

To understand concepts in graph theory, lattices and automata.

MODULE I

Order Relations, Lattices; Boolean Algebra Definition and Properties, Boolean Functions.

MODULE II

Basic concepts, Subgraphs, Degree of vertices, Paths and connectedness, Automorphism of a simple graph, Operations on graphs, Vertex cuts and Edge cuts, Connectivity and Edge connectivity, Trees-Definition, Characterization and Simple properties, Eulerian graphs, Planar and Non planar graphs, Euler formula and its consequences, K5 and K3,3 are non planar graphs, Dual of a plane graph.

MODULE III

Automata and Formal Languages: Introduction to the theory of Computation, Finite Automata.

TEXTBOOKS

TEXT 1: R. BALAKRISHNAN and K. RANGANATHAN, A TEXT BOOK OF GRAPH THEORY, Springer-Verlag New York, Inc., 2000.

TEXT 2: K. D JOSHI, FOUNDATIONS OF DISCRETE MATHEMATICS, New Age International(P) Limited, New Delhi, 1989.

TEXT 3: PETER LINZ, AN INTRODUCTION TO FORMAL LANGUAGES AND AUTOMATA (2nd Edn.), Narosa Publishing House, New Delhi, 1997.

REFERENCES

[1] J. C. Abbot: Sets, lattices and Boolean Algebras; Allyn and Bacon, Boston; 1969.

[2] J. A. Bondy, U.S.R. Murty: Graph Theory; Springer; 2000.

[3] S. M. Cioaba and M.R. Murty: A First Course in Graph Theory and Combinatorics; Hindustan Book Agency; 2009.

[4] J. A. Clalrk: A first look at Graph Theory; World Scientific; 1991.

OBJECTIVES

- To understand the definition of Boolean algebra and Boolean functions along with various properties.
- To study graph and its types with suitable examples.
- To learn about connectivity of graphs.
- To understand the definition of trees and learn various theorems related to it.
- To study about language, grammar and types of acceptors.

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I	Lattices; Boolean Algebra Definition and Properties, Boolean Functions	• Discussion • Participative learning • Problem solving	Seminars by students	To study about Boolean algebra and Boolean functions.	Evaluation through test paper.
MODULE II	Graph definition with examples, isomorphism, connected graphs, planar graphs, trees and eulerian graphs	• Lecture • Discussion • Participative learning • Problem solving	Assignments on isomorphism of graphs. Discussion about various definitions.	To learn basics about graphs and trees. To study about planarity and connectivity.	Evaluation through test paper.
MODULE III	Definition of automata. Languages and Grammars. DFA and NFA	• Lecture • Discussion • Participative learning • Problem solving	Discussion on applications of automata. Working out exercise problems on DFA and NFA	To know the basic about automata. To learn about DFA and NFA	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about Boolean algebra and Boolean functions.
CO2	To learn basics about graphs and trees. To study about planarity and connectivity.
CO3	To know the basic about automata. To learn about DFA and NFA

Faculty in Charge
Ms Meera V

MTH1C02: LINEAR ALGEBRA
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the basic concepts of Linear Algebra.

MODULE I

Vector Spaces & Linear Transformations

MODULE II

Linear Transformations (continued) and Elementary Canonical Forms

MODULE III

Elementary Canonical Forms (continued), Inner Product Spaces

TEXT:

HOFFMAN K. and KUNZE R., LINEAR ALGEBRA (2nd Edn.), Prentice Hall of India, 199

REFERENCES :

[1] P. R. Halmos: Finite Dimensional Vector spaces; Narosa Pub House, New Delhi; 1980.

[2] A. K. Hazra: Matrix: Algebra, Calculus and generalised inverse- Part I; Cambridge International Science Publishing; 2007.

[3] I. N. Herstein: Topics in Algebra; Wiley Eastern Ltd Reprint; 1991.

[4] S. Kumaresan: Linear Algebra-A Geometric Approach; Prentice Hall of India; 2000.

[5] S. Lang: Linear Algebra; Addison Wesley Pub.Co.Reading, Mass; 1972.

[6] S. Maclane and G. Bikhrkhoff: Algebra; Macmillan Pub Co NY; 1967.

[7] N. H. McCoy and R. Thomas: Algebra; Allyn Bacon Inc NY; 1977.

[8] R. R. Stoll and E.T.Wong: Linear Algebra; Academic Press International Edn; 1968.

[9] G. Strang: linear algebra and its applications(4th edn.); Cengage Learning; 2006.

OBJECTIVES

a) **To understand the concept of vector spaces, basis and dimension.**

b) **To study about linear transformations and its properties.**

c) **To understand the concept of functionals and dual space**

d) **To study the relation between linear transformations and corresponding matrices.**

e) **To study about inner product spaces.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (30 hours)	Vector spaces, subspace, basis, dimension, properties, linear transformations	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on properties of vector spaces	To understand: • the basics of vector spaces, basis • notion of linear transformation • properties of linear transformation	Evaluation through test papers and interaction with students
Module I1 (35 hours)	linear transformations, functionals, dual space and elementary canonical transformations	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain the properties of linear transformations	To understand: • More about linear transformation • Significance of dual space	Evaluation through test paper
Module III (25 Hours)	canonical transformations inner product spaces,	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on inner product spaces	To understand: • Inner product spaces and their relevance • Orthogonal compliment and direct sums of vector spaces	Evaluation through test paper

Course Outcomes

CO1	To understand the concept of vector spaces, their basis, dimension and linear transformations
CO2	To understand more about linear transformations and some of its important properties, elementary canonical forms
CO3	To introduce the concept of Inner product spaces, orthogonal compliment and direct sums of vector spaces

Faculty in charge:
Ms Nikita P B

MT1C05: NUMBER THEORY

Number of hours of Lectures per week: 5

Number of Credits: 4

Objectives

To understand the basic concepts of Number Theory.

Module 1

Arithmetical functions and Dirichlet multiplication; Averages of arithmetical functions

Module 2

Some elementary theorems on the distribution of prime numbers

Module 3

Quadratic residues and quadratic reciprocity law ,Cryptography, Public key.

TEXT 1 : APOSTOL T.M., INTRODUCTION TO ANALYTIC NUMBER THEORY, Narosa Publishing House, New Delhi, 1990.

TEXT 2: KOBLITZ NEAL A., COURSE IN NUMBER THEROY AND CRYPTOGRAPHY, SpringerVerlag, NewYork, 1987.

References

[1] A. Beautelspacher: Cryptology; Mathematical Association of America (Incorporated); 1994

[2] H. Davenport: The higher arithmetic(6th Edn.); Cambridge Univ.Press; 1992

[3] G. H. Hardy and E.M. Wright: Introduction to the theory of numbers; Oxford International Edn; 1985

[4] A. Hurwitz & N. Kritiko: Lectures on Number Theory; Springer Verlag ,Universitext; 1986

[5] T. Koshy: Elementary Number Theory with Applications; Harcourt / Academic Press; 2002

[6] D. Redmond: Number Theory; Monographs & Texts in Mathematics No: 220; Marcel Dekker Inc.; 1994

[7] P. Ribenboim: The little book of Big Primes; Springer-Verlag, New York; 1991

[8] K.H. Rosen: Elementary Number Theory and its applications(3rd Edn.); Addison Wesley Pub Co.; 1993

[9] W. Stallings: Cryptography and Network Security-Principles and Practices; PHI; 2004

[10] D.R. Stinson: Cryptography- Theory and Practice(2nd Edn.); Chapman & Hall / CRC (214. Simon Sing : The Code Book The Fourth Estate London); 1999

[11] J. Stopple: A Primer of Analytic Number Theory-From Pythagorus to Riemann; Cambridge Univ Press; 2003

[12] S.Y. Yan: Number Theroy for Computing(2nd Edn.); Springer-Verlag; 2002

OBJECTIVES

a) **To understand the basic arithmetical functions and its averages.**

b) **To get familiarize with theorems on the distribution of prime numbers.**

c) **To understand quadratic residues, quadratic reciprocity law.**

d) **To study about basics of cryptography .**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (30 hours)	Arithmetical functions and Dirichlet multiplication; Averages of arithmetical functions	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on various arithmetic functions.	To understand: • Arithmetical functions • Dirichlet multiplication and derivatives of arithmetical functions • Averages of arithmetical functions.	Evaluation Through Test paper
Module I1	Some elementary theorems on the	• Lecture • Discussion • Participative	• Student seminars to	To understand: • Equivalent	Evaluation Through test paper

(30 hours)	distribution of prime numbers	learning • Problem solving	explain theorems on distribution of prime numbers.	forms of prime number theorem. • Partial sums of Mobius function.	
Module III (30 Hours)	Quadratic residues and quadratic reciprocity law, Cryptography, Public key	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on legendre's symbol, its properties and Gauss lemma.	To understand: • Quadratic Residues and Quadratic reciprocity law,jacobi's symbol. • Basics of cryptography, types of crypto-system and its cryptanalysis.	Evaluation through test paper

Course Outcomes

CO1	To introduce the Arithmetical functions,Dirichlet multiplication and derivatives of arithmetical functions,Averages of arithmetic.
CO2	To understand the Equivalent forms of prime number theorem, Partial sums of Mobius function.
CO3	To understand the quadratic residues and quadratic reciprocity law, jacobi's symbol , basics of cryptography, types of cryptosystem and its cryptanalysis.

Faculty in charge:
Ms. Lipsy Paulose

MT1C03: REAL ANALYSIS I
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the basic concepts of real analysis.

MODULE I

Basic Topololgy, Finite, Countable and Uncountable sets Metric Spaces, Compact Sets, Perfect Sets, Connected Sets. Continuity - Limits of function, Continuous functions, Continuity and compactness, continuity and connectedness, Discontinuities, Monotonic functions, Infinite limits and Limits at Infinity

MODULE II

Differentiation The derivative of a real function, Mean Value theorems, The continuity of Derivatives, L Hospitals Rule, Derivatives of Higher Order, Taylors Theorem, Differentiation of Vector valued functions. The Riemann Stieltjes Integral, - Definition and Existence of the integral, properties of the integral, Integration and Differentiation

MODULE III

The Riemann Stieltjes Integral (Continued) - Integration of Vector vector-valued Functions, Rectifiable curves. Sequences and Series of Functions - Discussion of Main problem, Uniform convergence, Uniform convergence and continuity, Uniform convergence and Integration, Uniform convergence and Differentiation. Equicontinuous Families of Functions, The Stone Weierstrass

TEXT:

RUDIN W., PRINCIPLES OF MATHEMATICAL ANALYSIS (3rd Edn.), Mc. Graw-Hill, 1986.

REFERENCES :

[1] H. Amann and J. Escher: Analysis-I; Birkhuser; 2006.

[2] T. M. Apostol: Mathematical Analysis(2nd Edn.); Narosa; 2002.

[3] R. G. Bartle: Elements of Real Analysis(2nd Edn.); Wiley International Edn.; 1976.

[4] R. G. Bartle and D.R. Sherbert: Introduction to Real Analysis; John Wiley Bros; 1982.

[5] J. V. Deshpande: Mathematical Analysis and Applications- an Introduction; Alpha Science International; 2004.

OBJECTIVES

a) **To understand the basic concepts of Topology: Finite, Countable and Uncountable sets, Metric spaces, Compact sets, Perfect sets, Connected sets.**

b) **To develop the notion of continuity of functions in R^K.**

c) **To understand the concept of differentiation of real valued and complex valued functions.**

d) **To study about Riemann Stieltjes Integral and Rectifiable curves.**

e) **To understand the convergence of sequence and series of functions.**

f) **To understand the relation between uniform convergence and continuity, uniform convergence and differentiation, uniform convergence and integration**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (35 hours)	Basic topology, Continuous functions, continuity and compactness, continuity and connectedness, discontinuities	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on basic topology and continuity of functions	To understand: • the basics of topology • notion of continuity • difference between continuity and uniform continuity	Evaluation Through MCQ
Module I1 (30 hours)	Differentiation, derivatives of higher order, differentiation of	• Lecture • Discussion • Participative	• Student seminars to explain the	To understand: • differentiation of vector valued	Evaluation Through test paper

	vector valued functions, Riemann Stieltjes Integral	learning • Problem solving	properties of differentiation and integration	functions • integration of vector valued functions	
Module III (25 Hours)	Convergence of sequence and series of functions, uniform convergence and continuity, uniform convergence and differentiation, uniform convergence and integration	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on properties of convergence of functions	To understand: • Convergence of sequence and series of functions • Differentiate between convergence and uniform convergence	Evaluation through test paper

Course Outcomes

CO1	To introduce the concept of basic topology, difference between continuous and uniformly continuous functions and its properties.
CO2	To understand the concept of differentiation of vector valued functions and integration of functions.
CO3	To understand the difference between pointwise convergence and uniform convergence of sequence of functions, convergence of series of functions

Faculty in charge:
M D Varghese

MTH2C06: ALGEBRA II
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the ideas and concepts of insolvability of the quintic.

MODULE I

Prime and Maximal Ideals, Introduction to Extension Fields, Algebraic Extensions (Omit Proof of the Existence of an Algebraic Closure), Geometric Constructions. [27, 29, 31, 32]

MODULE II

Finite Fields, Automorphisms of Fields, the Isomorphism Extension Theorem, Splitting Fields, Separable Extensions. [33, 48, 49, 50, 51]

MODULE III

Galois Theory, Illustration of Galois Theory, Cyclotomic Extensions, Insolvability of the Quintic. [53, 54, 55, 56]

TEXT: John B. Fraleigh: A FIRST COURSE IN ABSTRACT ALGEBRA (7th Edn), Pearson Education Inc., 2003.

REFERENCES :

[1] N. Bourbaki: Elements of Mathematics: Algebra I, Springer; 1998

[2] Dummit and Foote: Abstract algebra (3rd Edn); Wiley India; 2011

[3] M.H. Fenrick: Introduction to the Galois correspondence (2nd Edn); Birkhuser; 1998

[4] P.A. Grillet: Abstract algebra (2nd Edn); Springer; 2007

[5] I.N. Herstein: Topics in Algebra (2nd Edn); John Wiley & Sons, 2006.

[6] T.W. Hungerford: Algebra; Springer Verlag GTM 73 (4th Printing); 1987

[7] C. Lanski: Concepts in Abstract Algebra; American Mathematical Society; 2010

[8] R. Lidl and G. Pilz Applied abstract algebra(2nd edn.); Springer; 1998

[9] N.H. Mc Coy: Introduction to modern algebra, Literary Licensing, LLC; 2012

[10] J. Rotman: An Introduction to the Theory of Groups (4th Edn); Springer; 1999

[11] I. Stewart: Galois theory(3rd edn.); Chapman & Hall/CRC; 2003

OBJECTIVES

a) **To understand the basic concepts of Prime and Maximal Ideals.**

b) **To get familiarize with Algebraic Extensions.**

c) **To understand the Automorphisms of fields, Separable Extensions and Splitting Fields.**

d) **To study about the Galois Theory, Cyclotomic Extensions and the Insolvability of the Quintic.**

LESSON PLAN

Unit/ session/ hours (time required)	**Topics to be taught (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module 1 (30 hours)	Prime and Maximal Ideals, Introduction to Extension Fields, Algebraic Extensions, Geometric Constructions.	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on prime and maximal ideals and algebraic extensions	To understand: • the basics of extension fields • geometric constructions	Evaluation through MCQ
Module I1 (30 hours)	Finite Fields, Automorphisms of Fields, the Isomorphism Extension Theorem, Splitting Fields, Separable Extensions.	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain about separable extensions	To understand: • Isomorphism Extension Theorem Splitting and Separable Extensions	Evaluation through test paper
Module III (30 hours)	Galois Theory, Illustration of Galois Theory, Cyclotomic Extensions, Insolvability of the Quintic.	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on Cyclotomic Extensions	To understand: • Galois Theory • Insolvability of the Quintic	Evaluation through test paper

Course Outcomes

CO1	To introduce the concept of finite and extension fields, geometric constructions etc.
CO2	To understand the concept of Isomorphism Extension Theorem, Splitting and Separable Extensions.
CO3	To understand Galois theory and the Insolvability of the Quintic

Faculty in charge:
Ms. Smitha Davis

MTH2C07: REAL ANALYSIS II
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the advanced concepts of real analysis.

MODULE I

The Real Numbers: Sets, Sequences and Functions, Sigma Algebra, Borel sets, Lebesgue Measure, Lebesgue Measurable Functions

MODULE II

Lebesgue Integration, Lebesgue Integration: Further topics

MODULE III

Differentiation and Integration, The L^p spaces : Completeness and Approximation

TEXT:

H. L.Royden ,P. M. FitzpatrickH.L. REAL ANAYLSIS (4th Edn.), Prentice Hall of India, 2000.

REFERENCES :

[1] K B. Athreya and S N Lahiri:,Measure theory,Hindustan Book Agency,New Delhi,(2006).

[2] R G Bartle:, The Elements of Integration and Lebsgue Mesure , Wiley(1995).

[3] S K Berberian: ,measure theory and Integration,The Mc Millan Company,New York,(1965).

[4] L M Graves: ,The Theory of Functions of Real Variable Tata McGraw-Hill Book Co(1978)

[5] P R Halmos: , Measure Theory, GTM ,Springer Verlag [6] W Rudin:, Real and Complex Analysis,Tata McGraw Hill,New Delhi,2006

[7] I K Rana:,An Introduction to Measure and Integration,Narosa Publishing Company,New York.

[8] Terence Tao: ,An Introduction to Measure Theory,Graduate Studies in Mathematics,Vol 126 AMS

OBJECTIVES

a) **To understand the basic concepts of Sigma Algebra, Borel sets.**

b) **To understand Lebesgue Measure and Lebesgue Measurable Functions and its properties**

c) **To understand the concept of Lebesgue Integration,**

d) **To perform differentiation and Integration**

e) **To study about the L^p spaces : Completeness and Approximation**

LESSON PLAN

Unit/ session/ hours (time required)	**Topics to be taught (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module 1 (30 hours)	Sets, Sequences and Functions, Sigma Algebra, Borel sets, Lebesgue Measure, Lebesgue Measurable Functions	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on Lebesgue measure and Lebesgue measurable functions	To understand: • the basics of sigma algebra • notion of Lebesgue measure and measurable functions	Evaluation through interaction with students and test papers
Module I1 (30 hours)	Lebesgue Integration	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars on some topics of Lebesgue integration	To understand: • Concepts of Lebesgue integration	Evaluation through test paper
Module II1 (30 hours)	Differentiation and Integration, The L^p spaces : Completeness and Approximation	• Lecture • Discussion • Participative learning • Problem solving	• Assignments on Differentiation and Integration	To understand: • Concepts of L^pspaces	Evaluation through test paper

Course Outcomes

CO1	To introduce the concept of Sigma Algebra, Borel sets, Lebesgue Measure, Lebesgue Measurable Functions
CO2	To understand the concept of Lebesgue integration, the L^p spaces : Completeness and Approximation
CO3	To understand the concept of differentiation and integration.

Faculty in charge:
Dr. Nidhin TJ

MTH2C08: TOPOLOGY
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the motivation and concepts of topology.

MODULE I

A Quick Revision of Chapter 1,2 and 3. Topological space, basic concepts [Chapter 4 and Chapter5 Section 1, Section 2(excluding 2.11 and 2.12) and Section 3 only]

MODULE II

Making Functions Continuous, quotient spaces, spaces with special properties [Chapter 5 Section4 and Chapter 6]

MODULE III

Separation axioms: Hierarchy of separation axioms, Compactness and separation axioms, The Urysohn characterization of normality, Tietze characterization of normality.[Chapter 7 Section 1 to 3 andSection 4 up to and including 4.6]

TEXT:

JOSHI K D, INTRODUCTION TO GENERAL TOPOLOGY (Revised Edn.), New Age International (P)Ltd., New Delhi, 1983

Inc., 2003.

REFERENCES :

[1] M A Armstrong: Basic Topology, Springer- Verlag New York; 1983.

[2] J Dugundji: Topology; Prentice hall of India; 1975.

[3] M Gemignani: Elementary Topology; Addison Wesley Pub Co Reading Mass, 1971

[4] M G Murdeshwar: General Topology(2nd Edn);Wiley Eastern Ltd, 1990

[5] G F Simmons: Introduction to Topology and modern analysis; McGraw-Hill international student

Edn;1963.

OBJECTIVES

a) **To understand the basic concepts of Topological Spaces.**

b) **To get familiarize with making functions continuous, Quotient Spaces.**

c) **To understand the separation axioms, Hierarchy of separation axioms, compactness and separation axioms.**

d) **To study the Urysohn characterization of normality, Tietze characterization of normality.**

LESSON PLAN

Unit/ session/ hours (time required)	**Topics to be taught (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module 1 (30 hours)	Topological Spaces, Basic concepts	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on basic topology and topological space	To understand: • the basics of topology • topological spaces • different types of topologies	Evaluation Through MCQ
Module I1 (30 hours)	Making functions continuous, quotient spaces, spaces with special properties	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain about making functions continuous	To understand: • Compact Lindeloff spaces • Connectedness Local Connectedness Path Connectedness	Evaluation Through test paper

Module III (30 Hours)	Separation axioms: Hierarchy of separation axioms, compactness and separation axioms, The Urysohn characterization of normality, Tietze characterization of normality	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on separation axioms	To understand: • Separation axioms • Urysohn characterization of normality	Evaluation through test paper

Course Outcomes

CO1	To introduce the concept of basic topology, topological space, different types of topologies.
CO2	To understand the concept of making functions continuous, quotient spaces
CO3	To understand the separation axioms, the Urysohn characterization of normality, Tietz characterization of normality

Faculty in charge:
Ms. Linet Roslin Antony

MT2C10: ODE AND CALCULUS OF VARIATIONS
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the basic concepts of ordinary differential equations and its applications.

MODULE I

Power Series Solutions and Special functions; Some Special Functions of Mathematical Physics.

MODULE II

Some special functions of Mathematical Physics (continued), Systems of First Order Equations; Non linearEquations

MODULE III

Oscillation Theory of Boundary Value Problems, The Existence and Uniqueness of Solutions, TheCalculus of Variations.

TEXT:

SIMMONS, G.F., DIFFERENTIAL EQUATIONS WITH APPLICATIONS AND HISTORICAL NOTES (3rd Edn.), New Delhi, 1974.

REFERENCES :

[1] G. Birkhoff and G.C. Rota: Ordinary Differential Equations(3rd Edn.); Edn. Wiley & Sons; 1978
[2] W.E. Boyce and R.C. Diprima: Elementary Differential Equations and boundary value problems (2nd Edn.); John Wiley & Sons, NY; 1969
[3] A. Chakrabarti: Elements of ordinary Differential Equations and special functions; Wiley Eastern Ltd., New Delhi; 1990
[4] E.A. Coddington: An Introduction to Ordinary Differential Eqution; Printice Hall of India, New Delhi; 1974
[5] R.Courant and D. Hilbert: Methods of Mathematical Physics- vol I; Wiley Eastern Reprint; 1975
[6] P. Hartman: Ordinary Differential Equations; John Wiley & Sons; 1964 [7] L.S. Pontriyagin : A course in ordinary Differential Equations Hindustan Pub. Corporation, Delhi; 1967

[8] I. Sneddon: Elements of Partial Differential Equations; McGraw-Hill International, Edn.;1957

OBJECTIVES

a) **To study how to compute power series solution of first order ODE.**

b) **To get familiarize with some special functions of Mathematical Physics.**

c) **To study the methods to solve systems of first order equations.**

d) **To study more about qualitative properties of solutions.**

e) **To understand the concept of calculus of variations.**

LESSON PLAN

Unit/ session/ hours (time required)	**Topics to be taught (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module 1 (35 hours)	Power series solutions of first order ODEs, special functions in Mathematical Physics	• Lecture • Discussion • Participative learning • Problem solving	• Problem solving sessions in groups. • Discussing the solutions obtained	To understand: • the basics of solutions of ODE • significance of special functions	Evaluation Through test papers
Module I1 (30 hours)	Solve systems of first order and nonlinear equations	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain nonlinear equations	To understand: • the method to solve systems of first order equations • theory of solutions of nonlinear equations	Evaluation through test paper
Module III (25 Hours)	Existence and uniqueness of solutions, calculus of variations	• Lecture • Discussion • Participative learning • Problem solving	• Assignment on existence and uniqueness of solutions • Discussion in peer groups on Calculus of Variations	To understand: • the applications in Calculus of variations • the qualitative nature of solutions	Evaluation through test paper

Course Outcomes

CO1	To understand the power series solutions of ordinary differential equations and the significance of special functions.
CO2	To know more about special functions, systems of first order equations and nonlinear equations
CO3	To understand the qualitative nature of solutions and calculus of variation.

Faculty in charge:
Dr. Vijitha Mukundan

MTH2C10 – OPERATIONS RESEARCH

Number of hours of lectures per week : 5 hrs

Number of credits : 4

OBJECTIVE

To learn various methods to solve an LPP and study about game theory and networking.

MODULE I

Convex Functions; Linear Programming

MODULE II

Linear Programming (contd.); Transportation Problem

MODULE III

Integer Programming; Sensitivity Analysis; Flow and Potential in Networks; Theory of Games

TEXTBOOK

K.V. MITAL; C. MOHAN., OPTIMIZATION METHODS IN OPERATIONS RESEARCH AND SYSTEMS ANALYSIS(3rd. Edn.), New Age International(P) Ltd., 1996.

REFERENCES

[1] R.L. Ackoff and M.W. Sasioni: Fundamentals of Operations Research; Wiley Eastern Ltd. New Delhi; 1991

[2] C.S. Beightler, D.T. Philiphs and D.J. Wilde: Foundations of optimization(2nd Edn.); Prentice Hall of India, Delhi; 1979

[3] G. Hadley: Linear Programming; Addison-Wesley Pub Co Reading, Mass; 1975

[4] G. Hadley: Non-linear and Dynamic Programming; Wiley Eastern Pub Co. Reading, Mass; 1964

OBJECTIVES

- To learn about convex function and few theorems related to it.
- To study LPP and simplex method to solve it.
- Understand and solve transportation problems.

- ❖ To study about the sensitivity analysis.
- ❖ To learn flow and networks.
- ❖ To understand the problems related to game theory.

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I	Convex functions. Definition of LPP.	• Discussion • Participative learning • Problem solving • Lecture	Assignments on LPP	To study about convex functions and definition of LPP	Evaluation through test paper.
MODULE II	Simplex method to solve LPP. Transportation problem. VAM and MODI method to solve transportation problem.	• Lecture • Discussion • Participative learning • Problem solving	Assignments on simplex method and solving of transportation method	To learn to solve LPP using simplex method. To solve Transportation problem.	Evaluation through test paper.
MODULE III	Integer programming and sensitivity analysis. Networking. Introduction to Game theory.	• Lecture • Discussion • Participative learning • Problem solving	Seminar by students on sensitivity analysis. Methods to solve flow and network. Game theory problem solving.	Discussion on sensitivity analysis. To solve networks and problems on game theory.	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about convex functions
CO2	To learn about methods to solve LPP and transportation problems
CO3	To know about sensitivity in LPP and methods to solve networks. To understand game theory.

Faculty in charge: Ms. Amala Mary George

MTH3C11 – MULTIVARIABLE CALCULUS AND GEOMETRY

Number of hours of lectures per week : 5 hrs

Number of credits : 4

OBJECTIVE

To understand concepts in Differential Geometry

MODULE I

Functions of Several Variables Linear Transformations, Differentiation, The Contraction Principle, The Inverse Function Theorem, the Implicit Function Theorem.

MODULE II

What is a curve? Arc-length, Reparametrization, Closed curves, Level curves versus parametrized curves. Curvature, Plane curves, Space curves What is a surface, Smooth surfaces, Smooth maps, Tangents and derivatives, Normals and orientability.

MODULE III

Level surfaces, Ruled surfaces and surfaces of revolution, Applications of the inverse function theorem, Lengths of curves on surfaces, Equiareal maps and a theorem of Archimedes, The second fundamental form, The Gauss and Weingarten maps, Normal and geodesic curvatures. Gaussian and mean curvatures, Principal curvatures of a surface.

TEXTBOOKS

TEXT 1 : RUDIN W., PRINCIPLES OF MATHEMATICAL ANALYSIS, (3rd Edn.), Mc. Graw Hill, 1986.

TEXT 2: ANDREW PRESSLEY, ELEMENTARY DIFFERENTIAL GEOMETRY(2nd Edn.), Springer-Verlag, 2010.

REFERENCES

[1] M. P. do Carmo: Differential Geometry of Curves and Surfaces;

[2] W. Klingenberg: A course in Differential Geometry;

[3] J. R. Munkres: Analysis on Manifolds; Westview Press; 1997

[4] C. C. Pugh: Real Mathematical Analysis, Springer; 2010

[5] M. Spivak: A Comprehensive Introduction to Differential Geometry-Vol. I; Publish

or Perish, Boston; 1970

[6] M. Spivak: Calculus on Manifolds; Westview Press; 1971

[7] V.A. Zorich: Mathematical Analysis-I; Springer; 2008

OBJECTIVES

- To understand functions of several variables and its differentiation
- To study curves, level curves and curvature.
- To learn about surfaces and its properties as normal, orientablity and tangents.
- To understand the definition Guass Weingarten maps
- To study about Guassian, mean curvatures

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I	The Contraction Principle, The Inverse Function Theorem, the Implicit Function Theorem.	• Discussion • Participative learning • Problem solving	Seminars by students	To study about Functions of Several Variables Linear Transformations and its properties	Evaluation through test paper.
MODULE II	Arc-length, Reparametrization, Level curves versus parametrized curves. Curvature, Tangents and derivatives, Normals and orientability.	• Lecture • Discussion • Participative learning • Problem solving	Assignments on Tangents and derivatives. Discussion about various definitions.	To learn basics about Curves, Level curves, curvature, Smooth maps,Tangents, Normals.	Evaluation through MCQ
MODULE III	Level surfaces, Applications of the inverse function theorem, Normal and geodesic curvatures. Gaussian and mean curvatures, Principal curvatures of a surface.	• Lecture • Discussion • Participative learning • Problem solving	Discussion on Surfaces and its properties.	To know the about Level, ruled surfaces, Guassian, mean, principal curvatures. The Gauss and Weingarten maps,	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about functions of several variables
CO2	To learn about the analytical and geometric concepts of curves and its variations To study about cuvature and sufaces
CO3	To know The Gauss and Weingarten maps, To learn Guassian and mean curvature.

Faculty in Charge

Ms. Rossflower

MT3C14 – ADVANCED FUNCTIONAL ANALYSIS

Number of hours of lectures per week : 5 hrs

Number of credits : 4

OBJECTIVE

To learn about metric spaces, normed spaces, Banach spaces and Inner product spaces.

MODULE I

Metric spaces and Continuous Functions, Lp spaces , Fourier series and Integrals, Normed spaces Continuity of linear maps

MODULE II

Hahn-Banach Theorems, Banach spaces, Uniform Boundedness Principle

MODULE III

Closed Graph and Open Mapping Theorems, Bounded Inverse Theorem, Inner product spaces, Orthonormal sets

TEXTBOOK

LIMAYE , B.V, FUNCTIONAL ANALYSIS, (2nd Edn.) New Age International Ltd, Publishers, New Delhi, Bangalore (1996)

REFERENCES

[1]R. Bhatia, Notes on Functional Analysis TRIM series, Hindustan Book Agency

[2]KesavanS, Functional Analysis TRIM series, Hindustan Book Agency

[3] S David Promislow, A First Course in Functional Analysis Wiley Interscience, John wiley & Sons, INC., (2008)

[4]E.Kreyszig, Introductory Functional Analysis with Applications John Wiley & Sons (1978)

OBJECTIVES

- To define Metric spaces along with examples.
- To study normed spaces and its continuity.
- To learn Hahn Banach theorems.
- To understand Banach spaces.
- To study about Inner product spaces and orthonormality.

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I	Metric spaces.L_p spaces. Normed spaces. Continuity of linear maps	• Discussion • Participative learning • Problem solving • Lecture	Assignments on examples of metric spaces and normed spaces.	To study about metric spaces and its properties. To learn normed spaces.	Evaluation through test paper.
MODULE II	Hahn Banach Theorems. Banach spaces.	• Lecture • Discussion • Participative learning • Problem solving	Assignments on corollaries of Hahn Banach theorems.	To learn Hahn Banach theorem and study about Banach spaces	Evaluation through test paper.
MODULE III	Closed graph theorem. Open mapping theorem. Inner products. Orthonormality.	• Lecture • Discussion • Participative learning • Problem solving	Seminar by students	To study important theorems. To learn about Inner products and orthonormal space.	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about metric space and normed space along with its continuity
CO2	To study Hahn Banach theorem and Uniform Boundedness principle
CO3	To learn about inner products and orthonormal spaces.

Faculty in charge:
Krishnamol Ravindran

MT3C15: PDE and Integral Equations
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the basic theory of PDE and Integral Equations.

MODULE I

First Order PDE .

MODULE II

Second Order PDE .

MODULE III

Integral Equations

TEXTS : 1. AMARNATH, M., : PARTIAL DIFFERENTIAL EQUATIONS, Narosa , New Delhi (1997)

2. HILDEBRAND, F.B.: METHODS OF APPLIED MATHEMATICS, (2 nd Edn.) Prentice-Hall of India, New Delhi, 1972

REFERENCES :

1. G. Birkhoff & G.C. Rota : Ordinary Differential Equations, Edn. Wiley & Sons 3rd Edn (1978)
2. E.A. Coddington : An Introduction to Ordinary Differential Equations, Printice Hall of India, New Delhi (1974)
3. P. Hartman : Ordinary Differential Equations, John Wiley & Sons (1964)
4. L.S. Pontriyagin : A Course in Ordinary Differential Equations, Hindustan Pub. Corporation, Delhi (1967)
5. F. John : Partial Differential Equations, Narosa Pub. House New Delhi (1986)
6. Phoolan Prasad & : Partial Differential Equations, Renuka Ravindran Wiley Eastern Ltd New Delhi (1985)
7. R. Courant and D.Hilbert : Methods of Mathematical Physics , Vol I, Wiley Eastern Reprint (1975) 8. W.E. Boyce & R.C. Deprima : Elementary Differential Equations, and Boundary Value Problems John Wiley & Sons, NY, 9th Edition

OBJECTIVES

a) **To study the basic methods of solving partial differential equations.**

b) **To study different methods for solving second order linear and nonlinear pde.**

c) **To study the classification of PDE and to obtain the canonical forms.**

d) **To understand the relation between integral equations and differential equations and to study different methods to solve integral equations.**

LESSON PLAN

Unit/ session/ hours (time required)	**Topics to be taught (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module 1 (35 hours)	Linear equations of first order,Quasilinear equations, method of characteristics, the Lagrange method, Charpit method, Jacobi method, Cauchy problem	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on different methods of solving first order pde	To understand: • Different types of PDE • methods to solve pde • solving non linear problem	Evaluation through test paper and interaction with students

Module I1 (30 hours)	Classification of second order pde, solving wave, heat and Laplace equations, Separation of variables, canonical form, Cauchy problem for second order pde	• Lecture • Discussion • Participative learning • Problem solving	Student seminars to understand the method of solving wave, heat and Laplace equations	To understand: • Methods to solve second order PDE • Solutions of heat, wave and Laplace equations	Evaluation through test paper
Module III (25 Hours)	Integral equations, Fredholm and Volterra equations, Resolvent kernel,Neumann series, Fredholm Schmidt theory	• Lecture • Discussion • Participative learning • Problem solving	• Assignment and problem solving sessions on Integral equations	To understand: • Relation between integral equation and differential equation • Methods to solve integral equations of different kinds	Evaluation through test paper

Course Outcomes

CO1	To study different types of PDE and methods for solving them.
CO2	To study methods of solving second order PDE, heat, wave and Laplace equation, Cauchy problem
CO3	To understand the relation between differential equation and integral equations, also different methods to solve integral equations.

Faculty in charge:
Ms Lipsy Paulouse

MT 3C 12: COMPLEX ANALYSIS
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the ideas and concepts of analytic functions and singularities..

MODULE I

Conformality, Linear Transformations, Fundamental Theorems, Cauchy's Integral Formula.

MODULE II

Local Properties of Analytical Functions, The General Form of Cauchy's Theorem, The Calculus of Residues, Harmonic Functions.

MODULE III

Power Series Expansions, Simply Periodic Functions, Doubly Periodic Functions, The Weierstrass Theory.

TEXT: LARS V. AHLFORS : Complex Analysis, 3rd edn. Mc Graw Hill (1979)

REFERENCES :

1. Cartan, H. : Elementary Theory of Analytic Functions of one or Several . Variables, Addison - Wesley Pub. Co. (1973)
2. Conway, J.B. : Functions of One Complex Variable, Narosa Pub. Co., New Delhi. . (1973)
3. Moore T.O. &Hadlock E.H. : Complex Analysis, Series in Pure Mathematics - Vol. 9. World Scientific . (1991)
4. Pennisi, L. : Elements of Complex Variables, Holf, Rinehart & Winston, 2nd Edn. . (1976)
5. Rudin, W. : Real and Complex Analysis, 3rd Edn. McGraw - Hill International . Edn. (1987)
6. Silverman, H. : Compex Variables, Houghton Mifflin Co. Boston (1975)
7. Remmert, R. : Theory of Complex Functions, UTM, Springer- Verlag, NY, (1991)

OBJECTIVES

a) **To understand the basic concepts of** Power series, Analytic functions, Analytic functions as mappings and Mobius transformations.

b) **To get familiarize with** Conformal mappings, Weistrass theory

c) **To understand the** Power series representation of analytic functions, Zeros of an analytic function, The index of a closed curve, Cauchy's Theorem and Integral Formula and the classification of singularities.

LESSON PLAN

Unit/ session / hours (time required)	**Topics to be taught (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module 1 (30 hours)	Conformal mappings, Cauchy Integral formula	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on Power series and Analytic functions	To understand: • Conformal mappings • Fundamental theorems	Evaluation through MCQ
Module I1 (30 hours)	Analytic functions, Harmonic funcions	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain about Power series representation of analytic functions	To understand: • Residue theorem • Calculus of residue.	Evaluation through test paper
Module III (30 hours)	Entire functions Wiestrass Theory	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on classification of singularities	To understand: • Simply periodic doubly periodic functions	Evaluation through test paper

Course Outcomes

CO1	To introduce the concept of Power series and Analytic functions
CO2	To understand the concept of Cauchy's Theorem and Integral Formula, Open Mapping Theorem and Goursat's Theorem.
CO3	To understand the Argument Principle, the Maximum Principle and Schwarz's Lemma.

Faculty in charge:
Ms.Nikita P B

MTH4E06: Algebraic Number Theory
Number of hours of Lectures per week: 5
Number of Credits: 3

Objectives

To understand the concepts of Algebraic Number Theory.

MODULE I

Symmetric polynomials, Modules, Free abelian groups, Algebraic Numbers, Conjugates and Discriminants, Algebraic Integers, Integral Bases, Norms and Traces, Rings of Integers, Quadratic Fields, Cyclotomic Fields

MODULE II

Historical background, Trivial Factorizations, Factorization into Irreducibles, Examples of Nonunique Factorization into Irreducibles, Prime Factorization, Euclidean Domains, Euclidean Quadratic fields Ideals Historical background, Prime Factorization of Ideals, The norm of an ideal

MODULE III

Lattices, The Quotient Torus, Minkowski theorem, The Space Lst, The Class-Group An Existence Theorem, Finiteness of the Class-Group, Factorization of a Rational Prime, Fermats Last Theorem Some history, Elementary Considerations, Kummers Lemma, Kummers Theorem.

TEXT : I. N. STEWART & D.O. TALL, ALGEBRAIC NUMBER THEORY, (2nd Edn.), Chapman &

Hall, (1987)

REFERENCES :

[1] P. Samuel : Theory of Algebraic Numbers, Herman Paris Houghton Mifflin, NY, (1975)
[2] S. Lang : Algebraic Number Theory, Addison Wesley Pub Co., Reading, Mass, (1970)
[3] bf D. Marcus : Number Fields, Universitext, Springer Verlag, NY, (1976)
[4] 4T.I.FR. Pamphlet No: 4 : Algebraic Number Theory (Bombay, 1966)
[5] Harvey Cohn : Advanced Number Theory, Dover Publications Inc., NY, (1980)
[6] Andre Weil : Basic Number Theory, (3rd Edn.), Springer Verlag, NY, (1974)
[7] G.H. Hardy and E.M. Wright : An Introduction to the Theory of Numbers, Oxford University

Press.
[8] Z.I. Borevich & I.R.Shafarevich : Number Theory, Academic Press, NY 1966.
[9] Esmonde & Ram Murthy : Problems in Algebraic Number Theory, Springer Verlag 2000

OBJECTIVES

a) **To study the basic concepts of numberfield, quadratic field, Guassian field and their properties.**

b) **To study how factorization into irreducibles hold in different fields.**

c) **To understand the concepts of lattices, the quotient torus and geometric representation of algebraic numbers.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (35 hours)	Factorization into Irreducibles, Examples of Nonunique Factorization into Irreducibles, Prime Factorization, Euclidean Domains, Euclidean Quadratic fields Ideals, Prime Factorization of Ideals,	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on numberfields and its properties	To understand: • the factorization into irreducibles • different types of numberfields • the factorization of ideals • properties of ideals	Evaluation through test paper and interaction with students

Module I1 (30 hours)	Examples of Nonunique Factorization into Irreducibles, Prime Factorization, Euclidean Domains, Euclidean Quadratic fields Ideals Historical background, Prime Factorization of Ideals, The norm of an ideal	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to understand prime factorization and quadratic fields	To understand: • Nonunique Factorization into Irreducibles • Factorization of Ideals and norm of an ideal	Evaluation Through test paper
Module III (25 Hours)	Lattices, The Quotient Torus, Minkowski theorem, The Space Lst, The Class-Group An Existence Theorem, Finiteness of the Class-Group, Factorization of a Rational Prime, Kummers Lemma, Kummers Theorem	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion and assignments to understand geometric representation of algebraic numbers	To understand: • The Quotient Torus • The class group	Evaluation through test paper

Course Outcomes

CO1	Awareness about different types of numberfield and their properties
CO2	Able to check unique factorization in fields and also can provide examples of nonunique factorizations
CO3	To understand the geometric representation of algebraic numbers

Faculty in charge:
Dr. Vijitha Mukundan

MTH4E09: DIFFERENTIAL GEOMETRY
Number of hours of Lectures per week: 5
Number of Credits: 3

Objectives

To understand the basic concepts of differential geometry.

MODULE I

Graphs and Level Set, Vector fields, The Tangent Space, Surfaces, Vector Fields on Surfaces, Orientation. The Gauss Map .

MODULE II

Geodesics, Parallel Transport, The Weingarten Map, Curvature of Plane Curves, Arc Length and Line Integrals.

MODULE III

Curvature of Surfaces, Parametrized Surfaces, Local Equivalence of Surfaces and Parametrized Surfaces.

TEXT:

J.A.THORPE : ELEMENTARY TOPICS IN DIFFERENTIAL GEOMETRY

REFERENCES :

1) M. de Carmo : Differential Geometry of Curves and Surfaces, Prentice Hall Inc Englewood Cliffs NJ (1976).
2) V. Grilleman and A. Pollack : Differential Topology, Prentice Hall Inc Englewood Cliffs NJ (1974)
3) B. O'Neil : Elementary Differential Geometry, Academic Press NY (1966)
4) M. Spivak : A Comprehensive Introduction to Differential, Geometry, (Volumes 1 to 5), Publish or Perish, Boston (1970, 75)
5) R. Millmen and G. Parker : Elements of Differential Geometry, Prentice Hall Inc Englewood Cliffs NJ (1977)
6) I. Singer and J.A. Thorpe : Lecture Notes on Elementary Topology and Geometry, UTM, Springer Verlag, NY (1967)
7) W.L.Burke: Applied Differential Geometry , Cambridge University Press (1985).

OBJECTIVES

a) **To understand the basic concepts of level sets, surfaces and its curvature, geodesics,and parametrized surfaces .**

b) **To get familiarize with covariant derivatives and its properties.**

c) **To understand the concept of local and global parametrization.**

d) **To study more about parametrized surfaces and local equivalence of surface and parametrized surfaces.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I (30 hours)	Level sets,vector fields, the tangent space, surfaces and the gauss map.	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on vector fields and level sets.	To understand: • the basics of surfaces • notion of tangent space and the gauss map	Evaluation Through MCQ
Module II (30 hours)	Geodesics, Parallel transport, The Weingarten map, Arc length and line integrals.	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain the properties of derivatives of smooth vector field and covariant derivative.	To understand: • Local and global parametrization. • Concept of parallel transport.	Evaluation Through test paper
Module III	Curvature of surfaces, First and second fundamental	• Lecture • Discussion • Participative	• Seminar and assignment on local	To understand: • Principal, Gaussian, Gauss	Evaluation through test paper

(30 Hours)	forms,Parametrized surfaces and its local equivalence with surfaces.	learning • Problem solving	equivalence of surfaces and parametrized surfaces.	Kronecker and Mean curvature • Inverse function theorems.	

Course Outcomes

CO1	To introduce the concept of graphs and level sets, basics of surfaces and notion of tangent space anf gauss map.
CO2	To understand the concept of parallel transport, local and global parametrization, arc length and line integral.
CO3	To understand the principal ,Gaussian ,Gauss Kronecker and Mean curvature, and parametrized surfaces.

Faculty in charge:
Dr. Nidhin T J

MT4E11 – ADVANCED FUNCTIONAL ANALYSIS

Number of hours of lectures per week : 5 hrs

Number of credits : 4

OBJECTIVE

To learn about duality, compactness and boundedness of spaces.

MODULE I

Duals and Transposes, Duals of Lp [a,b] and C[a,b], weak and weak* convergence, Reflexivity

MODULE II

Definition of Compact Linear Map, spectrum of a compact operator, Riesz Representation Theorems

MODULE III

Bounded Operators and Adjoints , Normal, Unitary and Self Adjoint Operators , Spectrum and Numerical Range , Compact self Adjoint Operator

TEXTBOOK

LIMAYE , B.V, FUNCTIONAL ANALYSIS, (2nd Edn.) New Age International Ltd, Publishers, New Delhi, Bangalore (1996)

REFERENCES

[1]R. Bhatia, Notes on Functional Analysis TRIM series, Hindustan Book Agency

[2]KesavanS, Functional Analysis TRIM series, Hindustan Book Agency

[3] S David Promislow, A First Course in Functional Analysis Wiley Interscience, John wiley & Sons, INC., (2008)

[4]E.Kreyszig, Introductory Functional Analysis with Applications John Wiley & Sons (1978)

OBJECTIVES

- To understand the concept of duality and reflexivity.
- To study spectrum of compact operators.
- To understand the concept of Bounded linear operators and its types.

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I	Dual spaces. Weak convergence Reflexivity	• Discussion • Participative learning • Problem solving • Lecture	Assignments on examples of dual spaces	To study about duality and weak convergence. To learn reflexivity.	Evaluation through test paper.
MODULE II	Compact operators and its spectrum. Riesz Representation theorems.	• Lecture • Discussion • Participative learning • Problem solving	Assignments on compact operators and examples	To learn about spectrum of compact operators	Evaluation through test paper.
MODULE III	Bounded operators. Adjoint, normal, unitary and self adjoint operators. Compact self adjoint operator.	• Lecture • Discussion • Participative learning • Problem solving	Seminar by students	To study Self adjoint operators and compactness.	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about duality and the concept of reflexivity
CO2	To learn about compact operators
CO3	To learn about Bounded linear operators and self adjoint operators

Faculty in charge: Ms. Amala Mary George

MTH4C11: GRAPH THEORY
Number of hours of Lectures per week: 5
Number of Credits: 3

Objectives

To understand the basic concepts of Graph theory.

Module 1

Basic concepts of Graph. Trees, Cut edges and Bonds, Cut vertices, Cayleys Formula, The Connector Problem, Connectivity, Blocks, Construction of Reliable Communication Networks, Euler Tours, Hamilton Cycles, The Chineese Postman Problem, The Travelling Salesman Problem.

Module 2

Matchings, Matchings and Coverings in Bipartite Graphs, Perfect Matchings, The Personnel Assignment Problem, Edge Chromatic Number, Vizings Theorem, The Timetabling Problem, Independent Sets, Ramseys Theorem

Module 3

Vertex Colouring-Chromatic Number, Brooks Theorem, Chromatic Polynomial, Girth and Chromatic Number, A Storage Problem, Plane and Planar Graphs, Dual Graphs, Eulers Formula, Bridges, Kuratowskis Theorem, The Five-Colour Theorem, Directed Graphs, Directed Paths, Directed Cycles.

TEXT : J.A. Bondy and U.S.R.Murty : Graph Theory with applications. Macmillan

References

[1] F. Harary : Graph Theory, Narosa publishers, Reprint 2013.
[2] Geir Agnarsson, Raymond Greenlaw: Graph Theory Modelling, Applications and Algorithms, Pearson Printice Hall, 2007.
[3] John Clark and Derek Allan Holton : A First look at Graph Theory, World Scientific (Singapore) in 1991 and Allied Publishers (India) in 1995
[4] R. Balakrishnan & K. Ranganathan : A Text Book of Graph Theory, Springer Verlag, 2nd edition 2012.

OBJECTIVES

a) **To understand the basic concepts of graphs, Trees, Cut edges and Bonds, Cut vertices, Euler Tours, Hamilton Cycles**

b) **To get familiarize with Matchings and Coverings in Bipartite Graphs, Perfect Matching, Independent Sets, Ramseys Theorem**

c) **To understand the concept of Vertex Colouring-Chromatic Number, Edge Chromatic Number , The Five-Colour Theorem, Directed Graphs.**

d) **To study more about Chromatic Polynomial, Girth and Chromatic Number**

e) **To understand The Five-Colour Theorem, Directed Graphs, Directed Paths, Directed Cycles.**

LESSON PLAN

Unit/ session/ hours (time required)	**Topics to be taught (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module 1 (30 hours)	Basic concepts of graph, Trees, Cut edges and Bonds, Cut vertices, Connectivity, Blocks, Euler Tours, Hamilton Cycles	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on basic concepts of graph	To understand: • the basics of graph, trees • Concepts of cut edges, cut vertices, Euler tour and Hamilton cycles	Evaluation Through MCQ
Module I1 (30 hours)	Matchings and Coverings, Perfect Matchings, Edge Chromatic Number, Vizings Theorem, Independent Sets, Edge colouring,Ramseys Theorem	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain the Personnel Assignment Problem and The Timetabling Problem	To understand: • differentiation of matchings and covering • Concepts of edge colouring and Ramseys theorem	Evaluation Through test paper
Module III (30 Hours)	Vertex Colouring-Chromatic Number, Brooks Theorem, , Plane and Planar Graphs, Dual Graphs, Eulers Formula, Bridges, Kuratowskis Theorem, The Five-Colour Theorem, Directed Graphs,	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on Storage Problem	To understand: • Vertex colouring and it's important results • Planar graphs, dual graphs and it's important result	Evaluation through test paper

Course Outcomes

CO1	To introduce the concept of basic graph theory, trees, cut vertices and cut edges, Euler tour and Hamilton cycles
CO2	To understand the concept of matchings and covering, Edge colouring.
CO3	To understand the concepts of vertex colouring and it's important results. Planar graphs and dual graphs.

Faculty in charge:
Ms Linet Roslin Antony

ST1CO1 BASIC STATISTICS AND PROBABILITY

Lecture Hours per week: 4, Credits: 3

Internal: 20, External: 80, Examination 3 Hours

Objectives

Introduce basic concepts of statistics and to understand various approaches to probability and compute probabilities.

Module I (20 hrs)

Population, sample, measures of central tendency - arithmetic mean, weighted arithmetic mean, geometric mean, harmonic mean, median, mode, partition values - quartile, percentile, measures of deviations - variance, standard deviation, mean deviation about mean, quartile deviation, co-efficient of variation

Module II (15 hrs)

Fitting of straight line, parabola, exponential, polynomial, (least square method), correlation, regression, two regression lines, regression coefficients, properties - rank correlation, partial and multiple correlation

Module III (25 hrs)

Random experiment, Sample space, event, classical definition of probability, statistical regularity, relative frequency definition, field, sigma field, axiomatic definition of probability and simple properties, concept of probability measure, addition theorem(two and three events), conditional probability of two events, multiplication theorem, independence of events(pair wise and mutual), Bayes theorem. –numerical problems

Module IV (12 hrs)

Random variable- discrete and continuous, probability mass function (pmf) and probability density function (pdf) properties and examples, Cumulative Distribution function and its properties , change of variable (univariate case)

Reference Books:

1) V. K. Rohatgi, An Introduction to Probability Theory and Mathematical

Statistics, Wiley Eastern.

2) S.C.Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chan and Sons

3) A.M. Mood, F.A. Graybill and D C Bose, Introduction to Theory of Statistics, McGraw Hill

4) John E Freund, Mathematical Statistics (6th edn), Pearson Edn, NewDelhi

OBJECTIVES

1) To understand the basic concepts of population and sample
2) To summarize the data in a diagrammatic and graphical way, obtain descriptive statistics and make possible and appropriate interpretations
3) To understand various approaches to probability and compute probabilities.

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **20 Hours**	Population, sample, measures of central tendency, measures of deviations	• Lecture • Discussion • Participative learning • Problem solving	• Group discussion on methods of sampling	To understand advantages and limitations of sampling	Evaluation through test paper
Module II **15 Hours**	Fitting of straight line , parabola, exponential, polynomial, correlation, regression, two regression lines,	• Lecture • Discussion • Participative learning • Problem solving	• Students seminar related to curve fitting	To solve problems related to curve fitting	Evaluation through test paper

	regression coefficients, properties - rank correlation, partial and multiple correlation				
Module III **25 Hours**	Random experiment, Sample space, event, classical definition of probability, axiomatic definition of probability and simple properties, addition theorem, conditional probability of two events, multiplication theorem, independence of events, Bayes theorem	• Lecture • Discussion • Participative learning • Problem solving	• Assignments to compute probabilities	To understand basic definition and properties of probability	Evaluation through test paper and viva
Module IV **12 Hours**	Random variable- discrete and continuous, probability mass function and	• Lecture • Discussions • Problem solving	• Student seminars on probability mass function , probability	To understand discrete and continuous random variables	Evaluation through test paper

	probability density function , Cumulative Distribution Function and its properties change of variable		density function and their properties		

Course Outcomes

CO1	To understand advantages and limitations of sampling
CO2	To summarize the data in a diagrammatic and graphical way, obtain descriptive statistics and make possible and appropriate interpretations
CO3	To understand various approaches to probability and compute probabilities
CO4	To understand discrete and continuous random variables and their probability functions

Teacher in Charge:

Ms. Nikita P B

ST2CO2 : PROBABILITY DISTRIBUTIONS

Lecture Hours per week: 4, Credits: 3

Internal: 20, External: 80, Examination 3 Hours

Objectives

To introduce the idea about mathematical expectation and conditional probability of univariate, Bivariate random variable, Also the standard distribution and its properties.

Module I (15 hrs)

Mathematical expectations (univariate): Definition, raw and central moments (definition and relationships), moment generating function and properties, characteristic function (definition and use only), Skewness and kurtosis (using moments)

Module II (15 hrs)

Bivariate random variable: joint pmf and joint pdf, marginal and conditional probability, independence of random variables, function of random variable. Bivariate Expectations, conditional mean and variance, covariance, Karl Pearson Correlation coefficient, independence of random variables based on expectation.

Module III (30 hrs)

Standard distributions: Discrete type Bernoulli, Binomial, Poisson, Geometric, negative binomial (definition, properties and applications), Uniform (mean, variance and mgf), Continuous typeUniform, exponential, gamma, Beta, Normal (definition, properties and applications), Lognormal, Pareto and Cauchy (Definition only).

Module IV (12 hrs)

Chebyshev's inequality, variables, Convergence in probability weak law of large numbers (iid case), Bernoulli law of large numbers, example only), Central limit theorem (Lindberg Levyiid case).

Reference Books:

1. V. K. Rohatgi, An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern.
2. S.C.Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons
3. A.M. Mood, F.A. Graybill and D C Bose, Introduction to Theory of Statistics, McGraw Hill
4. John E Freund, Mathematical Statistics (6th edn), Pearson Edn, NewDelhi

OBJECTIVES

1. Discribe the moments, mgf, expectations, characteristic function, Skewness , kurtosis of univariate and bivariate random variable.
2. Give the knowledge of important discrete and continuous distributions such as Binomial, Poisson,

   Geometric, Negative Binomial and Hyper-geometric, normal, uniform, exponential, beta and gamma distributions
3. Understand the Concept of law large numbers and their uses.
4. Understand the Concept of central limit theorem and its uses.

LESSON PLAN

Unit/ session/ hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **15 Hours**	Mathematical expectations (univariate): Definition, raw and central moments (definition and relationships), moment generating function and properties, characteristic function (definition and use only), Skewness and kurtosis (using moments)	• Lecture • Discussion • Participative learning • Problem solving	• Assignments related to mathematical expectation, raw and cenral moments, mgf	• Understand the definition of moments, mgf , characteristic function, Skewness and kurtosis	Evaluation through test paper
Module II **15 Hours**	Bivariate random variable: joint pmf and joint pdf, marginal and conditional probability, independence of random variables, function of random variable. Bivariate Expectations, conditional mean and variance, covariance, Karl Pearson Correlation coefficient, independence of random variables based on expectation.	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars on the topic bivariate Expectations, conditional mean variance, and covariance.	• Give knowledge related to the concept of Bivariate random variable including expectation moments and mgf.	Evaluation through test paper

Module III 30 Hours	Standard distributions: Discrete type Bernoulli, Binomial, Poisson, Geometric, negative binomial, Uniform, Continuous typeUniform, exponential, gamma, Beta, Normal, Lognormal, Pareto and Cauchy.	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on discrete and Continuous distribution.	• Enable to understand different type of distribution.	Evaluation through test paper
Module IV 12 Hours	Chebyshev's inequality, variables, Convergence in probability weak law of large numbers (iid case), Bernoulli law of large numbers, example only), Central limit theorem (Lindberg Levyiid case).	• Lecture • Discussion • Participative learning • Problem solving	• Assignment on the topic sample mean and variance.	• Understand the weak law of large numbers, Bernoulli law of large numbers, Central limit theorem and its applications	Evaluation through test paper and viva

Course Outcomes

CO1	Understand the concept of uni variate, Bivariate Discrete and continuous random variable including expectation, moments and mgf.
CO2	Enable one to identify and classify different type of standard distribution.
CO3	Understand the weak law of large numbers, Bernoulli law of large numbers, Central limit theorem and its applications.

Teacher in Charge:

Ms Geethu Simon

ST3CO3: STATISTICAL INFERENCE
Lecture Hours per week: 5, Credits: 3

Internal: 20, External: 80, Examination 3 Hours

Objectives

Introduce different type of sampling distributions and the concept of testing hypotheses.

Module I (25 hrs)

Sampling distributions: Statistic, Sampling distribution of a statistic, Standard error, Sampling from normal distribution, distribution of sample mean, sample variance, chisquare distribution, t distribution, and F distribution (definition, derivations and relationships only).

Module II (20 hrs)

Theory of Estimation: Point Estimation, desirable properties of a good estimator, unbiasedness, consistency, sufficiency, Fisher Neyman factorization theorem, efficiency. Methods of Estimation: Method of maximum likelihood, method of moments

Module III (15 hrs)

Interval Estimation: Interval estimates of mean, difference of means, variance, proportions and difference of proportions. Derivation of exact confidence intervals for means, variance and ratio of variances based on normal, t, chi square and F distributions

Module IV (30 hrs)

Testing of Hypotheses: concept of testing hypotheses, simple and composite hypotheses, null and alternative hypotheses, type I and II errors, critical region, level of significance and power of a test. Neyman Pearson approach: Large sample tests concerning mean equality of means, proportions, equality of proportions, Small sample tests based on t distribution for mean, equality of means and paired t test. Tests based on Fdistribution for ratio of variances. Tests based on Chi square distribution for variance, goodness of fit and for independence of attributes.

Reference Books:

1. V. K. Rohatgi, An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern.
2. S.C.Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons
3. A.M. Mood, F.A. Graybill and D C Bose, Introduction to Theory of Statistics, McGraw Hill
4. John E Freund, Mathematical Statistics (6th edn), Pearson Edn, NewDelhi

OBJECTIVES

- Introduce different type of sampling distributions.

- Introduce the concept of random sample from a distribution, sampling distribution of a statistic, standard error of important estimates such as mean and proportions
- knowledge about important inferential aspects such as point estimation, test of hypotheses and associated concepts
- Introduce Neyman Pearson approach in testing of hypotheses.

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **25 Hours**	Statistic, Sampling distribution of a statistic, Standard error, Sampling from normal distribution, distribution of sample mean, sample variance, chisquare distribution, t distribution, and F distribution	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on chisquare distribution, t distribution, and F distribution.	• Understand different type of sampling distributions.	Evaluation through test paper
Module II **20 Hours**	Point Estimation, desirable properties of a good estimator, unbiasedness, consistency, sufficiency, Fisher Neyman factorization theorem, Method of maximum likelihood,	• Lecture • Discussion • Participative learning • Problem solving	• Seminar on the topic Method of maximum likelihood and method of moments.	• Understand point estimation methods.	Evaluation through test paper.

	method of moments.				
Module III **15 Hours**	Interval estimates of mean, difference of means, variance, proportions and difference of proportions. Derivation of exact confidence intervals for means, variance and ratio of variances based on normal, t, chi square and F distributions	• Lecture • Discussion • Participative learning • Problem solving	• Seminar related to the topic difference of means, variance, and difference of proportions.	• Understand Interval estimation methods	Evaluation through Group Discussion.
Module IV **30 Hours**	concept of testing hypotheses, simple and composite hypotheses, null and alternative hypotheses, type I and II errors, critical region, level of significance and power of a test. Large sample tests, proportions, equality of proportions, Small sample tests based on t distribution for mean, equality of means and paired t test. Tests based on Fdistribution for ratio	• Lecture • Discussions • Problem solving	• Student seminars in connection with type I and II errors.	• Become familiar with the concept of testing hypotheses and different sample tests.	Evaluation through test paper

	of variances. Tests based on Chi square distribution for variance, goodness of fit and for independence of attributes.				

Course Outcomes

CO1	Understnd different sampling distribution and its properties.
CO2	Understand the tecniques of estimation and testing hypotheses for mean, variance, proportions, correlation coefficient, association and goodness of fit.
CO3	Knowledge of point and interval estimation proceduers and different method of point estimation.

Teacher in Charge:

Ms Lipsy Paulouse

ST4CO4 APPLIED STATISTICS

Lecture Hours per week: 5, Credits: 3

Internal: 20, External: 80, Examination 3 Hours

Objectives

To introduce sampling techniques and statistical quality control

Module I (20 hrs)

Census and Sampling, Principal steps in a sample survey, different types of sampling, Organisation and execution of large scale sample surveys, errors in sampling(sampling and non sampling errors), preparation of questionnaire, simple random sampling with and without replacement, Systematic, stratified and cluster sampling

Module II (15 hrs)

Analysis of variance; one way, two way classifications. Null hypothesis, total, between and within sum of squares. Assumptions - ANOVA table..

Module III (30 hrs)

Time series : Components of time series additive and multiplicative models , measurement of trend , moving averages, seasonal indicessimple averageratio to moving average., Index numbers: meaning and definition uses and types - problems in the construction of index numbers -different types of simple and weighted index numbers. Test for an ideal index number - time and factor reversal test.

Module IV (25 hrs)

Statistical Quality Control: Concept of statistical quality control, assignable causes and chance causes, process control, Construction of control charts, 3sigma limits, Control chart for variables -Mean chart and Range chart, Control chart for attributes - pchart, d or np chart and c chart

Reference Books:

1) S.C.Gupta and V. K. Kapoor, Fundamentals of Applied Statistics, Sultan Chand and Sons
2) Grant E L, Statistical quality control, McGraw Hill
3) Duncan A J, Quality Control and Industrial Statistics, Taraporewala and sons
4) Montegomery D C, Introduction to Statistical Quality Control, John Wiley and sons

5) S.P.Gupta: statistical methods

OBJECTIVES

1) To equip students with sampling techniques used in conducting sample surveys.
2) To understand the concepts of ANOVA model
3) To expose the area of time series and index numbers.
4) To provide an insight into quality assessment techniques.

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **20 Hours**	Census and Sampling, Principal steps in a sample survey, different types of sampling, Organisation and execution of large scale sample surveys, sampling and non sampling errors, simple random sampling with and without replacement, Systematic,	• Lecture • Discussion • Participative learning • Problem solving	• Group discussion on sampling and sample survey	To understand sampling techniques used in conducting sample surveys	Evaluation through test paper

	stratified and cluster sampling				
Module II **15 Hours**	Analysis of variance; one way, two way classifications, Null hypothesis, Assumptions - ANOVA table..	• Lecture • Discussion • Participative learning • Problem solving	• Assignments in finding variance between the samples	To understand the concepts of ANOVA model	Evaluation through test paper and viva
Module III **30 Hours**	Time series, Components of time series, measurement of trend, moving averages, seasonal indices, Index numbers, different types of simple and weighted index numbers, time and factor reversal test.	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars related to components of time series	To understand time series, seasonal indices and index numbers	Evaluation through MCQ and Group Discussion
Module IV **25 Hours**	Statistical Quality Control, assignable causes and chance causes, process control, Construction of	• Lecture • Discussions • Problem solving	• Assignment to construct control charts	To understand statistical quality control and its uses	Evaluation through test paper

	control charts, 3sigma limits, Control chart for variables- Mean chart and Range chart,Control chart for attributes- pchart, d or np chart and c chart				

Course Outcomes

CO1	To understand sampling techniques used in conducting sample surveys
CO2	To understand the concepts of ANOVA model
CO3	To learn the concepts of time series and index numbers
CO4	To provide an insight into quality assessment techniques.

Teacher in Charge:

Ms. Nikita P B

MAT 1C01 – MATHEMATICS(Complementary Course)

Number of hours of lectures per week : 4 hrs

Number of credits : 3

OBJECTIVE

To understand concepts of limit, Continuity, derivatives and integration.

MODULE I

Limits and Continuity: Rules for finding limits. Target values and formal definitions of limits. Extensions of limit concept, Continuity, Tangent lines

.

MODULE II

Derivatives: The derivative of a function, a quick review of differentiation rules, rate of Change.

MODULE III

Application of derivatives: Extreme values of a function. The mean value theorem, First derivative test, Graphing with y' and y''. Limits as x approaches infinity. Asymptotes and dominant terms, Linearization and differentials. The L'Hopital's Rule.

MODULE IV

Integration: Riemann sums and Definite integrals; properties, areas and the Mean value theorem. The Fundamental theorem. Application of Integrals: Areas between curves, Finding Volumes by slicing.

TEXTBOOKS

George B. Thomas Jr. and Ross L. Finney : Calculus, LPE, Ninth edition, Pearson Education.

REFERENCES

[1] S.S. Sastry, Engineering Mathematics, Volume 1, 4th Edition PHI.

[2] Muray R Spiegel, Advanced Calculus, Schaum's Outline series.

OBJECTIVES

- To understand the basics of limits and continuity.
- To learn derivatives and differentiation rules
- To learn about applications of derivatives
- To understand L'Hospital's rule.
- To study in detail Riemann sums and integration.

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I (20 hours)	Limits and Continuity Epsilon – delta definitions	• Discussion • Participative learning • Problem solving	Discussions Lectures and Quizzes	Limits, Sandwich theorem,	Evaluation through test paper.
MODULE II (12 hours)	Derivatives and differentiation rukes	• Lecture • Discussion • Participative learning • Problem solving	. Discussion about differentiation rules.	Derivatives and rate of Change.	Evaluation through test paper.
MODULE III (24 hours)	Applications of derivatives, Graphing of functions	• Lecture • Discussion • Participative learning • Problem solving	Discussion Maximum minimum points	Plot graphs of a function by finding maximum and minimum points using derivatives	Evaluation through MCQ.
MODULE IV (16 hours)	Riemann Sums and integration and applications of integration	• Lecture • Discussion • Participative learning • Problem solving	Discussion on integration concepts	Integration concept using Riemann sums, area of surfaces	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about limit continuity and derivatives
CO2	To learn application of derivatives To study about plotting function graphs
CO3	To know about integration and its origin To learn about applications of integration

Faculty in Charge

Dr. Nidhin T J

Ms. Smitha Davis

MAT 2C02 – MATHEMATICS(Complementary Course)

Number of hours of lectures per week : 4 hrs

Number of credits : 3

OBJECTIVE

To understand concepts of hyperbolic functions, improper integrals, partial differentiation, infinite series and polar coordinates.

MODULE I

Hyperbolic Functions - Definitions and Identities, Derivatives and Integrals, Inverse Hyperbolic , functions - Derivatives and Integrals, Application of Integrals :, Volumes of Solids of Revolution (Disk method only), Lengths of plane curves. Areas of surfaces of revolution Improper Integrals, Convergence and Divergence, Tests for Convergence and Divergence, Direct Comparison Test and Limit Comparison Test

.

MODULE II

Limit of Sequences of Number, Theorems for calculating limits of sequences (Excluding Picard's Method), Infinite series, The ratio and root test for series of non negative terms, alternating series, Absolute and conditional convergence, Power Series, Taylor and Maclaurin Series.

MODULE III

Polar coordinates, Graphing in Polar Coordinates, Polar equations for conic sections, integration in Polar coordinates, Cylindrical and Spherical Coordinates.

MODULE IV

Functions of Several Variables, Limits and Continuity, Partial Derivatives, differentiability, Chain rule

.

TEXTBOOKS

George B. Thomas Jr. and Ross L. Finney : Calculus, LPE, Ninth edition, Pearson Education.

REFERENCES

[1] S.S. Sastry, Engineering Mathematics, Volume 1, 4th Edition PHI.

[2] Muray R Spiegel, Advanced Calculus, Schaum's Outline series.

OBJECTIVES

- To understand the Hyperbolic functions and improper integrals.
- To learn about sequences and series.
- To learn about polar coordinates and is graphing.
- To understand functions of several variables.
- To study partial differntiaition .

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I (20 hours)	Hyperbolic functions, Applications of integrals, improper integrals.	• Discussion • Participative learning • Problem solving	Discussions Lectures and Quizzes	Integrats and derivatives of Hyperbolic functions, Improper integrals, Volume and area of integrals	Evaluation through test paper.
MODULE II (28 hours)	Sequences and series of real numbers	• Lecture • Discussion • Participative learning • Problem solving	.Discussion about convergence of various series.	Convergence and divergence of series. Taylor and Maclaurin series.	Evaluation through test paper.
MODULE III (10 hours)	Polar Coordinates, Graphing, Cylindrical and Spherical coordinates.	• Lecture • Discussion • Participative learning • Problem solving	Discussion on cylindrical and spherical coordinates	Plot graphs of polar coordinates	Evaluation through MCQ.
MODULE IV (14 hours)	Functions of several variables, partial derivatives	• Lecture • Discussion • Participative learning • Problem solving	Discussion on partial derivatives	Partial differentiation	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about Infinite series and its convergence.
CO2	To learn hyperbolic functions and improper integrals. To study about Taylor series and Maclaurain series.
CO3	To know about polar coordinates and its plotting. To learn about partial differentiation.

Faculty in Charge

Dr. Vijitha Mukundan

Ms. Amala Mary George

MAT 3C03 – MATHEMATICS(Complementary Course)

Number of hours of lectures per week : 5 hrs

Number of credits : 3

OBJECTIVE

To understand concepts of Ordinary differential equations, matrices and vector calculus.

MODULE I

Basic concepts and ideas, Geometrical meaning of y' = f(x,y). Direction Fields, Separable Differential Equations. Exact Differential Equations; Integrating Factors, Linear Differential Equations; Bernoulli Equation, Orthogonal Trajectories of Curves.

MODULE II

Rank of a Matrix, Non-Singular and Singular matrices, Elementary Transformations, Inverse of an elementary Transformations, Row Canonical form, Normal form. Systems of Linear equations: Homogeneous and Non Homogenoeus Equations, Characteristic equation of a matrix; Characteristic roots and characteristic vectors. Cayley-Hamilton Theorem (statement only) and simple applications.

MODULE III

A quick Review of vector algebra, Inner product and vector product in R^2 and R^3 . Vector and scalar functions and Fields, Derivatives, Curves, Tangents, Arc Length, Velocity and acceleration, Gradient of a scalar field; Directional Derivative, Divergence of a vector field, Curl of a Vector Field.

MODULE IV

Line Integrals, Independence of path, Green's Theorem in the Plane (without proof), surfaces for Surface Integrals, Surface Integrals, Triple Integrals, Divergence theorem of Gauss and Stoke's theorem (without proofs).

TEXTBOOKS

1. Erwin Kreyszig : Advanced Engineering Mathematics, Eighth Edition, Wiley, India.

2. Frank Ayres JR : Matrices, Schaum's Outline Series, TMH Edition.

REFERENCES

[1] S.S. Sastry, Engineering Mathematics, Volume 1, 4th Edition PHI.

[2] Muray R Spiegel, Vector Analysis, Schaum's Outline series, Asian Student Edition.

[3] Shanthi Narayanan & P.K. Mittal, A Text Book of Matrices, S. Chand

[4] Harry F. Davis & Arthur David Snider, Introduction to Vector Analysis, 6th ed., Universal Book Stall, New Delhi.

OBJECTIVES

- To understand the concepts in ordinary differential equations
- To learn about matrices and its properties
- To learn about Cayley Hamilton theorem
- To understand vectors
- To study in detail Vector Calculus

LESSON PLAN

Unit/Session (hours required)	Topics to be taught (input)	Procedure(process) Student centric method of teaching	Activity	Learning Outcome (output)	Assessment
MODULE I (20 hours)	Modeling of differential equations, methods to solve first order differential equations.	• Discussion • Participative learning • Problem solving	Discussions Lectures and Quizzes	Geometrical meaning of ODE, solving I order ODEs	Evaluation through test paper.
MODULE II (20 hours)	Rank of a matrix, solution of system of linear equations, Cayley- Hamilton theorem	• Lecture • Discussion • Participative learning • Problem solving	. Discussion about Eigen values and vectors	Normal and Echoleon form of matrices, Solution of linear system of equations, Eigen values and vectors	Evaluation through test paper.
MODULE III (25 hours)	Introduction to vectors and vector differential calculus	• Lecture • Discussion • Participative learning • Problem solving	Discussion on derivatives of vector functions	Know gradient, divergence, curl of a vector function	Evaluation through MCQ.
MODULE IV (25 hours)	Vector integral calculus	• Lecture • Discussion • Participative learning • Problem solving	Discussion on surface integrals	Greens theorem, Stoke's theorem, Gauss divergence theorem	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about I order ordinary differential equations
CO2	To learn solution of system of linear equations To study about eigen values and eigen vectors.
CO3	To know about vector differential calculus To learn about vector integral calculus

Faculty in Charge

Dr. Vijitha Mukundan

Ms. Linet Roslin Antony

Ms. Amala Mary George

MAT 4C04 – MATHEMATICS(Complementary Course)

Number of hours of lectures per week : 5 hrs

Number of credits : 3

OBJECTIVE

To understand concepts of Second order differential equations, Laplace tranforms, Fourier series, Numerical methods

MODULE I

Linear Differential equations of Second and Higher order: Differential Operators, Euler-Cauchy Equation, Wronskian, Nonhomogeneous Equations, Solutions by Undetermined Coefficients, Solution by variation of Parameters.

MODULE II

Laplace Transforms: Laplace Transform, Inverse Transform, Linearity, Shifting, Transforms of Derivatives of Integrals, Differential Equations. Unit step Function, Second Shifting Theorem, Dirac Delta Function, Differentiation and integration of Transforms, Convolution, Integral Equations, Partial Fractions, Differential Equations.

.

MODULE III

Fourier Series : Periodic Functions, Trigonometric Series, Fourier Series, Even and Odd functions, Half-range Expansions, Partial differential Equations: Basic Concepts, Vibrating String, Wave Equation, Separation of Variables, Use of Fourier Series

MODULE IV

Numerical Methods: Methods of First-order Differential Equations, Picard's iteration for initial Value Problems. Numerical Integration: Trapezoidal Rule, Simpson's Rule.

TEXTBOOKS

1. Erwin Kreyszig, Advanced Engineering Mathematics, Eighth Edition, Wiley, India.
2. George B. Thomas Jr. and Ross L. Finney : Calculus, LPE, Ninth edition, Pearson Education.

REFERENCES

[1] S.S. Sastry, Engineering Mathematics, Volume 1, 4th Edition PHI.
[2] Muray R Spiegel, Advanced Calculus, Schaum's Outline series.

[3] Murray R. Spiegel, Laplace Transforms, Schaum's Outline Series.

OBJECTIVES

- To understand the methods to solve II and higher order derivatives
- To learn Laplace and inverse Laplace equations
- To learn about Fourier series and Half range expansions
- To understand classical partial differential equations
- To study in detail some numerical methods for integration and ODEs.

LESSON PLAN

Unit/Session (hours required)	Topics to be taught (input)	Procedure(process) Student centric method of teaching	Activity	Learning Outcome (output)	Assessment
MODULE I (20 hours)	Solution of II and higher order differential equations	• Discussion • Participative learning • Problem solving	Discussions Lectures on wronskian	Euler-Cauchy equations, various methods for solving II order DEs	Evaluation through test paper.
MODULE II (20 hours)	Laplace transforms, Inverse Laplace transforms, Shifting theorems	• Lecture • Discussion • Participative learning • Problem solving	. Discussion about laplace and inverse Laplace transforms	Solution of differential equations using Laplace transforms	Evaluation through test paper.
MODULE III (30 hours)	Fourier series and its half range expansions	• Lecture • Discussion • Participative learning • Problem solving	Discussion on Fourier series expansions of periodic functions	Solution of heat and wave equations using Fourier series	Evaluation through test paper.
MODULE IV (20 hours)	Numerical methods for integration and solving differential equations	• Lecture • Discussion • Participative learning • Problem solving	Discussion on various numerical methods	Runge – Kutta, Euler methods, Trapeziodal, Simpson’s rule.	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about Euler- Cauchy equations, method of undetermined coefficients and method of variation of parameters
CO2	To learn Solving differential equations using Laplace transforms To study about Fourier series
CO3	To know about solution of Heat and Wave Equations To learn about various numerical methods.

Faculty in Charge

Ms. Smitha Davis

Ms. Linet Roslin Antony

Dr. Nidhin T J

MAT1B01: FOUNDATIONS OF MATHEMATICS

Lecture Hours per week: 4, Credits: 4

Internal: 20, External: 80, Examination 3 Hours

Objectives

To get introduced to many mathematical terms.

Module I (16 hrs)

Set operations: Difference and Symmetric difference, Algebra of sets, Duality, Classes of sets, Powersets Relations: Product set, Relations, Composition of relations, Types of relations, Partitions, Equivalence relations with example of congruence modulo relation, Partial ordering relations, n- ary relations.

Module II (16 hrs)

Functions : Identity function, constant functions, product (composition) of functions, theorems on one-one and onto functions, Mathematical functions, Recursively defined functions, Indexed collection of sets, Operations on indexed collection of sets, Equipotent sets, Denumerable and countable sets, Cardinal numbers.

Module III (20 hrs)

Function quick review, Shifting graphs , Limit and continuity , The Sandwich theorem, Target values and formal definition of limits, Extensions of limit concept, Continuity.

Module IV (20 hrs)

Basic Logic: Introduction, propositions, truth table, negation, conjunction and disjunction. Implications, biconditional propositions, converse, contra positive and inverse propositions and precedence of logical operators, Propositional equivalence, Logical equivalences, Predicates and quantifiers: Introduction, Quantifiers, Binding variables and Negations.

Textbooks:

1) **S. Lipschutz**: Set Theory and related topics (Second Edition), Schaum Outline Series, TataMcGraw-Hill Publishing Company, New Delhi.

2) **Thomas /Finney** : Calculus, 9th ed., LPE, Pearson Education.
3) **K.H. Rosen**: Discrete Mathematics and its Applications (sixth edition), Tata McGraw Hill Publishing Company.

Reference Books:

1) P.R. Halmos: Naive Set Theory, Springer.
2) E. Kamke, Theory of Sets, Dover Publishers.
3) Anton : Calculus, Wiley.
4) R.P. Grimaldi: Discrete and Combinatorial Mathematics, Pearson Education.

OBJECTIVES

1) To get familiarized with different set operations.
2) To learn about different kind of functions and sets.
3) To understand concepts like limit and continuity.
4) To introduce basic logic.

LESSON PLAN

Unit/ Hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **16 Hours**	Set operations, Relations.	• Lecture • Discussion • Participative learning • Problem solving	Seminar on Set Operations.	To master in Set Operations.	Evaluation through test paper

Module II **16 Hours**	Functions, Different kinds of Sets.	• Lecture • Discussion • Participative learning • Problem solving	Assignment on One-one and Onto functions.	To understand different kinds of functions and sets.	Evaluation through test paper
Module III **20 Hours**	Shifting Graphs, Limit and Continuity.	• Lecture • Discussion • Participative learning • Problem solving	Peer discussion on Limits.	To get introduced to Limit and Continuity.	Evaluation through testpaper and Viva
Module IV **20 Hours**	Logical equivalences, Quantifiers.	• Lecture • Discussions • Problem solving	Assignment on Logical equivalences.	To understand Logical equivalences.	Evaluation through testpaper

Course Outcomes

CO1	Get introduced to new mathematical terms.
CO2	Understand set properties and set functions.
CO3	Learn about functions and know about limit and continuity
CO4	To appreciate the beauty of logical arguments.

Teacher in Charge:

Ms. Geethu Simon

MAT2B02: CALCULUS

Lecture Hours per week: 4, Credits: 4

Internal: 20, External: 80, Examination 3 Hours

Objectives

To introduce students to the fundamental ideas of differentiability and integrability and also to some basic theorems of differential calculus.

Module I (20 hrs)

Extreme value of functions, The mean value theorem, The first derivative test for local extremum values , Graphing with y' and y'', Limit as x, Assymptotes and dominant terms.

Module II (20 hrs)

Optimization, Linearization and differentials, Riemann sums and definite – integrals, Properties, area and the mean value theorem, The fundamental theorem, Substitution in Definite Integrals.

Module III (20 hrs)

Areas between curves, Finding volumes by slicing ,Volumes of solids of revolution, Lengths of plane curves, Areas of surface of revolution.

Module IV (12 hrs)

Moments and centres of mass, Work

Textbooks:

1) **Thomas / Finney**: Calculus, 9th ed., LPE, Pearson Education.

Reference Books:

1) Anton : Calculus, Wiley.
2) S.K. Stein : Calculus with Analytic Geometry, McGraw Hill.

OBJECTIVES

1) To get an idea of sketching of curves.
2) To see different applications of derivatives and integrals.
3) To solve some optimization problems of interest in real life.
4) To establish the close connection between the two branches of Calculus: Differential and Integral Calculus.

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **20 Hours**	Extreme value of functions, The mean value theorem, The first derivative test for local extremum values , Graphing with y' and y'', Limit as x, Assymptotes and dominant terms.	• Lecture • Discussion • Participative learning • Problem solving	Group discussion on Curve Sketching	To understand several techniques of sketching curves and learning limits.	Evaluation through test paper and group discussion
Module II **20 Hours**	Optimization, Linearization and differentials, Riemann sums and definite – integrals, Properties, area and the mean value	• Lecture • Discussion • Participative learning • Problem solving	Assignment to find integrals of functions	To deal with real life problems in Physics, Chemistry etc.	Evaluation through test paper

	theorem, The fundamental theorem, Substitution in Definite Integrals.				
Module III **20 Hours**	Areas between curves, Finding volumes by slicing, Volumes of solids of revolution, Lengths of plane curves, Areas of surface of Revolution	• Lecture • Discussion • Participative learning • Problem solving	Assignment to find volume of some familiar objects	To explore relationship between Surfaces and Curves	Evaluation through testpaper
Module IV **12 Hours**	Moments and centres of mass, Work	• Lecture • Problem solving • Participative learning • Videos	Seminars related to Centre of Mass	To understand concepts like Work and Moment.	Evaluation through test paper and viva

Course Outcomes

CO1	To explore the relationship between moving/changing objects
CO2	To master integrals which is a powerful tool in solving problems in Physics, Chemistry, Biology, Engineering, Economics and other fields.
CO3	To deal with real life optimization problems.
CO4	To learn the practical way of evaluating the definite integral.

Teacher in Charge:

Ms. Geethu Simon

MAT3B03 CALCULUS AND ANALYTIC GEOMETRY

Lecture Hours per week: 5, Credits: 4

Internal: 20, External: 80, Examination 3 Hours

Objectives

To introduce fundamentals of calculus and geometry

Module I (15 hrs)

Natural logarithms, The Exponential function, and log , Growth and decay ,
L'Hopital's Rule, Relative rates of growth, Hyperbolic functions

Module II (25 hrs)

Limits of sequence of numbers,Theorems for calculating limits of sequences, Infinite series, Integral test for series of non-
negative terms,Comparison test for series of non negativeterms,Ratio and root test for series of non negati veterms, Alternating series, Absolute and conditional convergence.

Module III (15 hrs)

Power series, Taylor and Maclaurin's series, Convergence of Taylor series ,Error estimate

Module IV (35 hrs)

Conic section and quadratic equations, Classifying conic section by eccentricity ,Quadratic equations and rota tions, Parametrisation of plane curves, Calculus with parametrisedcurves,Polar coordinates, Graphing in polar co- ordinates, Polar equations for conic sections, Integration in polar coordinates.

Textbooks :

1) Thomas / Finney: Calculus, 9th ed., LPE, Pearson Education.

Reference Books:

1) Anton : Calculus, Wiley.

2) S.K. Stein : Calculus and Analytic Geometry, McGraw Hill

OBJECTIVES

1) To know transcendental functions such as natural logarithmic and exponential function.
2) To study a related notion of convergence of series
3) To study Power series, Taylor series , Maclaurin's series and their convergence
4) To understand parametrisation of plane curves

LESSON PLAN

Unit/ session/ hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **15 Hours**	Natural logarithms , The Exponential function, and log , Growth and decay ,L'Hopital's Rule, Relative rate of growth, Hyper-bolic functions.	• Lecture • Discussion • Participative learning • Problem solving	• Group discussion on Growth and decay functions	To understand transcendental functions	Evaluation through test paper
Module II **25 Hours**	Limits of sequence of numbers, Infinite series, Integral test for series,Comparison test ,Ratio and root test , Alternating series, Absolute and co	• Lecture • Discussion • Participative learning • Problem solving	• Assignments related to convergence tests of infinite series	To understand convergence of sequences and series	Evaluation through test paper

	nditional converg ence.				
Module III **15 Hours**	Power series, Tay lor and Maclaurin's series, Convergence of Taylor series , Error estimate	• Lecture • Discussion • Participative learning • Problem solving	• Group discussion on power series	To study power series and convergence	Evaluation through test paper and group discussion
Module IV **35 Hours**	Conic section and quadratic equations ,Quadratic equation and rotations, Para metrisation of plane curves,Polar coordinates, Graph ing in polar co-ordinates, Polar eq uations for conic se ctions, Integration in polar coordinate s	• Lecture • Discussions • Problem solving	• Student seminars in connection with polar coordinates	To understand parametrisation of plane curves	Evaluation through test paper

Course Outcomes

CO1	To understand transcendental functions such as natural logarithmic and exponential function
CO2	To handle the convergence of series with different tests.
CO3	To learn Power series, Taylor series , Maclaurin's series and their convergence
CO4	To understand parametrisation of plane curves

Teacher in Charge:

Ms. Reshma Joshy

Ms. Jiji Pauly

MAT4B04: THEORY OF EQUATIONS, MATRICES AND VECTOR CALCULUS

Lecture Hours per week: 5, Credits: 4

Internal: 20, External: 80, Examination 3 Hours

Objectives

Develops a new and fundamental ideas of calculus for the simple, but important case of polynomials. Also uses the matrices to solve system of linear equations.

Module I (30 hrs)

Polynomial Equations and Fundamental Theorem of Algebra(without proof). Applications of the Fundamental theorem to equations having one or more complex roots, Rational roots or multiple roots. Relations between roots and co-efficients of a polynomial equation and computation of symmetric functions of roots.Finding equations whose roots are functions of the roots of a given equation. Reciprocal equation and method of finding its roots. Analytical methods for solving polynomial equations of order up to four - quadratic formula.Cardano's method for solving cubic equations.Ferrari's method (for quadratic equations). Remarks about the insolvability of equations of degree five or more.Finding the nature of roots without solving Descartes' rule of signs.

Module II (16 hrs)

Elementary transformation, reduction to normal form, row reduced echelon form.Computing the inverse of a non singular matrix using elementary row transformation.

Module III (20 hrs)

System of linear homogeneous equations.Null space and nullity of matrix. Sylvester's law of nullity.Range of a matrix.Systems of linear non homogeneous equations. Characteristic roots and characteristic vectors of a square matrix. Some fundamental theorem.Characteristic roots of Hermitian, Skew Hermitian and Unitary matrices.Characteristic equation of a matrix, Cayley- Hamilton theorem

Module IV (24 hrs)

Lines and planes in space. Cylinders and Quadric surfaces, Cylindrical and spherical coordinates, Vector valued functions and space curves, Arc length and Unit tangent vector , Curvature, torsion and TNB frame

Textbooks :

1. Bernard and Child: Higher Algebra, Macmillan

2.Shanti Narayanan &Mittal : A Text Book of Matrices, Revised edn., S. Chand

3. Thomas /Finney : Calculus, 9th ed., LPE, Pearson Education

Reference Books:

1.Kenneth Hoffman & Ray Kunze : Linear Algebra, Pearson Education.

2.ManicavachagomPillai, Natarajan, Ganapathy- Algebra

3.Dickson: First Course in Theory of Equation

4. Frank Ayres, Jr. : Matrices, Schaum's Outline Series, Asian Student edition.

5. Devi Prasad : Elementary Linear Algebra, Narosa Pub. House.

6. Kreyszig : Advanced Engineering Mathematics, 8th ed., Wiley.

7. H.F. Davis and A.D. Snider: Introduction to Vector Analysis, 6th ed.,

OBJECTIVE

- Learn to find the roots of polynomial equations up to degree 4, insolvability of equations of degree 5 or more.
- To compute the inverse of a non singular matrix using elementary row transformations.
- To understand about the characteristic equation and characteristic root of a matrix.
- Learn to use matrix to solve system of linear equations.
- Understand the basics of vector algebra
- Learn inner product, vector product and scalar triple product.
- Understand the concept of cylindrical and spherical coordinates.
- Learn about the plane and curves in space.

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **30 Hours**	Polynomial Equations and Fundamental Theorem of Algebra. Applications of the Fundamental theorem to equations having one or more complex roots, Rational roots or multiple roots. Relations between roots and co-efficients of a polynomial equation	• Lecture • Discussion • Participative learning • Problem solving	• Assignments to find roots of polynomial equations. • Seminar on the topic Transformation of	• Learned to solve polynomials using cardan's method, Ferrari methods etc	Evaluation through test paper.

	and computation of symmetric functions of roots.Finding equations whose roots are functions of the roots of a given equation. Reciprocal equation and method of finding its roots. Analytical methods for solving polynomial equations of order up to four - quadratic formula.Cardano's method for solving cubic equations.Ferrari's method (for quadratic equations). Remarks about the insolvability of equations of degree five or more.Finding the nature of roots without solving Descartes' rule of signs.		equations.		
Module II **16 Hours**	Elementary transformation, reduction to normal form, row reduced echelon form.Computing the inverse of a non singular matrix using elementary row transformation.	• Lecture • Discussion • Participative learning • Problem solving	• Assignments to find the inverse of a non singular matrix using elementary row transformation .	• Learn to determine wether a matrix is singular or non singular • Learn to find out the rank of a matrix.	Evaluation through test paper.
Module III **20 Hours**	System of linear homogeneous equations.Null space and nullity of matrix.	• Lecture • Discussion • Participative learning	• Seminar on the topic related to vector space	• Understand to solve system of equation using matrix	Evaluation through Test paper

	Sylvester's law of nullity. Range of a matrix.Systems of linear non homogeneous equations. Characteristic roots and characteristic vectors of a square matrix. Some fundamental theorem. Characteristic roots of Hermitian, Skew Hermitian and Unitary matrices. Characteristic equation of a matrix, Cayley- Hamilton theorem	• Problem solving	of n-tuples. • Assignments to solve system of equations.	• Learn about characteristic roots and vectors.	
Module IV **24 Hours**	Lines and planes in space. Cylinders and Quadric surfaces, Cylindrical and spherical coordinates, Vector valued functions and space curves, Arc length and Unit tangent vector , Curvature, torsion and TNB frame	• Lecture • Discussions • Problem solving	• Group discussion on Cylindrical and spherical coordinates.	• Learn basic results in vector algebra.	Evaluation through test paper

Course Outcomes

CO1	Learned to find out the roots of polynomial equations.
CO2	Computed the inverse of a non singular matrix using elementary row transformations.
CO3	Understand about the characteristic equation and characteristic root of a matrix.
CO4	Understand the method of Gauss-Jordan elimination to find the solutions of systems of simultaneous linear equations and Learned to solve a system of linear equations by row-reduced echelon form.
CO5	Understand the basic concepts in vector algebra.

Teacher in Charge:

Ms. Reshma Joshy

Ms. Jiji Pauly

MAT5B06 : ABSTRACT ALGEBRA

Lecture Hours per week: 5, Credits: 5

Internal: 30, External: 120, Examination 3 Hours

Objectives

To introduce the basic concept of the nature of abstract algebra also gives the idea of group and ring.

Module I (20 hrs)

Binary operations, Isomorphic binary structures, Groups, Sub groups

Module II (25 hrs)

Cyclic groups, Groups and permutations, Orbits, cycles and Alternating groups

Module III (15 hrs)

Cosets and Theorem of Lagrange, Homomorphisms

Module IV (30hrs)

Rings and Fields, Integral Domains, The Field of Quotients of an Integral Domain

Textbooks :

John B. Fraleigh : A First Course in Abstract Algebra, 7th Ed., Pearson.

Reference Books:

1. Joseph A. Gallian : Contemporary Abstract Algebra. Narosa Pub. House.
2. P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul: Basic Abstract Algebra, 2nded., Cambridge University
3. Artin : Algebra, PHI.
4. Durbin : Modern Algebra : An Introduction, 5th ed., Wiley.

OBJECTIVES

1) To enable one to determine whether the given binary operation on a given set forms a group.
2) To understand the concept of subgroups.
3) To describe all elements of a cyclic group using generators.
4) To enable one to understand the homomorphism and Theorem of Lagrange.
5) To understand the concept of rings, fields and integral domains.

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **20 Hours**	Binary operations, Isomorphic binary structures, Groups; Sub groups	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on Binary operation.	• Enable to understand the concept of Groups.	Evaluation through test paper
Module II **25 Hours**	Cyclic groups, Groups and permutations, Orbits, cycles and Alternating groups	• Lecture • Discussion • Participative learning • Problem solving	• Assignments on permutation and orbits.	• enable one to compute the expression of permutation and permutation multiplication • Enable to understand different type of groups.	Evaluation through test paper
Module III **15 Hours**	Cosets and Theorem of Lagrange, Homomorphism	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on properties of homomorphism • Peer group discussion on	• Understand the theorem Lagrange and homomorphisam.	Evaluation through test paper

			Cosets.		
Module IV **30 Hours**	Rings and Fields, Integral Domains, The Field of Quotients of an Integral Domain	• Lecture • Discussion • Participative learning • Problem solving	• Seminar on the topic Rings and fields.	• To understand the concept of rings and fields • Learn the concept of Integral domain.	Evaluation through test paper and viva

Course Outcomes

CO1	Understand the concept of binary operation on a given set.
CO2	To get the idea of groups, rings, fields and integral domain.
CO3	Understand different type of groups like cyclic and alternating groups
CO4	Understand the homomorphism and Theorem of Lagrange

Teacher in Charge:

Ms. Geethu simon

MAT5B07: BASIC MATHEMATICAL ANALYSIS

Lecture Hours per week: 6, Credits: 5

Internal: 30, External: 120, Examination 3 Hours

Objectives

To develop ability to analyze and prove statements of mathematics using logical arguments.

Module I (20 hrs)

A quick review of sets and functions, Mathematical induction, Finite and infinite sets, Real Numbers, The algebraic property of real numbers.

Module II (24 hrs)

Absolute value and real line, The completeness property of R, Applications of supremum property, Intervals, Nested interval property and uncountability of R.

Module III (30 hrs)

Sequence of real numbers, Sequence and their limits, Limit theorems, Monotone sequences, Subsequence and Bolzano – Weirstrass theorem, Cauchy criterio,Properly divergent sequences, Open and closed sets.

Module IV (34 hrs)

COMPLEX NUMBERS: Sums and Products, Basic Algebraic properties, Further properties, Vectors and Moduli, Complex Conjugates, Exponential form, Product and powers in exponential form, Arguments of products and quotients, Roots of complex numbers, Regions in the complex plane, Functions of complex variable, Limits, Theorems on limits, Limits involving the points at infinity, Continuity.

Textbooks:

1) **Robert G. Bartle & Donald R. Sherbert**: Introduction to Real Analysis, 3rded., Wiley.
2) **J.W. Brown and Ruel V. Churchill**: Complex Variables and Applications, 8th Ed., McGraw Hill.

Reference Books:

1) J.M. Howie : Real Analysis, Springer 2007.

2) Ghorpade and Limaye : A Course in Calculus and Real Analysis, Springer, 2006.
3) K.A. Ross : Elementary Real Analysis : The Theory of Calculus, Springer Indian Reprint.
4) J.V. Deshpande : Mathematical Analysis and Applications, Narosh Pub. House.
5) M.R. Spiegel : Complex Variables, Schaum's Outline Series.

OBJECTIVES

1) To learn to prove Archimedean property, density theorem, existence of a positive square root for positive numbers and so on and the learning will help them to appreciate the beauty of logical arguments.
2) To learn how monotone convergence theorem can be used in establishing the divergence of the harmonic series, how it helps in the calculation of square root of positive numbers and how it establishes the existence of the transcendental number e.
3) To understand the concept of open and closed sets, their properties, their characterization and so on.
4) To familiarize the use of geometry, comparison between real and complex calculus-areas

LESSON PLAN

Unit/ Hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **20 Hours**	A quick review of sets and functions ,Mathematical induction, Finite and infinite sets Real Numbers, The algebraic property of	• Lecture • Discussion • Participative learning • Problem solving	Group discussion on Algebraic properties of R.	To generate the ability to analyze and prove statements of Mathematics.	Evaluation through test paper

	real numbers.				
Module II **24 Hours**	Absolute value and real line, The completeness property of R, Applications of supremum property Intervals, Nested interval property and uncountability of R.	• Lecture • Discussion • Participative learning • Problem solving	Student seminars related to Completeness Property of R.	To master different techniques of finding limits.	Evaluation through test paper
Module III **30 Hours**	Sequence of real numbers, Sequence and their limits, Limit theorems, Monotone sequences, Subsequence and Bolzano – Weirstrass theorem, Cauchy criterio, Properly divergent sequences, Open and closed sets.	• Lecture • Discussion • Participative learning • Problem solving	• Assignment in Limit Theorems. • Discussion on Open and Closed Sets.	To familiarize with different kinds of sequences.	Evaluation through testpaper and Viva
Module IV **34 Hours**	Sums and Products, Basic Algebraic properties, Further properties, Vectors and Moduli, Complex Conjugates, Exponential form, Product and powers in exponential form, Arguments of products and quotients, Roots of	• Lecture • Discussions • Problem solving	Student seminars to familiarize properties of Complex Numbers.	To understand areas where real and complex calculus agree and where they differ.	Evaluation through testpaper

	complex numbers, Regions in the complex plane, Functions of complex variable, Limits, Theorems on limits, Limits involving the points at infinity, Continuity.				

Course Outcomes

CO1	To appreciate the beauty of logical arguments and embolden them to apply it in similar and unknown problems.
CO2	To establish the divergence and convergence of different sequences and series.
CO3	To understand some basic topological properties of real number system.
CO4	To demystify student's belief that complex variable theory is incomprehensible.

Teacher in Charge:

Ms. Geethu Simon

Ms. Reshma Joshy

MAT5B08: DIFFERENTIAL EQUATIONS

Lecture Hours per week: 5, Credits: 4

Internal: 30, External: 120, Examination 3 Hours

Objectives

To find out ways and means for solving differential equations.

Module I (24 hrs)

Some Basic Mathematical Models: Direction Fields, Solutions of some Differential equations, Classification of Differential Equations, Historical Remarks, First order differential equations: Linear equations with variable coefficients, Separable equations, Modeling with first order equations, Differences between linear and non linear equations, Exact equations and integrating factors, The existence and uniqueness theorem.

Module II (29 hrs)

Second Order Linear Differential Equations: Homogeneous equation with constant coefficients, Fundamental solutions of Linear Homogeneous equations, Linear independence and Wronskian, Complex roots of characteristic equations, Repeated roots Reduction of order, Non homogeneous equations, Method of Undetermined coefficients, Variation of parameters, Mechanical and Electrical vibrations, Systems of First Order Linear equations: Introduction, Basic theory of systems of first order Linear Equations.

Module III (17 hrs)

Definition of Laplace Transforms , Solution of Initial Value Problem , Step functions , Impulse functions, The Convolution Integral.

Module IV (20 hrs)

Two point Boundary value problems , Fourier Series, The Fourier Convergence Theorem, Even and odd functions , Separation of variables; Heat conduction in a rod , The Wave equation, Vibrations of an elastic string.

Textbooks:

1) Thomas / Finney : Calculus, 9th ed., LPE, Pearson Education.

Reference Books:

1) Kreyszig : Advanced Engineering Mathematics, 8th ed., Wiley.
2) H.F. Davis and A.D. Snider: Introduction to Vector Analysis, 6th ed.,Universal Book Stall, New Delhi.

OBJECTIVES

1) To learn to solve DEs that are in linear, separable and in exact forms and also to analyze the solution.
2) To be familiar with the theory and method of solving a second order linear homogeneous and nonhomogeneous equation with constant coefficients.
3) To acquire the knowledge of solving a differential equation using Laplace method.
4) To get familiarized with Fourier series and its applications.

LESSON PLAN

Unit/ Hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **24 Hours**	Some Basic Mathematical Models, First order differential equations	• Lecture • Discussion • Participative learning • Problem solving	Assignment on solving first order differential equations.	To learn to solve DEs that are in linear, separable and in exact forms and also to analyze the solution.	Evaluation through test paper

Module II **29 Hours**	Second Order Linear Differential Equations, Systems of First Order Linear equations	• Lecture • Discussion • Participative learning • Problem solving	Student seminars related to Completeness Property of R.	To be familiar with the theory and method of solving a second order linear homogeneous and nonhomogeneous equation with constant coefficients.	Evaluation through test paper
Module III **17 Hours**	Laplace Transforms	• Lecture • Discussion • Participative learning • Problem solving	Assignment in solving Differential equations using Laplace transforms.	To acquire the knowledge of solving a differential equation using Laplace method.	Evaluation through testpaper and Viva
Module IV **20 Hours**	Partial Differential Equations and Fourier Series	• Lecture • Discussions • Problem solving	Student seminars in applications of Fourier Series.	To get familiarized with Fourier series and its applications.	Evaluation through testpaper

Course Outcomes

CO1	Students could identify a number of areas where the modelling process results in a differential equation.
CO2	They will realize the basic differences between linear and non linear DEs and also basic results that guarantees a solution in each case.
CO3	They will become familiar with the theory and method of solving a second order linear homogeneous and nonhomogeneous equation with constant coefficients.
CO4	Students acquire the knowledge of solving a differential equation using Laplace method which is especially suitable to deal with problems arising in engineering field.

Teacher in Charge:

Ms. Reshma Joshy

MAT5D02: MATHEMATICS FOR NATURAL SCIENCES

Lecture Hours per week: 2 Credits: 2

Internal: 10, External: 40, Examination 2 Hours

Objectives

To get introduced to statistical measures and analysis.

Module I (20 hrs)

The idea of sets, Operation on sets, Relations and functions, Variables and graphs, Frequency distributions, The Mean, Median, Mode and other measures of central tendency, Dispersion or variation, The Range, The Mean deviation, The Semi- inter quartile range, The 10- 90 Percentile range.

Module II (16 hrs)

The standard deviation, Properties of Standard Deviation, The variance, Short methods of computing standard deviation, Moments, Moments for grouped data, relation between moments, Computation of moment for grouped data. Skewness and Kurtosis.

Textbooks :

Murray R. Spiegel : Statistics, 2nd Edn., Schaum's Outline Series.

Reference Books:

1) Hogg & Craig: Introduction to Mathematical Statistics.
2) Freund & Walpole: Mathematical Statistics

OBJECTIVES

1) To understand different measures of tendency.
2) To analyse data using measures like SD, Skewness and Kurtosis.

LESSON PLAN

Unit/ Hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **18 Hours**	Sets, Frequency Distribution, Measures of Tendency	• Lecture • Discussion • Participative learning • Problem solving	Assignment on different measures of tendency.	To understand which measure is better for different kinds of data.	Evaluation through test paper and viva
Module II **12 Hours**	Standard Deviation, Moments, Skewness and Kurtosis.	• Lecture • Discussion • Participative learning • Problem solving	Student seminars on Skewness and Kurtosis on different datas.	To visualize how the data behaves.	Evaluation through test paper

Course Outcomes

CO1	Students get an understanding about the use of some statistical tools.
CO2	They learn to analyze data using different measures.

Teacher in Charge:

Ms. Reshma Joshy

MAT5B05: VECTOR CALCULUS

Lecture Hours per week: 5, Credits: 4

Internal: 30, External: 120, Examination 3 Hours

Objectives

To Provide skils to visualize and manipulate multivariable and vector values functions. Also enable students to evaluate multiple integrals.

Module I (15 hrs)

Functions of several variables, Limits and Continuity, Partial derivatives, Differentiability linearization and differentials, Chain rule, Partial derivatives with constrained variables.

Module II (20 hrs)

Directional derivatives, gradient vectors and tangent planes, Extreme value and saddle points, Lagrange multipliers, Taylor's formula, Double Integrals, Double integrals in polar form.

Module III (25 hrs)

Triple integrals in Rectangular Coordinates, Triple integrals in cylindrical and spherical coordinates, Substitutions in multiple integrals, Line integrals, Vector fields, work circulation and flux, Path independence, potential functions and conservative fields.

Module IV (30hrs)

Green's theorem in the plane, Surface area and surface integrals, Parametrized surfaces, Stokes' theorem (statement only), Divergence theorem and unified theory (no proof).

Textbooks :

Thomas / Finney : Calculus, 9th ed., LPE, Pearson Education.

Reference Books:

1. Kreyszig : Advanced Engineering Mathematics, 8th ed., Wiley.
2. H.F. Davis and A.D. Snider: Introduction to Vector Analysis, 6th ed.,

OBJECTIVES

1) To enable one to apply the basic concepts of partial derivatives.
2) To learn to find multiple integrals.
3) To understand concept of the integrals of the functions and vector fields over parametrized surfaces and compute them in simple examples.
4) To calculate directional derivatives and gradients.
5) To learn application of greens theorem and stokes theorem.

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **15 Hours**	Functions of several variables, Limits and Continuity, Partial derivatives, Differentiability linearization and differentials, Chain rule, Partial derivatives with constrained variables.	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on Partial derivatives.	• Enable to find partial derivatives.	Evaluation through test paper
Module II **20 Hours**	Directional derivatives, gradient vectors and tangent planes, Extreme value and saddle points, Lagrange multipliers, Taylor's formula, Double Integrals, Double integrals in polar	• Lecture • Discussion • Participative learning • Problem solving	• Assignments in finding Directional derivatives and double integrals.	• Enable to evaluate double integrals.	Evaluation through test paper

	form.				
Module III **25 Hours**	Triple integrals in Rectangular Coordinates, Triple integrals in cylindrical and spherical coordinates, Substitutions in multiple integrals, Line integrals, Vector fields, work circulation and flux, Path independence, potential functions and conservative fields.	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain vector fields, work and circulation	Understand triple integrals and vector fields.	Evaluation through MCQ and Group Discussion
Module IV **30 Hours**	Green's theorem in the plane, Surface area and surface integrals, Parametrized surfaces, Stokes' theorem (statement only), Divergence theorem and unified theory (no proof).	• Lecture • Discussion • Participative learning • Problem solving	• Assignments related to Surface integrals.	Learn the application of greens theorem and stokes theorem in multiple integrals.	Evaluation through test paper

Course Outcomes

CO1	Understand the basic concept of partial derivatives.
CO2	Enable to calculate multiple integrals.
CO3	Understand the concept of a conservative vector field
CO4	Learn the application of greens theorem and stokes theorem in multiple integrals and understand how they are generalizations of the Fundamental theorem of calculus.

Teacher in Charge:

Ms. Jiji Pauly

MAT6B10 : COMPLEX ANALYSIS

Lecture Hours per week: 5, Credits: 5

Internal: 30, External: 120, Examination 3 Hours

Objectives

To learn basic concepts of complex analysis and its applications.

Module I : Analytic Functions (15 hrs)

Derivatives, Differentiation formula, Cauchy-
Riemann Equations, Polar coordinates, Analytic functions, Harmonic functions , Elementary functions , The exponential function, Logarithmic function, Complex exponents, Trigonometric functions, Hyperbolic f unctions, Inverse Trigonometric and Hyperbolic functions.

Module II : Integrals (25 hrs)

Derivatives of functions ω(t); Indefinite integral of ω(t); Contours, Contour integrals, Antiderivatives, Cauchy -
Goursat theorem (without proof), Simply and multiply connected domains, Cauchy's integral formula and its e xtension, Liouville's theorem and fundamental theorem of algebra, Maximum modulus principle.

Module III : Series (25 hrs)

A quick review of convergence of sequence and series of complex numbers,Taylor series, Laurents series (wi thoutproof), Applications,Power series: Absolute and uniform convergence,Continuity of sum of powerseries, Differentiation and integration of power series, Multiplication and division of power series.

Module IV : Residues (25 hrs)

Isolated singular points, Residues, Cauchy's residue theorem, Residue at infinity, Three types of isolated

singular points, Residues at poles, Zeroes of analytic functions, Zeroes and poles,Applications of residues, E valuation of improper integrals, Jordan's Lemma (statement only), Definite integrals involving sines and cosi nes.

Textbooks :

1) **James Ward Brown and Ruel V. Churchill** : Complex Variables and Applications (8th Edn.), McGraw Hill.

Reference Books:

1) Mark J.Ablowitz and Anthanassios S. Fokas: Complex Variables, Cambridge Text, 2nd Edn

2) S. Ponnusamy : Foundation of Complex Analysis : Narosa.

3) Murray R. Spiegel: Complex Variables, Schaum's Outline series.

4) J.M. Howie: Complex Analysis: Springer India Reprint

5) Stewart & Tall: Complex Analysis, CUP

OBJECTIVES

1) To develop differentiability and analyticity of complex valued functions
2) To develop complex integration
3) To represent an analytic function as power series.
4) To classify the singular points using Laurent series and develop the concept of residues and its applications.

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **15 Hours**	Derivatives, Cauchy- Riemann Equations,Analytic functions,Harmonic functions , Exponential ,	• Lecture • Discussion • Participative learning • Problem solving	• Assignments in finding harmonic conjugates	To understand the difference between differentiability and analyticity	Evaluation through test paper

	Logarithmic, Trigonometric , Hyperbolic , Inverse Trigonometric and Hyperbolic functions				
Module II **25 Hours**	Derivatives ofω(t), Indefinite integral of ω(t); Contours, Contour integrals, Antiderivatives, Cauchy- Goursat theorem , Simplyand multiply connected domains, Cauchy's integralformula and its extension, Liouville's theorem and fundamental theorem of algebra, Maximum modulus principle.	• Lecture • Discussion • Participative learning • Problem solving	• Group discussion on contour integrals	To understand integration of complex functions and related theorems	Evaluation through test paper and viva
Module III **25 Hours**	Convergence of sequence and series of complex numbers ,Taylor series, Laurents series , Absolute and Uniform convergence, Continuity of sum of powerseries,	• Lecture • Discussion • Participative learning • Problem solving	• Student seminar to explain absolute and uniform convergence of power series	To understand Taylor series and Laurent series	Evaluation through Test paper and Group Discussion

	Differentiation and integration of power series, Multiplication and division of power series.				
Module IV **25 Hours**	Isolated singular points, Residues, Cauchy's residue theorem, Residue at infinity, Three types of isolated singular points, Residues at poles, Zeroes of analytic functions, Zeroes and poles, Applications of residues, Evaluation of improper integrals, Jordan's Lemma , Definite integral involving sines and cosines.	• Lecture • Discussions • Problem solving	• Assignments in finding isolated singular points and residues	To understand isolated singular points, residues and applications of residues	Evaluation through test paper

Course Outcomes

CO1	To understand difference between differentiability and analyticity of complex valued functions.

CO2	To learn indefinite integrals of complex valued functions.
CO3	Learn to express an analytic function as a power series.
CO4	To understand the concepts of singular points, residues, and applications of residues.

Teacher in Charge:

Ms. Geethu Simon

MAT6B13(E02) : LINEAR PROGRAMMING

Lecture Hours per week: 3, Credits: 2

Internal: 20, External: 80, Examination 3 Hours

Objectives

Formulate our real life problem into a mathematical model also different techniques to solve LPP are introduced.

Module I (16 hrs)

Formulation, Convex sets, General LLP

Module II (14 hrs)

Simplex Method, Duality

Module III (18 hrs)

The transportation problem, The assignment Problems

Textbooks :

Gupta and Manmohan - Linear Programming And Theory of Games

Reference Books:

1. . K. V. Mital&Manmohan: Optimization methods in Operations Research and Systems Analysis, 3rdEdn., New Age International publishers.
2. DipakChatterjee: Linear Programming and Game Theory, Prentice Hall of India.

OBJECTIVE

1. Enable to formulate LPP from real life problem
2. Conceptulize the feasible region, feasible solution, optimal solution etc.
3. Solve the LPP with two variables using graphical method
4. Solve the LPP using simplex method
5. Formulate the dual problem from primal
6. Solve transportation problem and the assignment Problems which are relevent in daily life.

LESSON PLAN

Unit/ session/ hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **16 Hours**	Formulation, Convex sets, General LLP	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on formulation of lpp. • Seminar on the topic convex sets.	• Understand to formulate lpp.	Evaluation through test paper
Module II **14 Hours**	Simplex Method, Duality	• Lecture • Discussion • Participative learning • Problem solving	• Assignments in solving LPP using simplex method.	• Understand to solve lpp in finite number of steps using simplex method.	Evaluation through test paper and viva
Module III **18 Hours**	The transportation problem, The assignment Problems	• Lecture • Discussion • Participative learning • Problem solving	• Assignments related to solve transportation problems and assignment problems	• Enable one to solve transportation problem and the assignment Problems which are relevent in daily life.	Evaluation through Test paper and Group Discussion

Course Outcomes

Course Outcomes

CO1	Enable one to formulate LPP from real life problem.

CO2	Solve the LPP with two variables using graphical method
CO3	Solve the LPP using simplex method
CO4	Solve transportation problem and the assignment Problems which are relevent in daily life.

Teacher in Charge:

Ms. Reshma Joshy

MAT6B12 : NUMBER THEORY AND LINEAR ALGEBRA

Lecture Hours per week: 5, Credits: 4

Internal: 30, External: 120, Examination 3 Hours

Objectives

To study about the integers and integer valued functions. Also introduce the concept of vector fields and linear transformations.

Module I (30 hrs)

Divisibility theory in the integers – the division algorithm, the greatest common divisor, the Euclidean algorithm, the Diophantine equation ax + by = c. Primes and their distribution. The fundamental theorem of arithmetic.The sieve of Eratosthenes. The theory of congruences.Basic properties of congruence.Binary and decimal representation of integers. Linear congruences and Chinese remainder theorem

Module II (25 hrs)

Fermat's little theorem and pseudoprimes Wilson's theorem. The sum and number of divisors.The greatest integer function.Euler's phi-function.Euler's generalization of Fermat's theorem.Properties of the phi-function.

Module III (15 hrs)

Vectorspaces-examples, linearcombinations, spanning, linearindependence, base, finite dimensional vector spaces.

Module IV (20 hrs)

Linear mappings- Linear transformations, examples, nullspace, rank –nullity theorem, linear isomorphism

Textbooks :

1. David M. Burton : Elementary Number Theory, Sixth Edn., TMH.

2. T. S. Blynth and E.F. Robertson: Basic Linear Algebra, second Edn springer under graduate mathematics series 2009

Reference Books:

1. C.Y. Hsiung : Elementary Theory of Numbers. Allied Publishers.

2. Neville Robbins : Beginning Number Theory, Second Ed. Narosa.
3. George E. Andrews : Number Theory, HPC.
4. Kenneth Hoffman & Ray Kunze : Linear Algebra, Pearson Education.
5. Frank Ayres, Jr. : Matrices, Schaum's Outline Series, Asian Student edition.
6. Devi Prasad : Elementary Linear Algebra, Narosa Pub. House

OBJECTIVE

1. Enable to find gcd using Euclidean algorithm.
2. To understand the solution of diophantine equations.
3. Enable to solve system of congruence using chinese remainder theorem.
4. To learn Wilson's theorem, Fermat's little theorem and Euler's theorem
5. Understand the concept of vector space and its basis.
6. Understand the concept of linear transformation and application of rank nullity theorem.

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I 30 Hours	The division algorithm, Gcd, the Euclidean algorithm, the Diophantine equation. Primes and their distribution. The fundamental theorem of arithmetic. The sieve of Eratosthenes. The theory of congruences. Basic	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on gcd and euclidean algorithm. • Assignment in finding solution of system of congruence using chinese remainder theorem	• Understand the linear congruence and the method for finding its solutions.	Evaluation through test paper

	properties of congruence. Binary and decimal representation of integers. Linear congruences and Chinese remainder theorem.				
Module II **25 Hours**	Fermat's little theorem and pseudoprimes Wilson's theorem. The sum and number of divisors. The greatest integer function. Euler's phi-function. Euler's generalization of Fermat's theorem. Properties of the phi-function.	• Lecture • Discussion • Participative learning • Problem solving	• Assignments in finding sum and number of divisors • Seminar on the topic Euler's phi-function and Properties of the phi-function.	• Understand fermat's theorem, wilson's theorem, euler's theorem and its applications.	Evaluation through test paper and viva
Module III **15 Hours**	Vectorspaces- examples, linearcombinations, spanning, linearindependence, base, finite dimensional vector spaces.	• Lecture • Discussion • Participative learning • Problem solving	• Assignments related to vector space and its example.	• Understand the definition of vector space and its basis.	Evaluation through MCQ and Group Discussion
Module IV **20 Hours**	Linear mappings- Linear transformations, examples, nullspace, ranknullity theorem, linear isomorphism.	• Lecture • Discussions • Problem solving	• Student seminars inconnection with Linear transformation and its example.	• Become familiar with the concept of Linear transformations and rank nullity theorem.	Evaluation through test paper

Course Outcomes

CO1	To prove results involving divisibility, greatest common divisor, least commonmultiple and a few applications.
CO2	Enable to solve system of congruence and diophantine equation
CO3	To learn the theorems viz. Wilson's theorem, Fermat's little theorem and Euler's theorem and its applications.
CO4	To Lean if a set of vectors is a vector space or a basis for a vetor space.
CO5	Understand the concept of linear transformation and application of rank nullity theorem.

Teacher in Charge:

Ms. Jiji Pauly

MAT6B11 : NUMERICAL METHODS

Lecture Hours per week: 5, Credits: 4

Internal: 30, External: 120, Examination 3 Hours

Objectives

To provide techniques and algorithms to find approximate numerical solution to problems in several areas of mathematics.

Module I : Solution of Algebraic and Transcendental Equation (23 hrs)

Introduction, Bisection Method, Method of false position, Iteration method, Newton- Raphson Method, Ramanujan's method, The Secant Method, Finite Differences, Forward differences, Backward differences, Central differences, Symbolic relations and separation of symbols, Differences of a Polynomial.

Module II : Interpolation (23 hrs)

Newton's formulae for intrapolation, Central difference interpolation formulae, Gauss' Central Difference Formulae, Interpolation with unevenly spaced points, Langrange's interpolation formula, Divided differences and their properties, Newton's General interpolation formula, Inverse interpolation, Numerical Differentiation and Integration, Introduction, Numerical differentiation (using Newton's forward and backward formulae), Numerical Integration, Trapizoidal Rule, Simpson's 1/3- Rule , Simpson's 3/8- Rule.

Module III : Matrices and Linear Systems of equations (22 hrs)

Solution of Linear Systems – Direct Methods, Gauss elimination, Gauss- Jordan Method, Modification of Gauss method to compute the inverse, LU Decomposition, LU Decomposition from Gauss elimination, Solution of Linear Systems – Iterative methods, The eigen value problem, Eigen values of Symmetric Tridiazonal matrix.

Module IV : Numerical Solutions of Ordinary Differential Equations (22 hrs)

Introduction, Solution by Taylor's series, Picard's method of successive approximations, Euler's method, Modified Euler's Method, Runge- Kutta method, Predictor- Corrector Methods, Adams- Moulton Method, Milne's method.

Textbooks:

1) **S.S. Sastry** : Introductory Methods of Numerical Analysis, Fourth Edition, PHI.

Reference Books:

1) S. SankaraRao : Numerical Methods of Scientists and Engineer, 3rd ed., PHI.
2) F.B. Hidebrand : Introduction to Numerical Analysis, TMH.
3) J.B. Scarborough : Numerical Mathematical Analysis, Oxford and IBH

OBJECTIVES

1) To understand several methods such as bisection method, fixed point iteration method, regula falsi method etc.
2) To understand the concept of interpolation.
3) To solve system of linear equations using matrices.
4) To learn to find numerical approximations to solutions of initial value problems.

LESSON PLAN

Unit/ Hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **23 Hours**	Solution of Algebraic and Transcendental Equation, Finite differences	• Lecture • Discussion • Participative learning • Problem solving	• Assignment in different methods to solve equations	To learn to solve equations using different techniques.	Evaluation through test paper

			• Seminars in Finite differences		
Module II **23 Hours**	Interpolation, Numerical Differentiation, Numerical Integration	• Lecture • Discussion • Participative learning • Problem solving	Assignments in different techniques.	To find derivatives and integrals at a point using numerical techniques.	Evaluation through test paper
Module III **22 Hours**	Matrices and Linear Systems of equations	• Lecture • Discussion • Participative learning • Problem solving	Seminar on which technique is better and easier.	To learn to use matrices to solve system of linear equations.	Evaluation through testpaper and Viva
Module IV **22 Hours**	Numerical Solutions of Ordinary Differential Equations	• Lecture • Discussions • Problem solving	Assignment related to IVP	To find out numerical approximations to solutions of initial value problems.	Evaluation through testpaper

Course Outcomes

CO1	Understand several methods such as bisection method, fixed point iteration method, regula falsi method etc. to find out the approximate numerical solutions of algebraic and transcendental equations with desired accuracy.
CO2	Understand the concept of interpolation and also learn some well known interpolation techniques.
CO3	Understand a few techniques for numerical differentiation and integration and also realize their merits and demerits.
CO4	Find out numerical approximations to solutions of initial value problems and also to understand the efficiency of various methods.
CO5	Learn to solve system of linear equations using matrices.

Teacher in Charge:

Ms. Reshma Joshy

MAT6B09: REAL ANALYSIS

Lecture Hours per week: 5, Credits: 5

Internal: 30, External: 120, Examination 3 Hours

Objectives

To teach one how to combine different definitions, theorems and techniques to solve problems.

Module I : Continuous Functions (25 hrs)

Continuous functions, Continuous functions on intervals, Uniform continuity

Module II : Riemann Integral (25 hrs)

Riemann Integral, Riemann Integrable Functions, The fundamental theorem, Substitution theorem and application, Approximate Integration

Module III : Sequence and series of functions (20 hrs)

A quick review of series of real numbers, Pointwise and uniform convergence, Interchange of limit and continuity, Series of functions .

Module IV (20 hrs)

Improper Integrals : Improper integrals of the first kind, Improper integrals of the second kind,Cauchy Principal value, Improper Integrals of the third kind.

Beta and Gamma functions : Beta Functions, Gamma Functions, Relation between Beta and Gamma Functions

Textbooks:

1) **G. Bartle, Donald R. Sherbert** : Introduction to Real Analysis (3rd Edn.)
2) **R.R. Goldberg** : Methods of Real Analysis.
3) **Narayanan & Manicavachagom Pillay** : Calculus, Vol. II

Reference Books:

1) J.V. Deshpande: Mathematical Analysis and Applications, Narosa Pub. House.
2) Torence Tao : Analysis I, TRIM 37, Hindustan Book Agency.
3) K.A. Ross: Elementary Real Analysis : Theory of Calculus, Springer.
4) K.G. Binmore: Mathematical Analysis, CUP

OBJECTIVES

1) To state the definition of continuous functions, formulate sequential criteria for continuity and prove or disprove continuity of functions using this criteria.
2) To develop the notion of Riemann integrability of a function using the idea of tagged partitions and calculate the integral value of some simple functions using the definition.
3) To prove convergence and divergence of sequences of functions and series.
4) To learn the properties of and relationship among two important improper integrals.

LESSON PLAN

Unit/ Hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **25 Hours**	Continuous Functions, Uniform Continuity	• Lecture • Discussion • Participative learning • Problem solving	Assignment regarding difference in Continuity and Uniform Continuity.	To understand several deep and fundamental results of continuous functions on intervals.	Evaluation through test paper

Module II **25 Hours**	Riemann Integral	• Lecture • Discussion • Participative learning • Problem solving	Student seminars related to Riemann Intregrability.	To understand a few basic and fundamental results of integration theory.	Evaluation through test paper
Module III **20 Hours**	Sequence and series of functions	• Lecture • Discussion • Participative learning • Problem solving	Assignment on convergence of series and sequences of functions.	To understand the difference between pointwise and uniform convergence of sequences and series of functions.	Evaluation through testpaper and Viva
Module IV **20 Hours**	Improper Integrals, Beta and Gamma functions	• Lecture • Discussions • Problem solving	Seminars related to Improper Integrals and Principal Value.	To understand the notion of improper integrals, their convergence, principal value and evaluation.	Evaluation through testpaper

Course Outcomes

CO1	To understand several deep and fundamental results of continuous functions on intervals such as boundedness theorem, maximum-minimum theorem, intermediate value theorem, preservation of interval theorem and so on.
CO2	To develop the notion of Riemann integrability of a function using the idea of tagged partitions and calculate the integral value of some simple functions using the definition.
CO3	To learn and find out examples/counter examples to prove or disprove the validity of several mathematical statements that arise naturally in the process/context of learning.
CO4	To learn the properties of and relationship among two important improper integrals namely beta and gamma functions that frequently appear in mathematics, statistics, science and engineering.

Teacher in Charge:

Ms. Geethu Simon

Ms. Reshma Joshy

MT1C02: LINEAR ALGEBRA
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the basic concepts of Linear Algebra.

MODULE I

Vector Spaces & Linear Transformations

MODULE II

Linear Transformations (continued) and Elementary Canonical Forms

MODULE III

Elementary Canonical Forms (continued), Inner Product Spaces

TEXT:

HOFFMAN K. and KUNZE R., LINEAR ALGEBRA (2nd Edn.), Prentice Hall of India, 199

REFERENCES :

[1] P. R. Halmos: Finite Dimensional Vector spaces; Narosa Pub House, New Delhi; 1980.

[2] A. K. Hazra: Matrix: Algebra, Calculus and generalised inverse- Part I; Cambridge International Science Publishing; 2007.

[3] I. N. Herstein: Topics in Algebra; Wiley Eastern Ltd Reprint; 1991.

[4] S. Kumaresan: Linear Algebra-A Geometric Approach; Prentice Hall of India; 2000.

[5] S. Lang: Linear Algebra; Addison Wesley Pub.Co.Reading, Mass; 1972.

[6] S. Maclane and G. Bikhrkhoff: Algebra; Macmillan Pub Co NY; 1967.

[7] N. H. McCoy and R. Thomas: Algebra; Allyn Bacon Inc NY; 1977.

[8] R. R. Stoll and E.T.Wong: Linear Algebra; Academic Press International Edn; 1968.

[9] G. Strang: linear algebra and its applications(4th edn.); Cengage Learning; 2006.

OBJECTIVES

a) **To understand the concept of vector spaces, basis and dimension.**

b) **To study about linear transformations and its properties.**

c) **To understand the concept of functionals and dual space**

d) **To study the relation between linear transformations and corresponding matrices.**

e) **To study about inner product spaces.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (30 hours)	Vector spaces, subspace, basis, dimension, properties, linear transformations	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on properties of vector spaces	To understand: • the basics of vector spaces, basis • notion of linear transformation • properties of linear transformation	Evaluation through test papers and interaction with students
Module I1 (35 hours)	linear transformations, functionals, dual space and elementary canonical transformations	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain the properties of linear transformations	To understand: • More about linear transformation • Significance of dual space	Evaluation through test paper
Module III (25 Hours)	canonical transformations inner product spaces,	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on inner product spaces	To understand: • Inner product spaces and their relevance • Orthogonal compliment and direct sums of vector spaces	Evaluation through test paper

Course Outcomes

CO1	To understand the concept of vector spaces, their basis, dimension and linear transformations
CO2	To understand more about linear transformations and some of its important properties, elementary canonical forms
CO3	To introduce the concept of Inner product spaces, orthogonal compliment and direct sums of vector spaces

Faculty in charge:
Dr. Nidhin T J

MT1C05: NUMBER THEORY

Number of hours of Lectures per week: 5

Number of Credits: 4

Objectives

To understand the basic concepts of Number Theory.

Module 1

Arithmetical functions and Dirichlet multiplication; Averages of arithmetical functions

Module 2

Some elementary theorems on the distribution of prime numbers

Module 3

Quadratic residues and quadratic reciprocity law ,Cryptography, Public key.

TEXT 1 : APOSTOL T.M., INTRODUCTION TO ANALYTIC NUMBER THEORY, Narosa Publishing House, New Delhi, 1990.

TEXT 2: KOBLITZ NEAL A., COURSE IN NUMBER THEROY AND CRYPTOGRAPHY, SpringerVerlag, NewYork, 1987.

References

[1] A. Beautelspacher: Cryptology; Mathematical Association of America (Incorporated); 1994

[2] H. Davenport: The higher arithmetic(6th Edn.); Cambridge Univ.Press; 1992

[3] G. H. Hardy and E.M. Wright: Introduction to the theory of numbers; Oxford International Edn; 1985

[4] A. Hurwitz & N. Kritiko: Lectures on Number Theory; Springer Verlag ,Universitext; 1986

[5] T. Koshy: Elementary Number Theory with Applications; Harcourt / Academic Press; 2002

[6] D. Redmond: Number Theory; Monographs & Texts in Mathematics No: 220; Marcel Dekker Inc.; 1994

[7] P. Ribenboim: The little book of Big Primes; Springer-Verlag, New York; 1991

[8] K.H. Rosen: Elementary Number Theory and its applications(3rd Edn.); Addison Wesley Pub Co.; 1993

[9] W. Stallings: Cryptography and Network Security-Principles and Practices; PHI; 2004

[10] D.R. Stinson: Cryptography- Theory and Practice(2nd Edn.); Chapman & Hall / CRC (214. Simon Sing : The Code Book The Fourth Estate London); 1999

[11] J. Stopple: A Primer of Analytic Number Theory-From Pythagorus to Riemann; Cambridge Univ Press; 2003

[12] S.Y. Yan: Number Theroy for Computing(2nd Edn.); Springer-Verlag; 2002

OBJECTIVES

a) **To understand the basic arithmetical functions and its averages.**

b) **To get familiarize with theorems on the distribution of prime numbers.**

c) **To understand quadratic residues, quadratic reciprocity law.**

d) **To study about basics of cryptography .**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (30 hours)	Arithmetical functions and Dirichlet multiplication; Averages of arithmetical functions	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on various arithmetic functions.	To understand: • Arithmetical functions • Dirichlet multiplication and derivatives of arithmetical functions • Averages of arithmetical functions.	Evaluation Through Test paper
Module I1	Some elementary theorems on the	• Lecture • Discussion • Participative	• Student seminars to	To understand: • Equivalent	Evaluation Through test paper

(30 hours)	distribution of prime numbers	learning • Problem solving	explain theorems on distribution of prime numbers.	forms of prime number theorem. • Partial sums of Mobius function.	
Module III (30 Hours)	Quadratic residues and quadratic reciprocity law, Cryptography, Public key	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on legendre's symbol, its properties and Gauss lemma.	To understand: • Quadratic Residues and Quadratic reciprocity law,jacobi's symbol. • Basics of cryptography, types of crypto-system and its cryptanalysis.	Evaluation through test paper

Course Outcomes

CO1	To introduce the Arithmetical functions,Dirichlet multiplication and derivatives of arithmetical functions,Averages of arithmetic.
CO2	To understand the Equivalent forms of prime number theorem, Partial sums of Mobius function.
CO3	To understand the quadratic residues and quadratic reciprocity law, jacobi's symbol , basics of cryptography, types of cryptosystem and its cryptanalysis.

Faculty in charge:
Ms. Smitha Davis

MT1C03: REAL ANALYSIS I
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the basic concepts of real analysis.

MODULE I

Basic Topololgy, Finite, Countable and Uncountable sets Metric Spaces, Compact Sets, Perfect Sets, Connected Sets. Continuity - Limits of function, Continuous functions, Continuity and compactness, continuity and connectedness, Discontinuities, Monotonic functions, Infinite limits and Limits at Infinity

MODULE II

Differentiation The derivative of a real function, Mean Value theorems, The continuity of Derivatives, L Hospitals Rule, Derivatives of Higher Order, Taylors Theorem, Differentiation of Vector valued functions. The Riemann Stieltjes Integral, - Definition and Existence of the integral, properties of the integral, Integration and Differentiation

MODULE III

The Riemann Stieltjes Integral (Continued) - Integration of Vector vector-valued Functions, Rectifiable curves. Sequences and Series of Functions - Discussion of Main problem, Uniform convergence, Uniform convergence and continuity, Uniform convergence and Integration, Uniform convergence and Differentiation. Equicontinuous Families of Functions, The Stone Weierstrass

TEXT:

RUDIN W., PRINCIPLES OF MATHEMATICAL ANALYSIS (3rd Edn.), Mc. Graw-Hill, 1986.

REFERENCES :

[1] H. Amann and J. Escher: Analysis-I; Birkhuser; 2006.

[2] T. M. Apostol: Mathematical Analysis(2nd Edn.); Narosa; 2002.

[3] R. G. Bartle: Elements of Real Analysis(2nd Edn.); Wiley International Edn.; 1976.

[4] R. G. Bartle and D.R. Sherbert: Introduction to Real Analysis; John Wiley Bros; 1982.

[5] J. V. Deshpande: Mathematical Analysis and Applications- an Introduction; Alpha Science International; 2004.

OBJECTIVES

a) **To understand the basic concepts of Topology: Finite, Countable and Uncountable sets, Metric spaces, Compact sets, Perfect sets, Connected sets.**

b) **To develop the notion of continuity of functions in R^K.**

c) **To understand the concept of differentiation of real valued and complex valued functions.**

d) **To study about Riemann Stieltjes Integral and Rectifiable curves.**

e) **To understand the convergence of sequence and series of functions.**

f) **To understand the relation between uniform convergence and continuity, uniform convergence and differentiation, uniform convergence and integration**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (35 hours)	Basic topology, Continuous functions, continuity and compactness, continuity and connectedness, discontinuities	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on basic topology and continuity of functions	To understand: • the basics of topology • notion of continuity • difference between continuity and uniform continuity	Evaluation Through MCQ
Module I1 (30 hours)	Differentiation, derivatives of higher order, differentiation of	• Lecture • Discussion • Participative	• Student seminars to explain the	To understand: • differentiation of vector valued	Evaluation Through test paper

	vector valued functions, Riemann Stieltjes Integral	learning • Problem solving	properties of differentiation and integration	functions • integration of vector valued functions	
Module III (25 Hours)	Convergence of sequence and series of functions, uniform convergence and continuity, uniform convergence and differentiation, uniform convergence and integration	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on properties of convergence of functions	To understand: • Convergence of sequence and series of functions • Differentiate between convergence and uniform convergence	Evaluation through test paper

Course Outcomes

CO1	To introduce the concept of basic topology, difference between continuous and uniformly continuous functions and its properties.
CO2	To understand the concept of differentiation of vector valued functions and integration of functions.
CO3	To understand the difference between pointwise convergence and uniform convergence of sequence of functions, convergence of series of functions

Faculty in charge:
Dr. Vijitha Mukundan

MTH1C01: ALGEBRA I
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the basic concepts of abstract algebra.

MODULE I

Plane Isometries, Direct products & finitely generated Abelian Groups, Factor Groups, Factor-Group Computations and Simple Groups, Group action on a set, Applications of G-set to counting

MODULE II

Isomorphism theorems, Series of groups, (Omit Butterfly Lemma and proof of the Schreier Theorem), Sylow theorems, Applications of the Sylow theory, Free Groups

MODULE III

Group Presentations, Rings of polynomials, Factorization of polynomials over a field, Non Commutative examples, Homomorphism and factor rings

TEXT:

JOHN B. FRALEIGH, A FIRST COURSE IN ABSTRACT ALGEBRA(7th Edn.), Pearson Education Inc., 2003.

REFERENCES :

[1] N. Bourbaki: Elements of Mathematics: Algebra I, Springer; 1998.

[2] Dummit and Foote: Abstract algebra(3rd edn.); Wiley India; 2011.

[3] P.A. Grillet: Abstract algebra(2nd edn.); Springer; 2007

[4] I.N. Herstein: Topics in Algebra(2nd Edn); John Wiley & Sons, 2006.

[5] T.W. Hungerford: Algebra; Springer Verlag GTM 73(4th Printing); 1987.

[6] N. Jacobson: Basic Algebra-Vol. I; Hindustan Publishing Corporation(India), Delhi; 1991.

[7] T.Y. Lam: Exercises in classical ring theory(2nd edn); Springer; 2003.

[8] C. Lanski: Concepts in Abstract Algebra; American Mathematical Society; 2010.

[9] N.H. Mc Coy: Introduction to modern algebra, Literary Licensing, LLC; 2012.

[10] S. M. Ross: Topics in Finite and Discrete Mathematics; Cambridge; 2000.

[11] J. Rotman: An Introduction to the Theory of Groups(4th edn.); Springer, 1999.

OBJECTIVES

a) **To understand the basic concepts of groups, factor groups, simple groups and group action on a set.**

b) **To get familiarize with Isomorphism theorems and its properties.**

c) **To understand the concept of sylow theorems and its applications.**

d) **To study more about rings of polynomials and factorization of polynomials over a field.**

e) **To understand homomorphism and factor ring.**

LESSON PLAN

Unit/ session/ hours (time required)	**Topics to be taught (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module 1 (30 hours)	Plane Isometries, Abelian groups, Factor groups, Simple groups, group action on a set	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on groups and its properties	To understand: • the basics of different types of groups • notion of group action on a set	Evaluation Through MCQ
Module I1 (30 hours)	Isomorphism theorems, Sylow theorems and its applications	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain the properties of Isomprhism • Peer group discussion on Sylow theorems	To understand: • Isomorphism theorems and their significance • Sylow theorems and its applications	Evaluation Through test paper

Module III (30 Hours)	Ring of polynomials, factorization of a polynomial over a field, homomorphism and factor rings	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on properties of homomorphism and factor rings	To understand: • homomorphism and factor rings • factorization of a polynomial over a field convergence	Evaluation through test paper

Course Outcomes

CO1	To get the idea of different types of groups and group action on a set
CO2	To understand the concept of isomorphism theorems and their significance, Sylow theorems and its applications
CO3	To understand factorization of a polynomial over a field, homomorphism and factor rings

Faculty in charge:
Ms. Linet Roslin Antony

MTH1C05 – DISCRETE MATHEMATICS

Number of hours of lectures per week : 5 hrs

Number of credits : 4

OBJECTIVE

To understand concepts in graph theory, lattices and automata.

MODULE I

Order Relations, Lattices; Boolean Algebra Definition and Properties, Boolean Functions.

MODULE II

Basic concepts, Subgraphs, Degree of vertices, Paths and connectedness, Automorphism of a simple graph, Operations on graphs, Vertex cuts and Edge cuts, Connectivity and Edge connectivity, Trees-Definition, Characterization and Simple properties, Eulerian graphs, Planar and Non planar graphs, Euler formula and its consequences, K5 and K3,3 are non planar graphs, Dual of a plane graph.

MODULE III

Automata and Formal Languages: Introduction to the theory of Computation, Finite Automata.

TEXTBOOKS

TEXT 1: R. BALAKRISHNAN and K. RANGANATHAN, A TEXT BOOK OF GRAPH THEORY, Springer-Verlag New York, Inc., 2000.

TEXT 2: K. D JOSHI, FOUNDATIONS OF DISCRETE MATHEMATICS, New Age International(P) Limited, New Delhi, 1989.

TEXT 3: PETER LINZ, AN INTRODUCTION TO FORMAL LANGUAGES AND AUTOMATA (2nd Edn.), Narosa Publishing House, New Delhi, 1997.

REFERENCES

[1] J. C. Abbot: Sets, lattices and Boolean Algebras; Allyn and Bacon, Boston; 1969.

[2] J. A. Bondy, U.S.R. Murty: Graph Theory; Springer; 2000.

[3] S. M. Cioaba and M.R. Murty: A First Course in Graph Theory and Combinatorics; Hindustan Book Agency; 2009.

[4] J. A. Clalrk: A first look at Graph Theory; World Scientific; 1991.

OBJECTIVES

- To understand the definition of Boolean algebra and Boolean functions along with various properties.
- To study graph and its types with suitable examples.
- To learn about connectivity of graphs.
- To understand the definition of trees and learn various theorems related to it.
- To study about language, grammar and types of acceptors.

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I	Lattices; Boolean Algebra Definition and Properties, Boolean Functions	• Discussion • Participative learning • Problem solving	Seminars by students	To study about Boolean algebra and Boolean functions.	Evaluation through test paper.
MODULE II	Graph definition with examples, isomorphism, connected graphs, planar graphs, trees and eulerian graphs	• Lecture • Discussion • Participative learning • Problem solving	Assignments on isomorphism of graphs. Discussion about various definitions.	To learn basics about graphs and trees. To study about planarity and connectivity.	Evaluation through test paper.
MODULE III	Definition of automata. Languages and Grammars. DFA and NFA	• Lecture • Discussion • Participative learning • Problem solving	Discussion on applications of automata. Working out exercise problems on DFA and NFA	To know the basic about automata. To learn about DFA and NFA	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about Boolean algebra and Boolean functions.
CO2	To learn basics about graphs and trees. To study about planarity and connectivity.
CO3	To know the basic about automata. To learn about DFA and NFA

Faculty in Charge
Ms. Amala Mary George

MTH2C06: ALGEBRA II
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the ideas and concepts of insolvability of the quintic.

MODULE I

Prime and Maximal Ideals, Introduction to Extension Fields, Algebraic Extensions (Omit Proof of the Existence of an Algebraic Closure), Geometric Constructions. [27, 29, 31, 32]

MODULE II

Finite Fields, Automorphisms of Fields, the Isomorphism Extension Theorem, Splitting Fields, Separable Extensions. [33, 48, 49, 50, 51]

MODULE III

Galois Theory, Illustration of Galois Theory, Cyclotomic Extensions, Insolvability of the Quintic. [53, 54, 55, 56]

TEXT: John B. Fraleigh: A FIRST COURSE IN ABSTRACT ALGEBRA (7th Edn), Pearson Education Inc., 2003.

REFERENCES :

[1] N. Bourbaki: Elements of Mathematics: Algebra I, Springer; 1998

[2] Dummit and Foote: Abstract algebra (3rd Edn); Wiley India; 2011

[3] M.H. Fenrick: Introduction to the Galois correspondence (2nd Edn); Birkhuser; 1998

[4] P.A. Grillet: Abstract algebra (2nd Edn); Springer; 2007

[5] I.N. Herstein: Topics in Algebra (2nd Edn); John Wiley & Sons, 2006.

[6] T.W. Hungerford: Algebra; Springer Verlag GTM 73 (4th Printing); 1987

[7] C. Lanski: Concepts in Abstract Algebra; American Mathematical Society; 2010

[8] R. Lidl and G. Pilz Applied abstract algebra(2nd edn.); Springer; 1998

[9] N.H. Mc Coy: Introduction to modern algebra, Literary Licensing, LLC; 2012

[10] J. Rotman: An Introduction to the Theory of Groups (4th Edn); Springer; 1999

[11] I. Stewart: Galois theory(3rd edn.); Chapman & Hall/CRC; 2003

OBJECTIVES

a) **To understand the basic concepts of Prime and Maximal Ideals.**

b) **To get familiarize with Algebraic Extensions.**

c) **To understand the Automorphisms of fields, Separable Extensions and Splitting Fields.**

d) **To study about the Galois Theory, Cyclotomic Extensions and the Insolvability of the Quintic.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (30 hours)	Prime and Maximal Ideals, Introduction to Extension Fields, Algebraic Extensions, Geometric Constructions.	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on prime and maximal ideals and algebraic extensions	To understand: • the basics of extension fields • geometric constructions	Evaluation through MCQ
Module I1 (30 hours)	Finite Fields, Automorphisms of Fields, the Isomorphism Extension Theorem, Splitting Fields, Separable Extensions.	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain about separable extensions	To understand: • Isomorphism Extension Theorem Splitting and Separable Extensions	Evaluation through test paper
Module III (30 hours)	Galois Theory, Illustration of Galois Theory, Cyclotomic Extensions, Insolvability of the Quintic.	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on Cyclotomic Extensions	To understand: • Galois Theory • Insolvability of the Quintic	Evaluation through test paper

Course Outcomes

CO1	To introduce the concept of finite and extension fields, geometric constructions etc.
CO2	To understand the concept of Isomorphism Extension Theorem, Splitting and Separable Extensions.
CO3	To understand Galois theory and the Insolvability of the Quintic

Faculty in charge:
Ms. Smitha Davis

MT2C10: ODE AND CALCULUS OF VARIATIONS
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the basic concepts of ordinary differential equations and its applications.

MODULE I

Power Series Solutions and Special functions; Some Special Functions of Mathematical Physics.

MODULE II

Some special functions of Mathematical Physics (continued), Systems of First Order Equations; Non linear Equations

MODULE III

Oscillation Theory of Boundary Value Problems, The Existence and Uniqueness of Solutions, The Calculus of Variations.

TEXT:

SIMMONS, G.F., DIFFERENTIAL EQUATIONS WITH APPLICATIONS AND HISTORICAL NOTES (3rd Edn.), New Delhi, 1974.

REFERENCES :

[1] G. Birkhoff and G.C. Rota: Ordinary Differential Equations(3rd Edn.); Edn. Wiley & Sons; 1978
[2] W.E. Boyce and R.C. Diprima: Elementary Differential Equations and boundary value problems (2nd Edn.); John Wiley & Sons, NY; 1969
[3] A. Chakrabarti: Elements of ordinary Differential Equations and special functions; Wiley Eastern Ltd., New Delhi; 1990
[4] E.A. Coddington: An Introduction to Ordinary Differential Equtions; Printice Hall of India, New Delhi; 1974
[5] R.Courant and D. Hilbert: Methods of Mathematical Physics- vol I; Wiley Eastern Reprint; 1975
[6] P. Hartman: Ordinary Differential Equations; John Wiley & Sons; 1964 [7] L.S. Pontriyagin : A course in ordinary Differential Equations Hindustan Pub. Corporation, Delhi; 1967

[8] I. Sneddon: Elements of Partial Differential Equations; McGraw-Hill International, Edn.;1957

OBJECTIVES

a) **To study how to compute power series solution of first order ODE.**

b) **To get familiarize with some special functions of Mathematical Physics.**

c) **To study the methods to solve systems of first order equations.**

d) **To study more about qualitative properties of solutions.**

e) **To understand the concept of calculus of variations.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (35 hours)	Power series solutions of first order ODEs, special functions in Mathematical Physics	• Lecture • Discussion • Participative learning • Problem solving	• Problem solving sessions in groups. • Discussing the solutions obtained	To understand: • the basics of solutions of ODE • significance of special functions	Evaluation Through test papers
Module I1 (30 hours)	Solve systems of first order and nonlinear equations	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain nonlinear equations	To understand: • the method to solve systems of first order equations • theory of solutions of nonlinear equations	Evaluation through test paper
Module III (25 Hours)	Existence and uniqueness of solutions, calculus of variations	• Lecture • Discussion • Participative learning • Problem solving	• Assignment on existence and uniqueness of solutions • Discussion in peer groups on	To understand: • the applications in Calculus of variations • the	Evaluation through test paper

			Calculus of Variations	qualitative nature of solutions	

Course Outcomes

CO1	To understand the power series solutions of ordinary differential equations and the significance of special functions.
CO2	To know more about special functions, systems of first order equations and nonlinear equations
CO3	To understand the qualitative nature of solutions and calculus of variation.

Faculty in charge:
Dr. Vijitha Mukundan

MTH2C10 – OPERATIONS RESEARCH

Number of hours of lectures per week : 5 hrs

Number of credits : 4

OBJECTIVE

To learn various methods to solve an LPP and study about game theory and networking.

MODULE I

Convex Functions; Linear Programming

MODULE II

Linear Programming (contd.); Transportation Problem

MODULE III

Integer Programming; Sensitivity Analysis; Flow and Potential in Networks; Theory of Games

TEXTBOOK

K.V. MITAL; C. MOHAN., OPTIMIZATION METHODS IN OPERATIONS RESEARCH AND SYSTEMS ANALYSIS(3rd. Edn.), New Age International(P) Ltd., 1996.

REFERENCES

[1] R.L. Ackoff and M.W. Sasioni: Fundamentals of Operations Research; Wiley Eastern Ltd. New Delhi; 1991

[2] C.S. Beightler, D.T. Philiphs and D.J. Wilde: Foundations of optimization(2nd Edn.); Prentice Hall of India, Delhi; 1979

[3] G. Hadley: Linear Programming; Addison-Wesley Pub Co Reading, Mass; 1975

[4] G. Hadley: Non-linear and Dynamic Programming; Wiley Eastern Pub Co. Reading, Mass; 1964

OBJECTIVES

- To learn about convex function and few theorems related to it.
- To study LPP and simplex method to solve it.

- ❖ Understand and solve transportation problems.
- ❖ To study about the sensitivity analysis.
- ❖ To learn flow and networks.
- ❖ To understand the problems related to game theory.

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I	Convex functions. Definition of LPP.	• Discussion • Participative learning • Problem solving • Lecture	Assignments on LPP	To study about convex functions and definition of LPP	Evaluation through test paper.
MODULE II	Simplex method to solve LPP. Transportation problem. VAM and MODI method to solve transportation problem.	• Lecture • Discussion • Participative learning • Problem solving	Assignments on simplex method and solving of transportation method	To learn to solve LPP using simplex method. To solve Transportation problem.	Evaluation through test paper.
MODULE III	Integer programming and sensitivity analysis. Networking. Introduction to Game theory.	• Lecture • Discussion • Participative learning • Problem solving	Seminar by students on sensitivity analysis. Methods to solve flow and network. Game theory problem solving.	Discussion on sensitivity analysis. To solve networks and problems on game theory.	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about convex functions
CO2	To learn about methods to solve LPP and transportation problems
CO3	To know about sensitivity in LPP and methods to solve networks. To understand game theory.

Faculty in charge:

Ms. Amala Mary George

MTH2C08: TOPOLOGY
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the motivation and concepts of topology.

MODULE I

A Quick Revision of Chapter 1,2 and 3. Topological space, basic concepts [Chapter 4 and Chapter5 Section 1, Section 2(excluding 2.11 and 2.12) and Section 3 only]

MODULE II

Making Functions Continuous, quotient spaces, spaces with special properties [Chapter 5 Section 4 and Chapter 6]

MODULE III

Separation axioms: Hierarchy of separation axioms, Compactness and separation axioms, The Urysohn characterization of normality, Tietze characterization of normality.[Chapter 7 Section 1 to 3 and Section 4 up to and including 4.6]

TEXT:

JOSHI K D, INTRODUCTION TO GENERAL TOPOLOGY (Revised Edn.), New Age International (P) Ltd., New Delhi, 1983

Inc., 2003.

REFERENCES :

[1] M A Armstrong: Basic Topology, Springer- Verlag New York; 1983.

[2] J Dugundji: Topology; Prentice hall of India; 1975.

[3] M Gemignani: Elementary Topology; Addison Wesley Pub Co Reading Mass, 1971

[4] M G Murdeshwar: General Topology(2nd Edn);Wiley Eastern Ltd, 1990

[5] G F Simmons: Introduction to Topology and modern analysis; McGraw-Hill international student Edn;1963.

OBJECTIVES

a) **To understand the basic concepts of Topological Spaces.**

b) **To get familiarize with making functions continuous, Quotient Spaces.**

c) **To understand the separation axioms, Hierarchy of separation axioms, compactness and separation axioms.**

d) **To study the Urysohn characterization of normality, Tietze characterization of normality.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (30 hours)	Topological Spaces, Basic concepts	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on basic topology and topological space	To understand: • the basics of topology • topological spaces • different types of topologies	Evaluation Through MCQ
Module I1 (30 hours)	Making functions continuous, quotient spaces, spaces with special properties	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain about making functions continuous	To understand: • Compact Lindeloff spaces • Connectedness Local Connectedness	Evaluation Through test paper

				Path Connectedness	
Module III (30 Hours)	Separation axioms: Hierarchy of separation axioms, compactness and separation axioms, The Urysohn characterization of normality, Tietze characterization of normality	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on separation axioms	To understand: • Separation axioms • Urysohn characterization of normality	Evaluation through test paper

Course Outcomes

CO1	To introduce the concept of basic topology, topological space, different types of topologies.
CO2	To understand the concept of making functions continuous, quotient spaces
CO3	To understand the separation axioms, the Urysohn characterization of normality, Tietz characterization of normality

Faculty in charge:
Ms. Linet Roslin Antony

MT2C08: REAL ANALYSIS - II
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the advanced concepts of real analysis.

MODULE I

Lebesgue outer measure, measurable sets, regularity, measurable functions, Borel and Lebesgue measurability, Integration of non-negative functions, the general integral, integration of series Reimann and Lebesgue integrals

MODULE II

Differentiation, continuous non-differentiable functions, functions of bounded variation, Lebesgue's differentiation theorem, differentiation and integration, Lebegues set, Measures and outer measures, extension of a measure, uniqueness of the extension, completion of a measure, measure spaces, integration with respect to a measure

MODULE III

Signed measures and the Hahn decomposition, Jordan decompositon, Radon– Nikodym theorem, some applications of Radon Nikodym Theorem, bounded linear functionals on L^p, Lebesgue stieltjes measure, absolutely continuous functions, integration by parts, change of variable, Riesz Representation theorem for C(I).

TEXT:

G.de Barra, Measure Theory and Integration, New Age International Ltd. Publishers, New Delhi, 2006.

REFERENCES :

[1] K. B. Athreya and S. N. Lahiri, Measure Theory, Hindustan Book Agency, New Delhi, 2006.

[2] R. G. Bartle, The Element of Integration, John Wiley, 1964.

[3] S. K. Berberian, Measure and Integration, The McMillan Company, NewYork, 1965.

[4] P. R. Halmos, Measure Theory, Springer verlag.

[5] H. L. Royden, Real Analysis, Prentice Hall India, 1988 (3rd edition).

[6] W. Rudin, Real and Complex Analysis, Tata McGraw Hill, New Delhi, 2006.

[7] I. K. Rana, An Introduction to Measure and Integration, Narosa Publishing company, New York, Analysis,Tata McGraw Hill,New Delhi,2006

[7] I K Rana:,An Introduction to Measure and Integration,Narosa Publishing Company,New York.

[8] Terence Tao: ,An Introduction to Measure Theory,Graduate Studies in Mathematics,Vol 126 AMS

OBJECTIVES

a) **To understand the basic concepts of Outer measure and measurable functions**

b) **To study about Reimann and Lebesgue Integrals**

c) **To understand Lebesgue Measure and Lebesgue Measurable Functions and its properties**

d) **To understand the concept of bounded linear functionals on L^p**

e) **To perform differentiation and Integration**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (30 hours)	Lebesgue outer measure, measurable sets, regularity, measurable functions, Integration of non-negative functions, Reimann and Lebesgue integrals Measure, Lebesgue Measurable Functions	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on Lebesgue measure and Lebesgue measurable functions	To understand: • the basics of sigma algebra • notion of Lebesgue measure and measurable functions	Evaluation through interaction with students and test papers
Module I1 (30 hours)	Differentiation,Lebesgue's differentiation theorem, differentiation and integration, Lebegues set, Measures and outer measures, measure spaces, integration with respect to a measure	• Lecture • Discussion • Participative learning • Problem solving	Student seminars on some topics Differentiation and Integration	To understand: • Concepts of Lebesgue integration and Differentiation	Evaluation through test papers and interaction with students
Module II1 (30 hours)	Signed measures and the Hahn decomposition, Jordan decompositon, Radon–	• Lecture • Discussion • Participativ	• Peer group discussion on theorems	To understand: • Concepts of signed	Evaluation through test paper

	Nikodym theorem, Riesz Representation theorem for C(I).	e learning		measures	

Course Outcomes

CO1	To introduce the concept of Sigma Algebra, Borel sets, Lebesgue Measure, Lebesgue Measurable Functions
CO2	To understand the concept of differentiation and integration.
CO3	To understand the concept of signed measures, bounded linear functionals on $L^{p.}$

Faculty in charge:
Dr. Nidhin T J

MT 3C 12: COMPLEX ANALYSIS
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the ideas and concepts of analytic functions and singularities..

MODULE I

Conformality, Linear Transformations, Fundamental Theorems, Cauchy's Integral Formula.

MODULE II

Local Properties of Analytical Functions, The General Form of Cauchy's Theorem, The Calculus of Residues, Harmonic Functions.

MODULE III

Power Series Expansions, Simply Periodic Functions, Doubly Periodic Functions, The Weierstrass Theory.

TEXT: LARS V. AHLFORS : Complex Analysis, 3rd edn. Mc Graw Hill (1979)

REFERENCES :

1. Cartan, H. : Elementary Theory of Analytic Functions of one or Several . Variables, Addison - Wesley Pub. Co. (1973)
2. Conway, J.B. : Functions of One Complex Variable, Narosa Pub. Co., New Delhi. . (1973)
3. Moore T.O. &Hadlock E.H. : Complex Analysis, Series in Pure Mathematics - Vol. 9. World Scientific . (1991)
4. Pennisi, L. : Elements of Complex Variables, Holf, Rinehart & Winston, 2nd Edn. . (1976)
5. Rudin, W. : Real and Complex Analysis, 3rd Edn. McGraw - Hill International . Edn. (1987)
6. Silverman, H. : Compex Variables, Houghton Mifflin Co. Boston (1975)
7. Remmert, R. : Theory of Complex Functions, UTM, Springer- Verlag, NY, (1991)

OBJECTIVES

a) **To understand the basic concepts of** Power series, Analytic functions, Analytic functions as mappings and Mobius transformations.

b) **To get familiarize with** Conformal mappings, Weistrass theory

c) **To understand the** Power series representation of analytic functions, Zeros of an analytic function, The index of a closed curve, Cauchy's Theorem and Integral Formula and the classification of singularities.

LESSON PLAN

Unit/ session / hours (time required)	**Topics to be taught (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module 1 (30 hours)	Conformal mappings, Cauchy Integral formula	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on Power series and Analytic functions	To understand: • Conformal mappings • Fundamental theorems	Evaluation through MCQ
Module I1 (30 hours)	Analytic functions, Harmonic funcions	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain about Power series representation of analytic functions	To understand: • Residue theorem • Calculus of residue.	Evaluation through test paper
Module III (30	Entire functions Wiestrass Theory	• Lecture • Discussion • Participative learning	• Seminar and assignment on	To understand: • Simply periodic doubly	Evaluation through test paper

hours)		• Problem solving	classification of singularities	periodic functions	

Course Outcomes

CO1	To introduce the concept of Power series and Analytic functions
CO2	To understand the concept of Cauchy's Theorem and Integral Formula, Open Mapping Theorem and Goursat's Theorem.
CO3	To understand the Argument Principle, the Maximum Principle and Schwarz's Lemma.

Faculty in charge:
Ms. Linet Roslin Antony

MT3C14 – ADVANCED FUNCTIONAL ANALYSIS

Number of hours of lectures per week : 5 hrs

Number of credits : 4

OBJECTIVE

To learn about metric spaces, normed spaces, Banach spaces and Inner product spaces.

MODULE I

Metric spaces and Continuous Functions, Lp spaces , Fourier series and Integrals, Normed spaces Continuity of linear maps

MODULE II

Hahn-Banach Theorems, Banach spaces, Uniform Boundedness Principle

MODULE III

Closed Graph and Open Mapping Theorems, Bounded Inverse Theorem, Inner product spaces, Orthonormal sets

TEXTBOOK

LIMAYE , B.V, FUNCTIONAL ANALYSIS, (2nd Edn.) New Age International Ltd, Publishers, New Delhi, Bangalore (1996)

REFERENCES

[1]R. Bhatia, Notes on Functional Analysis TRIM series, Hindustan Book Agency

[2]KesavanS, Functional Analysis TRIM series, Hindustan Book Agency

[3] S David Promislow, A First Course in Functional Analysis Wiley Interscience, John wiley & Sons, INC., (2008)

[4]E.Kreyszig, Introductory Functional Analysis with Applications John Wiley & Sons (1978)

OBJECTIVES

- ❖ To define Metric spaces along with examples.
- ❖ To study normed spaces and its continuity.
- ❖ To learn Hahn Banach theorems.
- ❖ To understand Banach spaces.
- ❖ To study about Inner product spaces and orthonormality.

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I	Metric spaces.L_p spaces. Normed spaces. Continuity of linear maps	• Discussion • Participative learning • Problem solving • Lecture	Assignments on examples of metric spaces and normed spaces.	To study about metric spaces and its properties. To learn normed spaces.	Evaluation through test paper.
MODULE II	Hahn Banach Theorems. Banach spaces.	• Lecture • Discussion • Participative learning • Problem solving	Assignments on corollaries of Hahn Banach theorems.	To learn Hahn Banach theorem and study about Banach spaces	Evaluation through test paper.
MODULE III	Closed graph theorem. Open mapping theorem. Inner products. Orthonormality.	• Lecture • Discussion • Participative learning • Problem solving	Seminar by students	To study important theorems. To learn about Inner products and orthonormal space.	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about metric space and normed space along with its continuity
CO2	To study Hahn Banach theorem and Uniform Boundedness principle
CO3	To learn about inner products and orthonormal spaces.

Faculty in charge:
Ms. Amala mary George

MTH3C11 – MULTIVARIABLE CALCULUS AND GEOMETRY

Number of hours of lectures per week : 5 hrs

Number of credits : 4

OBJECTIVE

To understand concepts in Differential Geometry

MODULE I

Functions of Several Variables Linear Transformations, Differentiation, The Contraction Principle, The Inverse Function Theorem, the Implicit Function Theorem.

MODULE II

What is a curve? Arc-length, Reparametrization, Closed curves, Level curves versus parametrized curves. Curvature, Plane curves, Space curves What is a surface, Smooth surfaces, Smooth maps, Tangents and derivatives, Normals and orientability.

MODULE III

Level surfaces, Ruled surfaces and surfaces of revolution, Applications of the inverse function theorem, Lengths of curves on surfaces, Equiareal maps and a theorem of Archimedes, The second fundamental form, The Gauss and Weingarten maps, Normal and geodesic curvatures. Gaussian and mean curvatures, Principal curvatures of a surface.

TEXTBOOKS

TEXT 1 : RUDIN W., PRINCIPLES OF MATHEMATICAL ANALYSIS, (3rd Edn.), Mc. Graw Hill, 1986.

TEXT 2: ANDREW PRESSLEY, ELEMENTARY DIFFERENTIAL GEOMETRY(2nd Edn.), Springer-Verlag, 2010.

REFERENCES

[1] M. P. do Carmo: Differential Geometry of Curves and Surfaces;

[2] W. Klingenberg: A course in Differential Geometry;

[3] J. R. Munkres: Analysis on Manifolds; Westview Press; 1997

[4] C. C. Pugh: Real Mathematical Analysis, Springer; 2010

[5] M. Spivak: A Comprehensive Introduction to Differential Geometry-Vol. I; Publish

or Perish, Boston; 1970

[6] M. Spivak: Calculus on Manifolds; Westview Press; 1971

[7] V.A. Zorich: Mathematical Analysis-I; Springer; 2008

OBJECTIVES

- To understand functions of several variables and its differentiation
- To study curves, level curves and curvature.
- To learn about surfaces and its properties as normal, orientablity and tangents.
- To understand the definition Guass Weingarten maps
- To study about Guassian, mean curvatures

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I	The Contraction Principle, The Inverse Function Theorem, the Implicit Function Theorem.	• Discussion • Participative learning • Problem solving	Seminars by students	To study about Functions of Several Variables Linear Transformations and its properties	Evaluation through test paper.
MODULE II	Arc-length, Reparametrization, Level curves versus parametrized curves. Curvature, Tangents and derivatives, Normals and orientability.	• Lecture • Discussion • Participative learning • Problem solving	Assignments on Tangents and derivatives. Discussion about various definitions.	To learn basics about Curves, Level curves, curvature, Smooth maps,Tangents, Normals.	Evaluation through MCQ

MODULE III	Level surfaces, Applications of the inverse function theorem, Normal and geodesic curvatures. Gaussian and mean curvatures, Principal curvatures of a surface.	• Lecture • Discussion • Participative learning • Problem solving	Discussion on Surfaces and its properties.	To know the about Level, ruled surfaces, Guassian, mean, principal curvatures. The Gauss and Weingarten maps,	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about functions of several variables
CO2	To learn about the analytical and geometric concepts of curves and its variations To study about cuvature and sufaces
CO3	To know The Gauss and Weingarten maps, To learn Guassian and mean curvature.

Faculty in Charge

Ms. Nidhin T J

MT3C15: PDE and Integral Equations
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the basic theory of PDE and Integral Equations.

MODULE I

First Order PDE .

MODULE II

Second Order PDE .

MODULE III

Integral Equations

TEXTS : 1. AMARNATH, M., : PARTIAL DIFFERENTIAL EQUATIONS, Narosa , New Delhi (1997)

2. HILDEBRAND, F.B.: METHODS OF APPLIED MATHEMATICS, (2 nd Edn.) Prentice-Hall of India, New Delhi, 1972

REFERENCES :

1. G. Birkhoff & G.C. Rota : Ordinary Differential Equations, Edn. Wiley & Sons 3rd Edn (1978)
2. E.A. Coddington : An Introduction to Ordinary Differential Equations, Printice Hall of India, New Delhi (1974)
3. P. Hartman : Ordinary Differential Equations, John Wiley & Sons (1964)
4. L.S. Pontriyagin : A Course in Ordinary Differential Equations, Hindustan Pub. Corporation, Delhi (1967)
5. F. John : Partial Differential Equations, Narosa Pub. House New Delhi (1986)
6. Phoolan Prasad & : Partial Differential Equations, Renuka Ravindran Wiley Eastern Ltd New Delhi (1985)
7. R. Courant and D.Hilbert : Methods of Mathematical Physics , Vol I, Wiley Eastern Reprint (1975) 8. W.E. Boyce & R.C. Deprima : Elementary Differential Equations, and Boundary Value Problems

John Wiley & Sons, NY, 9th Edition

OBJECTIVES

a) **To study the basic methods of solving partial differential equations.**

b) **To study different methods for solving second order linear and nonlinear pde.**

c) **To study the classification of PDE and to obtain the canonical forms.**

d) **To understand the relation between integral equations and differential equations and to study different methods to solve integral equations.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (35 hours)	Linear equations of first order,Quasilinear equations, method of characteristics, the Lagrange method, Charpit method, Jacobi method, Cauchy problem	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on different methods of solving first order pde	To understand: • Different types of PDE • methods to solve pde • solving non linear problem	Evaluation through test paper and interaction with students

Module I1 (30 hours)	Classification of second order pde, solving wave, heat and Laplace equations, Separation of variables, canonical form, Cauchy problem for second order pde	• Lecture • Discussion • Participative learning • Problem solving	Student seminars to understand the method of solving wave, heat and Laplace equations	To understand: • Methods to solve second order PDE • Solutions of heat, wave and Laplace equations	Evaluation through test paper
Module III (25 Hours)	Integral equations, Fredholm and Volterra equations, Resolvent kernel,Neumann series, Fredholm Schmidt theory	• Lecture • Discussion • Participative learning • Problem solving	• Assignment and problem solving sessions on Integral equations	To understand: • Relation between integral equation and differential equation • Methods tosolve integral equations of different kinds	Evaluation through test paper

Course Outcomes

CO1	To study different types of PDE and methods for solving them.

CO2	To study methods of solving second order PDE, heat, wave and Laplace equation, Cauchy problem
CO3	To understand the relation between differential equation and integral equations, also different methods to solve integral equations.

Faculty in charge:
Ms. Vijitha Mukundan

MTH4E06: Algebraic Number Theory
Number of hours of Lectures per week: 5
Number of Credits: 3

Objectives

To understand the concepts of Algebraic Number Theory.

MODULE I

Symmetric polynomials, Modules, Free abelian groups, Algebraic Numbers, Conjugates and Discriminants, Algebraic Integers, Integral Bases, Norms and Traces, Rings of Integers, Quadratic Fields, Cyclotomic Fields

MODULE II

Historical background, Trivial Factorizations, Factorization into Irreducibles, Examples of Nonunique Factorization into Irreducibles, Prime Factorization, Euclidean Domains, Euclidean Quadratic fields Ideals Historical background, Prime Factorization of Ideals, The norm of an ideal

MODULE III

Lattices, The Quotient Torus, Minkowski theorem, The Space Lst, The Class-Group An Existence Theorem, Finiteness of the Class-Group, Factorization of a Rational Prime, Fermats Last Theorem Some history, Elementary Considerations, Kummers Lemma, Kummers Theorem.

TEXT : I. N. STEWART & D.O. TALL, ALGEBRAIC NUMBER THEORY, (2nd Edn.), Chapman & Hall, (1987)

REFERENCES :

[1] P. Samuel : Theory of Algebraic Numbers, Herman Paris Houghton Mifflin, NY, (1975)
[2] S. Lang : Algebraic Number Theory, Addison Wesley Pub Co., Reading, Mass, (1970)
[3] bf D. Marcus : Number Fields, Universitext, Springer Verlag, NY, (1976)
[4] 4T.I.FR. Pamphlet No: 4 : Algebraic Number Theory (Bombay, 1966)
[5] Harvey Cohn : Advanced Number Theory, Dover Publications Inc., NY, (1980)
[6] Andre Weil : Basic Number Theory, (3rd Edn.), Springer Verlag, NY, (1974)
[7] G.H. Hardy and E.M. Wright : An Introduction to the Theory of Numbers, Oxford University Press.
[8] Z.I. Borevich & I.R.Shafarevich : Number Theory, Academic Press, NY 1966.
[9] Esmonde & Ram Murthy : Problems in Algebraic Number Theory, Springer Verlag 2000

OBJECTIVES

a) **To study the basic concepts of numberfield, quadratic field, Guassian field and their properties.**

b) **To study how factorization into irreducibles hold in different fields.**

c) **To understand the concepts of lattices, the quotient torus and geometric representation of algebraic numbers.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (35 hours)	Factorization into Irreducibles, Examples of Nonunique Factorization into Irreducibles, Prime Factorization, Euclidean Domains, Euclidean Quadratic fields Ideals, Prime Factorization of Ideals,	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on numberfields and its properties	To understand: • the factorization into irreducibles • different types of numberfields • the factorization of ideals • properties of ideals	Evaluation through test paper and interaction with students

Module I1 (30 hours)	Examples of Nonunique Factorization into Irreducibles, Prime Factorization, Euclidean Domains, Euclidean Quadratic fields Ideals Historical background, Prime Factorization of Ideals, The norm of an ideal	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to understand prime factorization and quadratic fields	To understand: • Nonunique Factorization into Irreducibles • Factorization of Ideals and norm of an ideal	Evaluation Through test paper
Module III (25 Hours)	Lattices, The Quotient Torus, Minkowski theorem, The Space Lst, The Class-Group An Existence Theorem, Finiteness of the Class-Group, Factorization of a Rational Prime, Kummers Lemma, Kummers Theorem	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion and assignments to understand geometric representation of algebraic numbers	To understand: • The Quotient Torus • The classgroup	Evaluation through test paper

Course Outcomes

CO1	Awareness about different types of numberfield and their properties
CO2	Able to check unique factorization in fields and also can provide examples of nonunique factorizations
CO3	To understand the geometric representation of algebraic numbers

Faculty in charge:
Dr. Vijitha Mukundan

MT4E11 – ADVANCED FUNCTIONAL ANALYSIS

Number of hours of lectures per week : 5 hrs

Number of credits : 4

OBJECTIVE

To learn about duality, compactness and boundedness of spaces.

MODULE I

Duals and Transposes, Duals of Lp [a,b] and C[a,b], weak and weak* convergence, Reflexivity

MODULE II

Definition of Compact Linear Map, spectrum of a compact operator, Riesz Representation Theorems

MODULE III

Bounded Operators and Adjoints , Normal, Unitary and Self Adjoint Operators , Spectrum and Numerical Range , Compact self Adjoint Operator

TEXTBOOK

LIMAYE , B.V, FUNCTIONAL ANALYSIS, (2nd Edn.) New Age International Ltd, Publishers, New Delhi, Bangalore (1996)

REFERENCES

[1]R. Bhatia, Notes on Functional Analysis TRIM series, Hindustan Book Agency

[2]KesavanS, Functional Analysis TRIM series, Hindustan Book Agency

[3] S David Promislow, A First Course in Functional Analysis Wiley Interscience, John wiley & Sons, INC., (2008)

[4]E.Kreyszig, Introductory Functional Analysis with Applications John Wiley & Sons (1978)

OBJECTIVES

- To understand the concept of duality and reflexivity.
- To study spectrum of compact operators.
- To understand the concept of Bounded linear operators and its types.

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I	Dual spaces. Weak convergence Reflexivity	• Discussion • Participative learning • Problem solving • Lecture	Assignments on examples of dual spaces	To study about duality and weak convergence. To learn reflexivity.	Evaluation through test paper.
MODULE II	Compact operators and its spectrum. Riesz Representation theorems.	• Lecture • Discussion • Participative learning • Problem solving	Assignments on compact operators and examples	To learn about spectrum of compact operators	Evaluation through test paper.
MODULE III	Bounded operators. Adjoint, normal, unitary and self adjoint operators. Compact self adjoint operator.	• Lecture • Discussion • Participative learning • Problem solving	Seminar by students	To study Self adjoint operators and compactness.	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about duality and the concept of reflexivity
CO2	To learn about compact operators
CO3	To learn about Bounded linear operators and self adjoint operators

Faculty in charge:

Ms. Amala Mary George

MTH4C11: GRAPH THEORY
Number of hours of Lectures per week: 5
Number of Credits: 3

Objectives

To understand the basic concepts of Graph theory.

Module 1

Basic concepts of Graph. Trees, Cut edges and Bonds, Cut vertices, Cayleys Formula, The Connector Problem, Connectivity, Blocks, Construction of Reliable Communication Networks, Euler Tours, Hamilton Cycles, The Chineese Postman Problem, The Travelling Salesman Problem.

Module 2

Matchings, Matchings and Coverings in Bipartite Graphs, Perfect Matchings, The Personnel Assignment Problem, Edge Chromatic Number, Vizings Theorem, The Timetabling Problem, Independent Sets, Ramseys Theorem

Module 3

Vertex Colouring-Chromatic Number, Brooks Theorem, Chromatic Polynomial, Girth and Chromatic Number, A Storage Problem, Plane and Planar Graphs, Dual Graphs, Eulers Formula, Bridges, Kuratowskis Theorem, The Five-Colour Theorem, Directed Graphs, Directed Paths, Directed Cycles.

TEXT : J.A. Bondy and U.S.R.Murty : Graph Theory with applications. Macmillan

References

[1] F. Harary : Graph Theory, Narosa publishers, Reprint 2013.
[2] Geir Agnarsson, Raymond Greenlaw: Graph Theory Modelling, Applications and Algorithms, Pearson Printice Hall, 2007.
[3] John Clark and Derek Allan Holton : A First look at Graph Theory, World Scientific (Singapore) in 1991 and Allied Publishers (India) in 1995
[4] R. Balakrishnan & K. Ranganathan : A Text Book of Graph Theory, Springer Verlag, 2nd edition 2012.

OBJECTIVES

a) **To understand the basic concepts of graphs, Trees, Cut edges and Bonds, Cut vertices, Euler Tours, Hamilton Cycles**

b) **To get familiarize with Matchings and Coverings in Bipartite Graphs, Perfect**

Matching, Independent Sets, Ramseys Theorem

c) **To understand the concept of Vertex Colouring-Chromatic Number, Edge Chromatic Number , The Five-Colour Theorem, Directed Graphs.**

d) **To study more about Chromatic Polynomial, Girth and Chromatic Number**

e) **To understand The Five-Colour Theorem, Directed Graphs, Directed Paths, Directed Cycles.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (30 hours)	Basic concepts of graph, Trees, Cut edges and Bonds, Cut vertices, Connectivity, Blocks, Euler Tours, Hamilton Cycles	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on basic concepts of graph	To understand: • the basics of graph, trees • Concepts of cut edges, cut vertices, Euler tour and Hamilton cycles	Evaluation Through MCQ
Module I1 (30 hours)	Matchings and Coverings, Perfect Matchings, Edge Chromatic Number, Vizings Theorem, Independent Sets, Edge colouring,Ramseys Theorem	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain the Personnel Assignment Problem and The Timetabling Problem	To understand: • differentiation of matchings and covering • Concepts of edge colouring and Ramseys theorem	Evaluation Through test paper
Module III (30 Hours)	Vertex Colouring-Chromatic Number, Brooks Theorem, , Plane and Planar Graphs, Dual Graphs, Eulers Formula, Bridges,	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on Storage Problem	To understand: • Vertex colouring and it's important results • Planar	Evaluation through test paper

	Kuratowskis Theorem, The Five-Colour Theorem, Directed Graphs,			graphs, dual graphs and it's important result	

Course Outcomes

CO1	To introduce the concept of basic graph theory, trees, cut vertices and cut edges, Euler tour and Hamilton cycles
CO2	To understand the concept of matchings and covering, Edge colouring.
CO3	To understand the concepts of vertex colouring and it's important results. Planar graphs and dual graphs.

Faculty in charge:
Ms. Linet Roslin Antony

MTH4E09: DIFFERENTIAL GEOMETRY
Number of hours of Lectures per week: 5
Number of Credits: 3

Objectives

To understand the basic concepts of differential geometry.

MODULE I

Graphs and Level Set, Vector fields, The Tangent Space, Surfaces, Vector Fields on Surfaces, Orientation. The Gauss Map .

MODULE II

Geodesics, Parallel Transport, The Weingarten Map, Curvature of Plane Curves, Arc Length and Line Integrals.

MODULE III

Curvature of Surfaces, Parametrized Surfaces, Local Equivalence of Surfaces and Parametrized Surfaces.

TEXT:

J.A.THORPE : ELEMENTARY TOPICS IN DIFFERENTIAL GEOMETRY

REFERENCES :

1) M. de Carmo : Differential Geometry of Curves and Surfaces, Prentice Hall Inc Englewood Cliffs NJ (1976).
2) V. Grilleman and A. Pollack : Differential Topology, Prentice Hall Inc Englewood Cliffs NJ (1974)
3) B. O'Neil : Elementary Differential Geometry, Academic Press NY (1966)
4) M. Spivak : A Comprehensive Introduction to Differential, Geometry, (Volumes 1 to 5), Publish or Perish, Boston (1970, 75)
5) R. Millmen and G. Parker : Elements of Differential Geometry, Prentice Hall Inc Englewood Cliffs NJ (1977)
6) I. Singer and J.A. Thorpe : Lecture Notes on Elementary Topology and Geometry, UTM, Springer Verlag, NY (1967)

7) W.L.Burke: Applied Differential Geometry , Cambridge University Press (1985).

OBJECTIVES

a) **To understand the basic concepts of level sets, surfaces and its curvature, geodesics,and parametrized surfaces .**

b) **To get familiarize with covariant derivatives and its properties.**

c) **To understand the concept of local and global parametrization.**

d) **To study more about parametrized surfaces and local equivalence of surface and parametrized surfaces.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I (30 hours)	Level sets,vector fields, the tangent space, surfaces and the gauss map.	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on vector fields and level sets.	To understand: • the basics of surfaces • notion of tangent space and the gauss map	Evaluation Through MCQ
Module II (30 hours)	Geodesics, Parallel transport, The Weingarten map, Arc length and line integrals.	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain the properties of derivatives of smooth vector field and covariant	To understand: • Local and global parametrization . • Concept of parallel transport.	Evaluation Through test paper

			derivative.		
Module III (30 Hours)	Curvature of surfaces, First and second fundamental forms,Parametrized surfaces and its local equivalence with surfaces.	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on local equivalence of surfaces and parametrized surfaces.	To understand: • Principal, Gaussian, Gauss Kronecker and Mean curvature • Inverse function theorems.	Evaluation through test paper

Course Outcomes

CO1	To introduce the concept of graphs and level sets, basics of surfaces and notion of tangent space anf gauss map.
CO2	To understand the concept of parallel transport, local and global parametrization, arc length and line integral.
CO3	To understand the principal ,Gaussian ,Gauss Kronecker and Mean curvature, and parametrized surfaces.

Faculty in charge:
Dr. Nidhin T J

ST1CO1 BASIC STATISTICS AND PROBABILITY

Lecture Hours per week: 4, Credits: 3

Internal: 20, External: 80, Examination 3 Hours

Objectives

Introduce basic concepts of statistics and to understand various approaches to probability and compute probabilities.

Module I (20 hrs)

Population, sample, measures of central tendency - arithmetic mean, weighted arithmetic mean, geometric mean, harmonic mean, median, mode, partition values - quartile, percentile, measures of deviations - variance, standard deviation, mean deviation about mean, quartile deviation, co-efficient of variation

Module II (15 hrs)

Fitting of straight line, parabola, exponential, polynomial, (least square method), correlation, regression, two regression lines, regression coefficients, properties - rank correlation, partial and multiple correlation

Module III (25 hrs)

Random experiment, Sample space, event, classical definition of probability, statistical regularity, relative frequency definition, field, sigma field, axiomatic definition of probability and simple properties, concept of probability measure, addition theorem(two and three events), conditional probability of two events, multiplication theorem, independence of events(pair wise and mutual), Bayes theorem. –numerical problems

Module IV (12 hrs)

Random variable- discrete and continuous, probability mass function (pmf) and probability density function (pdf) properties and examples, Cumulative Distribution function and its properties , change of variable (univariate case)

Reference Books:

1) V. K. Rohatgi, An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern.

2) S.C.Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chan and Sons

3) A.M. Mood, F.A. Graybill and D C Bose, Introduction to Theory of Statistics, McGraw Hill

4) John E Freund, Mathematical Statistics (6th edn), Pearson Edn, NewDelhi

OBJECTIVES

1) To understand the basic concepts of population and sample
2) To summarize the data in a diagrammatic and graphical way, obtain descriptive statistics and make possible and appropriate interpretations
3) To understand various approaches to probability and compute probabilities.

LESSON PLAN

Unit/ session/ hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **20 Hours**	Population, sample, measures of central tendency, measures of deviations	• Lecture • Discussion • Participative learning • Problem solving	• Group discussion on methods of sampling	To understand advantages and limitations of sampling	Evaluation through test paper
Module II **15 Hours**	Fitting of straight line , parabola, exponential,	• Lecture • Discussion • Participative learning	• Students seminar related to curve fitting	To solve problems related to curve fitting	Evaluation through test paper

	polynomial, correlation, regression, two regression lines, regression coefficients, properties - rank correlation, partial and multiple correlation	• Problem solving			
Module III **25 Hours**	Random experiment, Sample space, event, classical definition of probability, axiomatic definition of probability and simple properties, addition theorem, conditional probability of two events, multiplication theorem, independence of events,	• Lecture • Discussion • Participative learning • Problem solving	• Assignments to compute probabilities	To understand basic definition and properties of probability	Evaluation through test paper and viva

	Bayes theorem				
Module IV **12 Hours**	Random variable- discrete and continuous, probability mass function and probability density function , Cumulative Distribution Function and its properties change of variable	• Lecture • Discussions • Problem solving	• Student seminars on probability mass function , probability density function and their properties	To understand discrete and continuous random variables	Evaluation through test paper

Course Outcomes

CO1	To understand advantages and limitations of sampling
CO2	To summarize the data in a diagrammatic and graphical way, obtain descriptive statistics and make possible and appropriate interpretations
CO3	To understand various approaches to probability and compute probabilities
CO4	To understand discrete and continuous random variables and their probability functions

Teacher in Charge:

Ms. Jiji Pauly

ST2CO2 : PROBABILITY DISTRIBUTIONS

Lecture Hours per week: 4, Credits: 3

Internal: 20, External: 80, Examination 3 Hours

Objectives

To introduce the idea about mathematical expectation and conditional probability of univariate, Bivariate random variable, Also the standard distribution and its properties.

Module I (15 hrs)

Mathematical expectations (univariate): Definition, raw and central moments (definition and relationships), moment generating function and properties, characteristic function (definition and use only), Skewness and kurtosis (using moments)

Module II (15 hrs)

Bivariate random variable: joint pmf and joint pdf, marginal and conditional probability, independence of random variables, function of random variable. Bivariate Expectations, conditional mean and variance, covariance, Karl Pearson Correlation coefficient, independence of random variables based on expectation.

Module III (30 hrs)

Standard distributions: Discrete type Bernoulli, Binomial, Poisson, Geometric, negative binomial (definition, properties and applications), Uniform (mean, variance and mgf), Continuous typeUniform, exponential, gamma, Beta, Normal (definition, properties and applications), Lognormal, Pareto and Cauchy (Definition only).

Module IV (12 hrs)

Chebyshev's inequality, variables, Convergence in probability weak law of large numbers (iid case), Bernoulli law of large numbers, example only), Central limit theorem (Lindberg Levyiid case).

Reference Books:

1. V. K. Rohatgi, An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern.
2. S.C.Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons
3. A.M. Mood, F.A. Graybill and D C Bose, Introduction to Theory of Statistics, McGraw Hill
4. John E Freund, Mathematical Statistics (6th edn), Pearson Edn, NewDelhi

OBJECTIVES

1. Discribe the moments, mgf, expectations, characteristic function, Skewness , kurtosis of univariate and bivariate random variable.
2. Give the knowledge of important discrete and continuous distributions such as Binomial, Poisson,

   Geometric, Negative Binomial and Hyper-geometric, normal, uniform, exponential, beta and gamma distributions
3. Understand the Concept of law large numbers and their uses.
4. Understand the Concept of central limit theorem and its uses.

LESSON PLAN

Unit/ session/ hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **15 Hours**	Mathematical expectations (univariate): Definition, raw and central moments (definition and relationships), moment generating function and properties, characteristic function (definition and use only), Skewness and kurtosis (using moments)	• Lecture • Discussion • Participative learning • Problem solving	• Assignments related to mathematical expectation, raw and cenral moments, mgf	• Understand the definition of moments, mgf , characteristic function, Skewness and kurtosis	Evaluation through test paper
Module II **15 Hours**	Bivariate random variable: joint pmf and joint pdf, marginal and conditional probability, independence of random variables, function of random variable. Bivariate Expectations, conditional mean and variance, covariance, Karl Pearson Correlation coefficient,	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars on the topic bivariate Expectations, conditional mean variance, and covariance.	• Give knowledge related to the concept of Bivariate random variable including expectation moments and mgf.	Evaluation through test paper

	independence of random variables based on expectation.				
Module III 30 Hours	Standard distributions: Discrete type Bernoulli, Binomial, Poisson, Geometric, negative binomial, Uniform, Continuous typeUniform, exponential, gamma, Beta, Normal, Lognormal, Pareto and Cauchy.	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on discrete and Continuous distribution.	• Enable to understand different type of distribution.	Evaluation through test paper
Module IV 12 Hours	Chebyshev's inequality, variables, Convergence in probability weak law of large numbers (iid case), Bernoulli law of large numbers, example only), Central limit theorem (Lindberg Levyiid case).	• Lecture • Discussion • Participative learning • Problem solving	• Assignment on the topic sample mean and variance.	• Understand the weak law of large numbers, Bernoulli law of large numbers, Central limit theorem and its applications	Evaluation through test paper and viva

Course Outcomes

CO1	Understand the concept of uni variate, Bivariate Discrete and continuous random variable including expectation, moments and mgf.
CO2	Enable one to identify and classify different type of standard distribution.
CO3	Understand the weak law of large numbers, Bernoulli law of large numbers, Central limit theorem and its applications.

Teacher in Charge:

Ms. Geethu Simon

ST3CO3: STATISTICAL INFERENCE
Lecture Hours per week: 5, Credits: 3

Internal: 20, External: 80, Examination 3 Hours

Objectives

Introduce different type of sampling distributions and the concept of testing hypotheses.

Module I (25 hrs)

Sampling distributions: Statistic, Sampling distribution of a statistic, Standard error, Sampling from normal distribution, distribution of sample mean, sample variance, chisquare distribution, t distribution, and F distribution (definition, derivations and relationships only).

Module II (20 hrs)

Theory of Estimation: Point Estimation, desirable properties of a good estimator, unbiasedness, consistency, sufficiency, Fisher Neyman factorization theorem, efficiency. Methods of Estimation: Method of maximum likelihood, method of moments

Module III (15 hrs)

Interval Estimation: Interval estimates of mean, difference of means, variance, proportions and difference of proportions. Derivation of exact confidence intervals for means, variance and ratio of variances based on normal, t, chi square and F distributions

Module IV (30 hrs)

Testing of Hypotheses: concept of testing hypotheses, simple and composite hypotheses, null and alternative hypotheses, type I and II errors, critical region, level of significance and power of a test. Neyman Pearson approach: Large sample tests concerning mean equality of means, proportions, equality of proportions, Small sample tests based on t distribution for mean, equality of means and paired t test. Tests based on Fdistribution for ratio of variances. Tests based on Chi square distribution for variance, goodness of fit and for independence of attributes.

Reference Books:

1. V. K. Rohatgi, An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern.
2. S.C.Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons
3. A.M. Mood, F.A. Graybill and D C Bose, Introduction to Theory of Statistics, McGraw Hill
4. John E Freund, Mathematical Statistics (6th edn), Pearson Edn, NewDelhi

OBJECTIVES

- Introduce different type of sampling distributions.

- Introduce the concept of random sample from a distribution, sampling distribution of a statistic, standard error of important estimates such as mean and proportions
- knowledge about important inferential aspects such as point estimation, test of hypotheses and associated concepts
- Introduce Neyman Pearson approach in testing of hypotheses.

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **25 Hours**	Statistic, Sampling distribution of a statistic, Standard error, Sampling from normal distribution, distribution of sample mean, sample variance, chisquare distribution, t distribution, and F distribution	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on chisquare distribution, t distribution, and F distribution.	• Understand different type of sampling distributions.	Evaluation through test paper
Module II **20 Hours**	Point Estimation, desirable properties of a good estimator, unbiasedness, consistency, sufficiency, Fisher Neyman factorization	• Lecture • Discussion • Participative learning • Problem solving	• Seminar on the topic Method of maximum likelihood and methodof moments.	• Understand point estimation methods.	Evaluation through test paper.

	theorem, Method of maximum likelihood, method of moments.				
Module III **15 Hours**	Interval estimates of mean, difference of means, variance, proportions and difference of proportions. Derivation of exact confidence intervals for means, variance and ratio of variances based on normal, t, chi square and F distributions	• Lecture • Discussion • Participative learning • Problem solving	• Seminar related to the topic difference of means, variance, and difference of proportions.	• Understand Interval estimation methods	Evaluation through Group Discussion.
Module IV **30 Hours**	concept of testing hypotheses, simple and composite hypotheses, null and alternative hypotheses,type I and II errors, critical region, level of significance and power of a test. Large sample tests, proportions, equality of proportions, Small sample tests based on t distribution for	• Lecture • Discussions • Problem solving	• Student seminars in connection with type I and II errors.	• Become familiar with the concept of testing hypotheses and different sample tests.	Evaluation through test paper

	mean, equality of means and paired t test. Tests based on Fdistribution for ratio of variances. Tests based on Chi square distribution for variance, goodness of fit and for independence of attributes.				

Course Outcomes

CO1	Understnd different sampling distribution and its properties.
CO2	Understand the tecniques of estimation and testing hypotheses for mean, variance, proportions, correlation coefficient, association and goodness of fit.
CO3	Knowledge of point and interval estimation proceduers and different method of point estimation.

Teacher in Charge:

Ms. Geethu Simon

ST4CO4 APPLIED STATISTICS

Lecture Hours per week: 5, Credits: 3

Internal: 20, External: 80, Examination 3 Hours

Objectives

To introduce sampling techniques and statistical quality control

Module I (20 hrs)

Census and Sampling, Principal steps in a sample survey, different types of sampling, Organisation and execution of large scale sample surveys, errors in sampling(sampling and non sampling errors), preparation of questionnaire, simple random sampling with and without replacement, Systematic, stratified and cluster sampling

Module II (15 hrs)

Analysis of variance; one way, two way classifications. Null hypothesis, total, between and within sum of squares. Assumptions - ANOVA table..

Module III (30 hrs)

Time series : Components of time series additive and multiplicative models , measurement of trend , moving averages, seasonal indicessimple averageratio to moving average., Index numbers: meaning and definition uses and types - problems in the construction of index numbers -different types of simple and weighted index numbers. Test for an ideal index number - time and factor reversal test.

Module IV (25 hrs)

Statistical Quality Control: Concept of statistical quality control, assignable causes and chance causes, process control, Construction of control charts, 3sigma limits, Control chart for variables -Mean chart and Range chart, Control chart for attributes - pchart, d or np chart and c chart

Reference Books:

1) S.C.Gupta and V. K. Kapoor, Fundamentals of Applied Statistics, Sultan Chand and Sons

2) Grant E L, Statistical quality control, McGraw Hill

3) Duncan A J, Quality Control and Industrial Statistics, Taraporewala and sons

4) Montegomery D C, Introduction to Statistical Quality Control, John Wiley and sons

5) S.P.Gupta: statistical methods

OBJECTIVES

1) To equip students with sampling techniques used in conducting sample surveys.
2) To understand the concepts of ANOVA model
3) To expose the area of time series and index numbers.
4) To provide an insight into quality assessment techniques.

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **20 Hours**	Census and Sampling, Principal steps in a sample survey, different types of sampling, Organisation and execution of large scale sample surveys, sampling and non sampling errors, simple random sampling	• Lecture • Discussion • Participative learning • Problem solving	• Group discussion on sampling and sample survey	To understand sampling techniques used in conducting sample surveys	Evaluation through test paper

	with and without replacement, Systematic, stratified and cluster sampling				
Module II **15 Hours**	Analysis of variance; one way, two way classifications, Null hypothesis, Assumptions - ANOVA table..	• Lecture • Discussion • Participative learning • Problem solving	• Assignments in finding variance between the samples	To understand the concepts of ANOVA model	Evaluation through test paper and viva
Module III **30 Hours**	Time series, Components of time series, measurement of trend, moving averages, seasonal indices, Index numbers, different types of simple and weighted index numbers, time and factor reversal test.	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars related to components of time series	To understand time series, seasonal indices and index numbers	Evaluation through MCQ and Group Discussion
Module IV **25 Hours**	Statistical Quality Control, assignable causes	• Lecture • Discussion s	• Assignment to construct control charts	To understand statistical quality control	Evaluation through test paper

	and chance causes, process control, Construction of control charts, 3sigma limits, Control chart for variables- Mean chart and Range chart,Control chart for attributes pcha rt, d or np chart and c chart	• Problem solving		and its uses	

Course Outcomes

CO1	To understand sampling techniques used in conducting sample surveys
CO2	To understand the concepts of ANOVA model
CO3	To learn the concepts of time series and index numbers
CO4	To provide an insight into quality assessment techniques.

Teacher in Charge:

Ms. Jiji Pauly

MTS1C01: MATHEMATICS I
Lecture Hours per week: 4, Credits: 3
Internal: 15, External: 60, Unty. Exam Dur. : 2 Hours

Objectives

To develop basic concepts of Mathematics that include continuity, differentiation and integration

Module I

Introduction to the derivative, instantaneous velocity, slope of tangent line, differentiating simplest functions, Limits Notion of limit, basic properties, derived properties, continuity, continuity of rational functions, one sided limit, limit involving $\pm\infty$, The derivative as Limit formal definition, examples, differentiability and continuity, Leibnitz notation, Differentiating Polynomials power rule, sum rule etc., Product and quotients product, quotient, reciprocal & integral power rule , Linear Approximation and Tangent Lines equation of tangent line and linear approximation, illustrations

Module II

Rate of change and second derivative linear or proportional change, rates of change, second derivative, The Chain Rule power of a function rule, chain rule, Fractional Power & Implicit Differentiation rational power of a function rule, implicit differentiation, Related rates and parametric curves Related rates, parametric curves, word problems involving related rates, Anti derivatives anti differentiation and indefinite integrals, antidifferentiation rules

Module III

Continuity and Intermediate value theorem IVT: first and second version Increasing and decreasing function Increasing and decreasing test, critical point test, first derivative test, Second derivative and concavity second derivative test for local maxima , minima and concavity , inflection points, Drawing of Graphs graphing procedure, asymptotic behaviour, Maximum Minimum Problems maximum and minimum values on intervals, extreme value theorem, closed interval test, word problems , The Mean Value Theorem The MVT, consequences of MVT, Rolles Theorem, horserace

theorem, L'Hospital rule Preliminary version, strengthened version

Module IV

Summation, distance and velocity, properties of summation, telescoping sum (quick introduction relevant ideas only) Sums and Areas step functions, area under graph and its counterpart in distance velocity problem The definition of Integral signed area , The integral, Riemann sums The Fundamental Theorem of Calculus Arriving at FTC intuitively using distance velocity problem, Fundamental integration Method, proof of FTC, Area under graph, displacements and velocity Definite and Indefinite integral indefinite integral test, properties of definite integral, fundamental theorem of calculus: alternative version (interpretation and explanation in terms of areas): Applications of the Integral Area between graphs, area between intersecting graphs, total changes from rates of change, Volume by slice method the slice method, volume of solid of revolution by Disk method

Text

(1) Calculus I (2/e) : Jerrold Marsden & Alan Weinstein SpringerVerlag New York Inc(1985) ISBN 0387909745 Text

(2) Calculus II (2/e) : Jerrold Marsden & Alan Weinstein SpringerVerlag New York Inc(1985) ISBN 0387909753

References

1. Soo T Tan: Calculus Brooks/Cole, Cengage Learning(2010)ISBN 0534 46579X
2. Gilbert Strang: Calculus Wellesley Cambridge Press(1991)ISBN:09614088 20
3. Ron Larson. Bruce Edwards: Calculus(11/e) Cengage Learning(2018) ISBN: 9781337275347
4. Robert A Adams & Christopher Essex : Calculus Single Variable (8/e) Pearson Education Canada (2013) ISBN: 0321877403
5. Joel Hass, Christopher Heil & Maurice D. Weir : Thomas' Calculus(14/e) Pearson (2018) ISBN 0134438981
6. Jon Rogawski & Colin Adams : Calculus Early Transcendentals (3/e) W. H. Freeman and

Company(2015) ISBN: 1319116450

OBJECTIVES

a) **To develop the concept of first order derivative**

b) **To understand how to calculate second order derivative**

c) **To study Continuity and Intermediate value theorem, drawing of graphs, the Mean value theorems**

d) **To study about Riemann sums, definite and indefinite integral**

LESSON PLAN

Unit/ hours	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 14 hours	First order derivative and its significance, Linear Approximation and Tangent Lines	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on first order derivative	To understand: • The difference between differentiability and analyticity	Evaluation through test papers
Module 2 **13 Hours**	Second order derivative, fractional derivative, implicit differentiation	• Lecture • Discussion • Participative learning • Problem solving	• Assignments to understand second order derivative	To understand: • Second order derivative • Implicit differentiation	Evaluation through test paper
Module 3 **18 Hours**	Continuity and Intermediate value theorem, drawing of graphs, the MVT	• Lecture • Discussion • Participative learning	Peer group discussion on drawing graphs	To understand: • Continuity andIVT	Evaluation Through interaction with

				• Drawing graphs	students
Module4 **19 Hours**	Fundamental theorem of Calculus, Definite and Indefinite integral	• Lecture • Discussion • Problem solving	• Peer group discussion on definite and indefinite integral	To understand: • Fundamental theorem of calculus • definite and indefinite integral	Evaluation through test paper

Course Outcomes

CO1	**To develop the concept of first order derivative, its physical significance and antiderivative**
CO2	**To study derivative of second order, fractional Power & implicit differentiation and antiderivative**
CO3	**To develop the concepts of the MVT, consequences of MVT, Rolles Theorem.**
CO4	**To study fundamental theorem of calculus and calculate volume by slice method**

Teacher in Charge
Ms. Smitha Davis
Dr. Nidhin T J

MTS2C02: MATHEMATICS-2
Lecture Hours per week: 4, Credits: 3
Internal: 15, External: 60, Unty. Exam Dur. : 2 Hours

Objectives

To develop concepts of Mathematics that include hyperbolic functions, numerical integration, matrices and its properties.

Module I

Polar coordinates and Trigonometry – Cartesian and polar coordinates, Inverse functions-inverse function test, inverse function rule, Graphing in polar coordinates- Checking symmetry of graphs given in polar equation, drawings, tangents to graph in polar coordinates Hyperbolic functions- hyperbolic sine, cosine, tan etc., derivatives, antidifferentiation formulas Inverse hyperbolic functions- inverse hyperbolic functions (their derivatives and antiderivatives) Arc length and surface area- Length of curves, Area of surface of revolution about x and y axes

Module II

Improper integrals- integrals over unbounded intervals, comparison test, integrals of unbounded functions, Limit of sequences and Newton's method ε-N definition, limit of powers, comparison test, Newton's method : Numerical Integration- Riemann Sum, Trapezoidal Rule, Simpson's Rule The sum of an infinite series - convergence of series, properties of limit of sequences (statements only), geometric series, algebraic rules for series, the ith term test The comparison test and alternating series- comparison test, ratio comparison test, alternating series, alternating series test, absolute and conditional convergence

Module III

Vector spaces – definition, examples, subspaces, basis, dimension, span Gram-Schmidt Orthogonalization Process- orthonormal bases for R^n , construction of orthonomal basis of R^n Systems of Linear Algebraic Equations- General form, solving systems, augmented matrix, Elementary row operations, Elimination Methods- Gaussian elimination, Gauss– Jordan

elimination, row echelon form, reduced row echelon form, inconsistent system, networks, homogeneous system, over and underdetermined system ,Rank of a Matrix- definition, row space, rank by row reduction, rank and linear system, consistency of linear system, Determinants- definition, cofactor, Properties of determinant- properties, evaluation of determinant by row reducing to triangular form

Module IV

Inverse of a Matrix – finding inverse, properties of inverse, adjoint method, row operations method, using inverse to solve a linear system, The eigenvalue problem- Definition, finding eigenvalues and eigenvectors, complex eigenvalues, eigenvalues and singular matrices, eigenvalues of inverse Powers of Matrices- Cayley Hamilton theorem, finding the inverse, Orthogonal Matrices - symmetric matrices and eigenvalues, inner product, criterion for orthogonal matrix, construction of orthogonal matrix, Diagonalization- diagonalizable matrix-sufficient conditions, orthogonal diagonalizability of symmetric matrix, Quadratic Forms

Text

(1) Calculus I (2/e): Jerrold Marsden & Alan Weinstein Springer Verlag New York Inc(1985) ISBN 0387909745

(2) Calculus II (2/e): Jerrold Marsden & Alan Weinstein Springer Verlag New York Inc(1985) ISBN 0387909753

(3) Advanced Engineering Mathematics(6/e): Dennis G Zill Jones & Bartlett Learning, LLC (2018) ISBN: 978-1-284-10590-2.

References

1 Soo T Tan: Calculus Brooks/Cole, Cengage Learning (2010) ISBN 0-534-46579-X
2 Gilbert Strang: Calculus Wellesley Cambridge Press (1991)ISBN:0-9614088-2-0
3 Ron Larson. Bruce Edwards: Calculus(11/e) Cengage Learning (2018) ISBN: 978-1-337- 27534-7
4 Robert A Adams & Christopher Essex : Calculus Single Variable (8/e) Pearson Education Canada (2013) ISBN: 0321877403
5 Joel Hass, Christopher Heil & Maurice D. Weir : Thomas' Calculus(14/e) Pearson (2018) ISBN 0134438981
6 Advanced Engineering Mathematics(7/e) Peter V O'Neil: Cengage Learning (2012) ISBN:

978-1-
111-42741-2
7 Erwin Kreyszig: Advanced Engineering Mathematics(10/e) John Wiley & Sons (2011) ISBN: 978-
0- 470-45836-5
8 Glyn James: Advanced Modern Engineering Mathematics(4/e) 1 Pearson Education Limited (2011)
ISBN: 978-0-273-71923-6

OBJECTIVES

a) **To develop the concept of derivative and integral of hyperbolic functions and inverse hyperbolic functions.**

b) **To understand how to calculate arc length and area of surface of revolution.**

c) **To study about improper integrals and numerical integration.**

d) **To compute matrix inverse and study some important properties.**

LESSON PLAN

Unit/ hour	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 14 hours	Inverse functions, hyperbolic functions, Arc length and surface area- Length of curves, Area of surface of revolution about x and y axes	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion derivative and antiderivative of hyperbolic functions	To understand: • Hyperbolic functions • Length of curves • Surface of revolution	Evaluation through test papers
Module 2 **17 Hours**	Improper integrals, Numerical Integration- Riemann Sum, Trapezoidal Rule,	• Lecture • Discussion • Participative learning • Problem	• Assignments to understand numerical integration	To understand: • Improper integrals • Numerical integration	Evaluation through test paper

	Simpson's Rule	solving			
Module 3 19 Hours	Vector spaces, Gaussian elimination, Gauss– Jordan elimination, rank of matrix, determinants	• Lecture • Discussion • Participative learning	Peer group discussion on matrix properties	To understand: • Notion ofvector spaces • Matrix properties	Evaluation through test papers
Module 4 14 Hours	Inverse of a matrix, orthogonal matrix, power of matrices, diagonalization of matrices	• Lecture • Discussion • Problem solving	• Peer group discussion on inverse of a matrix	To understand: • Orthogonal matrix and its properties • Diagonalizationof matrices	Evaluation through test paper

Course Outcomes

CO1	**To develop the concept of differentiation and integration of hyperbolic and inverse hyperbolic functions, to calculate arc length and surface of revolution**
CO2	**To study about improper integrals and numerical integration.**
CO3	**To develop the concepts of vector spaces, and basics of matrices**
CO4	**To study how to compute inverse of matrix and diagonalization of the matrices.**

Teacher in Charge
Dr. Vijitha Mukundan
Ms. Geethika P R

MAT 3C03 – MATHEMATICS(Complementary Course)

Number of hours of lectures per week : 5 hrs

Number of credits : 3

OBJECTIVE

To understand concepts of Ordinary differential equations, matrices and vector calculus.

MODULE I

Basic concepts and ideas, Geometrical meaning of y' = f(x,y). Direction Fields, Separable Differential Equations. Exact Differential Equations; Integrating Factors, Linear Differential Equations; Bernoulli Equation, Orthogonal Trajectories of Curves.

MODULE II

Rank of a Matrix, Non-Singular and Singular matrices, Elementary Transformations, Inverse of an elementary Transformations, Row Canonical form, Normal form. Systems of Linear equations: Homogeneous and Non Homogenoeus Equations, Characteristic equation of a matrix; Characteristic roots and characteristic vectors. Cayley-Hamilton Theorem (statement only) and simple applications.

MODULE III

A quick Review of vector algebra, Inner product and vector product in R^2 and R^3 . Vector and scalar functions and Fields, Derivatives, Curves, Tangents, Arc Length, Velocity and acceleration, Gradient of a scalar field; Directional Derivative, Divergence of a vector field, Curl of a Vector Field.

MODULE IV

Line Integrals, Independence of path, Green's Theorem in the Plane (without proof), surfaces for Surface Integrals, Surface Integrals, Triple Integrals, Divergence theorem of Gauss and Stoke's theorem (without proofs).

TEXTBOOKS

1. Erwin Kreyszig : Advanced Engineering Mathematics, Eighth Edition, Wiley, India.

2. Frank Ayres JR : Matrices, Schaum's Outline Series, TMH Edition.

REFERENCES

[1] S.S. Sastry, Engineering Mathematics, Volume 1, 4th Edition PHI.

[2] Muray R Spiegel, Vector Analysis, Schaum's Outline series, Asian Student Edition.

[3] Shanthi Narayanan & P.K. Mittal, A Text Book of Matrices, S. Chand

[4] Harry F. Davis & Arthur David Snider, Introduction to Vector Analysis, 6th ed., Universal Book Stall, New Delhi.

OBJECTIVES

- To understand the concepts in ordinary differential equations
- To learn about matrices and its properties
- To learn about Cayley Hamilton theorem
- To understand vectors
- To study in detail Vector Calculus

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I (20 hours)	Modeling of differential equations, methods to solve first order differential equations.	• Discussion • Participative learning • Problem solving	Discussions Lectures and Quizzes	Geometrical meaning of ODE, solving I order ODEs	Evaluation through test paper.
MODULE II (20 hours)	Rank of a matrix, solution of system of linear equations, Cayley- Hamilton theorem	• Lecture • Discussion • Participative learning • Problem solving	. Discussion about Eigen values and vectors	Normal and Echoleon form of matrices, Solution of linear system of equations, Eigen values and vectors	Evaluation through test paper.
MODULE III (25 hours)	Introduction to vectors and vector differential calculus	• Lecture • Discussion • Participative learning • Problem solving	Discussion on derivatives of vector functions	Know gradient, divergence, curl of a vector function	Evaluation through MCQ.

MODULE IV (25 hours)	Vector integral calculus	• Lecture • Discussion • Participative learning • Problem solving	Discussion on surface integrals	Greens theorem, Stoke's theorem, Gauss divergence theorem	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about I order ordinary differential equations
CO2	To learn solution of system of linear equations To study about eigen values and eigen vectors.
CO3	To know about vector differential calculus To learn about vector integral calculus

Faculty in Charge

Dr. Vijitha Mukundan

Ms. Linet Roslin Antony

Ms. Geethika P R

MAT 4C04 – MATHEMATICS(Complementary Course)

Number of hours of lectures per week : 5 hrs

Number of credits : 3

OBJECTIVE

To understand concepts of Second order differential equations, Laplace tranforms, Fourier series, Numerical methods

MODULE I

Linear Differential equations of Second and Higher order: Differential Operators, Euler-Cauchy Equation, Wronskian, Nonhomogeneous Equations, Solutions by Undetermined Coefficients, Solution by variation of Parameters.

MODULE II

Laplace Transforms: Laplace Transform, Inverse Transform, Linearity, Shifting, Transforms of Derivatives of Integrals, Differential Equations. Unit step Function, Second Shifting Theorem, Dirac Delta Function, Differentiation and integration of Transforms, Convolution, Integral Equations, Partial Fractions, Differential Equations.

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MODULE III

Fourier Series : Periodic Functions, Trigonometric Series, Fourier Series, Even and Odd functions, Half-range Expansions, Partial differential Equations: Basic Concepts, Vibrating String, Wave Equation, Separation of Variables, Use of Fourier Series

MODULE IV

Numerical Methods: Methods of First-order Differential Equations, Picard's iteration for initial Value Problems. Numerical Integration: Trapezoidal Rule, Simpson's Rule.

TEXTBOOKS

1. Erwin Kreyszig, Advanced Engineering Mathematics, Eighth Edition, Wiley, India.
2. George B. Thomas Jr. and Ross L. Finney : Calculus, LPE, Ninth edition, Pearson Education.

REFERENCES

[1] S.S. Sastry, Engineering Mathematics, Volume 1, 4th Edition PHI.
[2] Muray R Spiegel, Advanced Calculus, Schaum's Outline series.
[3] Murray R. Spiegel, Laplace Transforms, Schaum's Outline Series.

OBJECTIVES

- To understand the methods to solve II and higher order derivatives
- To learn Laplace and inverse Laplace equations
- To learn about Fourier series and Half range expansions
- To understand classical partial differential equations
- To study in detail some numerical methods for integration and ODEs.

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I (20 hours)	Solution of II and higher order differential equations	• Discussion • Participative learning • Problem solving	Discussions Lectures on wronskian	Euler-Cauchy equations, various methods for solving II order DEs	Evaluation through test paper.
MODULE II (20 hours)	Laplace transforms, Inverse Laplace transforms, Shifting theorems	• Lecture • Discussion • Participative learning • Problem solving	. Discussion about laplace and inverse Laplace transforms	Solution of differential equations using Laplace transforms	Evaluation through test paper.
MODULE III (30 hours)	Fourier series and its half range expansions	• Lecture • Discussion • Participative learning • Problem solving	Discussion on Fourier series expansions of periodic functions	Solution of heat and wave equations using Fourier series	Evaluation through test paper.

MODULE IV (20 hours)	Numerical methods for integration and solving differential equations	• Lecture • Discussion • Participative learning • Problem solving	Discussion on various numerical methods	Runge – Kutta, Euler methods, Trapeziodal, Simpson's rule.	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about Euler- Cauchy equations, method of undetermined coefficients and method of variation of parameters
CO2	To learn Solving differential equations using Laplace transforms To study about Fourier series
CO3	To know about solution of Heat and Wave Equations To learn about various numerical methods.

Faculty in Charge

Ms. Smitha Davis

Ms. Linet Roslin Antony

Dr. Nidhin T J

MTS1 B01 BASIC LOGIC & NUMBER THEORY

Lecture Hours per week: 4, Credits: 4

Internal: 20, External: 80, Examination 2.5 Hours

Objectives

To enable one to think systematically, to make valid arguments in mathematical terms and master several techniques of problem solving.

Module I (15 hrs)

Propositions, Boolean variables, Truth Value, Conjunction, Boolean expression, Disjunction, Negation, Implication, Converse, Inverse and Contra positive, Biconditional statement, Order of Precedence, Tautology Contradiction and Contingency, Logical equivalences- laws of logic, Quantifiers- universal & existential, predicate logic, Arguments- valid and invalid arguments, inference rules, Proof Methods–vacuous proof, trivial proof, direct proof, indirect proof-contrapositive & contradiction, proof by cases , Existence proof-constructive & non constructive, counter example.

Module II (12hrs)

Mathematical induction- well ordering principle, simple applications, weak version of principle of mathematical induction, illustrations, strong version of induction, illustration, Recursion- recursive definition of a function, illustrations, The division algorithm – statement and proof, div & mod operator, card dealing, The two queens puzzle, pigeonhole principle and division algorithm, divisibility relation, illustration ,divisibility properties, union intersection and complement-inclusion-exclusion principle & applications, even and odd integers, Prime and Composite Numbers- definitions, infinitude of primes, The sieve of Eratosthenes, a number theoretic function, prime number theorem, distribution of primes.

Module III (17 hrs)

Greatest Common Divisor-gcd,symbolic definition, relatively prime integers, Duncan's identity, Polya's theorem, infinitude of primes, properties of gcd, linear combination, gcd as linear combination, an alternate definition of gcd, gcd of n positive integers, a linear combination of n positive integers, pairwise relatively prime integers, alternate proof for infinitude of prime, The Euclidean Algorithm- The Euclidean algorithm,

Ajigsaw puzzle, Lame's theorem, The Fundamental Theorem of Arithmetic- Euclid's lemma on division of product by a prime, fundamental theorem of arithmetic, Canonical Decomposition, number of trailing zeros, highest power of a prime dividing $n!$, Distribution of Primes Revisited, Dirichlet's Theorem, Least Common Multiple- definition, canonical decomposition to find lcm, relationship between gcd and lcm, relatively prime numbers and their lcm, Linear Diophantine Equations – LDE in two variables, conditions to have a solution, Aryabhatta's method, number of solutions, general solution, Mahavira's puzzle, hundred fowls puzzle, Monkey and Coconuts Puzzle, Fibonacci numbers and LDE, LDE in more number of variables and their solutions-theorem3.20.

Module IV (20hrs)

Congruences - congruence modulo m, properties of congruence, characterization of congruence, least residue, congruence classes, A Complete Set of Residues Modulo m, properties of congruence, use of congruence to find the remainder on division, Towers of Powers Modulo m, further properties of congruence and their application to find remainder congruences of two numbers with different moduli, Linear Congruence- solvability, uniqueness of solution, incongruent solutions, Modular Inverses, applications, Divisibility Tests-Divisibility Test for 10, Divisibility Test for 5, Divisibility Test for $2i$, Divisibility Tests for 3 and 9, Divisibility Test for 11, Wilson's Theorem- self invertible modulo prime, Wilson's theorem and its converse, Fermat's Little Theorem and its applications, inverse of a modulo p using FLT, application- solution of linear congruences , extension of FLT in various directions, Euler's Theorem- motivation, Euler's Phi Function φ, Euler's Theorem, applications, generalisation of Euler's theorem (koshy).

Textbooks :

1) **Thomas Koshy**: Discrete Mathematics with Applications**,** Elsever Academic Press (2004)
2) **Thomas Koshy**: Elementary Number Theory with Applications (2/e) , Elsever Academic Press (2007)

Reference Books:

1) Susanna S Epp: Discrete Mathematics with Applications(4/e) Brooks/Cole Cengage Learning(2011)
2) Kenneth H. Rosen: Discrete Mathematics and Its Applications(7/e) McGraw-Hill, NY(2007)
3) David M. Burton : Elementary Number Theory(7/e) McGraw-Hill (2011)

4) Gareth A. Jones and J. Mary Jones: Elementary Number Theory, Springer Undergraduate Mathematics Series(1998)
5) Underwood Dudley :Elementary Number Theory(2/e), Dover Publications (2008)
6) James K Strayer: Elementary Number Theory, Waveland Press, inc.(1994)
7) Kenneth H. Rosen: Elementary Number Theory(6/e), Pearson Education(2018)

OBJECTIVES

1) To enable one to think systematically.
2) To express ideas in precise and concise mathematical terms.
3) To learn to make valid arguments.
4) To master different techniques of problem solving.

LESSON PLAN

Unit/ hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **15 Hours**	Propositions, Logical Equivalences, Quantifiers, Arguments, Proof Methods	• Lecture • Discussion • Participative learning • Problem solving	Peer group discussion on Logical Equivalence	To understand techniques of logic and reasoning	Evaluation through test paper
Module II **12 Hours**	Mathematical Induction,	• Lecture • Discussion	Student seminars to	To understand several	Evaluation through test paper

	Recursion, Division Algorithm, Prime and Composite numbers.	• Participative learning • Problem solving	explain prime and composite numbers.	techniques of problem solving such as recursion and induction.	
Module III **17 Hours**	GCD, Euclidean algorithm, Fundamental theorem of arithmetic, LCM, Linear Diophantine Equations,	• Lecture • Discussion • Participative learning • Problem solving	Assignment to find GCD and LCM	To solve LDE	Evaluation through MCQ
Module IV **20 Hours**	Congruences, Linear congruence, Divisibility test, Wilson's Theorem, Fermat's LittleTheorem,Euler's Theorem.	• Lecture • Discussions • Problem solving	Student seminars to explain the divisibility test for 5 and 11	To solve linear congruences	Evaluation through test paper and viva

Course Outcomes

CO 1	To prove results involving divisibility, greatest common divisor, least common multiple and a few applications.
CO 2	To understand the theory and method of solutions of LDE.
CO	To understand the theory of congruence and a few applications.

CO 4	To solve linear congruent equations.
CO 5	To learn three classical theorems *viz*. Wilson's theorem, Fermat's little theorem and Euler's theorem and a few important consequences.

Teacher in Charge:

Ms. Geethu Simon

MTS2 B02 CALCULUS OF SINGLE VARIABLE-1
Lecture Hours per week: 4, Credits: 4
Internal: 20, External: 80, Examination 2.5 Hours

Objectives

To introduce students to the fundamental ideas of limit, continuity and differentiability and also to some basic theorems of differential calculus.

Module I - Functions and Limits (20 hrs)

Functions and their Graphs- Definition of a Function, Describing Functions, Evaluating Functions, Finding the Domain of a Function, The Vertical Line Test, Piecewise Defined Functions, Even and Odd Functions (quick review), Combining functions- Arithmetic Operations on Functions, Composition of Functions, Graphs of Transformed Functions, Vertical Translations, Horizontal Translations, Vertical Stretching and Compressing, Horizontal Stretching and Compressing, Reflecting , Intuitive introduction to Limits- A Real Life Example, Intuitive Definition of a Limit, One-Sided Limits, Using Graphing Utilities to Evaluate Limits, Techniques for finding Limits Computing Limits- Using the Laws of Limits, Limits of Polynomial and Rational Functions, Limits of Trigonometric Functions, The Squeeze Theorem, Precise Definition of a Limit $\varepsilon - \delta$ $definition$, A Geometric Interpretation, Some illustrative examples, Continuous Functions - Continuity at a Number, Continuity at an Endpoint, Continuity on an Interval, Continuity of Composite Functions, Intermediate Value Theorem ,Tangent Lines and Rate of change- An Intuitive Look, Estimating the Rate of Change of a Function from Its Graph, More Examples Involving Rates of Change, Defining a Tangent Line, Tangent Lines, Secant Lines, and Rates of Change The Derivatives Definition, Using the Derivative to Describe the Motion of the Maglev, Differentiation, Using the Graph of f to Sketch the Graph of f' Differentiability, Differentiability and Continuity , The role of derivative in the real world- Motion Along a Line, Marginal Functions in Economics , Differentials and Linear Approximations - increments, Differentials, Error Estimates, Linear Approximations, Error in Approximating Δy by dy.

Module II - Applications of the Derivative (17 hrs)

Extrema of Functions Absolute Extrema of Functions, Relative Extrema of Functions, Fermat's Theorem, Finding the Extreme Values of a Continuous Function on a Closed Interval, An Optimization Problem ,The Mean Value Theorem Rolle's Theorem, The Mean Value Theorem, Some Consequences of the Mean Value Theorem, Determining the Number of Zeros of a Function Increasing and Decreasing Functions definition ,

inferring the behaviour of function from sign of derivative, Finding the Relative Extrema of a Function, first derivative test, Concavity and Inflection points Concavity, Inflection Points, The Second Derivative Test, The Roles of f' and f'' in Determining the Shape of a Graph, Limits involving Infinity; Asymptotes Infinite Limits, Vertical Asymptotes, Limits at Infinity, Horizontal Asymptotes, Infinite Limits at Infinity, Precise Definitions, Curve Sketching The Graph of a Function, Guide to Curve Sketching, Slant Asymptotes , Finding Relative Extrema , Using a Graphing Utility, Optimization Problems – guidelines for finding absolute extrema, Formulating Optimization Problems application involving several real life problems.

Module III - Integration (14 hrs)

Anti derivatives, Indefinite integrals, Basic Rules of Integration, a few basic integration formulas and rules of integration, Differential Equations, Initial Value Problems, Area An Intuitive Look, The Area Problem, Defining the Area of the Region Under the Graph of a Function, technique of approximation, An Intuitive Look at Area , Defining the Area of the Region Under the Graph of a Function, Area and Distance, The Definite Integral Definition of the Definite Integral, Geometric Interpretation of the Definite Integral, The Definite Integral and Displacement, Properties of the Definite Integral , More General Definition of the Definite Integral, The Fundamental Theorem of Calculus, How Are Differentiation and Integration Related?, The Mean Value Theorem for Definite Integrals, The Fundamental Theorem of Calculus: Part I, inverse relationship between differentiation and integration, Fundamental Theorem of Calculus: Part 2, Evaluating Definite Integrals Using Substitution, Definite Integrals of Odd and Even Functions, The Definite Integral as a Measure of Net Change.

Module IV- Applications of Definite Integral (13 hrs)

Areas between Curves A Real Life Interpretation, The Area Between Two Curves, Integrating with Respect to *y*adapting to the shape of the region, What Happens When the Curves Intertwine? Volume – Solids of revolution, Volume by Disk Method, Region revolved about the x-axis, Region revolved about the y-axis , Volume by the Method of Cross Sections, Arc Length and Areas of surfaces of revolution Definition of Arc Length, Length of a Smooth Curve, arc length formula, The Arc Length Function, arc length differentials, Surfaces of Revolution, surface area as surface of revolution,Work Done by a Constant Force, Work Done by a Variable Force, Hook's Law, Moving non rigid matter, Work done by an expanding gas, Moments and Center of Mass Measures of Mass, Center of Mass of a System on a Line, Center of Mass of a System in the Plane, Center of Mass of Laminas.

Textbooks :

1) **Soo T Tan**, Calculus: Brooks/Cole, Cengage Learning (2010)

Reference Books:

1) Joel Hass, Christopher Heil & Maurice D. Weir : Thomas' Calculus(14/e) Pearson (2018)
2) Robert A Adams & Christopher Essex : Calculus Single Variable (8/e) Pearson Education Canada (2013)
3) Jon Rogawski & Colin Adams : Calculus Early Transcendentals (3/e) W. H. Freeman and Company(2015)
4) Anton, Bivens & Davis : Calculus Early Transcendentals (11/e) John Wiley & Sons
5) James Stewart : Calculus (8/e) Brooks/Cole Cengage Learning(2016)
6) Jerrold Marsden & Alan Weinstein : Calculus I and II (2/e) Springer Verlag NY(1985)

OBJECTIVES

1) To get an idea of sketching of curves.
2) To solve some optimization problems of interest in real life.
3) To establish the close connection between the two branches of Calculus: Differential and Integral Calculus

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I (Functions and Limits)	Functions and their Graphs, Combining	Lecture Discussion Participative	Seminar on real life applications of	To deal with real life measures	Evaluation through test paper and

20 Hours	Functions, Intuitive Introduction to Limits, Techniques for finding Limits, Precise definition of Limits, Continuous Functions, Tangent Lines and Rate of Change , The Derivatives, The Role of Derivative in the Real World, Differential and Linear Approximations	learning Problem solving	Derivatives	like speed and acceleration	group discussion
Module II (Applications of the Derivative) **17 Hours**	Extrema of Functions, The MVT, Increasing and Decreasing Functions, Concavity and Inflection Points, Limit involving Infinity, Curve Sketching, Optimization Problems	Lecture Discussion Participative learning Problem solving	Group discussion on Curve Sketching	To understand several techniques of sketching curves and learning limits	Evaluation through test paper
Module III (Integration) **14 Hours**	Indefinite Integrals, Area, The Definite Integrals, The Fundamental Theorem of Calculus	Lecture Discussion Participative learning Problem solving	Assignment to find integrals of functions	To deal with real life problems in Physics, Chemistry etc.	Evaluation through MCQ

Module IV (Applications of the Definite Integral) **13 Hours**	Areas between Curves, Volume, Arc Length and Areas of Surfaces of Revolution, Work, Moments and Center of Mass	Lecture Problem solving Participative learning Videos	Assignment to find volume of some familiar objects	To explore relationship between Surfaces and Curves	Evaluation through test paper and viva

Course Outcomes

CO1	To learn the practical way of evaluating the definite integral.
CO2	To master integrals which is a powerful tool in solving problems in physics, chemistry, biology, engineering, economics and other fields.
CO3	To deal with real life optimization problems.
CO4	To explore the relationship between moving/changing objects

Teacher in Charge:
Ms. Geethu Simon

MAT3B03 CALCULUS AND ANALYTIC GEOMETRY

Lecture Hours per week: 5, Credits: 4

Internal: 20, External: 80, Examination 3 Hours

Objectives

To introduce fundamentals of calculus and geometry

Module I (15 hrs)

Natural logarithms, The Exponential function, and log , Growth and decay , L'Hopital's Rule, Relative rates of growth, Hyperbolic functions

Module II (25 hrs)

Limits of sequence of numbers,Theorems for calculating limits of sequences, Infinite series, Integral test for series of non-negative terms,Comparison test for series of non negativeterms,Ratio and root test for series of non negativeterms, Alternating series, Absolute and conditional convergence.

Module III (15 hrs)

Power series, Taylor and Maclaurin's series, Convergence of Taylor series ,Error estimate

Module IV (35 hrs)

Conic section and quadratic equations, Classifying conic section by eccentricity ,Quadratic equations and rotations, Parametrisation of plane curves, Calculus with parametrisedcurves,Polar coordinates, Graphing in polar co-ordinates, Polar equations for conic sections, Integration in polar coordinates.

Textbooks :

1) Thomas / Finney: Calculus, 9th ed., LPE, Pearson Education.

Reference Books:

1) Anton : Calculus, Wiley.
2) S.K. Stein : Calculus and Analytic Geometry, McGraw Hill

OBJECTIVES

1) To know transcendental functions such as natural logarithmic and exponential function.
2) To study a related notion of convergence of series
3) To study Power series, Taylor series , Maclaurin's series and their convergence
4) To understand parametrisation of plane curves

LESSON PLAN

Unit/ session / hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **15 Hours**	Natural logarithms, The Exponential function, and log , Growth and decay ,L'Hopital's Rule, Relative rate of growth, Hyper-bolic functions.	• Lecture • Discussion • Participative learning • Problem solving	• Group discussion on Growth and decay functions	To understand transcendental functions	Evaluation through test paper
Module II **25 Hours**	Limits of sequence of numbers, Infinite series, Integral test for	• Lecture • Discussion • Participati	• Assignments related to convergence tests of	To understand convergence of sequences and series	Evaluation through test paper

	series,Comparison test ,Ratio and root test , Alternating series, Absolute and conditional convergence.	ve learning • Problem solving	infinite series		
Module III **15 Hours**	Power series, Taylor and Maclaurin's series, Convergence of Taylor series , Error estimate	• Lecture • Discussion • Participative learning • Problem solving	• Group discussion on power series	To study power series and convergence	Evaluation through test paper and group discussion
Module IV **35 Hours**	Conic section and quadratic equations,Quadratic equationand rotations, Parametrisation of plane curves,Polar coordinates, Graphing in polar co-ordinates, Polar equations for conic sections,	• Lecture • Discussions • Problem solving	• Student seminars in connection with polar coordinates	To understand parametrisation of plane curves	Evaluation through test paper

	Integration in pol ar coordinates				

Course Outcomes

CO1	To understand transcendental functions such as natural logarithmic and exponential function
CO2	To handle the convergence of series with different tests.
CO3	To learn Power series, Taylor series , Maclaurin's series and their convergence
CO4	To understand parametrisation of plane curves

Teacher in Charge:

Mr. Rahul M Raju
Ms. Jiji Pauly

MAT4B04: THEORY OF EQUATIONS, MATRICES AND VECTOR CALCULUS

Lecture Hours per week: 5, Credits: 4

Internal: 20, External: 80, Examination 3 Hours

Objectives

Develops a new and fundamental ideas of calculus for the simple, but important case of polynomials. Also uses the matrices to solve system of linear equations.

Module I (30 hrs)

Polynomial Equations and Fundamental Theorem of Algebra(without proof). Applications of the Fundamental theorem to equations having one or more complex roots, Rational roots or multiple roots. Relations between roots and co-efficients of a polynomial equation and computation of symmetric functions of roots.Finding equations whose roots are functions of the roots of a given equation. Reciprocal equation and method of finding its roots. Analytical methods for solving polynomial equations of order up to four - quadratic formula.Cardano's method for solving cubic equations.Ferrari's method (for quadratic equations). Remarks about the insolvability of equations of degree five or more.Finding the nature of roots without solving Descartes' rule of signs.

Module II (16 hrs)

Elementary transformation, reduction to normal form, row reduced echelon form.Computing the inverse of a non singular matrix using elementary row transformation.

Module III (20 hrs)

System of linear homogeneous equations.Null space and nullity of matrix. Sylvester's law of nullity.Range of a matrix.Systems of linear non homogeneous equations. Characteristic roots and characteristic vectors of a square matrix. Some fundamental theorem.Characteristic roots of Hermitian, Skew Hermitian and Unitary matrices.Characteristic equation of a matrix, Cayley- Hamilton theorem

Module IV (24 hrs)

Lines and planes in space. Cylinders and Quadric surfaces, Cylindrical and spherical coordinates, Vector valued functions and space curves, Arc length and Unit tangent vector , Curvature, torsion and TNB frame

Textbooks :

1. Bernard and Child: Higher Algebra, Macmillan

2.Shanti Narayanan &Mittal : A Text Book of Matrices, Revised edn., S. Chand

3. Thomas /Finney : Calculus, 9th ed., LPE, Pearson Education

Reference Books:

1.Kenneth Hoffman & Ray Kunze : Linear Algebra, Pearson Education.

2.ManicavachagomPillai, Natarajan, Ganapathy- Algebra

3.Dickson: First Course in Theory of Equation

4. Frank Ayres, Jr. : Matrices, Schaum's Outline Series, Asian Student edition.

5. Devi Prasad : Elementary Linear Algebra, Narosa Pub. House.

6. Kreyszig : Advanced Engineering Mathematics, 8th ed., Wiley.

7. H.F. Davis and A.D. Snider: Introduction to Vector Analysis, 6th ed.,

OBJECTIVE

- Learn to find the roots of polynomial equations up to degree 4, insolvability of equations of degree 5 or more.
- To compute the inverse of a non singular matrix using elementary row transformations.
- To understand about the characteristic equation and characteristic root of a matrix.
- Learn to use matrix to solve system of linear equations.
- Understand the basics of vector algebra
- Learn inner product, vector product and scalar triple product.
- Understand the concept of cylindrical and spherical coordinates.
- Learn about the plane and curves in space.

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **30 Hours**	Polynomial Equations and Fundamental Theorem of Algebra. Applications of the Fundamental theorem to equations having one or more complex roots, Rational roots or multiple roots.	• Lecture • Discussion • Participative learning • Problem	• Assignments to find roots of polynomial equations. • Seminar on	• Learned to solve polynomials using cardan's method,	Evaluation through test paper.

	Relations between roots and co-efficients of a polynomial equation and computation of symmetric functions of roots.Finding equations whose roots are functions of the roots of a given equation. Reciprocal equation and method of finding its roots. Analytical methods for solving polynomial equations of order up to four - quadratic formula.Cardano's method for solving cubic equations.Ferrari's method (for quadratic equations). Remarks about the insolvability of equations of degree five or more.Finding the nature of roots without solving Descartes' rule of signs.	solving	the topic Transformation of equations.	Ferrari methods etc	
Module II **16 Hours**	Elementary transformation, reduction to normal form, row reduced echelon form.Computing the inverse of a non singular matrix using elementary row transformation.	• Lecture • Discussion • Participative learning • Problem solving	• Assignments to find the inverse of a non singular matrix using elementary row transformation.	• Learn to determine wether a matrix is singular or non singular • Learn to find out the rank of a matrix.	Evaluation through test paper.

Module III **20 Hours**	System of linear homogeneous equations.Null space and nullity of matrix. Sylvester's law of nullity. Range of a matrix.Systems of linear non homogeneous equations. Characteristic roots and characteristic vectors of a square matrix. Some fundamental theorem. Characteristic roots of Hermitian, Skew Hermitian and Unitary matrices. Characteristic equation of a matrix, Cayley- Hamilton theorem	• Lecture • Discussion • Participative learning • Problem solving	• Seminar on the topic related to vector space of n-tuples. • Assignments to solve system of equations.	• Understand to solve system of equation using matrix • Learn about characteristic roots and vectors.	Evaluation through Test paper
Module IV **24 Hours**	Lines and planes in space. Cylinders and Quadric surfaces, Cylindrical and spherical coordinates, Vector valued functions and space curves, Arc length	• Lecture • Discussions • Problem solving	• Group discussion on Cylindrical and spherical coordinates.	• Learn basic results in vector algebra.	Evaluation through test paper

	and Unit tangent vector , Curvature, torsion and TNB frame				

Course Outcomes

CO1	Learned to find out the roots of polynomial equations.
CO2	Computed the inverse of a non singular matrix using elementary row transformations.
CO3	Understand about the characteristic equation and characteristic root of a matrix.
CO4	Understand the method of Gauss-Jordan elimination to find the solutions of systems of simultaneous linear equations and Learned to solve a system of linear equations by row-reduced echelon form.
CO5	Understand the basic concepts in vector algebra.

Teacher in Charge:

Mr. Rahul M Raju

Ms. Jiji Pauly

MAT5B06 : ABSTRACT ALGEBRA

Lecture Hours per week: 5, Credits: 5

Internal: 30, External: 120, Examination 3 Hours

Objectives

To introduce the basic concept of the nature of abstract algebra also gives the idea of group and ring.

Module I (20 hrs)

Binary operations, Isomorphic binary structures, Groups, Sub groups

Module II (25 hrs)

Cyclic groups, Groups and permutations, Orbits, cycles and Alternating groups

Module III (15 hrs)

Cosets and Theorem of Lagrange, Homomorphisms

Module IV (30hrs)

Rings and Fields, Integral Domains, The Field of Quotients of an Integral Domain

Textbooks :

John B. Fraleigh : A First Course in Abstract Algebra, 7th Ed., Pearson.

Reference Books:

1. Joseph A. Gallian : Contemporary Abstract Algebra. Narosa Pub. House.
2. P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul: Basic Abstract Algebra, 2nded., Cambridge University
3. Artin : Algebra, PHI.
4. Durbin : Modern Algebra : An Introduction, 5th ed., Wiley.

OBJECTIVES

1) To enable one to determine whether the given binary operation on a given set forms a group.
2) To understand the concept of subgroups.
3) To describe all elements of a cyclic group using generators.
4) To enable one to understand the homomorphism and Theorem of Lagrange.
5) To understand the concept of rings, fields and integral domains.

LESSON PLAN

Unit/ session/ hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **20 Hours**	Binary operations, Isomorphic binary structures, Groups; Sub groups	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on Binary operation.	• Enable to understand the concept of Groups.	Evaluation through test paper
Module II **25 Hours**	Cyclic groups, Groups and permutations, Orbits, cycles and Alternating groups	• Lecture • Discussion • Participative learning • Problem solving	• Assignments on permutation and orbits.	• enable one to compute the expression of permutation and permutation multiplication • Enable to understand different type of groups.	Evaluation through test paper
Module III **15 Hours**	Cosets and Theorem of Lagrange, Homomorphism	• Lecture • Discussion • Participativ	• Seminar and assignment on properties of	• Understand the theorem Lagrange and	Evaluation through test paper

		e learning • Problem solving	homomorphism • Peer group discussion on Cosets.	homomorphisam.	
Module IV **30 Hours**	Rings and Fields, Integral Domains, The Field of Quotients of an Integral Domain	• Lecture • Discussion • Participative learning • Problem solving	• Seminar on the topic Rings and fields.	• To understand the concept of rings and fields • Learn the concept of Integral domain.	Evaluation through test paper and viva

Course Outcomes

CO1	Understand the concept of binary operation on a given set.
CO2	To get the idea of groups, rings, fields and integral domain.
CO3	Understand different type of groups like cyclic and alternating groups
CO4	Understand the homomorphism and Theorem of Lagrange

Teacher in Charge:

Ms. Geethu simon

MAT5B08: DIFFERENTIAL EQUATIONS

Lecture Hours per week: 5, Credits: 4

Internal: 30, External: 120, Examination 3 Hours

Objectives

To find out ways and means for solving differential equations.

Module I (24 hrs)

Some Basic Mathematical Models: Direction Fields, Solutions of some Differential equations, Classification of Differential Equations, Historical Remarks, First order differential equations: Linear equations with variable coefficients, Separable equations, Modeling with first order equations, Differences between linear and non linear equations, Exact equations and integrating factors, The existence and uniqueness theorem.

Module II (29 hrs)

Second Order Linear Differential Equations: Homogeneous equation with constant coefficients, Fundamental solutions of Linear Homogeneous equations, Linear independence and Wronskian, Complex roots of characteristic equations, Repeated roots Reduction of order, Non homogeneous equations, Method of Undetermined coefficients, Variation of parameters, Mechanical and Electrical vibrations, Systems of First Order Linear equations: Introduction, Basic theory of systems of first order Linear Equations.

Module III (17 hrs)

Definition of Laplace Transforms , Solution of Initial Value Problem , Step functions , Impulse functions, The Convolution Integral.

Module IV (20 hrs)

Two point Boundary value problems , Fourier Series, The Fourier Convergence Theorem, Even and odd functions , Separation of variables; Heat conduction in a rod , The Wave equation, Vibrations of an elastic string.

Textbooks:

1) Thomas / Finney : Calculus, 9th ed., LPE, Pearson Education.

Reference Books:

1) Kreyszig : Advanced Engineering Mathematics, 8th ed., Wiley.
2) H.F. Davis and A.D. Snider: Introduction to Vector Analysis, 6th ed.,Universal Book Stall, New Delhi.

OBJECTIVES

1) To learn to solve DEs that are in linear, separable and in exact forms and also to analyze the solution.
2) To be familiar with the theory and method of solving a second order linear homogeneous and nonhomogeneous equation with constant coefficients.
3) To acquire the knowledge of solving a differential equation using Laplace method.
4) To get familiarized with Fourier series and its applications.

LESSON PLAN

Unit/ Hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **24 Hours**	Some Basic Mathematical Models, First order differential equations	• Lecture • Discussion • Participative learning	Assignment on solving first order differential equations.	To learn to solve DEs that are in linear, separable and in	Evaluation through test paper

		• Problem solving		exact forms and also to analyze the solution.	
Module II **29 Hours**	Second Order Linear Differential Equations, Systems of First Order Linear equations	• Lecture • Discussion • Participative learning • Problem solving	Student seminars related to Completeness Property of R.	To be familiar with the theory and method of solving a second order linear homogeneous and nonhomogeneous equation with constant coefficients.	Evaluation through test paper
Module III **17 Hours**	Laplace Transforms	• Lecture • Discussion • Participative learning • Problem solving	Assignment in solving Differential equations using Laplace transforms.	To acquire the knowledge of solving a differential equation using Laplace method.	Evaluation through testpaper and Viva
Module IV **20 Hours**	Partial Differential Equations and Fourier Series	• Lecture • Discussions • Problem solving	Student seminars in applications of Fourier Series.	To get familiarized with Fourier series and its applications.	Evaluation through testpaper

Course Outcomes

CO1	Students could identify a number of areas where the modelling process results in a differential equation.
CO2	They will realize the basic differences between linear and non linear DEs and also basic results that guarantees a solution in each case.
CO3	They will become familiar with the theory and method of solving a second order linear homogeneous and nonhomogeneous equation with constant coefficients.
CO4	Students acquire the knowledge of solving a differential equation using Laplace method which is especially suitable to deal with problems arising in engineering field.

Teacher in Charge:

Mr. Rahul M Raju

MAT5B07: BASIC MATHEMATICAL ANALYSIS

Lecture Hours per week: 6, Credits: 5

Internal: 30, External: 120, Examination 3 Hours

Objectives

To develop ability to analyze and prove statements of mathematics using logical arguments.

Module I (20 hrs)

A quick review of sets and functions, Mathematical induction, Finite and infinite sets, Real Numbers, The algebraic property of real numbers.

Module II (24 hrs)

Absolute value and real line, The completeness property of R, Applications of supremum property, Intervals, Nested interval property and uncountability of R.

Module III (30 hrs)

Sequence of real numbers, Sequence and their limits, Limit theorems, Monotone sequences, Subsequence and Bolzano – Weirstrass theorem, Cauchy criterio,Properly divergent sequences, Open and closed sets.

Module IV (34 hrs)

COMPLEX NUMBERS: Sums and Products, Basic Algebraic properties, Further properties, Vectors and Moduli, Complex Conjugates, Exponential form, Product and powers in exponential form, Arguments of products and quotients, Roots of complex numbers, Regions in the complex plane, Functions of complex variable, Limits, Theorems on limits, Limits involving the points at infinity, Continuity.

Textbooks:

1) **Robert G. Bartle & Donald R. Sherbert**: Introduction to Real Analysis, 3rded., Wiley.
2) **J.W. Brown and Ruel V. Churchill**: Complex Variables and Applications, 8th Ed., McGraw Hill.

Reference Books:

1) J.M. Howie : Real Analysis, Springer 2007.
2) Ghorpade and Limaye : A Course in Calculus and Real Analysis, Springer, 2006.
3) K.A. Ross : Elementary Real Analysis : The Theory of Calculus, Springer Indian Reprint.
4) J.V. Deshpande : Mathematical Analysis and Applications, Narosh Pub. House.
5) M.R. Spiegel : Complex Variables, Schaum's Outline Series.

OBJECTIVES

1) To learn to prove Archimedean property, density theorem, existence of a positive square root for positive numbers and so on and the learning will help them to appreciate the beauty of logical arguments.
2) To learn how monotone convergence theorem can be used in establishing the divergence of the harmonic series, how it helps in the calculation of square root of positive numbers and how it establishes the existence of the transcendental number e.
3) To understand the concept of open and closed sets, their properties, their characterization and so on.
4) To familiarize the use of geometry, comparison between real and complex calculus-areas

LESSON PLAN

Unit/ Hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **20 Hours**	A quick review of sets and functions ,Mathematical induction, Finite and	• Lecture • Discussion • Participative learning • Problem	Group discussion on Algebraic properties of R.	To generate the ability to analyze and	Evaluation through test paper

	infinite sets Real Numbers, The algebraic property of real numbers.	solving		prove statements of Mathematics.	
Module II **24 Hours**	Absolute value and real line, The completeness property of R, Applications of supremum property Intervals, Nested interval property and uncountability of R.	• Lecture • Discussion • Participative learning • Problem solving	Student seminars related to Completeness Property of R.	To master different techniques of finding limits.	Evaluation through test paper
Module III **30 Hours**	Sequence of real numbers, Sequence and their limits, Limit theorems, Monotone sequences, Subsequence and Bolzano – Weirstrass theorem, Cauchy criterio, Properly divergent sequences, Open and closed sets.	• Lecture • Discussion • Participative learning • Problem solving	• Assignment in Limit Theorems. • Discussion on Open and Closed Sets.	To familiarize with different kinds of sequences.	Evaluation through testpaper and Viva
Module IV **34 Hours**	Sums and Products, Basic Algebraic properties, Further properties, Vectors and Moduli,	• Lecture • Discussions • Problem solving	Student seminars to familiarize properties of Complex Numbers.	To understand areas where real and complex calculus agree and where they	Evaluation through testpaper

	Complex Conjugates, Exponential form, Product and powers in exponential form, Arguments of products and quotients, Roots of complex numbers, Regions in the complex plane, Functions of complex variable, Limits, Theorems on limits, Limits involving the points at infinity, Continuity.			differ.	

Course Outcomes

CO1	To appreciate the beauty of logical arguments and embolden them to apply it in similar and unknown problems.
CO2	To establish the divergence and convergence of different sequences and series.
CO3	To understand some basic topological properties of real number system.

CO4	To demystify student's belief that complex variable theory is incomprehensible.

Teacher in Charge:

Ms. Geethu Simon

Mr. Rahul P R

MAT5D02: MATHEMATICS FOR NATURAL SCIENCES

Lecture Hours per week: 2 Credits: 2

Internal: 10, External: 40, Examination 2 Hours

Objectives

To get introduced to statistical measures and analysis.

Module I (20 hrs)

The idea of sets, Operation on sets, Relations and functions, Variables and graphs, Frequency distributions, The Mean, Median, Mode and other measures of central tendency, Dispersion or variation, The Range, The Mean deviation, The Semi-inter quartile range, The 10-90 Percentile range.

Module II (16 hrs)

The standard deviation, Properties of Standard Deviation, The variance, Short methods of computing standard deviation, Moments, Moments for grouped data, relation between moments, Computation of moment for grouped data. Skewness and Kurtosis.

Textbooks :

Murray R. Spiegel : Statistics, 2nd Edn., Schaum's Outline Series.

Reference Books:

1) Hogg & Craig: Introduction to Mathematical Statistics.
2) Freund & Walpole: Mathematical Statistics

OBJECTIVES

1) To understand different measures of tendency.
2) To analyse data using measures like SD, Skewness and Kurtosis

LESSON PLAN

Unit/ Hours	Topics for student	Procedure (process)	Activity	Learning outcome	Assessment

(Time Required)	preparation (input)	Student centric Method of teaching		(output)	
Module I 18 Hours	Sets, Frequency Distribution, Measures of Tendency	• Lecture • Discussion • Participative learning • Problem solving	Assignment on different measures of tendency.	To understand which measure is better for different kinds of data.	Evaluation through test paper and viva
Module II 12 Hours	Standard Deviation, Moments, Skewness and Kurtosis.	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars on Skewness and Kurtosis on different datas.	To visualize how the data behaves.	Evaluation through test paper

Course Outcomes

CO1	Students get an understanding about the use of some statistical tools.
CO2	They learn to analyze data using different measures.

Teacher in Charge:

Mr. Rahul M Raju

MAT5B05: VECTOR CALCULUS

Lecture Hours per week: 5, Credits: 4

Internal: 30, External: 120, Examination 3 Hours

Objectives

To Provide skils to visualize and manipulate multivariable and vector values functions. Also enable students to evaluate multiple integrals.

Module I (15 hrs)

Functions of several variables, Limits and Continuity, Partial derivatives, Differentiability linearization and differentials, Chain rule, Partial derivatives with constrained variables.

Module II (20 hrs)

Directional derivatives, gradient vectors and tangent planes, Extreme value and saddle points, Lagrange multipliers, Taylor's formula, Double Integrals, Double integrals in polar form.

Module III (25 hrs)

Triple integrals in Rectangular Coordinates, Triple integrals in cylindrical and spherical coordinates, Substitutions in multiple integrals, Line integrals, Vector fields, work circulation and flux, Path independence, potential functions and conservative fields.

Module IV (30hrs)

Green's theorem in the plane, Surface area and surface integrals, Parametrized surfaces, Stokes' theorem (statement only), Divergence theorem and unified theory (no proof).

Textbooks :

Thomas / Finney : Calculus, 9th ed., LPE, Pearson Education.

Reference Books:

1. Kreyszig : Advanced Engineering Mathematics, 8th ed., Wiley.

2. H.F. Davis and A.D. Snider: Introduction to Vector Analysis, 6th ed.,

OBJECTIVES

1) To enable one to apply the basic concepts of partial derivatives.
2) To learn to find multiple integrals.
3) To understand concept of the integrals of the functions and vector fields over parametrized surfaces and compute them in simple examples.
4) To calculate directional derivatives and gradients.
5) To learn application of greens theorem and stokes theorem.

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **15 Hours**	Functions of several variables, Limits and Continuity, Partial derivatives, Differentiability linearization and differentials, Chain rule, Partial derivatives with constrained variables.	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on Partial derivatives.	• Enable to find partial derivatives.	Evaluation through test paper
Module II **20 Hours**	Directional derivatives, gradient vectors and tangent planes, Extreme value and saddle	• Lecture • Discussion • Participative learning	• Assignments in finding Directional derivatives	• Enable to evaluate double integrals.	Evaluation through test paper

	points, Lagrange multipliers, Taylor's formula, Double Integrals, Double integrals in polar form.	• Problem solving	and double integrals.		
Module III **25 Hours**	Triple integrals in Rectangular Coordinates, Triple integrals in cylindrical and spherical coordinates, Substitutions in multiple integrals, Line integrals, Vector fields, work circulation and flux, Path independence, potential functions and conservative fields.	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain vector fields, work and circulation	Understand triple integrals and vector fields.	Evaluation through MCQ and Group Discussion
Module IV **30 Hours**	Green's theorem in the plane, Surface area and surface integrals, Parametrized surfaces, Stokes' theorem (statement only), Divergence theorem and unified theory (no proof).	• Lecture • Discussion • Participative learning • Problem solving	• Assignments related to Surface integrals.	Learn the application of greens theorem and stokes theorem in multiple integrals.	Evaluation through test paper

Course Outcomes

CO1	Understand the basic concept of partial derivatives.
CO2	Enable to calculate multiple integrals.
CO3	Understand the concept of a conservative vector field

CO4	Learn the application of greens theorem and stokes theorem in multiple integrals and understand how they are generalizations of the Fundamental theorem of calculus.

Teacher in Charge:

Ms. Jiji Pauly

MAT6B10 : COMPLEX ANALYSIS

Lecture Hours per week: 5, Credits: 5

Internal: 30, External: 120, Examination 3 Hours

Objectives

To learn basic concepts of complex analysis and its applications.

Module I : Analytic Functions (15 hrs)

Derivatives, Differentiation formula, Cauchy-Riemann Equations, Polar coordinates, Analytic functions, Harmonic functions , Elementary functions , The exponential function, Logarithmic function, Complex exponents, Trigonometric functions, Hyperbolic functions, Inverse Trigonometric and Hyperbolic functions.

Module II : Integrals (25 hrs)

Derivatives of functions ω(t); Indefinite integral of ω(t); Contours, Contour integrals, Antiderivatives, Cauchy -Goursat theorem (without proof), Simply and multiply connected domains, Cauchy's integral formula and its extension, Liouville's theorem and fundamental theorem of algebra, Maximum modulus principle.

Module III : Series (25 hrs)

A quick review of convergence of sequence and series of complex numbers,Taylor series, Laurents series (withoutproof), Applications,Power series: Absolute and uniform convergence,Continuity of sum of powerseries, Differentiation and integration of power series, Multiplication and division of power series.

Module IV : Residues (25 hrs)

Isolated singular points, Residues, Cauchy's residue theorem, Residue at infinity, Three types of isolated singular points, Residues at poles, Zeroes of analytic functions, Zeroes and poles,Applications of residues, Evaluation of improper integrals, Jordan's Lemma (statement only), Definite integrals involving sines and cosines.

Textbooks :

1) **James Ward Brown and Ruel V. Churchill** : Complex Variables and Applications (8th Edn.),

McGraw Hill.

Reference Books:

1) Mark J.Ablowitz and Anthanassios S. Fokas: Complex Variables, Cambridge Text, 2nd Edn
2) S. Ponnusamy : Foundation of Complex Analysis : Narosa.
3) Murray R. Spiegel: Complex Variables, Schaum's Outline series.
4) J.M. Howie: Complex Analysis: Springer India Reprint
5) Stewart & Tall: Complex Analysis, CUP

OBJECTIVES

1) To develop differentiability and analyticity of complex valued functions
2) To develop complex integration
3) To represent an analytic function as power series.
4) To classify the singular points using Laurent series and develop the concept of residues and its applications.

LESSON PLAN

Unit/ session / hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **15 Hours**	Derivatives, Cauchy-Riemann Equations,Analytic functions,Harmon	• Lecture • Discussion • Participative learning • Problem	• Assignments in finding harmonic conjugates	To understand the difference between differentiability and	Evaluation through test paper

	ic functions , Exponential , Logarithmic, Trigonometric , Hyperbolic , Inver seTrigonometric a nd Hyperbolic functions	solving		analyticity	
Module II 25 Hours	Derivatives ofω(t) , Indefinite integral of ω(t); Contours, Contour integrals, Antiderivatives, Cauchy-Goursat theorem , Simplya nd multiply conne cted domains, Cau chy's integralformula a nd its extension, Liouville's theore m and fundamenta l theorem of algebr a, Maximum mod ulus principle.	• Lecture • Discussi on • Participati ve learning • Problem solving	• Group discussion on contour integrals	To understand integration of complex functions and related theorems	Evaluation through test paper and viva
Module III	Convergence of sequence and serie	• Lecture • Discussi	• Student seminar to	To understand Taylor series	Evaluation through

25 Hours	s of complex numbers,Taylor series, Laurents series , Absolute and Uniform convergence, Continuity of sum of powerseries, Differentiation and integration of power series, Multiplication and division of power series.	on • Participative learning • Problem solving	explain absolute and uniform convergence of power series	and Laurent series	Test paper and Group Discussion
Module IV **25 Hours**	Isolated singular points, Residues, Cauchy's residue theorem, Residue at infinity, Three types of isolated singular points, Residues at poles, Zeroes of analytic functions , Zeroes and poles, Applications of residues, Evaluation of improper integral	• Lecture • Discussions • Problem solving	• Assignments in finding isolated singular points and residues	To understand isolated singular points, residues and applications of residues	Evaluation through test paper

	s, Jordan's Lemma , Definite integral involving sines an d cosines.				

Course Outcomes

CO1	To understand difference between differentiability and analyticity of complex valued functions.
CO2	To learn indefinite integrals of complex valued functions.
CO3	Learn to express an analytic function as a power series.
CO4	To understand the concepts of singular points, residues, and applications of residues.

Teacher in Charge:

Ms. Geethu Simon

MAT6B13(E02) : LINEAR PROGRAMMING

Lecture Hours per week: 3, Credits: 2

Internal: 20, External: 80, Examination 3 Hours

Objectives

Formulate our real life problem into a mathematical model also different techniques to solve LPP are introduced.

Module I (16 hrs)

Formulation, Convex sets, General LLP

Module II (14 hrs)

Simplex Method, Duality

Module III (18 hrs)

The transportation problem, The assignment Problems

Textbooks :

Gupta and Manmohan - Linear Programming And Theory of Games

Reference Books:

1. . K. V. Mital&Manmohan: Optimization methods in Operations Research and Systems Analysis, 3rdEdn., New Age International publishers.
2. DipakChatterjee: Linear Programming and Game Theory, Prentice Hall of India.

OBJECTIVE

1. Enable to formulate LPP from real life problem
2. Conceptulize the feasible region, feasible solution, optimal solution etc.
3. Solve the LPP with two variables using graphical method
4. Solve the LPP using simplex method
5. Formulate the dual problem from primal
6. Solve transportation problem and the assignment Problems which are relevent in daily life.

LESSON PLAN

Unit/ session/ hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **16 Hours**	Formulation, Convex sets, General LLP	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on formulation of lpp. • Seminar on the topic convex sets.	• Understand to formulate lpp.	Evaluation through test paper
Module II **14 Hours**	Simplex Method, Duality	• Lecture • Discussion • Participative learning • Problem solving	• Assignments in solving LPP using simplex method.	• Understand to solve lpp in finite number of steps using simplex method.	Evaluation through test paper and viva
Module III **18 Hours**	The transportation problem, The assignment Problems	• Lecture • Discussion • Participative learning • Problem solving	• Assignments related to solve transportation problems and assignment problems	• Enable one to solve transportation problem and the assignment Problems which are relevent in daily life.	Evaluation through Test paper and Group Discussion

Course Outcomes

Course Outcomes

CO1	Enable one to formulate LPP from real life problem.
CO2	Solve the LPP with two variables using graphical method
CO3	Solve the LPP using simplex method
CO4	Solve transportation problem and the assignment Problems which are relevent in daily life.

Teacher in Charge:

Mr. Rahul M Raju

MAT6B12 : NUMBER THEORY AND LINEAR ALGEBRA

Lecture Hours per week: 5, Credits: 4

Internal: 30, External: 120, Examination 3 Hours

Objectives

To study about the integers and integer valued functions. Also introduce the concept of vector fields and linear transformations.

Module I (30 hrs)

Divisibility theory in the integers – the division algorithm, the greatest common divisor, the Euclidean algorithm, the Diophantine equation ax + by = c. Primes and their distribution. The fundamental theorem of arithmetic.The sieve of Eratosthenes. The theory of congruences.Basic properties of congruence.Binary and decimal representation of integers. Linear congruences and Chinese remainder theorem

Module II (25 hrs)

Fermat's little theorem and pseudoprimes Wilson's theorem. The sum and number of divisors.The greatest integer function.Euler's phi-function.Euler's generalization of Fermat's theorem.Properties of the phi-function.

Module III (15 hrs)

Vectorspaces-examples, linearcombinations, spanning, linearindependence, base, finite dimensional vector spaces.

Module IV (20 hrs)

Linear mappings- Linear transformations, examples, nullspace, rank –nullity theorem, linear isomorphism

Textbooks :

1. David M. Burton : Elementary Number Theory, Sixth Edn., TMH.

2. T. S. Blynth and E.F. Robertson: Basic Linear Algebra, second Edn springer under graduate mathematics series 2009

Reference Books:

1. C.Y. Hsiung : Elementary Theory of Numbers. Allied Publishers.
2. Neville Robbins : Beginning Number Theory, Second Ed. Narosa.
3. George E. Andrews : Number Theory, HPC.
4. Kenneth Hoffman & Ray Kunze : Linear Algebra, Pearson Education.
5. Frank Ayres, Jr. : Matrices, Schaum's Outline Series, Asian Student edition.
6. Devi Prasad : Elementary Linear Algebra, Narosa Pub. House

OBJECTIVE

1. Enable to find gcd using Euclidean algorithm.
2. To understand the solution of diophantine equations.
3. Enable to solve system of congruence using chinese remainder theorem.
4. To learn Wilson's theorem, Fermat's little theorem and Euler's theorem
5. Understand the concept of vector space and its basis.
6. Understand the concept of linear transformation and application of rank nullity theorem.

LESSON PLAN

Unit/ session/ hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **30 Hours**	The division algorithm, Gcd, the Euclidean algorithm, the Diophantine equation. Primes and their distribution. The fundamental theorem of arithmetic. The sieve of	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on gcd and euclidean algorithm. • Assignment in finding solution of system of congruence using chinese remainder	• Understand the linear congruence and the method for finding its solutions.	Evaluation through test paper

	Eratosthenes. The theory of congruences. Basic properties of congruence. Binary and decimal representation of integers. Linear congruences and Chinese remainder theorem.		theorem		
Module II **25 Hours**	Fermat's little theorem and pseudoprimes Wilson's theorem. The sum and number of divisors. The greatest integer function. Euler's phi-function. Euler's generalization of Fermat's theorem. Properties of the phi-function.	• Lecture • Discussion • Participative learning • Problem solving	• Assignments in finding sum and number of divisors • Seminar on the topic Euler's phi-function and Properties of the phi-function.	• Understand fermat's theorem, wilson's theorem, euler's theorem and its applications.	Evaluation through test paper and viva
Module III **15 Hours**	Vectorspaces-examples, linearcombinations, spanning, linearindependence, base, finite dimensional vector spaces.	• Lecture • Discussion • Participative learning • Problem solving	• Assignments related to vector space and its example.	• Understand the definition of vector space and its basis.	Evaluation through MCQ and Group Discussion
Module IV **20 Hours**	Linear mappings-Linear transformations, examples, nullspace, ranknullity theorem, linear isomorphism.	• Lecture • Discussions • Problem solving	• Student seminars inconnection with Linear transformation and its	• Become familiar with the concept of Linear transformations and rank	Evaluation through test paper

			example.	nullity theorem.	

Course Outcomes

CO1	To prove results involving divisibility, greatest common divisor, least commonmultiple and a few applications.
CO2	Enable to solve system of congruence and diophantine equation
CO3	To learn the theorems viz. Wilson's theorem, Fermat's little theorem and Euler's theorem and its applications.
CO4	To Lean if a set of vectors is a vector space or a basis for a vetor space.
CO5	Understand the concept of linear transformation and application of rank nullity theorem.

Teacher in Charge:

Ms. Jiji Pauly

MAT6B11 : NUMERICAL METHODS

Lecture Hours per week: 5, Credits: 4

Internal: 30, External: 120, Examination 3 Hours

Objectives

To provide techniques and algorithms to find approximate numerical solution to problems in several areas of mathematics.

Module I : Solution of Algebraic and Transcendental Equation (23 hrs)

Introduction, Bisection Method, Method of false position, Iteration method, Newton-Raphson Method, Ramanujan's method, The Secant Method, Finite Differences, Forward differences, Backward differences, Central differences, Symbolic relations and separation of symbols, Differences of a Polynomial.

Module II : Interpolation (23 hrs)

Newton's formulae for intrapolation, Central difference interpolation formulae, Gauss' Central Difference Formulae, Interpolation with unevenly spaced points, Langrange's interpolation formula, Divided differences and their properties, Newton's General interpolation formula, Inverse interpolation, Numerical Differentiation and Integration, Introduction, Numerical differentiation (using Newton's forward and backward formulae), Numerical Integration, Trapizoidal Rule, Simpson's 1/3-Rule , Simpson's 3/8-Rule.

Module III : Matrices and Linear Systems of equations (22 hrs)

Solution of Linear Systems – Direct Methods, Gauss elimination, Gauss-Jordan Method, Modification of Gauss method to compute the inverse, LU Decomposition, LU Decomposition from Gauss elimination, Solution of Linear Systems – Iterative methods, The eigen value problem, Eigen values of Symmetric Tridiazonal matrix.

Module IV : Numerical Solutions of Ordinary Differential Equations (22 hrs)

Introduction, Solution by Taylor's series, Picard's method of successive approximations, Euler's method, Modified Euler's Method, Runge-Kutta method, Predictor-Corrector Methods, Adams-Moulton Method, Milne's method.

Textbooks:

1) **S.S. Sastry** : Introductory Methods of Numerical Analysis, Fourth Edition, PHI.

Reference Books:

1) S. SankaraRao : Numerical Methods of Scientists and Engineer, 3rd ed., PHI.
2) F.B. Hidebrand : Introduction to Numerical Analysis, TMH.
3) J.B. Scarborough : Numerical Mathematical Analysis, Oxford and IBH

OBJECTIVES

1) To understand several methods such as bisection method, fixed point iteration method, regula falsi method etc.
2) To understand the concept of interpolation.
3) To solve system of linear equations using matrices.
4) To learn to find numerical approximations to solutions of initial value problems.

LESSON PLAN

Unit/ Hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **23 Hours**	Solution of Algebraic and Transcendental	• Lecture • Discussion • Participative	• Assignment in different methods to	To learn to solve equations	Evaluation through test paper

	Equation, Finite differences	learning • Problem solving	solve equations • Seminars in Finite differences	using different techniques.	
Module II **23 Hours**	Interpolation, Numerical Differentiation, Numerical Integration	• Lecture • Discussion • Participative learning • Problem solving	Assignments in different techniques.	To find derivatives and integrals at a point using numerical techniques.	Evaluation through test paper
Module III **22 Hours**	Matrices and Linear Systems of equations	• Lecture • Discussion • Participative learning • Problem solving	Seminar on which technique is better and easier.	To learn to use matrices to solve system of linear equations.	Evaluation through testpaper and Viva
Module IV **22 Hours**	Numerical Solutions of Ordinary Differential Equations	• Lecture • Discussions • Problem solving	Assignment related to IVP	To find out numerical approximations to solutions of initial value problems.	Evaluation through testpaper

Course Outcome

CO1	Understand several methods such as bisection method, fixed point iteration method, regula falsi method etc. to find out the approximate numerical solutions of algebraic and transcendental equations with desired accuracy.

CO2	Understand the concept of interpolation and also learn some well known interpolation techniques.
CO3	Understand a few techniques for numerical differentiation and integration and also realize their merits and demerits.
CO4	Find out numerical approximations to solutions of initial value problems and also to understand the efficiency of various methods.
CO5	Learn to solve system of linear equations using matrices.

Teacher in Charge:

Mr. Rahul M Raju

MAT6B09: REAL ANALYSIS

Lecture Hours per week: 5, Credits: 5

Internal: 30, External: 120, Examination 3 Hours

Objectives

To teach one how to combine different definitions, theorems and techniques to solve problems.

Module I : Continuous Functions (25 hrs)

Continuous functions, Continuous functions on intervals, Uniform continuity

Module II : Riemann Integral (25 hrs)

Riemann Integral, Riemann Integrable Functions, The fundamental theorem, Substitution theorem and application, Approximate Integration

Module III : Sequence and series of functions (20 hrs)

A quick review of series of real numbers, Pointwise and uniform convergence, Interchange of limit and continuity, Series of functions .

Module IV (20 hrs)

Improper Integrals : Improper integrals of the first kind, Improper integrals of the second kind,Cauchy Principal value, Improper Integrals of the third kind.

Beta and Gamma functions : Beta Functions, Gamma Functions, Relation between Beta and Gamma Functions

Textbooks:

1) **G. Bartle, Donald R. Sherbert** : Introduction to Real Analysis (3rd Edn.)
2) **R.R. Goldberg** : Methods of Real Analysis.
3) **Narayanan & Manicavachagom Pillay** : Calculus, Vol. II

Reference Books:

1) J.V. Deshpande: Mathematical Analysis and Applications, Narosa Pub. House.
2) Torence Tao : Analysis I, TRIM 37, Hindustan Book Agency.
3) K.A. Ross: Elementary Real Analysis : Theory of Calculus, Springer.
4) K.G. Binmore: Mathematical Analysis, CUP

OBJECTIVES

1) To state the definition of continuous functions, formulate sequential criteria for continuity and prove or disprove continuity of functions using this criteria.
2) To develop the notion of Riemann integrability of a function using the idea of tagged partitions and calculate the integral value of some simple functions using the definition.
3) To prove convergence and divergence of sequences of functions and series.
4) To learn the properties of and relationship among two important improper integrals.

LESSON PLAN

Unit/ Hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **25 Hours**	Continuous Functions, Uniform Continuity	• Lecture • Discussion • Participative learning • Problem	Assignment regarding difference in Continuity and Uniform	To understand several deep and fundamental results of	Evaluation through test paper

		solving	Continuity.	continuous functions on intervals.	
Module II **25 Hours**	Riemann Integral	• Lecture • Discussion • Participative learning • Problem solving	Student seminars related to Riemann Intregrability.	To understand a few basic and fundamental results of integration theory.	Evaluation through test paper
Module III **20 Hours**	Sequence and series of functions	• Lecture • Discussion • Participative learning • Problem solving	Assignment on convergence of series and sequences of functions.	To understand the difference between pointwise and uniform convergence of sequences and series of functions.	Evaluation through testpaper and Viva
Module IV **20 Hours**	Improper Integrals, Beta and Gamma functions	• Lecture • Discussions • Problem solving	Seminars related to Improper Integrals and Principal Value.	To understand the notion of improper integrals, their convergence, principal value and evaluation.	Evaluation through testpaper

Course Outcomes

CO1	To understand several deep and fundamental results of continuous functions on intervals such as boundedness theorem, maximum-minimum theorem, intermediate value theorem, preservation of interval theorem and so on.
CO2	To develop the notion of Riemann integrability of a function using the idea of tagged partitions and calculate the integral value of some simple functions using the definition.
CO3	To learn and find out examples/counter examples to prove or disprove the validity of several mathematical statements that arise naturally in the process/context of learning.
CO4	To learn the properties of and relationship among two important improper integrals namely beta and gamma functions that frequently appear in mathematics, statistics, science and engineering.

Teacher in Charge:

Ms. Geethu Simon

Mr. Rahul P R

MTH1C01: ALGEBRA I
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the basic concepts of abstract algebra.

MODULE I

Plane Isometries, Direct products & finitely generated Abelian Groups, Factor Groups, Factor-Group Computations and Simple Groups, Group action on a set, Applications of G-set to counting

MODULE II

Isomorphism theorems, Series of groups, (Omit Butterfly Lemma and proof of the Schreier Theorem), Sylow theorems, Applications of the Sylow theory, Free Groups

MODULE III

Group Presentations, Rings of polynomials, Factorization of polynomials over a field, Non Commutative examples, Homomorphism and factor rings

TEXT:

JOHN B. FRALEIGH, A FIRST COURSE IN ABSTRACT ALGEBRA(7th Edn.), Pearson Education Inc., 2003.

REFERENCES :

[1] N. Bourbaki: Elements of Mathematics: Algebra I, Springer; 1998.

[2] Dummit and Foote: Abstract algebra(3rd edn.); Wiley India; 2011.

[3] P.A. Grillet: Abstract algebra(2nd edn.); Springer; 2007

[4] I.N. Herstein: Topics in Algebra(2nd Edn); John Wiley & Sons, 2006.

[5] T.W. Hungerford: Algebra; Springer Verlag GTM 73(4th Printing); 1987.

[6] N. Jacobson: Basic Algebra-Vol. I; Hindustan Publishing Corporation(India), Delhi; 1991.

[7] T.Y. Lam: Exercises in classical ring theory(2nd edn); Springer; 2003.

[8] C. Lanski: Concepts in Abstract Algebra; American Mathematical Society; 2010.

[9] N.H. Mc Coy: Introduction to modern algebra, Literary Licensing, LLC; 2012.

[10] S. M. Ross: Topics in Finite and Discrete Mathematics; Cambridge; 2000.

[11] J. Rotman: An Introduction to the Theory of Groups(4th edn.); Springer, 1999.

OBJECTIVES

a) **To understand the basic concepts of groups, factor groups, simple groups and group action on a set.**

b) **To get familiarize with Isomorphism theorems and its properties.**

c) **To understand the concept of sylow theorems and its applications.**

d) **To study more about rings of polynomials and factorization of polynomials over a field.**

e) **To understand homomorphism and factor ring.**

LESSON PLAN

Unit/ session/ hours (time required)	**Topics to be taught (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module 1 (30 hours)	Plane Isometries, Abelian groups, Factor groups, Simple groups, group action on a set	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on groups and its properties	To understand: • the basics of different types of groups • notion of group action on a set	Evaluation Through MCQ
Module I1 (30 hours)	Isomorphism theorems, Sylow theorems and its applications	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain the properties of Isomprhism • Peer group discussion on Sylow theorems	To understand: • Isomorphism theorems and their significance • Sylow theorems and its applications	Evaluation Through test paper

Module III (30 Hours)	Ring of polynomials, factorization of a polynomial over a field, homomorphism and factor rings	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on properties of homomorphism and factor rings	To understand: • homomorphism and factor rings • factorization of a polynomial over a field convergence	Evaluation through test paper

Course Outcomes

CO1	To get the idea of different types of groups and group action on a set
CO2	To understand the concept of isomorphism theorems and their significance, Sylow theorems and its applications
CO3	To understand factorization of a polynomial over a field, homomorphism and factor rings

Faculty in charge:
Ms. Linet Roslin Antony

MTH1C05 – DISCRETE MATHEMATICS

Number of hours of lectures per week : 5 hrs

Number of credits : 4

OBJECTIVE

To understand concepts in graph theory, lattices and automata.

MODULE I

Order Relations, Lattices; Boolean Algebra Definition and Properties, Boolean Functions.

MODULE II

Basic concepts, Subgraphs, Degree of vertices, Paths and connectedness, Automorphism of a simple graph, Operations on graphs, Vertex cuts and Edge cuts, Connectivity and Edge connectivity, Trees-Definition, Characterization and Simple properties, Eulerian graphs, Planar and Non planar graphs, Euler formula and its consequences, K5 and K3,3 are non planar graphs, Dual of a plane graph.

MODULE III

Automata and Formal Languages: Introduction to the theory of Computation, Finite Automata.

TEXTBOOKS

TEXT 1: R. BALAKRISHNAN and K. RANGANATHAN, A TEXT BOOK OF GRAPH THEORY, Springer-Verlag New York, Inc., 2000.

TEXT 2: K. D JOSHI, FOUNDATIONS OF DISCRETE MATHEMATICS, New Age International(P) Limited, New Delhi, 1989.

TEXT 3: PETER LINZ, AN INTRODUCTION TO FORMAL LANGUAGES AND AUTOMATA (2nd Edn.), Narosa Publishing House, New Delhi, 1997.

REFERENCES

[1] J. C. Abbot: Sets, lattices and Boolean Algebras; Allyn and Bacon, Boston; 1969.

[2] J. A. Bondy, U.S.R. Murty: Graph Theory; Springer; 2000.

[3] S. M. Cioaba and M.R. Murty: A First Course in Graph Theory and Combinatorics; Hindustan Book Agency; 2009.

[4] J. A. Clalrk: A first look at Graph Theory; World Scientific; 1991.

OBJECTIVES

- To understand the definition of Boolean algebra and Boolean functions along with various properties.
- To study graph and its types with suitable examples.
- To learn about connectivity of graphs.
- To understand the definition of trees and learn various theorems related to it.
- To study about language, grammar and types of acceptors.

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I	Lattices; Boolean Algebra Definition and Properties, Boolean Functions	• Discussion • Participative learning • Problem solving	Seminars by students	To study about Boolean algebra and Boolean functions.	Evaluation through test paper.
MODULE II	Graph definition with examples, isomorphism, connected graphs, planar graphs, trees and eulerian graphs	• Lecture • Discussion • Participative learning • Problem solving	Assignments on isomorphism of graphs. Discussion about various definitions.	To learn basics about graphs and trees. To study about planarity and connectivity.	Evaluation through test paper.
MODULE III	Definition of automata. Languages and Grammars. DFA and NFA	• Lecture • Discussion • Participative learning • Problem solving	Discussion on applications of automata. Working out exercise problems on DFA and NFA	To know the basic about automata. To learn about DFA and NFA	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about Boolean algebra and Boolean functions.
CO2	To learn basics about graphs and trees. To study about planarity and connectivity.
CO3	To know the basic about automata. To learn about DFA and NFA

Faculty in Charge
Ms. Geethika P R

MT1C02: LINEAR ALGEBRA
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the basic concepts of Linear Algebra.

MODULE I

Vector Spaces & Linear Transformations

MODULE II

Linear Transformations (continued) and Elementary Canonical Forms

MODULE III

Elementary Canonical Forms (continued), Inner Product Spaces

TEXT:

HOFFMAN K. and KUNZE R., LINEAR ALGEBRA (2nd Edn.), Prentice Hall of India, 199

REFERENCES :

[1] P. R. Halmos: Finite Dimensional Vector spaces; Narosa Pub House, New Delhi; 1980.

[2] A. K. Hazra: Matrix: Algebra, Calculus and generalised inverse- Part I; Cambridge International Science Publishing; 2007.

[3] I. N. Herstein: Topics in Algebra; Wiley Eastern Ltd Reprint; 1991.

[4] S. Kumaresan: Linear Algebra-A Geometric Approach; Prentice Hall of India; 2000.

[5] S. Lang: Linear Algebra; Addison Wesley Pub.Co.Reading, Mass; 1972.

[6] S. Maclane and G. Bikhrkhoff: Algebra; Macmillan Pub Co NY; 1967.

[7] N. H. McCoy and R. Thomas: Algebra; Allyn Bacon Inc NY; 1977.

[8] R. R. Stoll and E.T.Wong: Linear Algebra; Academic Press International Edn; 1968.

[9] G. Strang: linear algebra and its applications(4th edn.); Cengage Learning; 2006.

OBJECTIVES

a) **To understand the concept of vector spaces, basis and dimension.**

b) **To study about linear transformations and its properties.**

c) **To understand the concept of functionals and dual space**

d) **To study the relation between linear transformations and corresponding matrices.**

e) **To study about inner product spaces.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (30 hours)	Vector spaces, subspace, basis, dimension, properties, linear transformations	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on properties of vector spaces	To understand: • the basics of vector spaces, basis • notion of linear transformation • properties of linear transformation	Evaluation through test papers and interaction with students
Module I1 (35 hours)	linear transformations, functionals, dual space and elementary canonical transformations	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain the properties of linear transformations	To understand: • More about linear transformation • Significance of dual space	Evaluation through test paper
Module III (25	canonical transformations inner product spaces,	• Lecture • Discussion • Participative learning	• Seminar and assignment on inner product	To understand: • Inner product spaces	Evaluation through test paper

Hours)		• Problem solving	spaces	and their relevance • Orthogonal compliment and direct sums of vector spaces	

Course Outcomes

CO1	To understand the concept of vector spaces, their basis, dimension and linear transformations
CO2	To understand more about linear transformations and some of its important properties, elementary canonical forms
CO3	To introduce the concept of Inner product spaces, orthogonal compliment and direct sums of vector spaces

Faculty in charge:
Dr. Nidhin T J

MT1C05: NUMBER THEORY

Number of hours of Lectures per week: 5

Number of Credits: 4

Objectives

To understand the basic concepts of Number Theory.

Module 1

Arithmetical functions and Dirichlet multiplication; Averages of arithmetical functions

Module 2

Some elementary theorems on the distribution of prime numbers

Module 3

Quadratic residues and quadratic reciprocity law ,Cryptography, Public key.

TEXT 1 : APOSTOL T.M., INTRODUCTION TO ANALYTIC NUMBER THEORY, Narosa Publishing House, New Delhi, 1990.

TEXT 2: KOBLITZ NEAL A., COURSE IN NUMBER THEROY AND CRYPTOGRAPHY, SpringerVerlag, NewYork, 1987.

References

[1] A. Beautelspacher: Cryptology; Mathematical Association of America (Incorporated); 1994

[2] H. Davenport: The higher arithmetic(6th Edn.); Cambridge Univ.Press; 1992

[3] G. H. Hardy and E.M. Wright: Introduction to the theory of numbers; Oxford International Edn; 1985

[4] A. Hurwitz & N. Kritiko: Lectures on Number Theory; Springer Verlag ,Universitext; 1986

[5] T. Koshy: Elementary Number Theory with Applications; Harcourt / Academic Press; 2002

[6] D. Redmond: Number Theory; Monographs & Texts in Mathematics No: 220; Marcel Dekker Inc.; 1994

[7] P. Ribenboim: The little book of Big Primes; Springer-Verlag, New York; 1991
[8] K.H. Rosen: Elementary Number Theory and its applications(3rd Edn.); Addison Wesley Pub Co.; 1993

[9] W. Stallings: Cryptography and Network Security-Principles and Practices; PHI; 2004

[10] D.R. Stinson: Cryptography- Theory and Practice(2nd Edn.); Chapman & Hall / CRC (214. Simon Sing : The Code Book The Fourth Estate London); 1999

[11] J. Stopple: A Primer of Analytic Number Theory-From Pythagorus to Riemann; Cambridge Univ Press; 2003

[12] S.Y. Yan: Number Theroy for Computing(2nd Edn.); Springer-Verlag; 2002

OBJECTIVES

a) **To understand the basic arithmetical functions and its averages.**

b) **To get familiarize with theorems on the distribution of prime numbers.**

c) **To understand quadratic residues, quadratic reciprocity law.**

d) **To study about basics of cryptography .**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (30 hours)	Arithmetical functions and Dirichlet multiplication; Averages of arithmetical functions	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on various arithmetic functions.	To understand: • Arithmetical functions • Dirichlet multiplication and derivatives of arithmetical functions • Averages of arithmetical functions.	Evaluation Through Test paper

Module I1 (30 hours)	Some elementary theorems on the distribution of prime numbers	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain theorems on distribution of prime numbers.	To understand: • Equivalent forms of prime number theorem. • Partial sums of Mobius function.	Evaluation Through test paper
Module III (30 Hours)	Quadratic residues and quadratic reciprocity law, Cryptography, Public key	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on legendre's symbol, its properties and Gauss lemma.	To understand: • Quadratic Residues and Quadratic reciprocity law,jacobi's symbol. • Basics of cryptography, types of crypto-system and its cryptanalysis.	Evaluation through test paper

Course Outcomes

CO1	To introduce the Arithmetical functions,Dirichlet multiplication and derivatives of arithmetical functions,Averages of arithmetic.
CO2	To understand the Equivalent forms of prime number theorem, Partial sums of Mobius function.
CO3	To understand the quadratic residues and quadratic reciprocity law, jacobi's symbol , basics of cryptography, types of cryptosystem and its cryptanalysis.

Faculty in charge:
Ms. Smitha Davis

MT1C03: REAL ANALYSIS I
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the basic concepts of real analysis.

MODULE I

Basic Topololgy, Finite, Countable and Uncountable sets Metric Spaces, Compact Sets, Perfect Sets, Connected Sets. Continuity - Limits of function, Continuous functions, Continuity and compactness, continuity and connectedness, Discontinuities, Monotonic functions, Infinite limits and Limits at Infinity

MODULE II

Differentiation The derivative of a real function, Mean Value theorems, The continuity of Derivatives, L Hospitals Rule, Derivatives of Higher Order, Taylors Theorem, Differentiation of Vector valued functions. The Riemann Stieltjes Integral, - Definition and Existence of the integral, properties of the integral, Integration and Differentiation

MODULE III

The Riemann Stieltjes Integral (Continued) - Integration of Vector vector-valued Functions, Rectifiable curves. Sequences and Series of Functions - Discussion of Main problem, Uniform convergence, Uniform convergence and continuity, Uniform convergence and Integration, Uniform convergence and Differentiation. Equicontinuous Families of Functions, The Stone Weierstrass

TEXT:

RUDIN W., PRINCIPLES OF MATHEMATICAL ANALYSIS (3rd Edn.), Mc. Graw-Hill, 1986.

REFERENCES :

[1] H. Amann and J. Escher: Analysis-I; Birkhuser; 2006.

[2] T. M. Apostol: Mathematical Analysis(2nd Edn.); Narosa; 2002.

[3] R. G. Bartle: Elements of Real Analysis(2nd Edn.); Wiley International Edn.; 1976.

[4] R. G. Bartle and D.R. Sherbert: Introduction to Real Analysis; John Wiley Bros; 1982.

[5] J. V. Deshpande: Mathematical Analysis and Applications- an Introduction; Alpha Science International; 2004.

OBJECTIVES

a) **To understand the basic concepts of Topology: Finite, Countable and Uncountable sets, Metric spaces, Compact sets, Perfect sets, Connected sets.**

b) **To develop the notion of continuity of functions in R^K.**

c) **To understand the concept of differentiation of real valued and complex valued functions.**

d) **To study about Riemann Stieltjes Integral and Rectifiable curves.**

e) **To understand the convergence of sequence and series of functions.**

f) **To understand the relation between uniform convergence and continuity, uniform convergence and differentiation, uniform convergence and integration**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (35 hours)	Basic topology, Continuous functions, continuity and compactness, continuity and connectedness, discontinuities	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on basic topology and continuity of functions	To understand: • the basics of topology • notion of continuity • difference between continuity and	Evaluation Through MCQ

				uniform continuity	
Module I1 (30 hours)	Differentiation, derivatives of higher order, differentiation of vector valued functions, Riemann Stieltjes Integral	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain the properties of differentiation and integration	To understand: • differentiation of vector valued functions • integration of vector valued functions	Evaluation Through test paper
Module III (25 Hours)	Convergence of sequence and series of functions, uniform convergence and continuity, uniform convergence and differentiation, uniform convergence and integration	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on properties of convergence of functions	To understand: • Convergence of sequence and series of functions • Differentiate between convergence and uniform convergence	Evaluation through test paper

Course Outcomes

CO1	To introduce the concept of basic topology, difference between continuous and uniformly continuous functions and its properties.
CO2	To understand the concept of differentiation of vector valued functions and integration of functions.
CO3	To understand the difference between pointwise convergence and uniform convergence of sequence of functions, convergence of series of functions

Faculty in charge:
Dr. Vijitha Mukundan

MTH2C06: ALGEBRA II
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the ideas and concepts of insolvability of the quintic.

MODULE I

Prime and Maximal Ideals, Introduction to Extension Fields, Algebraic Extensions (Omit Proof of the Existence of an Algebraic Closure), Geometric Constructions. [27, 29, 31, 32]

MODULE II

Finite Fields, Automorphisms of Fields, the Isomorphism Extension Theorem, Splitting Fields, Separable Extensions. [33, 48, 49, 50, 51]

MODULE III

Galois Theory, Illustration of Galois Theory, Cyclotomic Extensions, Insolvability of the Quintic. [53, 54, 55, 56]

TEXT: John B. Fraleigh: A FIRST COURSE IN ABSTRACT ALGEBRA (7th Edn), Pearson Education Inc., 2003.

REFERENCES :

[1] N. Bourbaki: Elements of Mathematics: Algebra I, Springer; 1998

[2] Dummit and Foote: Abstract algebra (3rd Edn); Wiley India; 2011

[3] M.H. Fenrick: Introduction to the Galois correspondence (2nd Edn); Birkhuser; 1998

[4] P.A. Grillet: Abstract algebra (2nd Edn); Springer; 2007

[5] I.N. Herstein: Topics in Algebra (2nd Edn); John Wiley & Sons, 2006.

[6] T.W. Hungerford: Algebra; Springer Verlag GTM 73 (4th Printing); 1987

[7] C. Lanski: Concepts in Abstract Algebra; American Mathematical Society; 2010

[8] R. Lidl and G. Pilz Applied abstract algebra(2nd edn.); Springer; 1998

[9] N.H. Mc Coy: Introduction to modern algebra, Literary Licensing, LLC; 2012

[10] J. Rotman: An Introduction to the Theory of Groups (4th Edn); Springer; 1999

[11] I. Stewart: Galois theory(3rd edn.); Chapman & Hall/CRC; 2003

OBJECTIVES

a) **To understand the basic concepts of Prime and Maximal Ideals.**

b) **To get familiarize with Algebraic Extensions.**

c) **To understand the Automorphisms of fields, Separable Extensions and Splitting Fields.**

d) **To study about the Galois Theory, Cyclotomic Extensions and the Insolvability of the Quintic.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (30 hours)	Prime and Maximal Ideals, Introduction to Extension Fields, Algebraic Extensions, Geometric Constructions.	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on prime and maximal ideals and algebraic extensions	To understand: • the basics of extension fields • geometric constructions	Evaluation through MCQ
Module I1 (30 hours)	Finite Fields, Automorphisms of Fields, the Isomorphism Extension Theorem, Splitting Fields, Separable Extensions.	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain about separable extensions	To understand: • Isomorphism Extension Theorem Splitting and Separable Extensions	Evaluation through test paper
Module III (30 hours)	Galois Theory, Illustration of Galois Theory, Cyclotomic Extensions, Insolvability of the Quintic.	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on Cyclotomic Extensions	To understand: • Galois Theory • Insolvability of the Quintic	Evaluation through test paper

Course Outcomes

CO1	To introduce the concept of finite and extension fields, geometric constructions etc.
CO2	To understand the concept of Isomorphism Extension Theorem, Splitting and Separable Extensions.
CO3	To understand Galois theory and the Insolvability of the Quintic

Faculty in charge:
Ms. Smitha Davis

MTH2C09: ODE AND CALCULUS OF VARIATIONS
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the basic concepts of ordinary differential equations and its applications.

MODULE I

Power Series Solutions and Special functions; Some Special Functions of Mathematical Physics.

MODULE II

Some special functions of Mathematical Physics (continued), Systems of First Order Equations; Non linear Equations

MODULE III

Oscillation Theory of Boundary Value Problems, The Existence and Uniqueness of Solutions, The Calculus of Variations.

TEXT:

SIMMONS, G.F., DIFFERENTIAL EQUATIONS WITH APPLICATIONS AND HISTORICAL NOTES (3rd Edn.), New Delhi, 1974.

REFERENCES :

[1] G. Birkhoff and G.C. Rota: Ordinary Differential Equations(3rd Edn.); Edn. Wiley & Sons; 1978

[2] W.E. Boyce and R.C. Diprima: Elementary Differential Equations and boundary value problems (2nd Edn.); John Wiley & Sons, NY; 1969

[3] A. Chakrabarti: Elements of ordinary Differential Equations and special functions; Wiley Eastern Ltd., New Delhi; 1990

[4] E.A. Coddington: An Introduction to Ordinary Differential Eqution; Printice Hall of India, New Delhi; 1974

[5] R.Courant and D. Hilbert: Methods of Mathematical Physics- vol I; Wiley Eastern Reprint; 1975

[6] P. Hartman: Ordinary Differential Equations; John Wiley & Sons; 1964 [7] L.S. Pontriyagin : A course in ordinary Differential Equations Hindustan Pub. Corporation, Delhi; 1967

[8] I. Sneddon: Elements of Partial Differential Equations; McGraw-Hill International, Edn.;1957

OBJECTIVES

a) **To study how to compute power series solution of first order ODE.**

b) **To get familiarize with some special functions of Mathematical Physics.**

c) **To study the methods to solve systems of first order equations.**

d) **To study more about qualitative properties of solutions.**

e) **To understand the concept of calculus of variations.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (35 hours)	Power series solutions of first order ODEs, special functions in Mathematical Physics	• Lecture • Discussion • Participative learning • Problem solving	• Problem solving sessions in groups. • Discussing the solutions obtained	To understand: • the basics of solutions of ODE • significance of special functions	Evaluation Through test papers
Module I1 (30 hours)	Solve systems of first order and nonlinear equations	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain nonlinear equations	To understand: • the method to solve systems of first order equations • theory of solutions of nonlinear equations	Evaluation through test paper
Module III (25 Hours)	Existence and uniqueness of solutions, calculus of variations	• Lecture • Discussion • Participative learning • Problem solving	• Assignment on existence and uniqueness of solutions • Discussion in peer groups on Calculus of Variations	To understand: • the applications in Calculus of variations • the qualitative nature of solutions	Evaluation through test paper

Course Outcomes

CO1	To understand the power series solutions of ordinary differential equations and the significance of special functions.
CO2	To know more about special functions, systems of first order equations and nonlinear equations
CO3	To understand the qualitative nature of solutions and calculus of variation.

Faculty in charge:
Dr. Vijitha Mukundan

MTH2C10 – OPERATIONS RESEARCH

Number of hours of lectures per week : 5 hrs

Number of credits : 4

OBJECTIVE

To learn various methods to solve an LPP and study about game theory and networking.

MODULE I

Convex Functions; Linear Programming

MODULE II

Linear Programming (contd.); Transportation Problem

MODULE III

Integer Programming; Sensitivity Analysis; Flow and Potential in Networks; Theory of Games

TEXTBOOK

K.V. MITAL; C. MOHAN., OPTIMIZATION METHODS IN OPERATIONS RESEARCH AND SYSTEMS ANALYSIS(3rd. Edn.), New Age International(P) Ltd., 1996.

REFERENCES

[1] R.L. Ackoff and M.W. Sasioni: Fundamentals of Operations Research; Wiley Eastern Ltd. New Delhi; 1991

[2] C.S. Beightler, D.T. Philiphs and D.J. Wilde: Foundations of optimization(2nd Edn.); Prentice Hall of India, Delhi; 1979

[3] G. Hadley: Linear Programming; Addison-Wesley Pub Co Reading, Mass; 1975

[4] G. Hadley: Non-linear and Dynamic Programming; Wiley Eastern Pub Co. Reading, Mass; 1964

OBJECTIVES

- To learn about convex function and few theorems related to it.
- To study LPP and simplex method to solve it.

- ❖ Understand and solve transportation problems.
- ❖ To study about the sensitivity analysis.
- ❖ To learn flow and networks.
- ❖ To understand the problems related to game theory.

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I	Convex functions. Definition of LPP.	• Discussion • Participative learning • Problem solving • Lecture	Assignments on LPP	To study about convex functions and definition of LPP	Evaluation through test paper.
MODULE II	Simplex method to solve LPP. Transportation problem. VAM and MODI method to solve transportation problem.	• Lecture • Discussion • Participative learning • Problem solving	Assignments on simplex method and solving of transportation method	To learn to solve LPP using simplex method. To solve Transportation problem.	Evaluation through test paper.
MODULE III	Integer programming and sensitivity analysis. Networking. Introduction to Game theory.	• Lecture • Discussion • Participative learning • Problem solving	Seminar by students on sensitivity analysis. Methods to solve flow and network. Game theory problem solving.	Discussion on sensitivity analysis. To solve networks and problems on game theory.	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about convex functions
CO2	To learn about methods to solve LPP and transportation problems
CO3	To know about sensitivity in LPP and methods to solve networks. To understand game theory.

Faculty in charge:

Ms. Geethika P R

MTH2C07: REAL ANALYSIS II
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the advanced concepts of real analysis.

MODULE I

The Real Numbers: Sets, Sequences and Functions, Sigma Algebra, Borel sets, Lebesgue Measure, Lebesgue Measurable Functions

MODULE II

Lebesgue Integration, Lebesgue Integration: Further topics

MODULE III

Differentiation and Integration, The L^p spaces : Completeness and Approximation

TEXT:

H. L.Royden ,P. M. FitzpatrickH.L. REAL ANAYLSIS (4th Edn.), Prentice Hall of India, 2000.

REFERENCES :

[1] K B. Athreya and S N Lahiri:,Measure theory,Hindustan Book Agency,New Delhi,(2006).

[2] R G Bartle:, The Elements of Integration and Lebsgue Mesure , Wiley(1995).

[3] S K Berberian: ,measure theory and Integration,The Mc Millan Company,New York,(1965).

[4] L M Graves: ,The Theory of Functions of Real Variable Tata McGraw-Hill Book Co(1978)

[5] P R Halmos: , Measure Theory, GTM ,Springer Verlag [6] W Rudin:, Real and Complex Analysis,Tata McGraw Hill,New Delhi,2006

[7] I K Rana:,An Introduction to Measure and Integration,Narosa Publishing Company,New York.

[8] Terence Tao: ,An Introduction to Measure Theory,Graduate Studies in Mathematics,Vol 126 AMS

OBJECTIVES

a) **To understand the basic concepts of Sigma Algebra, Borel sets.**

b) **To understand Lebesgue Measure and Lebesgue Measurable Functions and its properties**

c) **To understand the concept of Lebesgue Integration,**

d) **To perform differentiation and Integration**

e) **To study about the L^p spaces : Completeness and Approximation**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (30 hours)	Sets, Sequences and Functions, Sigma Algebra, Borel sets, Lebesgue Measure, Lebesgue Measurable Functions	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on Lebesgue measure and Lebesgue measurable functions	To understand: • the basics of sigma algebra • notion of Lebesgue measure and measurable functions	Evaluation through interaction with students and test papers
Module I1 (30 hours)	Lebesgue Integration	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars on some topics of Lebesgue integration	To understand: • Concepts of Lebesgue integration	Evaluation through test paper
Module II1 (30 hours)	Differentiation and Integration, The L^p spaces : Completeness and	• Lecture • Discussion • Participative learning	• Assignments on Differentiatio	To understand: • Concepts of L^pspaces	Evaluation through test paper

	Approximation	• Problem solving	n and Integration		

Course Outcomes

CO1	To introduce the concept of Sigma Algebra, Borel sets, Lebesgue Measure, Lebesgue Measurable Functions
CO2	To understand the concept of Lebesgue integration, the L^p spaces : Completeness and Approximation
CO3	To understand the concept of differentiation and integration.

Faculty in charge:
Dr. Nidhin T J

MTH2C08: TOPOLOGY
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the motivation and concepts of topology.

MODULE I

A Quick Revision of Chapter 1,2 and 3. Topological space, basic concepts [Chapter 4 and Chapter5 Section 1, Section 2(excluding 2.11 and 2.12) and Section 3 only]

MODULE II

Making Functions Continuous, quotient spaces, spaces with special properties [Chapter 5 Section 4 and Chapter 6]

MODULE III

Separation axioms: Hierarchy of separation axioms, Compactness and separation axioms, The Urysohn characterization of normality, Tietze characterization of normality.[Chapter 7 Section 1 to 3 and Section 4 up to and including 4.6]

TEXT:

JOSHI K D, INTRODUCTION TO GENERAL TOPOLOGY (Revised Edn.), New Age International (P) Ltd., New Delhi, 1983

Inc., 2003.

REFERENCES :

[1] M A Armstrong: Basic Topology, Springer- Verlag New York; 1983.

[2] J Dugundji: Topology; Prentice hall of India; 1975.

[3] M Gemignani: Elementary Topology; Addison Wesley Pub Co Reading Mass, 1971

[4] M G Murdeshwar: General Topology(2nd Edn);Wiley Eastern Ltd, 1990

[5] G F Simmons: Introduction to Topology and modern analysis; McGraw-Hill international student Edn;1963.

OBJECTIVES

a) **To understand the basic concepts of Topological Spaces.**

b) **To get familiarize with making functions continuous, Quotient Spaces.**

c) **To understand the separation axioms, Hierarchy of separation axioms, compactness and separation axioms.**

d) **To study the Urysohn characterization of normality, Tietze characterization of normality.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (30 hours)	Topological Spaces, Basic concepts	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on basic topology and topological space	To understand: • the basics of topology • topological spaces • different types of topologies	Evaluation Through MCQ
Module I1 (30 hours)	Making functions continuous, quotient spaces, spaces with special properties	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain about making functions continuous	To understand: • Compact Lindeloff spaces • Connectedness Local Connectedness	Evaluation Through test paper

				Path Connectedness	
Module III (30 Hours)	Separation axioms: Hierarchy of separation axioms, compactness and separation axioms, The Urysohn characterization of normality, Tietze characterization of normality	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on separation axioms	To understand: • Separation axioms • Urysohn characterization of normality	Evaluation through test paper

Course Outcomes

CO1	To introduce the concept of basic topology, topological space, different types of topologies.
CO2	To understand the concept of making functions continuous, quotient spaces
CO3	To understand the separation axioms, the Urysohn characterization of normality, Tietz characterization of normality

Faculty in charge:
Ms. Linet Roslin Antony

MT 3C 12: COMPLEX ANALYSIS
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the ideas and concepts of analytic functions and singularities..

MODULE I

Conformality, Linear Transformations, Fundamental Theorems, Cauchy's Integral Formula.

MODULE II

Local Properties of Analytical Functions, The General Form of Cauchy's Theorem, The Calculus of Residues, Harmonic Functions.

MODULE III

Power Series Expansions, Simply Periodic Functions, Doubly Periodic Functions, The Weierstrass Theory.

TEXT: LARS V. AHLFORS : Complex Analysis, 3rd edn. Mc Graw Hill (1979)

REFERENCES :

1. Cartan, H. : Elementary Theory of Analytic Functions of one or Several . Variables, Addison - Wesley Pub. Co. (1973)
2. Conway, J.B. : Functions of One Complex Variable, Narosa Pub. Co., New Delhi. . (1973)
3. Moore T.O. &Hadlock E.H. : Complex Analysis, Series in Pure Mathematics - Vol. 9. World Scientific . (1991)
4. Pennisi, L. : Elements of Complex Variables, Holf, Rinehart & Winston, 2nd Edn. . (1976)
5. Rudin, W. : Real and Complex Analysis, 3rd Edn. McGraw - Hill International . Edn. (1987)
6. Silverman, H. : Compex Variables, Houghton Mifflin Co. Boston (1975)
7. Remmert, R. : Theory of Complex Functions, UTM, Springer- Verlag, NY, (1991)

OBJECTIVES

a) **To understand the basic concepts of** Power series, Analytic functions, Analytic functions as mappings and Mobius transformations.

b) **To get familiarize with** Conformal mappings, Weistrass theory

c) **To understand the** Power series representation of analytic functions, Zeros of an analytic function, The index of a closed curve, Cauchy's Theorem and Integral Formula and the classification of singularities.

LESSON PLAN

Unit/ session / hours (time required)	**Topics to be taught (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module 1 (30 hours)	Conformal mappings, Cauchy Integral formula	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on Power series and Analytic functions	To understand: • Conformal mappings • Fundamental theorems	Evaluation through MCQ
Module I1 (30 hours)	Analytic functions, Harmonic funcions	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain about Power series representation of analytic functions	To understand: • Residue theorem • Calculus of residue.	Evaluation through test paper
Module III (30	Entire functions Wiestrass Theory	• Lecture • Discussion • Participative learning	• Seminar and assignment on	To understand: • Simply periodic doubly	Evaluation through test paper

hours)		• Problem solving	classification of singularities	periodic functions	

Course Outcomes

CO1	To introduce the concept of Power series and Analytic functions
CO2	To understand the concept of Cauchy's Theorem and Integral Formula, Open Mapping Theorem and Goursat's Theorem.
CO3	To understand the Argument Principle, the Maximum Principle and Schwarz's Lemma.

Faculty in charge:
Ms. Linet Roslin Antony

MT3C14 – ADVANCED FUNCTIONAL ANALYSIS

Number of hours of lectures per week : 5 hrs

Number of credits : 4

OBJECTIVE

To learn about metric spaces, normed spaces, Banach spaces and Inner product spaces.

MODULE I

Metric spaces and Continuous Functions, Lp spaces , Fourier series and Integrals, Normed spaces Continuity of linear maps

MODULE II

Hahn-Banach Theorems, Banach spaces, Uniform Boundedness Principle

MODULE III

Closed Graph and Open Mapping Theorems, Bounded Inverse Theorem, Inner product spaces, Orthonormal sets

TEXTBOOK

LIMAYE , B.V, FUNCTIONAL ANALYSIS, (2nd Edn.) New Age International Ltd, Publishers, New Delhi, Bangalore (1996)

REFERENCES

[1]R. Bhatia, Notes on Functional Analysis TRIM series, Hindustan Book Agency

[2]KesavanS, Functional Analysis TRIM series, Hindustan Book Agency

[3] S David Promislow, A First Course in Functional Analysis Wiley Interscience, John wiley & Sons, INC., (2008)

[4]E.Kreyszig, Introductory Functional Analysis with Applications John Wiley & Sons (1978)

OBJECTIVES

- To define Metric spaces along with examples.
- To study normed spaces and its continuity.
- To learn Hahn Banach theorems.
- To understand Banach spaces.
- To study about Inner product spaces and orthonormality.

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I	Metric spaces.L_p spaces. Normed spaces. Continuity of linear maps	• Discussion • Participative learning • Problem solving • Lecture	Assignments on examples of metric spaces and normed spaces.	To study about metric spaces and its properties. To learn normed spaces.	Evaluation through test paper.
MODULE II	Hahn Banach Theorems. Banach spaces.	• Lecture • Discussion • Participative learning • Problem solving	Assignments on corollaries of Hahn Banach theorems.	To learn Hahn Banach theorem and study about Banach spaces	Evaluation through test paper.
MODULE III	Closed graph theorem. Open mapping theorem. Inner products. Orthonormality.	• Lecture • Discussion • Participative learning • Problem solving	Seminar by students	To study important theorems. To learn about Inner products and orthonormal space.	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about metric space and normed space along with its continuity
CO2	To study Hahn Banach theorem and Uniform Boundedness principle
CO3	To learn about inner products and orthonormal spaces.

Faculty in charge:
Ms.Geethila P R

MTH3C11 – MULTIVARIABLE CALCULUS AND GEOMETRY

Number of hours of lectures per week : 5 hrs

Number of credits : 4

OBJECTIVE

To understand concepts in Differential Geometry

MODULE I

Functions of Several Variables Linear Transformations, Differentiation, The Contraction Principle, The Inverse Function Theorem, the Implicit Function Theorem.

MODULE II

What is a curve? Arc-length, Reparametrization, Closed curves, Level curves versus parametrized curves. Curvature, Plane curves, Space curves What is a surface, Smooth surfaces, Smooth maps, Tangents and derivatives, Normals and orientability.

MODULE III

Level surfaces, Ruled surfaces and surfaces of revolution, Applications of the inverse function theorem, Lengths of curves on surfaces, Equiareal maps and a theorem of Archimedes, The second fundamental form, The Gauss and Weingarten maps, Normal and geodesic curvatures. Gaussian and mean curvatures, Principal curvatures of a surface.

TEXTBOOKS

TEXT 1 : RUDIN W., PRINCIPLES OF MATHEMATICAL ANALYSIS, (3rd Edn.), Mc. Graw Hill, 1986.

TEXT 2: ANDREW PRESSLEY, ELEMENTARY DIFFERENTIAL GEOMETRY(2nd Edn.), Springer-Verlag, 2010.

REFERENCES

[1] M. P. do Carmo: Differential Geometry of Curves and Surfaces;

[2] W. Klingenberg: A course in Differential Geometry;

[3] J. R. Munkres: Analysis on Manifolds; Westview Press; 1997

[4] C. C. Pugh: Real Mathematical Analysis, Springer; 2010

[5] M. Spivak: A Comprehensive Introduction to Differential Geometry-Vol. I; Publish

or Perish, Boston; 1970

[6] M. Spivak: Calculus on Manifolds; Westview Press; 1971

[7] V.A. Zorich: Mathematical Analysis-I; Springer; 2008

OBJECTIVES

- To understand functions of several variables and its differentiation
- To study curves, level curves and curvature.
- To learn about surfaces and its properties as normal, orientablity and tangents.
- To understand the definition Guass Weingarten maps
- To study about Guassian, mean curvatures

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I	The Contraction Principle, The Inverse Function Theorem, the Implicit Function Theorem.	• Discussion • Participative learning • Problem solving	Seminars by students	To study about Functions of Several Variables Linear Transformations and its properties	Evaluation through test paper.
MODULE II	Arc-length, Reparametrization, Level curves versus parametrized curves. Curvature, Tangents and derivatives, Normals and orientability.	• Lecture • Discussion • Participative learning • Problem solving	Assignments on Tangents and derivatives. Discussion about various definitions.	To learn basics about Curves, Level curves, curvature, Smooth maps,Tangents, Normals.	Evaluation through MCQ

MODULE III	Level surfaces, Applications of the inverse function theorem, Normal and geodesic curvatures. Gaussian and mean curvatures, Principal curvatures of a surface.	• Lecture • Discussion • Participative learning • Problem solving	Discussion on Surfaces and its properties.	To know the about Level, ruled surfaces, Guassian, mean, principal curvatures. The Gauss and Weingarten maps,	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about functions of several variables
CO2	To learn about the analytical and geometric concepts of curves and its variations To study about cuvature and sufaces
CO3	To know The Gauss and Weingarten maps, To learn Guassian and mean curvature.

Faculty in Charge

Ms. Nidhin T J

MT3C15: PDE and Integral Equations
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the basic theory of PDE and Integral Equations.

MODULE I

First Order PDE .

MODULE II

Second Order PDE .

MODULE III

Integral Equations

TEXTS : 1. AMARNATH, M., : PARTIAL DIFFERENTIAL EQUATIONS, Narosa , New Delhi (1997)

2. HILDEBRAND, F.B.: METHODS OF APPLIED MATHEMATICS, (2 nd Edn.) Prentice-Hall of India, New Delhi, 1972

REFERENCES :

1. G. Birkhoff & G.C. Rota : Ordinary Differential Equations, Edn. Wiley & Sons 3rd Edn (1978)
2. E.A. Coddington : An Introduction to Ordinary Differential Equations, Printice Hall of India, New Delhi (1974)
3. P. Hartman : Ordinary Differential Equations, John Wiley & Sons (1964)
4. L.S. Pontriyagin : A Course in Ordinary Differential Equations, Hindustan Pub. Corporation, Delhi (1967)
5. F. John : Partial Differential Equations, Narosa Pub. House New Delhi (1986)
6. Phoolan Prasad & : Partial Differential Equations, Renuka Ravindran Wiley Eastern Ltd New Delhi (1985)
7. R. Courant and D.Hilbert : Methods of Mathematical Physics , Vol I, Wiley Eastern Reprint (1975) 8. W.E. Boyce & R.C. Deprima : Elementary Differential Equations, and Boundary Value Problems

John Wiley & Sons, NY, 9th Edition

OBJECTIVES

a) **To study the basic methods of solving partial differential equations.**

b) **To study different methods for solving second order linear and nonlinear pde.**

c) **To study the classification of PDE and to obtain the canonical forms.**

d) **To understand the relation between integral equations and differential equations and to study different methods to solve integral equations.**

LESSON PLAN

Unit/ session/ hours (time required)	**Topics to be taught (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module 1 (35 hours)	Linear equations of first order,Quasilinear equations, method of characteristics, the Lagrange method, Charpit method, Jacobi method, Cauchy problem	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on different methods of solving first order pde	To understand: • Different types of PDE • methods to solve pde • solving non linear problem	Evaluation through test paper and interaction with students

Module I1 (30 hours)	Classification of second order pde, solving wave, heat and Laplace equations, Separation of variables, canonical form, Cauchy problem for second order pde	• Lecture • Discussion • Participative learning • Problem solving	Student seminars to understand the method of solving wave, heat and Laplace equations	To understand: • Methods to solve second order PDE • Solutions of heat, wave and Laplace equations	Evaluation through test paper
Module III (25 Hours)	Integral equations, Fredholm and Volterra equations, Resolvent kernel,Neumann series, Fredholm Schmidt theory	• Lecture • Discussion • Participative learning • Problem solving	• Assignment and problem solving sessions on Integral equations	To understand: • Relation between integral equation and differential equation • Methods tosolve integral equations of different kinds	Evaluation through test paper

Course Outcomes

CO1	To study different types of PDE and methods for solving them.
CO2	To study methods of solving second order PDE, heat, wave and Laplace equation, Cauchy problem
CO3	To understand the relation between differential equation and integral equations, also different methods to solve integral equations.

Faculty in charge:
Ms. Vijitha Mukundan

MTH4E06: Algebraic Number Theory
Number of hours of Lectures per week: 5
Number of Credits: 3

Objectives

To understand the concepts of Algebraic Number Theory.

MODULE I

Symmetric polynomials, Modules, Free abelian groups, Algebraic Numbers, Conjugates and Discriminants, Algebraic Integers, Integral Bases, Norms and Traces, Rings of Integers, Quadratic Fields, Cyclotomic Fields

MODULE II

Historical background, Trivial Factorizations, Factorization into Irreducibles, Examples of Nonunique Factorization into Irreducibles, Prime Factorization, Euclidean Domains, Euclidean Quadratic fields Ideals Historical background, Prime Factorization of Ideals, The norm of an ideal

MODULE III

Lattices, The Quotient Torus, Minkowski theorem, The Space Lst, The Class-Group An Existence Theorem, Finiteness of the Class-Group, Factorization of a Rational Prime, Fermats Last Theorem Some history, Elementary Considerations, Kummers Lemma, Kummers Theorem.

TEXT : I. N. STEWART & D.O. TALL, ALGEBRAIC NUMBER THEORY, (2nd Edn.), Chapman & Hall, (1987)

REFERENCES :

[1] P. Samuel : Theory of Algebraic Numbers, Herman Paris Houghton Mifflin, NY, (1975)
[2] S. Lang : Algebraic Number Theory, Addison Wesley Pub Co., Reading, Mass, (1970)
[3] bf D. Marcus : Number Fields, Universitext, Springer Verlag, NY, (1976)
[4] 4T.I.FR. Pamphlet No: 4 : Algebraic Number Theory (Bombay, 1966)
[5] Harvey Cohn : Advanced Number Theory, Dover Publications Inc., NY, (1980)
[6] Andre Weil : Basic Number Theory, (3rd Edn.), Springer Verlag, NY, (1974)
[7] G.H. Hardy and E.M. Wright : An Introduction to the Theory of Numbers, Oxford University Press.
[8] Z.I. Borevich & I.R.Shafarevich : Number Theory, Academic Press, NY 1966.
[9] Esmonde & Ram Murthy : Problems in Algebraic Number Theory, Springer Verlag 2000

OBJECTIVES

a) **To study the basic concepts of numberfield, quadratic field, Guassian field and their properties.**

b) **To study how factorization into irreducibles hold in different fields.**

c) **To understand the concepts of lattices, the quotient torus and geometric representation of algebraic numbers.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (35 hours)	Factorization into Irreducibles, Examples of Nonunique Factorization into Irreducibles, Prime Factorization, Euclidean Domains, Euclidean Quadratic fields Ideals, Prime Factorization of Ideals,	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on numberfields and its properties	To understand: • the factorization into irreducibles • different types of numberfields • the factorization of ideals • properties of ideals	Evaluation through test paper and interaction with students

Module I1 (30 hours)	Examples of Nonunique Factorization into Irreducibles, Prime Factorization, Euclidean Domains, Euclidean Quadratic fields Ideals Historical background, Prime Factorization of Ideals, The norm of an ideal	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to understand prime factorization and quadratic fields	To understand: • Nonunique Factorization into Irreducibles • Factorization of Ideals and norm of an ideal	Evaluation Through test paper
Module III (25 Hours)	Lattices, The Quotient Torus, Minkowski theorem, The Space Lst, The Class-Group An Existence Theorem, Finiteness of the Class-Group, Factorization of a Rational Prime, Kummers Lemma, Kummers Theorem	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion and assignments to understand geometric representation of algebraic numbers	To understand: • The Quotient Torus • The classgroup	Evaluation through test paper

Course Outcomes

CO1	Awareness about different types of numberfield and their properties
CO2	Able to check unique factorization in fields and also can provide examples of nonunique factorizations
CO3	To understand the geometric representation of algebraic numbers

Faculty in charge:
Dr. Vijitha Mukundan

MT4E11 – ADVANCED FUNCTIONAL ANALYSIS

Number of hours of lectures per week : 5 hrs

Number of credits : 4

OBJECTIVE

To learn about duality, compactness and boundedness of spaces.

MODULE I

Duals and Transposes, Duals of Lp [a,b] and C[a,b], weak and weak* convergence, Reflexivity

MODULE II

Definition of Compact Linear Map, spectrum of a compact operator, Riesz Representation Theorems

MODULE III

Bounded Operators and Adjoints , Normal, Unitary and Self Adjoint Operators , Spectrum and Numerical Range , Compact self Adjoint Operator

TEXTBOOK

LIMAYE , B.V, FUNCTIONAL ANALYSIS, (2nd Edn.) New Age International Ltd, Publishers, New Delhi, Bangalore (1996)

REFERENCES

[1]R. Bhatia, Notes on Functional Analysis TRIM series, Hindustan Book Agency

[2]KesavanS, Functional Analysis TRIM series, Hindustan Book Agency

[3] S David Promislow, A First Course in Functional Analysis Wiley Interscience, John wiley & Sons, INC., (2008)

[4]E.Kreyszig, Introductory Functional Analysis with Applications John Wiley & Sons (1978)

OBJECTIVES

- To understand the concept of duality and reflexivity.
- To study spectrum of compact operators.
- To understand the concept of Bounded linear operators and its types.

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I	Dual spaces. Weak convergence Reflexivity	• Discussion • Participative learning • Problem solving • Lecture	Assignments on examples of dual spaces	To study about duality and weak convergence. To learn reflexivity.	Evaluation through test paper.
MODULE II	Compact operators and its spectrum. Riesz Representation theorems.	• Lecture • Discussion • Participative learning • Problem solving	Assignments on compact operators and examples	To learn about spectrum of compact operators	Evaluation through test paper.
MODULE III	Bounded operators. Adjoint, normal, unitary and self adjoint operators. Compact self adjoint operator.	• Lecture • Discussion • Participative learning • Problem solving	Seminar by students	To study Self adjoint operators and compactness.	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about duality and the concept of reflexivity
CO2	To learn about compact operators
CO3	To learn about Bounded linear operators and self adjoint operators

Faculty in charge:

Ms Geethika P R

MTH4C11: GRAPH THEORY
Number of hours of Lectures per week: 5
Number of Credits: 3

Objectives

To understand the basic concepts of Graph theory.

Module 1

Basic concepts of Graph. Trees, Cut edges and Bonds, Cut vertices, Cayleys Formula, The Connector Problem, Connectivity, Blocks, Construction of Reliable Communication Networks, Euler Tours, Hamilton Cycles, The Chineese Postman Problem, The Travelling Salesman Problem.

Module 2

Matchings, Matchings and Coverings in Bipartite Graphs, Perfect Matchings, The Personnel Assignment Problem, Edge Chromatic Number, Vizings Theorem, The Timetabling Problem, Independent Sets, Ramseys Theorem

Module 3

Vertex Colouring-Chromatic Number, Brooks Theorem, Chromatic Polynomial, Girth and Chromatic Number, A Storage Problem, Plane and Planar Graphs, Dual Graphs, Eulers Formula, Bridges, Kuratowskis Theorem, The Five-Colour Theorem, Directed Graphs, Directed Paths, Directed Cycles.

TEXT : J.A. Bondy and U.S.R.Murty : Graph Theory with applications. Macmillan

References

[1] F. Harary : Graph Theory, Narosa publishers, Reprint 2013.
[2] Geir Agnarsson, Raymond Greenlaw: Graph Theory Modelling, Applications and Algorithms, Pearson Printice Hall, 2007.
[3] John Clark and Derek Allan Holton : A First look at Graph Theory, World Scientific (Singapore) in 1991 and Allied Publishers (India) in 1995
[4] R. Balakrishnan & K. Ranganathan : A Text Book of Graph Theory, Springer Verlag, 2nd edition 2012.

OBJECTIVES

a) **To understand the basic concepts of graphs, Trees, Cut edges and Bonds, Cut vertices, Euler Tours, Hamilton Cycles**

b) **To get familiarize with Matchings and Coverings in Bipartite Graphs, Perfect**

Matching, Independent Sets, Ramseys Theorem

c) **To understand the concept of Vertex Colouring-Chromatic Number, Edge Chromatic Number , The Five-Colour Theorem, Directed Graphs.**

d) **To study more about Chromatic Polynomial, Girth and Chromatic Number**

e) **To understand The Five-Colour Theorem, Directed Graphs, Directed Paths, Directed Cycles.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (30 hours)	Basic concepts of graph, Trees, Cut edges and Bonds, Cut vertices, Connectivity, Blocks, Euler Tours, Hamilton Cycles	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on basic concepts of graph	To understand: • the basics of graph, trees • Concepts of cut edges, cut vertices, Euler tour and Hamilton cycles	Evaluation Through MCQ
Module I1 (30 hours)	Matchings and Coverings, Perfect Matchings, Edge Chromatic Number, Vizings Theorem, Independent Sets, Edge colouring,Ramseys Theorem	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain the Personnel Assignment Problem and The Timetabling Problem	To understand: • differentiation of matchings and covering • Concepts of edge colouring and Ramseys theorem	Evaluation Through test paper
Module III (30 Hours)	Vertex Colouring-Chromatic Number, Brooks Theorem, , Plane and Planar Graphs, Dual Graphs, Eulers Formula, Bridges,	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on Storage Problem	To understand: • Vertex colouring and it's important results • Planar	Evaluation through test paper

	Kuratowskis Theorem, The Five-Colour Theorem, Directed Graphs,			graphs, dual graphs and it's important result	

Course Outcomes

CO1	To introduce the concept of basic graph theory, trees, cut vertices and cut edges, Euler tour and Hamilton cycles
CO2	To understand the concept of matchings and covering, Edge colouring.
CO3	To understand the concepts of vertex colouring and it's important results. Planar graphs and dual graphs.

Faculty in charge:
Ms. Linet Roslin Antony

MTH4E09: DIFFERENTIAL GEOMETRY
Number of hours of Lectures per week: 5
Number of Credits: 3

Objectives

To understand the basic concepts of differential geometry.

MODULE I

Graphs and Level Set, Vector fields, The Tangent Space, Surfaces, Vector Fields on Surfaces, Orientation. The Gauss Map .

MODULE II

Geodesics, Parallel Transport, The Weingarten Map, Curvature of Plane Curves, Arc Length and Line Integrals.

MODULE III

Curvature of Surfaces, Parametrized Surfaces, Local Equivalence of Surfaces and Parametrized Surfaces.

TEXT:

J.A.THORPE : ELEMENTARY TOPICS IN DIFFERENTIAL GEOMETRY

REFERENCES :

1) M. de Carmo : Differential Geometry of Curves and Surfaces, Prentice Hall Inc Englewood Cliffs NJ (1976).
2) V. Grilleman and A. Pollack : Differential Topology, Prentice Hall Inc Englewood Cliffs NJ (1974)
3) B. O'Neil : Elementary Differential Geometry, Academic Press NY (1966)
4) M. Spivak : A Comprehensive Introduction to Differential, Geometry, (Volumes 1 to 5), Publish or Perish, Boston (1970, 75)
5) R. Millmen and G. Parker : Elements of Differential Geometry, Prentice Hall Inc Englewood Cliffs NJ (1977)
6) I. Singer and J.A. Thorpe : Lecture Notes on Elementary Topology and Geometry, UTM, Springer Verlag, NY (1967)

7) W.L.Burke: Applied Differential Geometry , Cambridge University Press (1985).

OBJECTIVES

a) **To understand the basic concepts of level sets, surfaces and its curvature, geodesics,and parametrized surfaces .**

b) **To get familiarize with covariant derivatives and its properties.**

c) **To understand the concept of local and global parametrization.**

d) **To study more about parametrized surfaces and local equivalence of surface and parametrized surfaces.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I (30 hours)	Level sets,vector fields, the tangent space, surfaces and the gauss map.	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on vector fields and level sets.	To understand: • the basics of surfaces • notion of tangent space and the gauss map	Evaluation Through MCQ
Module II (30 hours)	Geodesics, Parallel transport, The Weingarten map, Arc length and line integrals.	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain the properties of derivatives of smooth vector field and covariant	To understand: • Local and global parametrization . • Concept of parallel transport.	Evaluation Through test paper

			derivative.		
Module III (30 Hours)	Curvature of surfaces, First and second fundamental forms,Parametrized surfaces and its local equivalence with surfaces.	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on local equivalence of surfaces and parametrized surfaces.	To understand: • Principal, Gaussian, Gauss Kronecker and Mean curvature • Inverse function theorems.	Evaluation through test paper

Course Outcomes

CO1	To introduce the concept of graphs and level sets, basics of surfaces and notion of tangent space anf gauss map.
CO2	To understand the concept of parallel transport, local and global parametrization, arc length and line integral.
CO3	To understand the principal ,Gaussian ,Gauss Kronecker and Mean curvature, and parametrized surfaces.

Faculty in charge:
Dr. Nidhin T J

STA 1C 01 INTRODUCTORY STATISTICS

Lecture Hours per week: 4, Credits: 3

Internal: 15, External: 60, Examination 2 Hours

Objectives

To introduce basic concepts of statistics

Module I (7 hrs)

Official statistics: The Statistical system in India: The Central and State Government organizations, functions of the Central Statistical Office (CSO), National Sample Survey Organization (NSSO) and the Department of Economics and Statistics.

Module II (30 hrs)

Introduction to Statistics: Nature of Statistics, Uses of Statistics, Statistics in relation to other disciplines, Abuses of Statistics,Concept of primary and secondary data. Designing a questionnaire and a schedule. Concepts of statistical population and sample from a population, quantitative and qualitative data, Nominal, ordinal and time series data, discrete and continuous data. Presentation of data by table and by diagrams, frequency distributions by histogram and frequency polygon, cumulative frequency distributions (inclusive and exclusive methods) and ogives. Measures of central tendency (mean, median, mode, geometric mean and harmonic mean) with simple applications. Absolute and relative measures of dispersion (range, quartile deviation, mean deviation and standard deviation) with simple applications. Co-efficient of variation, Box Plot. Importance of moments, central and non-central moments, and their interrelationships. Measures of skewness based on quartiles and moments; kurtosis based on moments.

Module III (15 hrs)

Correlation and Regression: Scatter Plot, Simple correlation, Simple regression, two regression lines, regression coefficients. Fitting of straight line, parabola, exponential, polynomial (least square method).

Module IV (20 hrs)

Time series: Introduction and examples of time series from various fields, Components of times series,

Additive and Multiplicative models. Trend: Estimation of trend by free hand curve method, method of semi averages, method of moving averages and fitting various mathematical curves. Seasonal Component: Estimation of seasonal component by Method of simple averages, Ratio to Trend. Index numbers: Definition, construction of index numbers and problems thereof for weighted and unweighted index numbers including Laspeyre's, Paasche's, Edgeworth-Marshall and Fisher's.

Reference Books:

1) S.C. Gupta and V.K. Kapoor. Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi
2) Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I & II, 8th Edn. The World Press, Kolkata.
3) Mukhopadhyay P. (2011): Applied Statistics, 2nded. Revised reprint, Books and Allied
4) Hoel P.G. Introduction to mathematical statistics, Asia Publishing house.
5) Chatfield.C. The Analysis of Time Series: An Introduction, Chapman & Hall
6) Guide to current Indian Official Statistics, Central Statistical Office, GOI, New Delhi.
7) www.mospi.gov.in
8) www.ecostat.kerala.gov.in

OBJECTIVES

1) To learn basic concepts of statistical system in India
2) To understand nature and uses of statistics
3) To understand correlation and regression
4) To expose statistics students to the areas of time series and index numbers

LESSON PLAN

Unit/ session / hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment

Module I 7 Hours	The Statistical system in India: The Central and State Government organizations, functions of the Central Statistical Office (CSO), National Sample Survey Organization (NSSO) and the Department of Economics and Statistics.	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars related to the central and government organizations	• To understand central and government organizations in India • To understand the functions of CSO and NSSO	Evaluation through test paper and viva
Module II 30 Hours	Nature of Statistics, Uses of Statistics, Statistics in relation to other disciplines, Abuses of Statistics,Concept of primary and secondary data, Concepts of statistical population and sample from a	• Lecture • Discussion • Participative learning • Problem solving	• Assignments in finding measures of central tendency	• To understand the nature, uses and abuses of statistics • To understand measures of central tendency and measures of	Evaluation through test paper

	population, Nominal, ordinal and time series data, discrete and continuous data, cumulative frequency distributions and ogives. Measures of central tendency with simple applications, Absolute and relative measures of dispersion with simple applications,Co-efficient of variation, Importance of moments, central and non-central moments, and their interrelationships, Measures of skewness based			dispersion and their applications	

	on quartiles and moments; kurtosis based on moments				
Module III **15 Hours**	Scatter Plot, Simple correlation, Simple regression, two regression lines, regression coefficients. Fitting of straight line, parabola, exponential, polynomial	• Lecture • Discussion • Participative learning • Problem solving	• Assignments related to find correlation and regression coefficients	• To understand correlation and regression	Evaluation through test paper
Module IV **20 Hours**	Introduction and examples of time series from various fields, Components of times series, Estimation of trend by free hand curve method, method of semi averages, method of moving	• Lecture • Discussions • Problem solving	• Student seminars related to components of time series	• To understand time series, seasonal indices and index numbers	Evaluation through test paper

	averages and fitting various mathematical curves, Estimation of seasonal component by Method of simple averages, Ratio to Trend,Definition , construction of index numbers and problems thereof for weighted and unweighted index numbers including Laspeyre's, Paasche's, Edgeworth-Mar shall and Fisher's.				

Course Outcomes

CO1	To understand central and government organizations in India and learn the functions of CSO and NSSO
CO2	To understand the nature, uses and abuses of statistics

CO3	To learn the concepts of correlation and regression
CO4	To understand time series, seasonal indices and index numbers

Teacher in Charge:

Ms.Jiji Pauly

STA 2C 02- PROBABILITY THEORY
Lecture Hours per week:4 , Credits: 3
Internal: 20, External: 80, Examination 3 Hours

Objectives

Give knowledge to conceptualise probabilities of an event including frequentist and axiomatic approach also the idea about mathematical expectation and conditional probability.

Module I (25 hrs)

Introduction to Probability: Random experiment, Sample space, events, classical definition of probability, statistical regularity, field, sigma field, axiomatic definition of probability and simple properties, addition theorem (two and three events), conditional probability of two events, multiplication theorem, independence of events-pair wise and mutual, Bayes theorem and its applications.

Module II (12 hrs)

Random variables: Discrete and continuous, probability mass function (pmf) and probability density function (pdf)-properties and examples, Cumulative distribution function and its properties, change of variables (univariate case only).

Module III (15 hrs)

Mathematical expectations (univaraite): Definition, raw and central moments(definition and relationships), moment generation function and properties, characteristic function (definition and use only), Skewness and kurtosis using moments.

Module IV (20 hrs)

Bivariate random variables: Joint pmf and joint pdf, marginal and conditional probability, independence of random variables, function of random variable. Bivariate Expectations, conditional mean and variance, covariance, Karl Pearson Correlation coefficient, independence of random variables based on expectation.

Reference Books:

1. Rohatgi V. K. and Saleh, A.K. Md. E. (2009): An Introduction to Probability and Statistics. 2ndEdn. (Reprint) John Wiley and Sons.
2. . S.C.Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons.
3. Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Edn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.
4. . John E Freund, Mathematical Statistics, Pearson Edn, New Delhi
5. Hoel P.G. Introduction to mathematical statistics, Asia Publishing house.

OBJECTIVE

- Ability to distinguish between random and non random experiments.
- Understand the classical and axiomatic definition of probability, also the noation of conditional probability including the concept of Baye's theorem
- Give knowledge related to the concept of uni variate, Bivariate Discrete and continuous random variable including expectation moments and mgf

LESSON PLAN

Unit/ session/ hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **25 Hours**	Random experiment, Sample space, events, classical definition of probability, statistical regularity, field, sigma field, axiomatic definition of probability and simple properties, addition theorem, conditional probability of two events, multiplication theorem, independence of events-pair wise and mutual, Bayes theorem and its applications.	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on axiomatic definition of probability and simple properties.	• Understand the basic definition and properties related to probability.	Evaluation through test paper and viva.
Module II	probability mass	• Lecture	• Seminar on	• Understand	Evaluation

12 Hours	function and probability density function properties and examples, Cumulative distribution function and its properties, change of variables.	• Discussion • Participative learning • Problem solving	the topic Cumulative distribution function and its properties	the concept of pmf, pdf and cdf in statistics.	through test paper and viva
Module III **15 Hours**	Mathematical expectations Definition, raw and central moment, mgf and properties, characteristic function, Skewness and kurtosis using moments.	• Lecture • Discussion • Participative learning • Problem solving	• Assignments related to mathematical expectation, raw and cenral moments, mgf	• Understand the definition of moments and mgf • Enable to find Skewness and kurtosis using moments.	Evaluation through test paper.
Module IV **20 Hours**	Bivariate random variables: Joint pmf and joint pdf, marginal and conditional probability, independence of random variables, function of random variable. Bivariate Expectations, conditional mean and variance, covariance, Karl Pearson Correlation coefficient, independence of random variables based on expectation.	• Lecture • Discussions • Problem solving	• Student seminars on the topic bivariate Expectations, conditional mean variance, and covariance.	• Give knowledge related to the concept of Bivariate random variable including expectation moments and mgf.	Evaluation through test paper.

Course Outcomes

CO1	Ability to distinguish between random and non-random experiment
CO2	Undestand the probabilities of an events including frequentist and axiomatic approach. Simultaneously learned the notion of conditional probability including the concept of Bayes' Theorem.
CO3	Understand the concept of univariate, Bivariate Discrete and continuous random variable including expectation moments and mgf.

Teacher in Charge:

Ms. Geethu Simon

ST3CO3: STATISTICAL INFERENCE
Lecture Hours per week: 5, Credits: 3

Internal: 20, External: 80, Examination 3 Hours

Objectives

Introduce different type of sampling distributions and the concept of testing hypotheses.

Module I (25 hrs)

Sampling distributions: Statistic, Sampling distribution of a statistic, Standard error, Sampling from normal distribution, distribution of sample mean, sample variance, chisquare distribution, t distribution, and F distribution (definition, derivations and relationships only).

Module II (20 hrs)

Theory of Estimation: Point Estimation, desirable properties of a good estimator, unbiasedness, consistency, sufficiency, Fisher Neyman factorization theorem, efficiency. Methods of Estimation: Method of maximum likelihood, method of moments

Module III (15 hrs)

Interval Estimation: Interval estimates of mean, difference of means, variance, proportions and difference of proportions. Derivation of exact confidence intervals for means, variance and ratio of variances based on normal, t, chi square and F distributions

Module IV (30 hrs)

Testing of Hypotheses: concept of testing hypotheses, simple and composite hypotheses, null and alternative hypotheses, type I and II errors, critical region, level of significance and power of a test. Neyman Pearson approach: Large sample tests concerning mean equality of means, proportions, equality of proportions, Small sample tests based on t distribution for mean, equality of means and paired t test. Tests based on Fdistribution for ratio of variances. Tests based on Chi square distribution for variance, goodness of fit and for independence of attributes.

Reference Books:

1. V. K. Rohatgi, An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern.
2. S.C.Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons
3. A.M. Mood, F.A. Graybill and D C Bose, Introduction to Theory of Statistics, McGraw Hill
4. John E Freund, Mathematical Statistics (6th edn), Pearson Edn, NewDelhi

OBJECTIVES

- Introduce different type of sampling distributions.

- Introduce the concept of random sample from a distribution, sampling distribution of a statistic, standard error of important estimates such as mean and proportions
- knowledge about important inferential aspects such as point estimation, test of hypotheses and associated concepts
- Introduce Neyman Pearson approach in testing of hypotheses.

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **25 Hours**	Statistic, Sampling distribution of a statistic, Standard error, Sampling from normal distribution, distribution of sample mean, sample variance, chisquare distribution, t distribution, and F distribution	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on chisquare distribution, t distribution, and F distribution.	• Understand different type of sampling distributions.	Evaluation through test paper
Module II **20 Hours**	Point Estimation, desirable properties of a good estimator, unbiasedness, consistency, sufficiency, Fisher Neyman factorization	• Lecture • Discussion • Participative learning • Problem solving	• Seminar on the topic Method of maximum likelihood and methodof moments.	• Understand point estimation methods.	Evaluation through test paper.

	theorem, Method of maximum likelihood, method of moments.				
Module III **15 Hours**	Interval estimates of mean, difference of means, variance, proportions and difference of proportions. Derivation of exact confidence intervals for means, variance and ratio of variances based on normal, t, chi square and F distributions	• Lecture • Discussion • Participative learning • Problem solving	• Seminar related to the topic difference of means, variance, and difference of proportions.	• Understand Interval estimation methods	Evaluation through Group Discussion.
Module IV **30 Hours**	concept of testing hypotheses, simple and composite hypotheses, null and alternative hypotheses,type I and II errors, critical region, level of significance and power of a test. Large sample tests, proportions, equality of proportions, Small sample tests based on t distribution for	• Lecture • Discussions • Problem solving	• Student seminars in connection with type I and II errors.	• Become familiar with the concept of testing hypotheses and different sample tests.	Evaluation through test paper

	mean, equality of means and paired t test. Tests based on Fdistribution for ratio of variances. Tests based on Chi square distribution for variance, goodness of fit and for independence of attributes.				

Course Outcomes

CO1	Understnd different sampling distribution and its properties.
CO2	Understand the tecniques of estimation and testing hypotheses for mean, variance, proportions, correlation coefficient, association and goodness of fit.
CO3	Knowledge of point and interval estimation proceduers and different method of point estimation.

Teacher in Charge:

Ms. Geethu Simon

ST4CO4 APPLIED STATISTICS

Lecture Hours per week: 5, Credits: 3

Internal: 20, External: 80, Examination 3 Hours

Objectives

To introduce sampling techniques and statistical quality control

Module I (20 hrs)

Census and Sampling, Principal steps in a sample survey, different types of sampling, Organisation and execution of large scale sample surveys, errors in sampling(sampling and non sampling errors), preparation of questionnaire, simple random sampling with and without replacement, Systematic, stratified and cluster sampling

Module II (15 hrs)

Analysis of variance; one way, two way classifications. Null hypothesis, total, between and within sum of squares. Assumptions - ANOVA table..

Module III (30 hrs)

Time series : Components of time series additive and multiplicative models , measurement of trend , moving averages, seasonal indicessimple averageratio to moving average., Index numbers: meaning and definition uses and types - problems in the construction of index numbers -different types of simple and weighted index numbers. Test for an ideal index number - time and factor reversal test.

Module IV (25 hrs)

Statistical Quality Control: Concept of statistical quality control, assignable causes and chance causes, process control, Construction of control charts, 3sigma limits, Control chart for variables -Mean chart and Range chart, Control chart for attributes - pchart, d or np chart and c chart

Reference Books:

1) S.C.Gupta and V. K. Kapoor, Fundamentals of Applied Statistics, Sultan Chand and Sons

2) Grant E L, Statistical quality control, McGraw Hill

3) Duncan A J, Quality Control and Industrial Statistics, Taraporewala and sons

4) Montegomery D C, Introduction to Statistical Quality Control, John Wiley and sons

5) S.P.Gupta: statistical methods

OBJECTIVES

1) To equip students with sampling techniques used in conducting sample surveys.
2) To understand the concepts of ANOVA model
3) To expose the area of time series and index numbers.
4) To provide an insight into quality assessment techniques.

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **20 Hours**	Census and Sampling, Principal steps in a sample survey, different types of sampling, Organisation and execution of large scale sample surveys, sampling and non sampling errors, simple random sampling	• Lecture • Discussion • Participative learning • Problem solving	• Group discussion on sampling and sample survey	To understand sampling techniques used in conducting sample surveys	Evaluation through test paper

	with and without replacement, Systematic, stratified and cluster sampling				
Module II **15 Hours**	Analysis of variance; one way, two way classifications, Null hypothesis, Assumptions - ANOVA table..	• Lecture • Discussion • Participative learning • Problem solving	• Assignments in finding variance between the samples	To understand the concepts of ANOVA model	Evaluation through test paper and viva
Module III **30 Hours**	Time series, Components of time series, measurement of trend, moving averages, seasonal indices, Index numbers, different types of simple and weighted index numbers, time and factor reversal test.	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars related to components of time series	To understand time series, seasonal indices and index numbers	Evaluation through MCQ and Group Discussion
Module IV **25 Hours**	Statistical Quality Control, assignable causes	• Lecture • Discussion s	• Assignment to construct control charts	To understand statistical quality control	Evaluation through test paper

	and chance causes, process control, Construction of control charts, 3sigma limits, Control chart for variables- Mean chart and Range chart,Control chart for attributes pcha rt, d or np chart and c chart	• Problem solving		and its uses	

Course Outcomes

CO1	To understand sampling techniques used in conducting sample surveys
CO2	To understand the concepts of ANOVA model
CO3	To learn the concepts of time series and index numbers
CO4	To provide an insight into quality assessment techniques.

Teacher in Charge:

Ms. Jiji Pauly

MTS1C01: MATHEMATICS I
Lecture Hours per week: 4, Credits: 3
Internal: 15, External: 60, Unty. Exam Dur. : 2 Hours

Objectives

To develop basic concepts of Mathematics that include continuity, differentiation and integration

Module I

Introduction to the derivative, instantaneous velocity, slope of tangent line, differentiating simplest functions, Limits Notion of limit, basic properties, derived properties, continuity, continuity of rational functions, one sided limit, limit involving $\pm\infty$, The derivative as Limit formal definition, examples, differentiability and continuity, Leibnitz notation, Differentiating Polynomials power rule, sum rule etc., Product and quotients product, quotient, reciprocal & integral power rule , Linear Approximation and Tangent Lines equation of tangent line and linear approximation, illustrations

Module II

Rate of change and second derivative linear or proportional change, rates of change, second derivative, The Chain Rule power of a function rule, chain rule, Fractional Power & Implicit Differentiation rational power of a function rule, implicit differentiation, Related rates and parametric curves Related rates, parametric curves, word problems involving related rates, Anti derivatives anti differentiation and indefinite integrals, antidifferentiation rules

Module III

Continuity and Intermediate value theorem IVT: first and second version Increasing and decreasing function Increasing and decreasing test, critical point test, first derivative test, Second derivative and concavity second derivative test for local maxima , minima and concavity , inflection points, Drawing of Graphs graphing procedure, asymptotic behaviour, Maximum Minimum Problems maximum and minimum values on intervals, extreme value theorem, closed interval test, word problems , The Mean Value Theorem The MVT, consequences of MVT, Rolles Theorem, horserace

theorem, L'Hospital rule Preliminary version, strengthened version

Module IV

Summation, distance and velocity, properties of summation, telescoping sum (quick introduction relevant ideas only) Sums and Areas step functions, area under graph and its counterpart in distance velocity problem The definition of Integral signed area , The integral, Riemann sums The Fundamental Theorem of Calculus Arriving at FTC intuitively using distance velocity problem, Fundamental integration Method, proof of FTC, Area under graph, displacements and velocity Definite and Indefinite integral indefinite integral test, properties of definite integral, fundamental theorem of calculus: alternative version (interpretation and explanation in terms of areas): Applications of the Integral Area between graphs, area between intersecting graphs, total changes from rates of change, Volume by slice method the slice method, volume of solid of revolution by Disk method

Text

(1) Calculus I (2/e) : Jerrold Marsden & Alan Weinstein SpringerVerlag New York Inc(1985) ISBN 0387909745 Text

(2) Calculus II (2/e) : Jerrold Marsden & Alan Weinstein SpringerVerlag New York Inc(1985) ISBN 0387909753

References

1. Soo T Tan: Calculus Brooks/Cole, Cengage Learning(2010)ISBN 0534 46579X
2. Gilbert Strang: Calculus Wellesley Cambridge Press(1991)ISBN:09614088 20
3. Ron Larson. Bruce Edwards: Calculus(11/e) Cengage Learning(2018) ISBN: 9781337275347
4. Robert A Adams & Christopher Essex : Calculus Single Variable (8/e) Pearson Education Canada (2013) ISBN: 0321877403
5. Joel Hass, Christopher Heil & Maurice D. Weir : Thomas' Calculus(14/e) Pearson (2018) ISBN 0134438981
6. Jon Rogawski & Colin Adams : Calculus Early Transcendentals (3/e) W. H. Freeman and

Company(2015) ISBN: 1319116450

OBJECTIVES

a) **To develop the concept of first order derivative**

b) **To understand how to calculate second order derivative**

c) **To study Continuity and Intermediate value theorem, drawing of graphs, the Mean value theorems**

d) **To study about Riemann sums, definite and indefinite integral**

LESSON PLAN

Unit/ hours	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 14 hours	First order derivative and its significance, Linear Approximation and Tangent Lines	● Lecture ● Discussion ● Participative learning ● Problem solving	● Peer group discussion on first order derivative	To understand: ●The difference between differentiability and analyticity	Evaluation through test papers
Module 2 **13 Hours**	Second order derivative, fractional derivative, implicit differentiation	● Lecture ● Discussion ● Participative learning ● Problem solving	● Assignments to understand second order derivative	To understand: ●Second order derivative ●Implicit differentiation	Evaluation through test paper
Module 3 **18 Hours**	Continuity and Intermediate value theorem, drawing of graphs, the MVT	● Lecture ● Discussion ● Participative learning	Peer group discussion on drawing graphs	To understand: ● Continuity and IVT	Evaluation Through interaction with

				• Drawing graphs	students
Module4 **19 Hours**	Fundamental theorem of Calculus, Definite and Indefinite integral	• Lecture • Discussion • Problem solving	• Peer group discussion on definite and indefinite integral	To understand: • Fundamental theorem of calculus • definite and indefinite integral	Evaluation through test paper

Course Outcomes

CO1	**To develop the concept of first order derivative, its physical significance and antiderivative**
CO2	**To study derivative of second order, fractional Power & implicit differentiation and antiderivative**
CO3	**To develop the concepts of the MVT, consequences of MVT, Rolles Theorem.**
CO4	**To study fundamental theorem of calculus and calculate volume by slice method**

Teacher in Charge
Ms. Linet Roslin Antony
Dr. Vijitha Mukundan

MTS2C02: MATHEMATICS-2
Lecture Hours per week: 4, Credits: 3
Internal: 15, External: 60, Unty. Exam Dur. : 2 Hours

Objectives

To develop concepts of Mathematics that include hyperbolic functions, numerical integration, matrices and its properties.

Module I

Polar coordinates and Trigonometry – Cartesian and polar coordinates, Inverse functions-inverse function test, inverse function rule, Graphing in polar coordinates- Checking symmetry of graphs given in polar equation, drawings, tangents to graph in polar coordinates Hyperbolic functions- hyperbolic sine, cosine, tan etc., derivatives, antidifferentiation formulas Inverse hyperbolic functions- inverse hyperbolic functions (their derivatives and antiderivatives) Arc length and surface area- Length of curves, Area of surface of revolution about x and y axes

Module II

Improper integrals- integrals over unbounded intervals, comparison test, integrals of unbounded functions, Limit of sequences and Newton's method ε-N definition, limit of powers, comparison test, Newton's method : Numerical Integration- Riemann Sum, Trapezoidal Rule, Simpson's Rule The sum of an infinite series - convergence of series, properties of limit of sequences (statements only), geometric series, algebraic rules for series, the ith term test The comparison test and alternating series- comparison test, ratio comparison test, alternating series, alternating series test, absolute and conditional convergence

Module III

Vector spaces – definition, examples, subspaces, basis, dimension, span Gram-Schmidt Orthogonalization Process- orthonormal bases for R^n , construction of orthonomal basis of R^n Systems of Linear Algebraic Equations- General form, solving systems, augmented matrix, Elementary row operations, Elimination Methods- Gaussian elimination, Gauss– Jordan

elimination, row echelon form, reduced row echelon form, inconsistent system, networks, homogeneous system, over and underdetermined system ,Rank of a Matrix- definition, row space, rank by row reduction, rank and linear system, consistency of linear system, Determinants- definition, cofactor, Properties of determinant- properties, evaluation of determinant by row reducing to triangular form

Module IV

Inverse of a Matrix – finding inverse, properties of inverse, adjoint method, row operations method, using inverse to solve a linear system, The eigenvalue problem- Definition, finding eigenvalues and eigenvectors, complex eigenvalues, eigenvalues and singular matrices, eigenvalues of inverse Powers of Matrices- Cayley Hamilton theorem, finding the inverse, Orthogonal Matrices - symmetric matrices and eigenvalues, inner product, criterion for orthogonal matrix, construction of orthogonal matrix, Diagonalization- diagonalizable matrix-sufficient conditions, orthogonal diagonalizability of symmetric matrix, Quadratic Forms

Text

(1) Calculus I (2/e): Jerrold Marsden & Alan Weinstein Springer Verlag New York Inc(1985) ISBN 0387909745

(2) Calculus II (2/e): Jerrold Marsden & Alan Weinstein Springer Verlag New York Inc(1985) ISBN 0387909753

(3) Advanced Engineering Mathematics(6/e): Dennis G Zill Jones & Bartlett Learning, LLC (2018) ISBN: 978-1-284-10590-2.

References

1 Soo T Tan: Calculus Brooks/Cole, Cengage Learning (2010) ISBN 0-534-46579-X
2 Gilbert Strang: Calculus Wellesley Cambridge Press (1991)ISBN:0-9614088-2-0
3 Ron Larson. Bruce Edwards: Calculus(11/e) Cengage Learning (2018) ISBN: 978-1-337- 27534-7
4 Robert A Adams & Christopher Essex : Calculus Single Variable (8/e) Pearson Education Canada (2013) ISBN: 0321877403
5 Joel Hass, Christopher Heil & Maurice D. Weir : Thomas' Calculus(14/e) Pearson (2018) ISBN 0134438981
6 Advanced Engineering Mathematics(7/e) Peter V O'Neil: Cengage Learning (2012) ISBN:

978-1-
111-42741-2
7 Erwin Kreyszig: Advanced Engineering Mathematics(10/e) John Wiley & Sons (2011) ISBN: 978-
0- 470-45836-5
8 Glyn James: Advanced Modern Engineering Mathematics(4/e) 1 Pearson Education Limited (2011)
ISBN: 978-0-273-71923-6

OBJECTIVES

a) **To develop the concept of derivative and integral of hyperbolic functions and inverse hyperbolic functions.**

b) **To understand how to calculate arc length and area of surface of revolution.**

c) **To study about improper integrals and numerical integration.**

d) **To compute matrix inverse and study some important properties.**

LESSON PLAN

Unit/ hour	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 14 hours	Inverse functions, hyperbolic functions, Arc length and surface area- Length of curves, Area of surface of revolution about x and y axes	● Lecture ● Discussion ● Participative learning ● Problem solving	● Peer group discussion derivative and antiderivative of hyperbolic functions	To understand: ●Hyperbolic functions ●Length of curves ●Surface of revolution	Evaluation through test papers
Module 2 **17 Hours**	Improper integrals, Numerical Integration- Riemann Sum, Trapezoidal Rule,	● Lecture ● Discussion ● Participative learning ● Problem	● Assignments to understand numerical integration	To understand: ●Improper integrals ●Numerical integration	Evaluation through test paper

	Simpson's Rule	solving			
Module 3 **19 Hours**	Vector spaces, Gaussian elimination, Gauss– Jordan elimination, rank of matrix, determinants	• Lecture • Discussion • Participative learning	Peer group discussion on matrix properties	To understand: • Notion of vector spaces • Matrix properties	Evaluation through test papers
Module 4 **14 Hours**	Inverse of a matrix, orthogonal matrix, power of matrices, diagonalization of matrices	• Lecture • Discussion • Problem solving	• Peer group discussion on inverse of a matrix	To understand: • Orthogonal matrix and its properties • Diagonalization of matrices	Evaluation through test paper

Course Outcomes

CO1	**To develop the concept of differentiation and integration of hyperbolic and inverse hyperbolic functions, to calculate arc length and surface of revolution**
CO2	**To study about improper integrals and numerical integration.**
CO3	**To develop the concepts of vector spaces, and basics of matrices**
CO4	**To study how to compute inverse of matrix and diagonalization of the matrices.**

Teacher in Charge

Ms. Linet Roslin Antony
Dr. Vjitha Mukundan

MTS3C03: MATHEMATICS -3
Lecture Hours per week: 5, Credits: 3
Internal: 15, External: 60, Unty. Exam Dur. : 2 Hours

Objectives

To develop some concepts of Mathematics that include partial differentiation, double integral, triple integral their physical significance and contour integral.

Module I

Vector Functions – Vector Valued Functions, Limits, Continuity, and Derivatives, Geometric Interpretation of $r'(t)$, Higher Order Derivatives, Integrals of Vector Functions, Length of a Space Curve, Arc Length as a Parameter, Motion on a Curve, Velocity and Acceleration, Centripetal Acceleration, Curvilinear Motion in the Plane, Curvature and components of Acceleration definition, Curvature of a Circle, Tangential and Normal Components of Acceleration, The Binormal, Radius of Curvature, Partial Derivatives, Functions of Two Variables, Level Curves, Level Surfaces, Higher Order and Mixed Derivatives, Functions of Three or More Variables, Chain Rule, Generalizations, Directional Derivative, The Gradient of a Function, A Generalization of Partial Differentiation, Method for Computing the Directional Derivative, Functions of Three Variables, Maximum Value of the Directional Derivative, Gradient Points in Direction of Most Rapid Increase of f, Tangent planes and Normal Lines, Geometric Interpretation of the Gradient, Tangent Plane, Surfaces Given by $z = f(x, y)$, Normal Line

Module II

Curl and Divergence, Vector Fields, definition of curl and divergence, Physical Interpretations, Line Integrals, definition of smooth, closed and simple closed curves, Line Integrals in the Plane, Method of Evaluation: curve as explicit function and curve given parametrically, Line Integrals in Space, Method of Evaluation, Work, Circulation, Independence of Path Conservative Vector Fields, Path Independence, A Fundamental Theorem, definition of connected, ,simply connected and multiconnected regions, Integrals Around Closed Paths, Test for a Conservative Field, Conservative Vector Fields in 3DSpace, Conservation of Energy, Double Integral: Integrability,

Area, Volume, Properties, Regions of Type I and II, Iterated Integrals, Evaluation of Double Integrals (Fubini theorem), Reversing the Order of Integration, Laminas with Variable Density—Center of Mass, Moments of Inertia, Radius of Gyration, Double Integrals in Polar Coordinates: Polar Rectangles, Change of Variables: Rectangular to Polar Coordinates, Green's Theorem: Line Integrals Along Simple Closed Curves, Green's theorem in plane, Region with Holes, Surface Integral: Surface Area, Differential of Surface Area, Surface Integral, Method of Evaluation, Projection of S into Other Planes, Mass of a Surface, Orientable Surfaces, Integrals of Vector Fields, Flux, Stokes's Theorem: Vector Form of Green's Theorem, Green's Theorem in 3 Space - Stoke's Theorem, Physical Interpretation of Curl

Module III

Triple Integral: Definition, Evaluation by Iterated Integrals, Applications, Cylindrical Coordinates, Conversion of Cylindrical Coordinates to Rectangular Coordinates, Conversion of Rectangular Coordinates to Cylindrical Coordinates, Triple Integrals in Cylindrical Coordinates, Spherical Coordinates, Conversion of Spherical Coordinates to Rectangular and Cylindrical Coordinates, Conversion of Rectangular Coordinates to Spherical Coordinates, Triple Integrals in Spherical Coordinates, Divergence Theorem: Another Vector Form of Green's Theorem, divergence or Gauss' theorem, (proof omitted), Physical Interpretation of Divergence, Change of Variable in Multiple Integral: Double Integrals, Triple Integrals, Complex Numbers: definition, arithmetic operations, conjugate, Geometric Interpretation, Powers and roots: Polar Form, Multiplication and Division, Integer Powers of z , De Moivre's Formula, Roots, Sets in the Complex Plane: neighbourhood, open sets, domain, region etc., Functions of a Complex Variable: complex functions, Complex Functions as Flows, Limits and Continuity, Derivative, Analytic Functions entire functions, Cauchy Riemann Equation: A Necessary Condition for Analyticity, Criteria for analyticity, Harmonic Functions, Harmonic Conjugate Functions, Exponential and Logarithmic function: Exponential Function, Properties, Periodicity, Complex Logarithm, principal value, properties, Analyticity, Trigonometric and Hyperbolic functions: Trigonometric Functions, Hyperbolic Functions, Properties Analyticity, periodicity, zeros etc.

Module IV

Contour integral: definition, Method of Evaluation, Properties, ML- inequality. Circulation and Net Cauchy Goursat Theorem: Simply and Multiply Connected Domains, Cauchy's Theorem, Cauchy–Goursat theorem, Cauchy– Goursat Theorem for Multiply Connected Domains, Independence of Path: Analyticity and path independence, fundamental theorem for contour integral, Existence of Antiderivative, Cauchy's Integral Formula: First Formula, Second Formula - C.I.F. for derivatives. Liouville's Theorem, Fundamental Theorem of Algebra.

Text

(1) Advanced Engineering Mathematics(6/e): Dennis G Zill Jones & Bartlett Learning, LLC (2018) ISBN: 9781284105902

References

1.Soo T Tan: Calculus Brooks/Cole, Cengage Learning (2010) ISBN 0534 46579X
2 Gilbert Strang: Calculus Wellesley Cambridge Press (1991) ISBN:096140882 0
3 Ron Larson. Bruce Edwards: Calculus(11/e) Cengage Learning (2018) ISBN: 9781337275347
4 Robert A Adams & Christopher Essex: Calculus several Variable (7/e) Pearson Education Canada (2010) ISBN: 9780321549297
5 Jerrold Marsden & Anthony Tromba: Vector Calculus (6/e) W. H. Freeman and Company ISBN 9781429215084
6 Peter V O'Neil: Advanced Engineering Mathematics(7/e) Cengage Learning (2012) ISBN: 9781111427412
7 Erwin Kreyszig: Advanced Engineering Mathematics(10/e) John Wiley & Sons (2011) ISBN: 9780470458365
8 Glyn James: Advanced Modern Engineering Mathematics(4/e) Pearson Education Limited (2011) ISBN: 9780273719236

OBJECTIVES

a) **To develop the concept of partial derivative.**

b) **To understand how to calculate double and triple integral and various theorems connecting them.**

c) **To understand the physical significance of curl and divergence.**

d) **To get an idea about complex functions and analytic functions.**

e) **To study about contour integral**

LESSON PLAN

Unit/ hours	**Topics to be taught (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module 1 21 hours	Vector functions, Motion on a Curve, Curvature and components of Acceleration, Partial derivatives, Directional derivative, Tangent planes and Normal Lines	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on partial derivative	To understand: ●Directional derivative ●Tangent planes ●Normal planes ●Vector functions	Evaluation through test papers
Module 2 **24 Hours**	Curl and divergence, Line integrals, Independence of Path, Double Integral, Green's theorem, Surface Integral, Stoke's theorem	• Lecture • Discussion • Participative learning • Problem solving	• Assignments to understand second order derivative	To understand: ●Physical meaning of curl and divergence ●Double integral ●Line Integrals ●Theorems connecting them	Evaluation through test paper
Module 3 **21 Hours**	Triple Integral, Divergence theorem, Change of Variable in Multiple Integral, complex numbers,	• Lecture • Discussion • Participative learning • Problem	Peer group discussion on change of variables in	To understand: • Triple integral • Change of	Evaluation Through interaction with students

	Powers and roots, Sets in the Complex Plane, Functions of a Complex Variable, Cauchy Riemann Equation, Exponential and Logarithmic function,Trigonometric and Hyperbolic functions	Solving	multiple integral	variable ● Multiple integral ● Complex numbers ● Analytic functions ● C-R equations ● Other important functions	
Module4 **14 Hours**	Contour Integral, Cauchy Goursat Theorem, Independence of Path, Cauchy's Integral Formula	● Lecture ● Discussion ● Problem solving	● Peer group discussion on contour integration	To understand: ● Contour integral ● Integral formula and theorem	Evaluation through test paper

Course Outcomes

CO1	**To develop the concept of partial derivative, directional derivative, tangent planes and normal lines**
CO2	**To study the physical interpretation of divergence and curl, double integral and theorems connecting them.**
CO3	**To study triple integral, change of variables in multiple integral and about complex functions.**
CO4	**To understand the concept of contour integration, integral formula and theorem.**

Teacher in Charge
Ms. Amala Mary George

MTS4C04: MATHEMATICS -4
Lecture Hours per week: 5, Credits: 3
Internal: 15, External: 60, Unty. Exam Dur. : 2 Hours

Objectives

To develop the understanding of solving ODEs, PDEs and the significance of Laplace transform and Fourier series.

Module I

Definitions and Terminology: definition, Classification by Type, Classification by Order, Classification by Linearity, Solution, Interval of Definition, Solution Curve, Explicit and Implicit Solutions, Families of Solutions, Singular Solution, Systems of Differential Equations, Initial Value Problems: First and Second Order IVPs, Existence of solution, Differential Equations as Mathematical Models: some specific differential equation models in biology, physics and chemistry, Solution Curves without Solution Direction Fields Separable Equations definition Method of solution, losing a solution, An Integral Defined Function Linear Equations: definition, standard form, homogeneous and non homogeneous DE, variation of parameter technique, Method of Solution, General Solution, Singular Points, Piecewise Linear Differential Equation, Error Function Exact Equations: Differential of a Function of Two Variables, Criteria for an exact differential, Method of Solution, Integrating Factors, Solutions by Substitution, Homogeneous Equations, Bernoulli's Equation, Reduction to Separation of Variables, A Numerical Method Using the Tangent Line, Euler's Method

Module II

Theory of Linear Equations: Initial Value and Boundary Value Problems, Homogeneous Equations [Differential Operators, Superposition Principle, Linear Dependence and Linear Independence, Wronskian] Nonhomogeneous Equations [Complementary Function, Another Superposition Principle], Reduction of Order a general method to find a second solution of linear second order equation by reducing to linear first order equation, Homogeneous Linear Equations with Constant Coefficients, Auxiliary Equation, Distinct Real Roots , Repeated Real Roots , Conjugate Complex

Roots, Higher Order Equations, Rational Roots, Undetermined Coefficients Method of Undetermined Coefficients for finding out particular solution, Variation of parameter: General solution using Variation of parameter technique, Cauchy Euler Equations Method of solution, Distinct Real Roots, Repeated Real Roots, Conjugate Complex Roots, Linear Models & Boundary Value Problems: Deflection of a Beam, Eigenvalues and Eigenfunctions

Module III

Definition of Laplace Transform definition, examples, linearity, Transforms of some basic functions, Sufficient Conditions for Existence of transform, Inverse Transform and Transforms of Derivative Inverse Transforms: A few important inverse transforms, Linearity, Partial Fractions, Transforms of Derivatives, Solving Linear ODEs, Translation Theorems: Translation on the s axis, first translation theorem, its inverse form, Translation on the t axis, Unit step function, second translation theorem. Its Inverse form, Alternative Form of second translation theorem. Beams, Additional Operational Properties: Derivatives of Transforms, Transforms of Integrals convolution, convolution theorem (without proof) and its inverse form, Volterra Integral Equation, Series Circuits, Transform of a Periodic Function, The Dirac delta Function Unit Impulse: The Dirac Delta Function and its transform

Module IV

Orthogonal Functions: Inner Product, Orthogonal Functions, Orthonormal Sets, Vector Analogy, Orthogonal Series Expansion, Complete Sets, Fourier Series: Trigonometric Series, Fourier Series, Convergence of a Fourier Series, Periodic Extension, Sequence of Partial Sums, Fourier Cosine and Sine Series: Even and Odd Functions., Properties, Cosine and Sine Series, Gibbs Phenomenon, Half Range Expansions, Periodic Driving Force, Separable Partial Differential Equations : Linear Partial Differential Equation, Solution of a PDE, Separation of Variables , Superposition Principle, Classification of Equations (hyperbolic, parabolic, elliptic) . Classical PDE's and BVP's Heat Equation: Wave Equation, Laplace's Equation, Initial Conditions, Boundary Conditions, Boundary Value Problems, Heat Equation: Solution of the BVP

Text

(1) Advanced Engineering Mathematics(6/e): Dennis G Zill Jones & Bartlett Learning, LLC (2018) ISBN: 9781284105902

References

1. Peter V O'Neil: Advanced Engineering Mathematics(7/e) Cengage Learning (2012) ISBN: 9781111427412
2. Erwin Kreyszig: Advanced Engineering Mathematics(10/e) John Wiley & Sons (2011) ISBN: 9780470458365
3. Alan Jeffrey: Advanced Engineering Mathematics Harcourt/Academic Press (2002) ISBN: 012382592X
4. Glyn James: Advanced Modern Engineering Mathematics(4/e) Pearson Education Limited (2011) ISBN: 9780273719236

OBJECTIVES

a) **To understand the methods to solve ODE**

b) **To understand the significance of Laplace transform and Inverse Laplace transform.**

c) **To understand the use of Fourier series.**

d) **To the methods to solve PDE.**

LESSON PLAN

Unit/ hours	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 21 hours	Initial Value Problems. Differential equations, separable equations, linear equations, exact equations, Solutions by Substitution, A numerical method	● Lecture ● Discussion ● Participative learning ● Problem solving	● Peer group discussion on solution of ODE	To understand: ●Methods to solve ODE ●Numerical methods	Evaluation through test papers

Module 2 **22 Hours**	Theory of Linear Equations, Reduction of order, Homogeneous Linear Equations with Constant Coefficients, Undetermined coefficients, variation of parameters, Cauchy-Euler equation, Linear Models & Boundary Value Problems	• Lecture • Discussion • Participative learning • Problem solving	• Assignments to understand variation of parameters	To understand: • The methods to solve homogeneous Linear Equations with Constant Coefficients • Method of Undetermined coefficients and variation of parameter • BVP	Evaluation through test paper
Module 3 **19 Hours**	Laplace transform, Inverse Transform and Transforms of Derivative, Translation theorems, Additional Operational Properties, The Dirac delta Function	• Lecture • Discussion • Participative learning • Problem Solving	Peer group discussion on translation theorems	To understand: • Laplace transform • Inverse Transform • Transforms of Derivative • Translation theorems • The Dirac delta Function	Evaluation Through interaction with students
Module4 **18 Hours**	Orthogonal functions, Fourier series, Fourier Cosine and Sine Series, Separable Partial Differential Equations, Classical PDE's and BVP's, Heat equation	• Lecture • Discussion • Problem solving	• Assignments to understand Fourier Cosine and Sine Series,	To understand: • Orthogonal functions • Fourier series,Fourier Cosine and Sine Series, • Separable Partial Differential Equations, • Classical PDE's and BVP's, Heat equation	Evaluation through test paper

Course Outcomes

CO1	**To develop the methods of solving ODEs.**
CO2	**To study the method to solve higher order ODE**
CO3	**To study the significance and properties of Laplace and Inverse Laplace transforms**
CO4	**To understand the use of Fourier series and some techniques to solve PDEs.**

Teacher in Charge
Ms. Smitha Davis
Ms. Amala Mary George

MTS1 B01 BASIC LOGIC & NUMBER THEORY

Lecture Hours per week: 4, Credits: 4

Internal: 20, External: 80, Examination 2.5 Hours

Objectives

To enable one to think systematically, to make valid arguments in mathematical terms and master several techniques of problem solving.

Module I (15 hrs)

Propositions, Boolean variables, Truth Value, Conjunction, Boolean expression, Disjunction, Negation, Implication, Converse, Inverse and Contra positive, Biconditional statement, Order of Precedence, Tautology Contradiction and Contingency, Logical equivalences- laws of logic, Quantifiers- universal & existential, predicate logic, Arguments- valid and invalid arguments, inference rules, Proof Methods–vacuous proof, trivial proof, direct proof, indirect proof-contrapositive & contradiction, proof by cases , Existence proof-constructive & non constructive, counter example.

Module II (12hrs)

Mathematical induction- well ordering principle, simple applications, weak version of principle of mathematical induction, illustrations, strong version of induction, illustration, Recursion- recursive definition of a function, illustrations, The division algorithm – statement and proof, div & mod operator, card dealing, The two queens puzzle, pigeonhole principle and division algorithm, divisibility relation, illustration ,divisibility properties, union intersection and complement-inclusion-exclusion principle & applications, even and odd integers, Prime and Composite Numbers- definitions, infinitude of primes, The sieve of Eratosthenes, a number theoretic function, prime number theorem, distribution of primes.

Module III (17 hrs)

Greatest Common Divisor-gcd,symbolic definition, relatively prime integers, Duncan's identity, Polya's theorem, infinitude of primes, properties of gcd, linear combination, gcd as linear combination, an alternate definition of gcd, gcd of n positive integers, a linear combination of n positive integers, pairwise relatively prime integers, alternate proof for infinitude of prime, The Euclidean Algorithm- The Euclidean algorithm,

Ajigsaw puzzle, Lame's theorem, The Fundamental Theorem of Arithmetic- Euclid's lemma on division of product by a prime, fundamental theorem of arithmetic, Canonical Decomposition, number of trailing zeros, highest power of a prime dividing $n!$, Distribution of Primes Revisited, Dirichlet's Theorem, Least Common Multiple- definition, canonical decomposition to find lcm, relationship between gcd and lcm, relatively prime numbers and their lcm, Linear Diophantine Equations – LDE in two variables, conditions to have a solution, Aryabhatta's method, number of solutions, general solution, Mahavira's puzzle, hundred fowls puzzle, Monkey and Coconuts Puzzle, Fibonacci numbers and LDE, LDE in more number of variables and their solutions-theorem3.20.

Module IV (20hrs)

Congruences - congruence modulo m, properties of congruence, characterization of congruence, least residue, congruence classes, A Complete Set of Residues Modulo m, properties of congruence, use of congruence to find the remainder on division, Towers of Powers Modulo m, further properties of congruence and their application to find remainder congruences of two numbers with different moduli, Linear Congruence- solvability, uniqueness of solution, incongruent solutions, Modular Inverses, applications, Divisibility Tests-Divisibility Test for 10, Divisibility Test for 5, Divisibility Test for $2i$, Divisibility Tests for 3 and 9, Divisibility Test for 11, Wilson's Theorem- self invertible modulo prime, Wilson's theorem and its converse, Fermat's Little Theorem and its applications, inverse of a modulo p using FLT, application-solution of linear congruences , extension of FLT in various directions, Euler's Theorem-motivation, Euler's Phi Function φ, Euler's Theorem, applications, generalisation of Euler's theorem (koshy).

Textbooks :

1) **Thomas Koshy**: Discrete Mathematics with Applications**,** Elsever Academic Press (2004)
2) **Thomas Koshy**: Elementary Number Theory with Applications (2/e) , Elsever Academic Press (2007)

Reference Books:

1) Susanna S Epp: Discrete Mathematics with Applications(4/e) Brooks/Cole Cengage Learning(2011)
2) Kenneth H. Rosen: Discrete Mathematics and Its Applications(7/e) McGraw-Hill, NY(2007)
3) David M. Burton : Elementary Number Theory(7/e) McGraw-Hill (2011)

4) Gareth A. Jones and J. Mary Jones: Elementary Number Theory, Springer Undergraduate Mathematics Series(1998)
5) Underwood Dudley :Elementary Number Theory(2/e), Dover Publications (2008)
6) James K Strayer: Elementary Number Theory, Waveland Press, inc.(1994)
7) Kenneth H. Rosen: Elementary Number Theory(6/e), Pearson Education(2018)

OBJECTIVES

1) To enable one to think systematically.
2) To express ideas in precise and concise mathematical terms.
3) To learn to make valid arguments.
4) To master different techniques of problem solving.

LESSON PLAN

Unit/ hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **15 Hours**	Propositions, Logical Equivalences, Quantifiers, Arguments, Proof Methods	• Lecture • Discussion • Participative learning • Problem solving	Peer group discussion on Logical Equivalence	To understand techniques of logic and reasoning	Evaluation through test paper
Module II **12 Hours**	Mathematical Induction,	• Lecture • Discussion	Student seminars to	To understand several	Evaluation through test paper

	Recursion, Division Algorithm, Prime and Composite numbers.	• Participative learning • Problem solving	explain prime and composite numbers.	techniques of problem solving such as recursion and induction.	
Module III **17 Hours**	GCD, Euclidean algorithm, Fundamental theorem of arithmetic, LCM, Linear Diophantine Equations,	• Lecture • Discussion • Participative learning • Problem solving	Assignment to find GCD and LCM	To solve LDE	Evaluation through MCQ
Module IV **20 Hours**	Congruences, Linear congruence, Divisibility test, Wilson's Theorem, Fermat's LittleTheorem,Euler's Theorem.	• Lecture • Discussions • Problem solving	Student seminars to explain the divisibility test for 5 and 11	To solve linear congruences	Evaluation through test paper and viva

Course Outcomes

CO 1	To prove results involving divisibility, greatest common divisor, least common multiple and a few applications.
CO 2	To understand the theory and method of solutions of LDE.
CO	To understand the theory of congruence and a few applications.

3	
CO 4	To solve linear congruent equations.
CO 5	To learn three classical theorems *viz*. Wilson's theorem, Fermat's little theorem and Euler's theorem and a few important consequences.

Teacher in Charge:

Ms. Athira V

MTS2 B02 CALCULUS OF SINGLE VARIABLE-1
Lecture Hours per week: 4, Credits: 4
Internal: 20, External: 80, Examination 2.5 Hours

Objectives

To introduce students to the fundamental ideas of limit, continuity and differentiability and also to some basic theorems of differential calculus.

Module I - Functions and Limits (20 hrs)

Functions and their Graphs- Definition of a Function, Describing Functions, Evaluating Functions, Finding the Domain of a Function, The Vertical Line Test, Piecewise Defined Functions, Even and Odd Functions (quick review), Combining functions- Arithmetic Operations on Functions, Composition of Functions, Graphs of Transformed Functions, Vertical Translations, Horizontal Translations, Vertical Stretching and Compressing, Horizontal Stretching and Compressing, Reflecting , Intuitive introduction to Limits- A Real Life Example, Intuitive Definition of a Limit, One-Sided Limits, Using Graphing Utilities to Evaluate Limits, Techniques for finding Limits Computing Limits- Using the Laws of Limits, Limits of Polynomial and Rational Functions, Limits of Trigonometric Functions, The Squeeze Theorem, Precise Definition of a Limit $\varepsilon - \delta\ definition$, A Geometric Interpretation, Some illustrative examples, Continuous Functions - Continuity at a Number, Continuity at an Endpoint, Continuity on an Interval, Continuity of Composite Functions, Intermediate Value Theorem ,Tangent Lines and Rate of change- An Intuitive Look, Estimating the Rate of Change of a Function from Its Graph, More Examples Involving Rates of Change, Defining a Tangent Line, Tangent Lines, Secant Lines, and Rates of Change The Derivatives Definition, Using the Derivative to Describe the Motion of the Maglev, Differentiation, Using the Graph of f to Sketch the Graph of f' Differentiability, Differentiability and Continuity , The role of derivative in the real world- Motion Along a Line, Marginal Functions in Economics , Differentials and Linear Approximations - increments, Differentials, Error Estimates, Linear Approximations, Error in Approximating Δy by dy.

Module II - Applications of the Derivative (17 hrs)

Extrema of Functions Absolute Extrema of Functions, Relative Extrema of Functions, Fermat's Theorem, Finding the Extreme Values of a Continuous Function on a Closed Interval, An Optimization Problem ,The Mean Value Theorem Rolle's Theorem, The Mean Value Theorem, Some Consequences of the Mean Value Theorem, Determining the Number of Zeros of a Function Increasing and Decreasing Functions definition ,

inferring the behaviour of function from sign of derivative, Finding the Relative Extrema of a Function, first derivative test, Concavity and Inflection points Concavity, Inflection Points, The Second Derivative Test, The Roles of f' and f'' in Determining the Shape of a Graph, Limits involving Infinity; Asymptotes Infinite Limits, Vertical Asymptotes, Limits at Infinity, Horizontal Asymptotes, Infinite Limits at Infinity, Precise Definitions, Curve Sketching The Graph of a Function, Guide to Curve Sketching, Slant Asymptotes , Finding Relative Extrema , Using a Graphing Utility, Optimization Problems – guidelines for finding absolute extrema, Formulating Optimization Problems application involving several real life problems.

Module III - Integration (14 hrs)

Anti derivatives, Indefinite integrals, Basic Rules of Integration, a few basic integration formulas and rules of integration, Differential Equations, Initial Value Problems, Area An Intuitive Look, The Area Problem, Defining the Area of the Region Under the Graph of a Function, technique of approximation, An Intuitive Look at Area , Defining the Area of the Region Under the Graph of a Function, Area and Distance, The Definite Integral Definition of the Definite Integral, Geometric Interpretation of the Definite Integral, The Definite Integral and Displacement, Properties of the Definite Integral , More General Definition of the Definite Integral, The Fundamental Theorem of Calculus, How Are Differentiation and Integration Related?, The Mean Value Theorem for Definite Integrals, The Fundamental Theorem of Calculus: Part I, inverse relationship between differentiation and integration, Fundamental Theorem of Calculus: Part 2, Evaluating Definite Integrals Using Substitution, Definite Integrals of Odd and Even Functions, The Definite Integral as a Measure of Net Change.

Module IV- Applications of Definite Integral (13 hrs)

Areas between Curves A Real Life Interpretation, The Area Between Two Curves, Integrating with Respect to *y*adapting to the shape of the region, What Happens When the Curves Intertwine? Volume – Solids of revolution, Volume by Disk Method, Region revolved about the x-axis, Region revolved about the y-axis , Volume by the Method of Cross Sections, Arc Length and Areas of surfaces of revolution Definition of Arc Length, Length of a Smooth Curve, arc length formula, The Arc Length Function, arc length differentials, Surfaces of Revolution, surface area as surface of revolution,Work Done by a Constant Force, Work Done by a Variable Force, Hook's Law, Moving non rigid matter, Work done by an expanding gas, Moments and Center of Mass Measures of Mass, Center of Mass of a System on a Line, Center of Mass of a System in the Plane, Center of Mass of Laminas.

Textbooks :

1) **Soo T Tan**, Calculus: Brooks/Cole, Cengage Learning (2010)

Reference Books:

1) Joel Hass, Christopher Heil & Maurice D. Weir : Thomas' Calculus(14/e) Pearson (2018)
2) Robert A Adams & Christopher Essex : Calculus Single Variable (8/e) Pearson Education Canada (2013)
3) Jon Rogawski & Colin Adams : Calculus Early Transcendentals (3/e) W. H. Freeman and Company(2015)
4) Anton, Bivens & Davis : Calculus Early Transcendentals (11/e) John Wiley & Sons
5) James Stewart : Calculus (8/e) Brooks/Cole Cengage Learning(2016)
6) Jerrold Marsden & Alan Weinstein : Calculus I and II (2/e) Springer Verlag NY(1985)

OBJECTIVES

1) To get an idea of sketching of curves.
2) To solve some optimization problems of interest in real life.
3) To establish the close connection between the two branches of Calculus: Differential and Integral Calculus

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I (Functions and Limits)	Functions and their Graphs, Combining	Lecture Discussion Participative	• Seminar on real life applications of	To deal with real life measures	Evaluation through test paper and

20 Hours	Functions, Intuitive Introduction to Limits, Techniques for finding Limits, Precise definition of Limits, Continuous Functions, Tangent Lines and Rate of Change , The Derivatives, The Role of Derivative in the Real World, Differential and Linear Approximations	learning Problem solving	Derivatives	like speed and acceleration	group discussion
Module II (Applications of the Derivative) **17 Hours**	Extrema of Functions, The MVT, Increasing and Decreasing Functions, Concavity and Inflection Points, Limit involving Infinity, Curve Sketching, Optimization Problems	Lecture Discussion Participative learning Problem solving	Group discussion on Curve Sketching	To understand several techniques of sketching curves and learning limits	Evaluation through test paper
Module III (Integration) **14 Hours**	Indefinite Integrals, Area, The Definite Integrals, The Fundamental Theorem of Calculus	Lecture Discussion Participative learning Problem solving	Assignment to find integrals of functions	To deal with real life problems in Physics, Chemistry etc.	Evaluation through MCQ

Module IV (Applications of the Definite Integral) **13 Hours**	Areas between Curves, Volume, Arc Length and Areas of Surfaces of Revolution, Work, Moments and Center of Mass	Lecture Problem solving Participative learning Videos	Assignment to find volume of some familiar objects	To explore relationship between Surfaces and Curves	Evaluation through test paper and viva

Course Outcomes

CO1	To learn the practical way of evaluating the definite integral.
CO2	To master integrals which is a powerful tool in solving problems in physics, chemistry, biology, engineering, economics and other fields.
CO3	To deal with real life optimization problems.
CO4	To explore the relationship between moving/changing objects

Teacher in Charge:
Ms. Nima Maria

MTS3 B03 CALCULUS OF SINGLE VARIABLE-2

Lecture Hours per week: 5, Credits: 4

Internal: 20, External: 80, Examination 2.5 Hours

Objectives

To be able to handle vectors in dealing with the problems involving geometry of lines, curves, planes and surfaces in space and have acquired the ability to sketch curves in plane and space given in vector valued form.

Module I-The Transcendental Functions (20 hrs)

The Natural logarithmic function, The Derivative of *ln x*, Laws of Logarithms, The Graph of the Natural Logarithmic Function, The Derivatives of Logarithmic Functions, Logarithmic Differentiation, Integration Involving Logarithmic Functions, Inverse Functions, The Inverse of a Function, The Graphs of Inverse Functions, Which Functions have Inverses?, Finding the Inverse of a Function, Continuity and Differentiability of Inverse Functions,Exponential Functions, The number *e* , Defining the Natural Exponential Function, properties, The Laws of Exponents, The Derivatives of Exponential Functions, Integration of the Natural Exponential Function, General Exponential and Logarithmic Functions, Exponential Functions with Base *a*, Laws of exponents, The Derivatives, Integrals and Graphs of Functions with Base a , Logarithmic Functions with Base *a*, Change of base formula, The Power Rule , The Derivatives of Logarithmic Functions with Base *a*, The Definition of the Number *e* as a Limit, Inverse trigonometric functions, graph, inverse properties,Derivative of inverse trigonometric functions, Integration Involving Inverse Trigonometric Functions, Hyperbolic functions,The Graphs of the Hyperbolic Functions, Hyperbolic Identities, Derivatives and Integrals of Hyperbolic Functions, Inverse Hyperbolic Functions, Representation in terms of Logarithmic Function, Derivatives of Inverse Hyperbolic Functions, An Application Indeterminate forms and l'H*ô*pital rule, The Indeterminate Forms .

Module II - Infinite Sequences and Series (20 hrs)

Improper integrals – definition, Infinite Intervals of Integration, Improper Integrals with Infinite Discontinuities, A Comparison Test for Improper Integrals, Sequences, Limit of a Sequence, Limit Laws, Squeeze Theorem, Bounded Monotonic Sequences, Monotone Convergence Theorem, Series, Defining the Sum, convergence and divergence, Geometric Series, The Harmonic Series, The Divergence Test,

Properties of Convergent Series, The Integral Test – investigation of convergence, Integral Test, The *p*-Series, its convergence and divergence, The Comparison Test, The Limit, Comparison Test, Alternating Series, The Alternating Series Test, its proof, examples, Approximating the Sum of an Alternating Series by *Sn*, Absolute Convergence, Conditionally Convergent, The Ratio Test, The Root Test, Summary of Tests for Convergence and Divergence of Series, Rearrangement of Series.

Module III (17 hrs)

Power Series, Interval of Convergence, radius of convergence, Differentiation and Integration of Power Series, Taylor and Maclaurin Series, Taylor and Maclaurin series of functions, Techniques for Finding Taylor Series ,Plane Curves and Parametric Equations, Why We Use Parametric Equations, Sketching Curves Defined by Parametric Equations, The Calculus of parametric equations, Tangent Lines to Curves Defined by Parametric Equations, Horizontal and Vertical Tangents, Finding second derivative from Parametric Equations, The Length of a Smooth Curve, The Area of a Surface of Revolution, Polar coordinate, The Polar Coordinate System, Relationship Between Polar and Rectangular Coordinates, Graphs of Polar Equations, Symmetry, Tangent Lines to Graphs of Polar Equations, Areas and Arc Lengths in polar coordinates, Areas in Polar Coordinates, area bounded by polar curves, Area Bounded by Two Graphs, Arc Length in Polar Coordinates, Area of a Surface of Revolution, Points of Intersection of Graphs in Polar Coordinates.

Module IV (20hrs)

Lines and Planes in Space, Equations of Lines in Space, Parametric Equation, Symmetric Equation of a Line, Equations of Planes in Space, Standard Equation, Parallel and Orthogonal Planes, The Angle Between Two Planes, The Distance Between a Point and a Plane Surfaces in SpaceTraces, Cylinders, Quadric Surfaces, Ellipsoids, Hyperboloids of One Sheet, Hyperboloids of Two Sheets, Cones, Paraboloids, Hyperbolic Paraboloids,Cylindrical and Spherical Coordinates, The Cylindrical Coordinate System, Converting Cylindrical to Rectangular and vice versa, The Spherical Coordinate System, Converting spherical to Rectangular and vice versa, Vector Valued functions and Space Curves, Curves Defined by Vector Functions, Limits and Continuity, Differentiation and Integration of Vector Valued Function The Derivative of a Vector Function, Higher Order Derivatives, Rules of Differentiation, Integration of Vector Functions, Arc length and Curvature, Arc Length of a space curve, Smooth Curves, Arc Length Parameter, arc length function, Curvature, Formula for finding Curvature, Radius of

Curvature,Velocity and AccelerationVelocity, Acceleration, and Speed; Motion of a Projectile,Tangential and Normal Components of Acceleration, The Unit Normal, principal unit normal vector, Tangential and Normal Components of Acceleration.

Textbooks :

1) **Soo T Tan**: Calculus, Brooks/Cole, Cengage Learning (2010)

Reference Books:

1) Joel Hass, Christopher Heil & Maurice D. Weir : Thomas' Calculus (14/e) Pearson(2018)
2) Robert A Adams & Christopher Essex : Calculus Single Variable (8/e) Pearson Education Canada (2013)
3) Jon Rogawski & Colin Adams : Calculus Early Transcendentals (3/e) W. H. Freeman and Company(2015)
4) Anton, Bivens & Davis : Calculus Early Transcendentals (11/e) John Wiley & Sons, Inc.(2016)
5) James Stewart : Calculus (8/e) Brooks/Cole Cengage Learning(2016)
6) Jerrold Marsden & Alan Weinstein : Calculus I and II (2/e) Springer Verlag NY(1985)

OBJECTIVES

1) To familiarize functions like natural logarithmic function and natural exponential function.
2) To study a related notion of convergence of a series.
3) To get the idea of parametrization of curves, they learn how to calculate the arc length, curvature etc.
4) To introduce coordinate systems which simplify the equation of curves and surfaces.

LESSON PLAN

Unit/ Hours	Topics for student preparation	Procedure (process)	Activity	Learning outcome	Assessment

(Time Required)	(input)	Student centric Method of teaching		(output)	
Module I **20 Hours**	The Natural logarithmic function, Inverse Functions, Exponential Functions, General Exponential and Logarithmic Functions, Inverse trigonometric functions, Hyperbolic functions, Indeterminate forms and l'Hôpital rule	Lecture Discussion Participative learning Problem solving	Group discussion on l'Hôpital rule	To master natural logarithmic function and natural exponential function.	Evaluation through test paper
Module II **20 Hours**	Improper integrals, Sequences, Series, The Integral Test, The Comparison Test, Alternating Series, Absolute Convergence	Lecture Discussion Participative learning Problem solving	Student seminars related to Integral Test and Comparison Test	To deal with power series - their region of convergence, differentiation and integration etc	Evaluation through test paper
Module III **20 Hours**	Power Series, Taylor and Maclaurin Series, Plane Curves and Parametric	Lecture Discussion Participative learning	Assignment in conversion between different	To learn how to calculate the arc length, curvature etc.	Evaluation through testpaper and Viva

	Equations, The Calculus of parametric equations, Polar coordinate, Areas and Arc Lengths in polar coordinates	Problem solving	coordinate systems.	using parametrizatio n	
Module IV **20 Hours**	Lines and Planes in Space, Surfaces in Space, Cylindrical and Spherical Coordinates, Vector Valued functions and Space Curves, Differentiation and Integration of VectorValued Function, Arc length and Curvature, Velocity and Acceleration, Tangential and Normal Components of Acceleration	Lecture Discussions Problem solving	Student seminars to familiarize vector-valued functions in real life.	To acquire the ability to sketch curves in plane and space given in vector valued form.	Evaluation through testpaper

Course Outcomes

CO1	To model a wide variety of phenomenon of interest in science, engineering, mathematics and economics.
CO2	To handle the convergence of series with different tests.
CO3	To acquire the ability to sketch curves in plane.
CO4	To deal with the problems involving geometry of lines, curves, planes and surfaces in space.

Teacher in Charge:

Ms. Nima Maria

MTS4 B04 LINEAR ALGEBRA
Lecture Hours per week: 5, Credits: 4
Internal: 20, External: 80, Examination 2.5 Hours

Objectives

To introduce students to the fundamental ideas of linear system of equations, vector spaces and linear transformations.

Module I (17hrs)

Introduction to Systems of Linear Equations- linear equation in n variables, linear system of m equations in n variables, solution, Linear Systems in Two and Three Unknowns, solution by geometric analysis, consistent and inconsistent systems, linear system with no, one, and infinite number of solutions, augmented matrix and elementary row operations ,Gaussian elimination Considerations in Solving Linear Systems, Echelon Forms, reduced row echelon form, Elimination Methods, Gauss–Jordan elimination, Gaussian elimination, Homogeneous Linear Systems, Free Variables, Free Variable Theorem for Homogeneous Systems, Gaussian Elimination and Back Substitution, Some Facts about Echelon Forms , Matrices and Matrix operations Matrix Notation and Terminology, row vector , column vector , square matrix of order n , Operations on Matrices , Partitioned Matrices, Matrix Multiplication by Columns and by Rows, Matrix Products as Linear Combinations, linear combination of column vectors, Column Row Expansion, Matrix Form of a Linear System, Transpose of a Matrix, Trace of a Matrix , Inverses and algebraic properties of matrices Properties of Matrix Addition and Scalar Multiplication, Properties of Matrix Multiplication, Zero Matrices and Properties, Identity Matrices, Inverse of a Matrix, Properties of Inverses, Solution of a Linear System by Matrix Inversion, Powers of a Matrix , Matrix Polynomials, Properties of the Transpose , Elementary matrices and a method for finding $A-1$row equivalence, elementary matrix, Row Operations by Matrix Multiplication, invertibility of elementary matrices, invertibility and equivalent statements, A Method for Inverting Matrices, Inversion Algorithm, illustrations, More on linear systems and invertible matrices Number of Solutions of a Linear System, Solving Linear Systems by Matrix Inversion, Linear Systems with a Common Coefficient Matrix, Properties of Invertible Matrices, equivalent statements for unique solution of $Ax = b$, determining consistency , Diagonal, Triangular and Symmetric matricesDiagonal Matrices, Inverses and Powers of Diagonal Matrices, Triangular Matrices. Properties of Triangular Matrices, Symmetric Matrices, algebraic properties of symmetric matrices, Invertibility of Symmetric Matrices ,Matrix transformation definition, Properties of Matrix Transformations, standard matrix, A Procedure for Finding Standard Matrices

,Determinants by cofactor expansion minors, cofactors, cofactor expansion, Definition of a General Determinant, A Useful Technique for Evaluating 2 × 2 and 3 × 3 Determinants ,Evaluating determinants by row reduction a few basic theorems, elementary row operations and determinant, determinant of elementary matrices, determinant by row reduction .

Module II (18hrs)

Real vector space - Vector Space Axioms, examples, Some Properties of Vectors ,Subspaces -definition, criteria for a subset to be a subspace, examples, Building Subspaces, linear combination, spanning, Solution Spaces of Homogeneous Systems as subspace, The Linear Transformation Viewpoint , kernel, different set of vectors spanning the subspace, Linear Independence- Linear Independence and Dependence, illustrations , A Geometric Interpretation of Linear Independence, Wronskian, linear independence using wronskian , Coordinates and basisCoordinate Systems in Linear Algebra, Basis for a Vector Space, finite and infinite dimensional vector spaces, illustrations, Coordinates Relative to a Basis, Uniqueness of Basis Representation ,Dimension- Number of Vectors in a Basis , dimension, Some Fundamental Theorems, dimension of subspaces.

Module III (22 hrs)

Change of basis- Coordinate Maps, Change of Basis, Transition Matrices, Invertibility of Transition Matrices, An Efficient Method for Computing Transition Matrices for $\mathbb{R}n$, Transition to the Standard Basis for $\mathbb{R}n$, Row space, Column space and Null space- vector spaces associated with matrices, consistency of linear system, Bases for Row Spaces, Column Spaces, and Null Spaces, basis from row echelon form, Basis for the Column Space of a Matrix, row equivalent matrices and relationship between basis for column space, Bases Formed from Row and Column Vectors of a Matrix , Rank Nullity and Fundamental matrix spaces- equality of dimensions of row and column spaces, Rank and Nullity, Dimension Theorem for Matrices, The Fundamental Spaces of a Matrix, rank of a matrix and its transpose, A Geometric Link Between the Fundamental Spaces, orthogonal complement,, invertibility and equivalent statements, Applications of Rank, Over determined and Underdetermined Systems , Basic matrix transformations in $R2$ and $R3$ -Reflection Operators, Projection Operators, Rotation Operators, Rotations in $\mathbb{R}3$, Dilations and Contractions, Expansions and Compressions, Shears, Orthogonal Projections onto LinesThrough the Origin, Reflections About Lines Through the Origin ,Properties of matrix transformation- Compositions of Matrix Transformations, OnetoOne Matrix Transformations, Kernel and Range, fundamental relationship between invertibility of a matrix and its matrix transformation, Inverse of a OnetoOne Matrix Operator.

Module IV (23 hrs)

Geometry of matrix operators-Transformations of Regions, Images of Lines Under Matrix Operators, Geometry of Invertible Matrix Operators, Elementary matrix and its matrix transformation, consequence ,Eigen values and Eigen Vectors- definition, Computing Eigenvalues and Eigenvectors, characteristic equation, alternative ways of describing eigen values, Finding Eigenvectors and Bases for Eigenspaces, Eigenvalues and Invertibility, Eigenvalues of General Linear Transformations, Diagonalization-The Matrix Diagonalization Problem, linear independence of eigen vectors and diagonalizability, Procedure for Diagonalizing a Matrix, Eigenvalues of Powers of a Matrix, Computing Powers of a Matrix, Geometric and Algebraic Multiplicity ,Inner Product – definition of General inner product, Euclidean inner product (or the standard inner product) on $\mathbb{R}n$, norm of a vector, properties , a few examples , Angle and orthogonality in Inner product spaces- only the definition of orthogonality in a real inner product space and examples,Gram–Schmidt Process -definition of Orthogonal and Orthonormal Sets, examples, linear independence of orthogonal set, orthonormal basis, Coordinates Relative to Orthonormal Bases ,The Gram–Schmidt Process , illustrations- examples , Extending Orthonormal Sets to Orthonormal Bases ,Orthogonal Matrices- definition, characterisation of orthogonal matrices, properties of orthogonal matrices, Orthogonal Matrices as Linear Operators, a geometric interpretation , Orthogonal Diagonalization -The Orthogonal Diagonalization Problem, Conditions for Orthogonal Diagonalizability, Properties of Symmetric Matrices, Procedure for Orthogonally Diagonalizing an n × n Symmetric Matrix, Spectral Decomposition.

Textbooks :

1) Howard Anton & Chris Rorres **,** Elementary Linear Algebra: Application Version(11/e)

Reference Books:

1) Jim DeFranza, Daniel Gagliardi: Introduction to Linear Algebra with Applications Waveland Press, Inc(2015)

2) Otto Bretscher: Linear Algebra with Applications(5/e) Pearson Education, Inc (2013)

3) Ron Larson, Edwards, David C Falvo : Elementary Linear Algebra(6/e) Houghton Mifflin Harcourt Publishing Company(2009)

4) David C. Lay, Steven R. Lay, Judi J. McDonald: Linear Algebra and its Application (5/e) Pearson Education, Inc(2016)

5) Martin Anthony, Michele Harvey: Linear Algebra: Concepts and Methods Cambridge University Press(2012)

6) Jeffrey Holt: Linear Algebra with Applications W. H. Freeman and Company (2013)

OBJECTIVES

1) To understand the modern view of a matrix as a linear transformation
2) To solve system of linear equations
3) To understand the concepts of vector space

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **17 Hours**	Introduction to Systems of Linear Equations, Gaussian elimination, Matrices and Matrix operations, Inverses and algebraic properties of matrices, Elementary matrices and a method for finding A-1, More on linear systems and invertible matrices, Diagonal, Triangular and Symmetric matrices, Matrix transformation, Determinants by cofactror expansion, Evaluating determinants by row reduction	• Lecture • Discussion • Participative learning • Problem solving	• Assignment to find inverse of matrices	To solve System of Linear Equations	Evaluation through test paper
Module II	Real vector	• Lecture • Discussio	• Group	To deal with	Evaluation through test

18 Hours	spaces, Subspaces, Linear Independence, Coordinates and basis, Dimension	n • Participative learning • Problem solving	discussion on properties of vector spaces	vector spaces- their properties, dimensions etc	paper and viva
Module III **22 Hours**	Change of basis, Row space , Column space and Null space, Rank Nullity and Fundamental matrix spaces, Basic matrix transformations in R2 and R3 , Properties of matrix transformation	• Lecture • Discussion • Participative learning • Problem solving	• Seminar on Row space, Column space and Null space	To deal with matrix transformations	Evaluation through MCQ
Module IV **23 Hours**	Geometry of matrix operators, Eigen values and Eigen Vectors, Diagonalization, Inner Product, Angle and orthogonality in Inner product spaces, Gram-Schmidt Process, Orthogonal Matrices, Orthogonal Diagonalization	• Lecture • Discussions • Problem solving	• Assignment to find Eigen values and Eigen vectors	To understand Inner product spaces and orthogonality	Evaluation through test paper

Course Outcomes

CO1	To learn the practical method of finding out the eigenvalues from the characteristic equation.
CO2	To learn fundamentals of linear algebra to apply it in several different fields such as data communication, computer graphics, modeling etc.
CO3	To study about invertibility of square matrix
CO4	To learn matrix transformations in vector spaces

Teacher in Charge:
Ms. Anjana Rajan

MAT5B06 : ABSTRACT ALGEBRA

Lecture Hours per week: 5, Credits: 5

Internal: 30, External: 120, Examination 3 Hours

Objectives

To introduce the basic concept of the nature of abstract algebra also gives the idea of group and ring.

Module I (20 hrs)

Binary operations, Isomorphic binary structures, Groups, Sub groups

Module II (25 hrs)

Cyclic groups, Groups and permutations, Orbits, cycles and Alternating groups

Module III (15 hrs)

Cosets and Theorem of Lagrange, Homomorphisms

Module IV (30hrs)

Rings and Fields, Integral Domains, The Field of Quotients of an Integral Domain

Textbooks :

John B. Fraleigh : A First Course in Abstract Algebra, 7th Ed., Pearson.

Reference Books:

1. Joseph A. Gallian : Contemporary Abstract Algebra. Narosa Pub. House.
2. P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul: Basic Abstract Algebra, 2nded., Cambridge University
3. Artin : Algebra, PHI.
4. Durbin : Modern Algebra : An Introduction, 5th ed., Wiley.

OBJECTIVES

1) To enable one to determine whether the given binary operation on a given set forms a group.
2) To understand the concept of subgroups.
3) To describe all elements of a cyclic group using generators.
4) To enable one to understand the homomorphism and Theorem of Lagrange.
5) To understand the concept of rings, fields and integral domains.

LESSON PLAN

Unit/ session/ hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **20 Hours**	Binary operations, Isomorphic binary structures, Groups; Sub groups	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on Binary operation.	• Enable to understand the concept of Groups.	Evaluation through test paper
Module II **25 Hours**	Cyclic groups, Groups and permutations, Orbits, cycles and Alternating groups	• Lecture • Discussion • Participative learning • Problem solving	• Assignments on permutation and orbits.	• enable one to compute the expression of permutation and permutation multiplication • Enable to understand different type of groups.	Evaluation through test paper
Module III **15 Hours**	Cosets and Theorem of Lagrange, Homomorphism	• Lecture • Discussion • Participativ	• Seminar and assignment on properties of	• Understand the theorem Lagrange and	Evaluation through test paper

		e learning ● Problem solving	homomorphism ● Peer group discussion on Cosets.	homomorphisam.	
Module IV **30 Hours**	Rings and Fields, Integral Domains, The Field of Quotients of an Integral Domain	● Lecture ● Discussion ● Participative learning ● Problem solving	● Seminar on the topic Rings and fields.	● To understand the concept of rings and fields ● Learn the concept of Integral domain.	Evaluation through test paper and viva

Course Outcomes

CO1	Understand the concept of binary operation on a given set.
CO2	To get the idea of groups, rings, fields and integral domain.
CO3	Understand different type of groups like cyclic and alternating groups
CO4	Understand the homomorphism and Theorem of Lagrange

Teacher in Charge:

Ms. Geethu simon

MAT5B07: BASIC MATHEMATICAL ANALYSIS

Lecture Hours per week: 6, Credits: 5

Internal: 30, External: 120, Examination 3 Hours

Objectives

To develop ability to analyze and prove statements of mathematics using logical arguments.

Module I (20 hrs)

A quick review of sets and functions, Mathematical induction, Finite and infinite sets, Real Numbers, The algebraic property of real numbers.

Module II (24 hrs)

Absolute value and real line, The completeness property of R, Applications of supremum property, Intervals, Nested interval property and uncountability of R.

Module III (30 hrs)

Sequence of real numbers, Sequence and their limits, Limit theorems, Monotone sequences, Subsequence and Bolzano – Weirstrass theorem, Cauchy criterio,Properly divergent sequences, Open and closed sets.

Module IV (34 hrs)

COMPLEX NUMBERS: Sums and Products, Basic Algebraic properties, Further properties, Vectors and Moduli, Complex Conjugates, Exponential form, Product and powers in exponential form, Arguments of products and quotients, Roots of complex numbers, Regions in the complex plane, Functions of complex variable, Limits, Theorems on limits, Limits involving the points at infinity, Continuity.

Textbooks:

1) **Robert G. Bartle & Donald R. Sherbert**: Introduction to Real Analysis, 3rded., Wiley.
2) **J.W. Brown and Ruel V. Churchill**: Complex Variables and Applications, 8th Ed., McGraw Hill.

Reference Books:

1) J.M. Howie : Real Analysis, Springer 2007.
2) Ghorpade and Limaye : A Course in Calculus and Real Analysis, Springer, 2006.
3) K.A. Ross : Elementary Real Analysis : The Theory of Calculus, Springer Indian Reprint.
4) J.V. Deshpande : Mathematical Analysis and Applications, Narosh Pub. House.
5) M.R. Spiegel : Complex Variables, Schaum's Outline Series.

OBJECTIVES

1) To learn to prove Archimedean property, density theorem, existence of a positive square root for positive numbers and so on and the learning will help them to appreciate the beauty of logical arguments.
2) To learn how monotone convergence theorem can be used in establishing the divergence of the harmonic series, how it helps in the calculation of square root of positive numbers and how it establishes the existence of the transcendental number e.
3) To understand the concept of open and closed sets, their properties, their characterization and so on.
4) To familiarize the use of geometry, comparison between real and complex calculus-areas

LESSON PLAN

Unit/ Hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **20 Hours**	A quick review of sets and functions ,Mathematical induction, Finite and	• Lecture • Discussion • Participative learning • Problem	Group discussion on Algebraic properties of R.	To generate the ability to analyze and	Evaluation through test paper

	infinite sets Real Numbers, The algebraic property of real numbers.	solving		prove statements of Mathematics.	
Module II **24 Hours**	Absolute value and real line, The completeness property of R, Applications of supremum property Intervals, Nested interval property and uncountability of R.	• Lecture • Discussion • Participative learning • Problem solving	Student seminars related to Completeness Property of R.	To master different techniques of finding limits.	Evaluation through test paper
Module III **30 Hours**	Sequence of real numbers, Sequence and their limits, Limit theorems, Monotone sequences, Subsequence and Bolzano – Weirstrass theorem, Cauchy criterio, Properly divergent sequences, Open and closed sets.	• Lecture • Discussion • Participative learning • Problem solving	• Assignment in Limit Theorems. • Discussion on Open and Closed Sets.	To familiarize with different kinds of sequences.	Evaluation through testpaper and Viva
Module IV **34 Hours**	Sums and Products, Basic Algebraic properties, Further properties, Vectors and Moduli,	• Lecture • Discussions • Problem solving	Student seminars to familiarize properties of Complex Numbers.	To understand areas where real and complex calculus agree and where they	Evaluation through testpaper

	Complex Conjugates, Exponential form, Product and powers in exponential form, Arguments of products and quotients, Roots of complex numbers, Regions in the complex plane, Functions of complex variable, Limits, Theorems on limits, Limits involving the points at infinity, Continuity.			differ.	

Course Outcomes

CO1	To appreciate the beauty of logical arguments and embolden them to apply it in similar and unknown problems.
CO2	To establish the divergence and convergence of different sequences and series.
CO3	To understand some basic topological properties of real number system.

CO4	To demystify student's belief that complex variable theory is incomprehensible.

Teacher in Charge:

Ms. Nima Maria

MAT5B08: DIFFERENTIAL EQUATIONS

Lecture Hours per week: 5, Credits: 4

Internal: 30, External: 120, Examination 3 Hours

Objectives

To find out ways and means for solving differential equations.

Module I (24 hrs)

Some Basic Mathematical Models: Direction Fields, Solutions of some Differential equations, Classification of Differential Equations, Historical Remarks, First order differential equations: Linear equations with variable coefficients, Separable equations, Modeling with first order equations, Differences between linear and non linear equations, Exact equations and integrating factors, The existence and uniqueness theorem.

Module II (29 hrs)

Second Order Linear Differential Equations: Homogeneous equation with constant coefficients, Fundamental solutions of Linear Homogeneous equations, Linear independence and Wronskian, Complex roots of characteristic equations, Repeated roots Reduction of order, Non homogeneous equations, Method of Undetermined coefficients, Variation of parameters, Mechanical and Electrical vibrations, Systems of First Order Linear equations: Introduction, Basic theory of systems of first order Linear Equations.

Module III (17 hrs)

Definition of Laplace Transforms , Solution of Initial Value Problem , Step functions , Impulse functions, The Convolution Integral.

Module IV (20 hrs)

Two point Boundary value problems , Fourier Series, The Fourier Convergence Theorem, Even and odd functions , Separation of variables; Heat conduction in a rod , The Wave equation, Vibrations of an elastic string.

Textbooks:

1) Thomas / Finney : Calculus, 9th ed., LPE, Pearson Education.

Reference Books:

1) Kreyszig : Advanced Engineering Mathematics, 8th ed., Wiley.
2) H.F. Davis and A.D. Snider: Introduction to Vector Analysis, 6th ed.,Universal Book Stall, New Delhi.

OBJECTIVES

1) To learn to solve DEs that are in linear, separable and in exact forms and also to analyze the solution.
2) To be familiar with the theory and method of solving a second order linear homogeneous and nonhomogeneous equation with constant coefficients.
3) To acquire the knowledge of solving a differential equation using Laplace method.
4) To get familiarized with Fourier series and its applications.

LESSON PLAN

Unit/ Hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **24 Hours**	Some Basic Mathematical Models, First order differential equations	• Lecture • Discussion • Participative learning	Assignment on solving first order differential equations.	To learn to solve DEs that are in linear, separable and in	Evaluation through test paper

		• Problem solving		exact forms and also to analyze the solution.	
Module II **29 Hours**	Second Order Linear Differential Equations, Systems of First Order Linear equations	• Lecture • Discussion • Participative learning • Problem solving	Student seminars related to Completeness Property of R.	To be familiar with the theory and method of solving a second order linear homogeneous and nonhomogeneous equation with constant coefficients.	Evaluation through test paper
Module III **17 Hours**	Laplace Transforms	• Lecture • Discussion • Participative learning • Problem solving	Assignment in solving Differential equations using Laplace transforms.	To acquire the knowledge of solving a differential equation using Laplace method.	Evaluation through testpaper and Viva
Module IV **20 Hours**	Partial Differential Equations and Fourier Series	• Lecture • Discussions • Problem solving	Student seminars in applications of Fourier Series.	To get familiarized with Fourier series and its applications.	Evaluation through testpaper

Course Outcomes

CO1	Students could identify a number of areas where the modelling process results in a differential equation.
CO2	They will realize the basic differences between linear and non linear DEs and also basic results that guarantees a solution in each case.
CO3	They will become familiar with the theory and method of solving a second order linear homogeneous and nonhomogeneous equation with constant coefficients.
CO4	Students acquire the knowledge of solving a differential equation using Laplace method which is especially suitable to deal with problems arising in engineering field.

Teacher in Charge:

Ms. Nima Maria

Ms. Geethu Simon

MAT5D02: MATHEMATICS FOR NATURAL SCIENCES

Lecture Hours per week: 2 Credits: 2

Internal: 10, External: 40, Examination 2 Hours

Objectives

To get introduced to statistical measures and analysis.

Module I (20 hrs)

The idea of sets, Operation on sets, Relations and functions, Variables and graphs, Frequency distributions, The Mean, Median, Mode and other measures of central tendency, Dispersion or variation, The Range, The Mean deviation, The Semi‑inter quartile range, The 10‑90 Percentile range.

Module II (16 hrs)

The standard deviation, Properties of Standard Deviation, The variance, Short methods of computing standard deviation, Moments, Moments for grouped data, relation between moments, Computation of moment for grouped data. Skewness and Kurtosis.

Textbooks :

Murray R. Spiegel : Statistics, 2nd Edn., Schaum's Outline Series.

Reference Books:

1) Hogg & Craig: Introduction to Mathematical Statistics.
2) Freund & Walpole: Mathematical Statistics

OBJECTIVES

1) To understand different measures of tendency.
2) To analyse data using measures like SD, Skewness and Kurtosis

LESSON PLAN

Unit/ Hours	Topics for student	Procedure (process)	Activity	Learning outcome	Assessment

(Time Required)	preparation (input)	Student centric Method of teaching		(output)	
Module I 18 Hours	Sets, Frequency Distribution, Measures of Tendency	• Lecture • Discussion • Participative learning • Problem solving	Assignment on different measures of tendency.	To understand which measure is better for different kinds of data.	Evaluation through test paper and viva
Module II 12 Hours	Standard Deviation, Moments, Skewness and Kurtosis.	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars on Skewness and Kurtosis on different datas.	To visualize how the data behaves.	Evaluation through test paper

Course Outcomes

CO1	Students get an understanding about the use of some statistical tools.
CO2	They learn to analyze data using different measures.

Teacher in Charge:

Ms. Geethu Simon

MAT5B05: VECTOR CALCULUS

Lecture Hours per week: 5, Credits: 4

Internal: 30, External: 120, Examination 3 Hours

Objectives

To Provide skils to visualize and manipulate multivariable and vector values functions. Also enable students to evaluate multiple integrals.

Module I (15 hrs)

Functions of several variables, Limits and Continuity, Partial derivatives, Differentiability linearization and differentials, Chain rule, Partial derivatives with constrained variables.

Module II (20 hrs)

Directional derivatives, gradient vectors and tangent planes, Extreme value and saddle points, Lagrange multipliers, Taylor's formula, Double Integrals, Double integrals in polar form.

Module III (25 hrs)

Triple integrals in Rectangular Coordinates, Triple integrals in cylindrical and spherical coordinates, Substitutions in multiple integrals, Line integrals, Vector fields, work circulation and flux, Path independence, potential functions and conservative fields.

Module IV (30hrs)

Green's theorem in the plane, Surface area and surface integrals, Parametrized surfaces, Stokes' theorem (statement only), Divergence theorem and unified theory (no proof).

Textbooks :

Thomas / Finney : Calculus, 9th ed., LPE, Pearson Education.

Reference Books:

1. Kreyszig : Advanced Engineering Mathematics, 8th ed., Wiley.

2. H.F. Davis and A.D. Snider: Introduction to Vector Analysis, 6th ed.,

OBJECTIVES

1) To enable one to apply the basic concepts of partial derivatives.
2) To learn to find multiple integrals.
3) To understand concept of the integrals of the functions and vector fields over parametrized surfaces and compute them in simple examples.
4) To calculate directional derivatives and gradients.
5) To learn application of greens theorem and stokes theorem.

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **15 Hours**	Functions of several variables, Limits and Continuity, Partial derivatives, Differentiability linearization and differentials, Chain rule, Partial derivatives with constrained variables.	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on Partial derivatives.	• Enable to find partial derivatives.	Evaluation through test paper
Module II **20 Hours**	Directional derivatives, gradient vectors and tangent planes, Extreme value and saddle	• Lecture • Discussion • Participative learning	• Assignments in finding Directional derivatives	• Enable to evaluate double integrals.	Evaluation through test paper

	points, Lagrange multipliers, Taylor's formula, Double Integrals, Double integrals in polar form.	• Problem solving	and double integrals.		
Module III **25 Hours**	Triple integrals in Rectangular Coordinates, Triple integrals in cylindrical and spherical coordinates, Substitutions in multiple integrals, Line integrals, Vector fields, work circulation and flux, Path independence, potential functions and conservative fields.	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain vector fields, work and circulation	Understand triple integrals and vector fields.	Evaluation through MCQ and Group Discussion
Module IV **30 Hours**	Green's theorem in the plane, Surface area and surface integrals, Parametrized surfaces, Stokes' theorem (statement only), Divergence theorem and unified theory (no proof).	• Lecture • Discussion • Participative learning • Problem solving	• Assignments related to Surface integrals.	Learn the application of greens theorem and stokes theorem in multiple integrals.	Evaluation through test paper

Course Outcomes

CO1	Understand the basic concept of partial derivatives.
CO2	Enable to calculate multiple integrals.
CO3	Understand the concept of a conservative vector field

CO4	Learn the application of greens theorem and stokes theorem in multiple integrals and understand how they are generalizations of the Fundamental theorem of calculus.

Teacher in Charge:

Ms. Anjana Rajan

MAT6B10 : COMPLEX ANALYSIS

Lecture Hours per week: 5, Credits: 5

Internal: 30, External: 120, Examination 3 Hours

Objectives

To learn basic concepts of complex analysis and its applications.

Module I : Analytic Functions (15 hrs)

Derivatives, Differentiation formula, Cauchy‑Riemann Equations, Polar coordinates, Analytic functions, Harmonic functions , Elementary functions , The exponential function, Logarithmic function, Complex exponents, Trigonometric functions, Hyperbolic functions, Inverse Trigonometric and Hyperbolic functions.

Module II : Integrals (25 hrs)

Derivatives of functions ω(t); Indefinite integral of ω(t); Contours, Contour integrals, Antiderivatives, Cauchy ‑Goursat theorem (without proof), Simply and multiply connected domains, Cauchy's integral formula and its extension, Liouville's theorem and fundamental theorem of algebra, Maximum modulus principle.

Module III : Series (25 hrs)

A quick review of convergence of sequence and series of complex numbers,Taylor series, Laurents series (withoutproof), Applications,Power series: Absolute and uniform convergence,Continuity of sum of powerseries, Differentiation and integration of power series, Multiplication and division of power series.

Module IV : Residues (25 hrs)

Isolated singular points, Residues, Cauchy's residue theorem, Residue at infinity, Three types of isolated singular points, Residues at poles, Zeroes of analytic functions, Zeroes and poles,Applications of residues, Evaluation of improper integrals, Jordan's Lemma (statement only), Definite integrals involving sines and cosines.

Textbooks :

1) **James Ward Brown and Ruel V. Churchill** : Complex Variables and Applications (8th Edn.),

McGraw Hill.

Reference Books:

1) Mark J.Ablowitz and Anthanassios S. Fokas: Complex Variables, Cambridge Text, 2nd Edn
2) S. Ponnusamy : Foundation of Complex Analysis : Narosa.
3) Murray R. Spiegel: Complex Variables, Schaum's Outline series.
4) J.M. Howie: Complex Analysis: Springer India Reprint
5) Stewart & Tall: Complex Analysis, CUP

OBJECTIVES

1) To develop differentiability and analyticity of complex valued functions
2) To develop complex integration
3) To represent an analytic function as power series.
4) To classify the singular points using Laurent series and develop the concept of residues and its applications.

LESSON PLAN

Unit/ session / hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **15 Hours**	Derivatives, Cauchy-Riemann Equations,Analytic functions,Harmon	• Lecture • Discussion • Participative learning • Problem	• Assignments in finding harmonic conjugates	To understand the difference between differentiability and	Evaluation through test paper

	ic functions , Exponential , Logarithmic, Trigonometric , Hyperbolic , Inver seTrigonometric a nd Hyperbolic functions	solving		analyticity	
Module II 25 Hours	Derivatives ofω(t) , Indefinite integral of ω(t); Contours, Contour integrals, Antiderivatives, Cauchy‑Goursat theorem , Simplya nd multiply conne cted domains, Cau chy's integralformula a nd its extension, Liouville's theore m and fundamenta l theorem of algebr a, Maximum mod ulus principle.	• Lecture • Discussi on • Participati ve learning • Problem solving	• Group discussion on contour integrals	To understand integration of complex functions and related theorems	Evaluation through test paper and viva
Module III	Convergence of sequence and serie	• Lecture • Discussi	• Student seminar to	To understand Taylor series	Evaluation through

25 Hours	s of complex num bers,Taylor series, Laurents series , Absolute and Uniform convergence, Continuity of sum of powerseries, Differentiation and integration of power series, Multiplication and division of power series.	on ● Participati ve learning ● Problem solving	explain absolute and uniform convergence of power series	and Laurent series	Test paper and Group Discussion
Module IV **25 Hours**	Isolated singular points, Residues, Cauchy's residue theorem, Residue at infinity, Three t ypes of isolated singular points, Residues a t poles, Zeroes of analytic functions , Zeroes and poles, Applications of re sidues, Evaluation of improper integral	● Lecture ● Discussi ons ● Problem solving	● Assignments in finding isolated singular points and residues	To understand isolated singular points, residues and applications of residues	Evaluation through test paper

	s, Jordan's Lemma , Definite integral involving sines an d cosines.				

Course Outcomes

CO1	To understand difference between differentiability and analyticity of complex valued functions.
CO2	To learn indefinite integrals of complex valued functions.
CO3	Learn to express an analytic function as a power series.
CO4	To understand the concepts of singular points, residues, and applications of residues.

Teacher in Charge:

Ms. Athira V

MAT6B13(E02) : LINEAR PROGRAMMING

Lecture Hours per week: 3, Credits: 2

Internal: 20, External: 80, Examination 3 Hours

Objectives

Formulate our real life problem into a mathematical model also different techniques to solve LPP are introduced.

Module I (16 hrs)

Formulation, Convex sets, General LLP

Module II (14 hrs)

Simplex Method, Duality

Module III (18 hrs)

The transportation problem, The assignment Problems

Textbooks :

Gupta and Manmohan - Linear Programming And Theory of Games

Reference Books:

1. . K. V. Mital&Manmohan: Optimization methods in Operations Research and Systems Analysis, 3rdEdn., New Age International publishers.
2. DipakChatterjee: Linear Programming and Game Theory, Prentice Hall of India.

OBJECTIVE

1. Enable to formulate LPP from real life problem
2. Conceptulize the feasible region, feasible solution, optimal solution etc.
3. Solve the LPP with two variables using graphical method
4. Solve the LPP using simplex method
5. Formulate the dual problem from primal
6. Solve transportation problem and the assignment Problems which are relevent in daily life.

LESSON PLAN

Unit/ session/ hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **16 Hours**	Formulation, Convex sets, General LLP	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on formulation of lpp. • Seminar on the topic convex sets.	• Understand to formulate lpp.	Evaluation through test paper
Module II **14 Hours**	Simplex Method, Duality	• Lecture • Discussion • Participative learning • Problem solving	• Assignments in solving LPP using simplex method.	• Understand to solve lpp in finite number of steps using simplex method.	Evaluation through test paper and viva
Module III **18 Hours**	The transportation problem, The assignment Problems	• Lecture • Discussion • Participative learning • Problem solving	• Assignments related to solve transportation problems and assignment problems	• Enable one to solve transportation problem and the assignment Problems which are relevent in daily life.	Evaluation through Test paper and Group Discussion

Course Outcome

CO1	Enable one to formulate LPP from real life problem.

CO2	Solve the LPP with two variables using graphical method
CO3	Solve the LPP using simplex method
CO4	Solve transportation problem and the assignment Problems which are relevent in daily life.

Teacher in Charge:

Ms. Anjana Rajan

MAT6B12 : NUMBER THEORY AND LINEAR ALGEBRA

Lecture Hours per week: 5, Credits: 4

Internal: 30, External: 120, Examination 3 Hours

Objectives

To study about the integers and integer valued functions. Also introduce the concept of vector fields and linear transformations.

Module I (30 hrs)

Divisibility theory in the integers – the division algorithm, the greatest common divisor, the Euclidean algorithm, the Diophantine equation ax + by = c. Primes and their distribution. The fundamental theorem of arithmetic.The sieve of Eratosthenes. The theory of congruences.Basic properties of congruence.Binary and decimal representation of integers. Linear congruences and Chinese remainder theorem

Module II (25 hrs)

Fermat's little theorem and pseudoprimes Wilson's theorem. The sum and number of divisors.The greatest integer function.Euler's phi-function.Euler's generalization of Fermat's theorem.Properties of the phi-function.

Module III (15 hrs)

Vectorspaces-examples, linearcombinations, spanning, linearindependence, base, finite dimensional vector spaces.

Module IV (20 hrs)

Linear mappings- Linear transformations, examples, nullspace, rank –nullity theorem, linear isomorphism

Textbooks :

1. David M. Burton : Elementary Number Theory, Sixth Edn., TMH.

2. T. S. Blynth and E.F. Robertson: Basic Linear Algebra, second Edn springer under graduate mathematics series 2009

Reference Books:

1. C.Y. Hsiung : Elementary Theory of Numbers. Allied Publishers.
2. Neville Robbins : Beginning Number Theory, Second Ed. Narosa.
3. George E. Andrews : Number Theory, HPC.
4. Kenneth Hoffman & Ray Kunze : Linear Algebra, Pearson Education.
5. Frank Ayres, Jr. : Matrices, Schaum's Outline Series, Asian Student edition.
6. Devi Prasad : Elementary Linear Algebra, Narosa Pub. House

OBJECTIVE

1. Enable to find gcd using Euclidean algorithm.
2. To understand the solution of diophantine equations.
3. Enable to solve system of congruence using chinese remainder theorem.
4. To learn Wilson's theorem, Fermat's little theorem and Euler's theorem
5. Understand the concept of vector space and its basis.
6. Understand the concept of linear transformation and application of rank nullity theorem.

LESSON PLAN

Unit/ session/ hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **30 Hours**	The division algorithm, Gcd, the Euclidean algorithm, the Diophantine equation. Primes and their distribution. The fundamental theorem of arithmetic. The sieve of	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on gcd and euclidean algorithm. • Assignment in finding solution of system of congruence using chinese remainder	• Understand the linear congruence and the method for finding its solutions.	Evaluation through test paper

	Eratosthenes. The theory of congruences. Basic properties of congruence. Binary and decimal representation of integers. Linear congruences and Chinese remainder theorem.		theorem		
Module II **25 Hours**	Fermat's little theorem and pseudoprimes Wilson's theorem. The sum and number of divisors. The greatest integer function. Euler's phi-function. Euler's generalization of Fermat's theorem. Properties of the phi-function.	• Lecture • Discussion • Participative learning • Problem solving	• Assignments in finding sum and number of divisors • Seminar on the topic Euler's phi-function and Properties of the phi-function.	• Understand fermat's theorem, wilson's theorem, euler's theorem and its applications.	Evaluation through test paper and viva
Module III **15 Hours**	Vectorspaces-examples, linearcombinations, spanning, linearindependence, base, finite dimensional vector spaces.	• Lecture • Discussion • Participative learning • Problem solving	• Assignments related to vector space and its example.	• Understand the definition of vector space and its basis.	Evaluation through MCQ and Group Discussion
Module IV **20 Hours**	Linear mappings-Linear transformations, examples, nullspace, ranknullity theorem, linear isomorphism.	• Lecture • Discussions • Problem solving	• Student seminars inconnection with Linear transformation and its	• Become familiar with the concept of Linear transformations and rank	Evaluation through test paper

			example.	nullity theorem.	

Course Outcomes

CO1	To prove results involving divisibility, greatest common divisor, least commonmultiple and a few applications.
CO2	Enable to solve system of congruence and diophantine equation
CO3	To learn the theorems viz. Wilson's theorem, Fermat's little theorem and Euler's theorem and its applications.
CO4	To Lean if a set of vectors is a vector space or a basis for a vetor space.
CO5	Understand the concept of linear transformation and application of rank nullity theorem.

Teacher in Charge:

Ms. Anjana Rajan

MAT6B11 : NUMERICAL METHODS

Lecture Hours per week: 5, Credits: 4

Internal: 30, External: 120, Examination 3 Hours

Objectives

To provide techniques and algorithms to find approximate numerical solution to problems in several areas of mathematics.

Module I : Solution of Algebraic and Transcendental Equation (23 hrs)

Introduction, Bisection Method, Method of false position, Iteration method, Newton-Raphson Method, Ramanujan's method, The Secant Method, Finite Differences, Forward differences, Backward differences, Central differences, Symbolic relations and separation of symbols, Differences of a Polynomial.

Module II : Interpolation (23 hrs)

Newton's formulae for intrapolation, Central difference interpolation formulae, Gauss' Central Difference Formulae, Interpolation with unevenly spaced points, Langrange's interpolation formula, Divided differences and their properties, Newton's General interpolation formula, Inverse interpolation, Numerical Differentiation and Integration, Introduction, Numerical differentiation (using Newton's forward and backward formulae), Numerical Integration, Trapizoidal Rule, Simpson's 1/3-Rule , Simpson's 3/8-Rule.

Module III : Matrices and Linear Systems of equations (22 hrs)

Solution of Linear Systems – Direct Methods, Gauss elimination, Gauss-Jordan Method, Modification of Gauss method to compute the inverse, LU Decomposition, LU Decomposition from Gauss elimination, Solution of Linear Systems – Iterative methods, The eigen value problem, Eigen values of Symmetric Tridiazonal matrix.

Module IV : Numerical Solutions of Ordinary Differential Equations (22 hrs)

Introduction, Solution by Taylor's series, Picard's method of successive approximations, Euler's method, Modified Euler's Method, Runge-Kutta method, Predictor-Corrector Methods, Adams-Moulton Method, Milne's method.

Textbooks:

1) **S.S. Sastry** : Introductory Methods of Numerical Analysis, Fourth Edition, PHI.

Reference Books:

1) S. SankaraRao : Numerical Methods of Scientists and Engineer, 3rd ed., PHI.
2) F.B. Hidebrand : Introduction to Numerical Analysis, TMH.
3) J.B. Scarborough : Numerical Mathematical Analysis, Oxford and IBH

OBJECTIVES

1) To understand several methods such as bisection method, fixed point iteration method, regula falsi method etc.
2) To understand the concept of interpolation.
3) To solve system of linear equations using matrices.
4) To learn to find numerical approximations to solutions of initial value problems.

LESSON PLAN

Unit/ Hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **23 Hours**	Solution of Algebraic and Transcendental	• Lecture • Discussion • Participative	• Assignment in different methods to	To learn to solve equations	Evaluation through test paper

	Equation, Finite differences	learning • Problem solving	solve equations • Seminars in Finite differences	using different techniques.	
Module II **23 Hours**	Interpolation, Numerical Differentiation, Numerical Integration	• Lecture • Discussion • Participative learning • Problem solving	Assignments in different techniques.	To find derivatives and integrals at a point using numerical techniques.	Evaluation through test paper
Module III **22 Hours**	Matrices and Linear Systems of equations	• Lecture • Discussion • Participative learning • Problem solving	Seminar on which technique is better and easier.	To learn to use matrices to solve system of linear equations.	Evaluation through testpaper and Viva
Module IV **22 Hours**	Numerical Solutions of Ordinary Differential Equations	• Lecture • Discussions • Problem solving	Assignment related to IVP	To find out numerical approximations to solutions of initial value problems.	Evaluation through testpaper

Course Outcome

CO1	Understand several methods such as bisection method, fixed point iteration method, regula falsi method etc. to find out the approximate numerical solutions of algebraic and transcendental equations with desired accuracy.

CO2	Understand the concept of interpolation and also learn some well known interpolation techniques.
CO3	Understand a few techniques for numerical differentiation and integration and also realize their merits and demerits.
CO4	Find out numerical approximations to solutions of initial value problems and also to understand the efficiency of various methods.
CO5	Learn to solve system of linear equations using matrices.

Teacher in Charge:

Ms. Nima Maria

MAT6B09: REAL ANALYSIS

Lecture Hours per week: 5, Credits: 5

Internal: 30, External: 120, Examination 3 Hours

Objectives

To teach one how to combine different definitions, theorems and techniques to solve problems.

Module I : Continuous Functions (25 hrs)

Continuous functions, Continuous functions on intervals, Uniform continuity

Module II : Riemann Integral (25 hrs)

Riemann Integral, Riemann Integrable Functions, The fundamental theorem, Substitution theorem and application, Approximate Integration

Module III : Sequence and series of functions (20 hrs)

A quick review of series of real numbers, Pointwise and uniform convergence, Interchange of limit and continuity, Series of functions .

Module IV (20 hrs)

Improper Integrals : Improper integrals of the first kind, Improper integrals of the second kind,Cauchy Principal value, Improper Integrals of the third kind.

Beta and Gamma functions : Beta Functions, Gamma Functions, Relation between Beta and Gamma Functions

Textbooks:

1) **G. Bartle, Donald R. Sherbert** : Introduction to Real Analysis (3rd Edn.)
2) **R.R. Goldberg** : Methods of Real Analysis.
3) **Narayanan & Manicavachagom Pillay** : Calculus, Vol. II

Reference Books:

1) J.V. Deshpande: Mathematical Analysis and Applications, Narosa Pub. House.
2) Torence Tao : Analysis I, TRIM 37, Hindustan Book Agency.
3) K.A. Ross: Elementary Real Analysis : Theory of Calculus, Springer.
4) K.G. Binmore: Mathematical Analysis, CUP

OBJECTIVES

1) To state the definition of continuous functions, formulate sequential criteria for continuity and prove or disprove continuity of functions using this criteria.
2) To develop the notion of Riemann integrability of a function using the idea of tagged partitions and calculate the integral value of some simple functions using the definition.
3) To prove convergence and divergence of sequences of functions and series.
4) To learn the properties of and relationship among two important improper integrals.

LESSON PLAN

Unit/ Hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **25 Hours**	Continuous Functions, Uniform Continuity	• Lecture • Discussion • Participative learning • Problem	Assignment regarding difference in Continuity and Uniform	To understand several deep and fundamental results of	Evaluation through test paper

		solving	Continuity.	continuous functions on intervals.	
Module II **25 Hours**	Riemann Integral	• Lecture • Discussion • Participative learning • Problem solving	Student seminars related to Riemann Intregrability.	To understand a few basic and fundamental results of integration theory.	Evaluation through test paper
Module III **20 Hours**	Sequence and series of functions	• Lecture • Discussion • Participative learning • Problem solving	Assignment on convergence of series and sequences of functions.	To understand the difference between pointwise and uniform convergence of sequences and series of functions.	Evaluation through testpaper and Viva
Module IV **20 Hours**	Improper Integrals, Beta and Gamma functions	• Lecture • Discussion s • Problem solving	Seminars related to Improper Integrals and Principal Value.	To understand the notion of improper integrals, their convergence, principal value and evaluation.	Evaluation through testpaper

Course Outcomes

CO1	To understand several deep and fundamental results of continuous functions on intervals such as boundedness theorem, maximum-minimum theorem, intermediate value theorem, preservation of interval theorem and so on.
CO2	To develop the notion of Riemann integrability of a function using the idea of tagged partitions and calculate the integral value of some simple functions using the definition.
CO3	To learn and find out examples/counter examples to prove or disprove the validity of several mathematical statements that arise naturally in the process/context of learning.
CO4	To learn the properties of and relationship among two important improper integrals namely beta and gamma functions that frequently appear in mathematics, statistics, science and engineering.

Teacher in Charge:

Ms. Nima Maria

MTH1C01: ALGEBRA I
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the basic concepts of abstract algebra.

MODULE I

Plane Isometries, Direct products & finitely generated Abelian Groups, Factor Groups, Factor-Group Computations and Simple Groups, Group action on a set, Applications of G-set to counting

MODULE II

Isomorphism theorems, Series of groups, (Omit Butterfly Lemma and proof of the Schreier Theorem), Sylow theorems, Applications of the Sylow theory, Free Groups

MODULE III

Group Presentations, Rings of polynomials, Factorization of polynomials over a field, Non Commutative examples, Homomorphism and factor rings

TEXT:

JOHN B. FRALEIGH, A FIRST COURSE IN ABSTRACT ALGEBRA(7th Edn.), Pearson Education Inc., 2003.

REFERENCES :

[1] N. Bourbaki: Elements of Mathematics: Algebra I, Springer; 1998.

[2] Dummit and Foote: Abstract algebra(3rd edn.); Wiley India; 2011.

[3] P.A. Grillet: Abstract algebra(2nd edn.); Springer; 2007

[4] I.N. Herstein: Topics in Algebra(2nd Edn); John Wiley & Sons, 2006.

[5] T.W. Hungerford: Algebra; Springer Verlag GTM 73(4th Printing); 1987.

[6] N. Jacobson: Basic Algebra-Vol. I; Hindustan Publishing Corporation(India), Delhi; 1991.

[7] T.Y. Lam: Exercises in classical ring theory(2nd edn); Springer; 2003.

[8] C. Lanski: Concepts in Abstract Algebra; American Mathematical Society; 2010.

[9] N.H. Mc Coy: Introduction to modern algebra, Literary Licensing, LLC; 2012.

[10] S. M. Ross: Topics in Finite and Discrete Mathematics; Cambridge; 2000.

[11] J. Rotman: An Introduction to the Theory of Groups(4th edn.); Springer, 1999.

OBJECTIVES

a) **To understand the basic concepts of groups, factor groups, simple groups and group action on a set.**

b) **To get familiarize with Isomorphism theorems and its properties.**

c) **To understand the concept of sylow theorems and its applications.**

d) **To study more about rings of polynomials and factorization of polynomials over a field.**

e) **To understand homomorphism and factor ring.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (30 hours)	Plane Isometries, Abelian groups, Factor groups, Simple groups, group action on a set	● Lecture ● Discussion ● Participative learning ● Problem solving	● Peer group discussion on groups and its properties	To understand: ●the basics of different types of groups ●notion of group action on a set	Evaluation Through MCQ
Module I1 (30 hours)	Isomorphism theorems, Sylow theorems and its applications	● Lecture ● Discussion ● Participative learning ● Problem solving	● Student seminars to explain the properties of Isomprhism ● Peer group discussion on Sylow theorems	To understand: ●Isomorphism theorems and their significance ●Sylow theorems and its applications	Evaluation Through test paper

Module III (30 Hours)	Ring of polynomials, factorization of a polynomial over a field, homomorphism and factor rings	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on properties of homomorphism and factor rings	To understand: • homomorphism and factor rings • factorization of a polynomial over a field convergence	Evaluation through test paper

Course Outcomes

CO1	To get the idea of different types of groups and group action on a set
CO2	To understand the concept of isomorphism theorems and their significance, Sylow theorems and its applications
CO3	To understand factorization of a polynomial over a field, homomorphism and factor rings

Faculty in charge:
Dr. Nidhin T J

MTH1C05 – DISCRETE MATHEMATICS

Number of hours of lectures per week : 5 hrs

Number of credits : 4

OBJECTIVE

To understand concepts in graph theory, lattices and automata.

MODULE I

Order Relations, Lattices; Boolean Algebra Definition and Properties, Boolean Functions.

MODULE II

Basic concepts, Subgraphs, Degree of vertices, Paths and connectedness, Automorphism of a simple graph, Operations on graphs, Vertex cuts and Edge cuts, Connectivity and Edge connectivity, Trees-Definition, Characterization and Simple properties, Eulerian graphs, Planar and Non planar graphs, Euler formula and its consequences, K5 and K3,3 are non planar graphs, Dual of a plane graph.

MODULE III

Automata and Formal Languages: Introduction to the theory of Computation, Finite Automata.

TEXTBOOKS

TEXT 1: R. BALAKRISHNAN and K. RANGANATHAN, A TEXT BOOK OF GRAPH THEORY, Springer-Verlag New York, Inc., 2000.

TEXT 2: K. D JOSHI, FOUNDATIONS OF DISCRETE MATHEMATICS, New Age International(P) Limited, New Delhi, 1989.

TEXT 3: PETER LINZ, AN INTRODUCTION TO FORMAL LANGUAGES AND AUTOMATA (2nd Edn.), Narosa Publishing House, New Delhi, 1997.

REFERENCES

[1] J. C. Abbot: Sets, lattices and Boolean Algebras; Allyn and Bacon, Boston; 1969.

[2] J. A. Bondy, U.S.R. Murty: Graph Theory; Springer; 2000.

[3] S. M. Cioaba and M.R. Murty: A First Course in Graph Theory and Combinatorics; Hindustan Book Agency; 2009.

[4] J. A. Clalrk: A first look at Graph Theory; World Scientific; 1991.

OBJECTIVES

- To understand the definition of Boolean algebra and Boolean functions along with various properties.
- To study graph and its types with suitable examples.
- To learn about connectivity of graphs.
- To understand the definition of trees and learn various theorems related to it.
- To study about language, grammar and types of acceptors.

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I	Lattices; Boolean Algebra Definition and Properties, Boolean Functions	• Discussion • Participative learning • Problem solving	Seminars by students	To study about Boolean algebra and Boolean functions.	Evaluation through test paper.
MODULE II	Graph definition with examples, isomorphism, connected graphs, planar graphs, trees and eulerian graphs	• Lecture • Discussion • Participative learning • Problem solving	Assignments on isomorphism of graphs. Discussion about various definitions.	To learn basics about graphs and trees. To study about planarity and connectivity.	Evaluation through test paper.
MODULE III	Definition of automata. Languages and Grammars. DFA and NFA	• Lecture • Discussion • Participative learning • Problem solving	Discussion on applications of automata. Working out exercise problems on DFA and NFA	To know the basic about automata. To learn about DFA and NFA	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about Boolean algebra and Boolean functions.
CO2	To learn basics about graphs and trees. To study about planarity and connectivity.
CO3	To know the basic about automata. To learn about DFA and NFA

Faculty in Charge
Ms. Smitha Davis

Dr. Nidhin T J

MT1C02: LINEAR ALGEBRA
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the basic concepts of Linear Algebra.

MODULE I

Vector Spaces & Linear Transformations

MODULE II

Linear Transformations (continued) and Elementary Canonical Forms

MODULE III

Elementary Canonical Forms (continued), Inner Product Spaces

TEXT:

HOFFMAN K. and KUNZE R., LINEAR ALGEBRA (2nd Edn.), Prentice Hall of India, 199

REFERENCES :

[1] P. R. Halmos: Finite Dimensional Vector spaces; Narosa Pub House, New Delhi; 1980.

[2] A. K. Hazra: Matrix: Algebra, Calculus and generalised inverse- Part I; Cambridge International Science Publishing; 2007.

[3] I. N. Herstein: Topics in Algebra; Wiley Eastern Ltd Reprint; 1991.

[4] S. Kumaresan: Linear Algebra-A Geometric Approach; Prentice Hall of India; 2000.

[5] S. Lang: Linear Algebra; Addison Wesley Pub.Co.Reading, Mass; 1972.

[6] S. Maclane and G. Bikhrkhoff: Algebra; Macmillan Pub Co NY; 1967.

[7] N. H. McCoy and R. Thomas: Algebra; Allyn Bacon Inc NY; 1977.

[8] R. R. Stoll and E.T.Wong: Linear Algebra; Academic Press International Edn; 1968.

[9] G. Strang: linear algebra and its applications(4th edn.); Cengage Learning; 2006.

OBJECTIVES

a) **To understand the concept of vector spaces, basis and dimension.**

b) **To study about linear transformations and its properties.**

c) **To understand the concept of functionals and dual space**

d) **To study the relation between linear transformations and corresponding matrices.**

e) **To study about inner product spaces.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (30 hours)	Vector spaces, subspace, basis, dimension, properties, linear transformations	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on properties of vector spaces	To understand: •the basics of vector spaces, basis •notion of linear transformation •properties of linear transformation	Evaluation through test papers and interaction with students
Module I1 (35 hours)	linear transformations, functionals, dual space and elementary canonical transformations	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain the properties of linear transformations	To understand: •More about linear transformation •Significance of dual space	Evaluation through test paper
Module III (25	canonical transformations inner product spaces,	• Lecture • Discussion • Participative learning	• Seminar and assignment on inner product	To understand: • Inner product spaces	Evaluation through test paper

Hours)		• Problem solving	spaces	and their relevance • Orthogonal compliment and direct sums of vector spaces	

Course Outcomes

CO1	To understand the concept of vector spaces, their basis, dimension and linear transformations
CO2	To understand more about linear transformations and some of its important properties, elementary canonical forms
CO3	To introduce the concept of Inner product spaces, orthogonal compliment and direct sums of vector spaces

Faculty in charge:
Ms. Linet Roslin Antony

MT1C05: NUMBER THEORY

Number of hours of Lectures per week: 5

Number of Credits: 4

Objectives

To understand the basic concepts of Number Theory.

Module 1

Arithmetical functions and Dirichlet multiplication; Averages of arithmetical functions

Module 2

Some elementary theorems on the distribution of prime numbers

Module 3

Quadratic residues and quadratic reciprocity law ,Cryptography, Public key.

TEXT 1 : APOSTOL T.M., INTRODUCTION TO ANALYTIC NUMBER THEORY, Narosa Publishing House, New Delhi, 1990.

TEXT 2: KOBLITZ NEAL A., COURSE IN NUMBER THEROY AND CRYPTOGRAPHY, SpringerVerlag, NewYork, 1987.

References

[1] A. Beautelspacher: Cryptology; Mathematical Association of America (Incorporated); 1994

[2] H. Davenport: The higher arithmetic(6th Edn.); Cambridge Univ.Press; 1992

[3] G. H. Hardy and E.M. Wright: Introduction to the theory of numbers; Oxford International Edn; 1985

[4] A. Hurwitz & N. Kritiko: Lectures on Number Theory; Springer Verlag ,Universitext; 1986

[5] T. Koshy: Elementary Number Theory with Applications; Harcourt / Academic Press; 2002

[6] D. Redmond: Number Theory; Monographs & Texts in Mathematics No: 220; Marcel Dekker Inc.; 1994

[7] P. Ribenboim: The little book of Big Primes; Springer-Verlag, New York; 1991
[8] K.H. Rosen: Elementary Number Theory and its applications(3rd Edn.); Addison Wesley Pub Co.; 1993

[9] W. Stallings: Cryptography and Network Security-Principles and Practices; PHI; 2004

[10] D.R. Stinson: Cryptography- Theory and Practice(2nd Edn.); Chapman & Hall / CRC (214. Simon Sing : The Code Book The Fourth Estate London); 1999

[11] J. Stopple: A Primer of Analytic Number Theory-From Pythagorus to Riemann; Cambridge Univ Press; 2003

[12] S.Y. Yan: Number Theroy for Computing(2nd Edn.); Springer-Verlag; 2002

OBJECTIVES

a) **To understand the basic arithmetical functions and its averages.**

b) **To get familiarize with theorems on the distribution of prime numbers.**

c) **To understand quadratic residues, quadratic reciprocity law.**

d) **To study about basics of cryptography .**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (30 hours)	Arithmetical functions and Dirichlet multiplication; Averages of arithmetical functions	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on various arithmetic functions.	To understand: • Arithmetical functions • Dirichlet multiplication and derivatives of arithmetical functions • Averages of arithmetical functions.	Evaluation Through Test paper

Module I1 (30 hours)	Some elementary theorems on the distribution of prime numbers	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain theorems on distribution of prime numbers.	To understand: • Equivalent forms of prime number theorem. • Partial sums of Mobius function.	Evaluation Through test paper
Module III (30 Hours)	Quadratic residues and quadratic reciprocity law, Cryptography, Public key	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on legendre's symbol, its properties and Gauss lemma.	To understand: • Quadratic Residues and Quadratic reciprocity law,jacobi's symbol. • Basics of cryptography, types of crypto-system and its cryptanalysis.	Evaluation through test paper

Course Outcomes

CO1	To introduce the Arithmetical functions,Dirichlet multiplication and derivatives of arithmetical functions,Averages of arithmetic.
CO2	To understand the Equivalent forms of prime number theorem, Partial sums of Mobius function.
CO3	To understand the quadratic residues and quadratic reciprocity law, jacobi's symbol , basics of cryptography, types of cryptosystem and its cryptanalysis.

Faculty in charge:
Ms. Smitha Davis

MT1C03: REAL ANALYSIS I
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the basic concepts of real analysis.

MODULE I

Basic Topololgy, Finite, Countable and Uncountable sets Metric Spaces, Compact Sets, Perfect Sets, Connected Sets. Continuity - Limits of function, Continuous functions, Continuity and compactness, continuity and connectedness, Discontinuities, Monotonic functions, Infinite limits and Limits at Infinity

MODULE II

Differentiation The derivative of a real function, Mean Value theorems, The continuity of Derivatives, L Hospitals Rule, Derivatives of Higher Order, Taylors Theorem, Differentiation of Vector valued functions. The Riemann Stieltjes Integral, - Definition and Existence of the integral, properties of the integral, Integration and Differentiation

MODULE III

The Riemann Stieltjes Integral (Continued) - Integration of Vector vector-valued Functions, Rectifiable curves. Sequences and Series of Functions - Discussion of Main problem, Uniform convergence, Uniform convergence and continuity, Uniform convergence and Integration, Uniform convergence and Differentiation. Equicontinuous Families of Functions, The Stone Weierstrass

TEXT:

RUDIN W., PRINCIPLES OF MATHEMATICAL ANALYSIS (3rd Edn.), Mc. Graw-Hill, 1986.

REFERENCES :

[1] H. Amann and J. Escher: Analysis-I; Birkhuser; 2006.

[2] T. M. Apostol: Mathematical Analysis(2nd Edn.); Narosa; 2002.

[3] R. G. Bartle: Elements of Real Analysis(2nd Edn.); Wiley International Edn.; 1976.

[4] R. G. Bartle and D.R. Sherbert: Introduction to Real Analysis; John Wiley Bros; 1982.

[5] J. V. Deshpande: Mathematical Analysis and Applications- an Introduction; Alpha Science International; 2004.

OBJECTIVES

a) **To understand the basic concepts of Topology: Finite, Countable and Uncountable sets, Metric spaces, Compact sets, Perfect sets, Connected sets.**

b) **To develop the notion of continuity of functions in R^K.**

c) **To understand the concept of differentiation of real valued and complex valued functions.**

d) **To study about Riemann Stieltjes Integral and Rectifiable curves.**

e) **To understand the convergence of sequence and series of functions.**

f) **To understand the relation between uniform convergence and continuity, uniform convergence and differentiation, uniform convergence and integration**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (35 hours)	Basic topology, Continuous functions, continuity and compactness, continuity and connectedness, discontinuities	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on basic topology and continuity of functions	To understand: • the basics of topology • notion of continuity • difference between continuity and	Evaluation Through MCQ

				uniform continuity	
Module I1 (30 hours)	Differentiation, derivatives of higher order, differentiation of vector valued functions, Riemann Stieltjes Integral	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain the properties of differentiation and integration	To understand: • differentiation of vector valued functions • integration of vector valued functions	Evaluation Through test paper
Module III (25 Hours)	Convergence of sequence and series of functions, uniform convergence and continuity, uniform convergence and differentiation, uniform convergence and integration	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on properties of convergence of functions	To understand: • Convergence of sequence and series of functions • Differentiate between convergence and uniform convergence	Evaluation through test paper

Course Outcomes

CO1	To introduce the concept of basic topology, difference between continuous and uniformly continuous functions and its properties.
CO2	To understand the concept of differentiation of vector valued functions and integration of functions.
CO3	To understand the difference between pointwise convergence and uniform convergence of sequence of functions, convergence of series of functions

Faculty in charge:
Dr. Vijitha Mukundan

MTH2C06: ALGEBRA II
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the ideas and concepts of insolvability of the quintic.

MODULE I

Prime and Maximal Ideals, Introduction to Extension Fields, Algebraic Extensions (Omit Proof of the Existence of an Algebraic Closure), Geometric Constructions. [27, 29, 31, 32]

MODULE II

Finite Fields, Automorphisms of Fields, the Isomorphism Extension Theorem, Splitting Fields, Separable Extensions. [33, 48, 49, 50, 51]

MODULE III

Galois Theory, Illustration of Galois Theory, Cyclotomic Extensions, Insolvability of the Quintic. [53, 54, 55, 56]

TEXT: John B. Fraleigh: A FIRST COURSE IN ABSTRACT ALGEBRA (7th Edn), Pearson Education Inc., 2003.

REFERENCES :

[1] N. Bourbaki: Elements of Mathematics: Algebra I, Springer; 1998

[2] Dummit and Foote: Abstract algebra (3rd Edn); Wiley India; 2011

[3] M.H. Fenrick: Introduction to the Galois correspondence (2nd Edn); Birkhuser; 1998

[4] P.A. Grillet: Abstract algebra (2nd Edn); Springer; 2007

[5] I.N. Herstein: Topics in Algebra (2nd Edn); John Wiley & Sons, 2006.

[6] T.W. Hungerford: Algebra; Springer Verlag GTM 73 (4th Printing); 1987

[7] C. Lanski: Concepts in Abstract Algebra; American Mathematical Society; 2010

[8] R. Lidl and G. Pilz Applied abstract algebra(2nd edn.); Springer; 1998

[9] N.H. Mc Coy: Introduction to modern algebra, Literary Licensing, LLC; 2012

[10] J. Rotman: An Introduction to the Theory of Groups (4th Edn); Springer; 1999

[11] I. Stewart: Galois theory(3rd edn.); Chapman & Hall/CRC; 2003

OBJECTIVES

a) **To understand the basic concepts of Prime and Maximal Ideals.**

b) **To get familiarize with Algebraic Extensions.**

c) **To understand the Automorphisms of fields, Separable Extensions and Splitting Fields.**

d) **To study about the Galois Theory, Cyclotomic Extensions and the Insolvability of the Quintic.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (30 hours)	Prime and Maximal Ideals, Introduction to Extension Fields, Algebraic Extensions, Geometric Constructions.	● Lecture ● Discussion ● Participative learning ● Problem solving	● Peer group discussion on prime and maximal ideals and algebraic extensions	To understand: ●the basics of extension fields ●geometric constructions	Evaluation through MCQ
Module I1 (30 hours)	Finite Fields, Automorphisms of Fields, the Isomorphism Extension Theorem, Splitting Fields, Separable Extensions.	● Lecture ● Discussion ● Participative learning ● Problem solving	● Student seminars to explain about separable extensions	To understand: ●Isomorphism Extension Theorem Splitting and Separable Extensions	Evaluation through test paper
Module III (30 hours)	Galois Theory, Illustration of Galois Theory, Cyclotomic Extensions, Insolvability of the Quintic.	● Lecture ● Discussion ● Participative learning ● Problem solving	● Seminar and assignment on Cyclotomic Extensions	To understand: ● Galois Theory ● Insolvability of the Quintic	Evaluation through test paper

Course Outcomes

CO1	To introduce the concept of finite and extension fields, geometric constructions etc.
CO2	To understand the concept of Isomorphism Extension Theorem, Splitting and Separable Extensions.
CO3	To understand Galois theory and the Insolvability of the Quintic

Faculty in charge:
Ms. Linet Roslin Antony

MTH2C09: ODE AND CALCULUS OF VARIATIONS
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the basic concepts of ordinary differential equations and its applications.

MODULE I

Power Series Solutions and Special functions; Some Special Functions of Mathematical Physics.

MODULE II

Some special functions of Mathematical Physics (continued), Systems of First Order Equations; Non linear Equations

MODULE III

Oscillation Theory of Boundary Value Problems, The Existence and Uniqueness of Solutions, The Calculus of Variations.

TEXT:

SIMMONS, G.F., DIFFERENTIAL EQUATIONS WITH APPLICATIONS AND HISTORICAL NOTES (3rd Edn.), New Delhi, 1974.

REFERENCES :

[1] G. Birkhoff and G.C. Rota: Ordinary Differential Equations(3rd Edn.); Edn. Wiley & Sons; 1978

[2] W.E. Boyce and R.C. Diprima: Elementary Differential Equations and boundary value problems (2nd Edn.); John Wiley & Sons, NY; 1969

[3] A. Chakrabarti: Elements of ordinary Differential Equations and special functions; Wiley Eastern Ltd., New Delhi; 1990

[4] E.A. Coddington: An Introduction to Ordinary Differential Eqution; Printice Hall of India, New Delhi; 1974

[5] R.Courant and D. Hilbert: Methods of Mathematical Physics- vol I; Wiley Eastern Reprint; 1975

[6] P. Hartman: Ordinary Differential Equations; John Wiley & Sons; 1964 [7] L.S. Pontriyagin : A course in ordinary Differential Equations Hindustan Pub. Corporation, Delhi; 1967

[8] I. Sneddon: Elements of Partial Differential Equations; McGraw-Hill International, Edn.;1957

OBJECTIVES

a) **To study how to compute power series solution of first order ODE.**

b) **To get familiarize with some special functions of Mathematical Physics.**

c) **To study the methods to solve systems of first order equations.**

d) **To study more about qualitative properties of solutions.**

e) **To understand the concept of calculus of variations.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (35 hours)	Power series solutions of first order ODEs, special functions in Mathematical Physics	• Lecture • Discussion • Participative learning • Problem solving	• Problem solving sessions in groups. • Discussing the solutions obtained	To understand: • the basics of solutions of ODE • significance of special functions	Evaluation Through test papers
Module I1 (30 hours)	Solve systems of first order and nonlinear equations	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain nonlinear equations	To understand: • the method to solve systems of first order equations • theory of solutions of nonlinear equations	Evaluation through test paper
Module III (25 Hours)	Existence and uniqueness of solutions, calculus of variations	• Lecture • Discussion • Participative learning • Problem solving	• Assignment on existence and uniqueness of solutions • Discussion in peer groups on Calculus of Variations	To understand: • the applications in Calculus of variations • the qualitative nature of solutions	Evaluation through test paper

Course Outcomes

CO1	To understand the power series solutions of ordinary differential equations and the significance of special functions.
CO2	To know more about special functions, systems of first order equations and nonlinear equations
CO3	To understand the qualitative nature of solutions and calculus of variation.

Faculty in charge:
Dr. Vijitha Mukundan

MTH2C10 – OPERATIONS RESEARCH

Number of hours of lectures per week : 5 hrs

Number of credits : 4

OBJECTIVE

To learn various methods to solve an LPP and study about game theory and networking.

MODULE I

Convex Functions; Linear Programming

MODULE II

Linear Programming (contd.); Transportation Problem

MODULE III

Integer Programming; Sensitivity Analysis; Flow and Potential in Networks; Theory of Games

TEXTBOOK

K.V. MITAL; C. MOHAN., OPTIMIZATION METHODS IN OPERATIONS RESEARCH AND SYSTEMS ANALYSIS(3rd. Edn.), New Age International(P) Ltd., 1996.

REFERENCES

[1] R.L. Ackoff and M.W. Sasioni: Fundamentals of Operations Research; Wiley Eastern Ltd. New Delhi; 1991

[2] C.S. Beightler, D.T. Philiphs and D.J. Wilde: Foundations of optimization(2nd Edn.); Prentice Hall of India, Delhi; 1979

[3] G. Hadley: Linear Programming; Addison-Wesley Pub Co Reading, Mass; 1975

[4] G. Hadley: Non-linear and Dynamic Programming; Wiley Eastern Pub Co. Reading, Mass; 1964

OBJECTIVES

- To learn about convex function and few theorems related to it.
- To study LPP and simplex method to solve it.

- ❖ Understand and solve transportation problems.
- ❖ To study about the sensitivity analysis.
- ❖ To learn flow and networks.
- ❖ To understand the problems related to game theory.

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I	Convex functions. Definition of LPP.	● Discussion ● Participative learning ● Problem solving ● Lecture	Assignments on LPP	To study about convex functions and definition of LPP	Evaluation through test paper.
MODULE II	Simplex method to solve LPP. Transportation problem. VAM and MODI method to solve transportation problem.	● Lecture ● Discussion ● Participative learning ● Problem solving	Assignments on simplex method and solving of transportation method	To learn to solve LPP using simplex method. To solve Transportation problem.	Evaluation through test paper.
MODULE III	Integer programming and sensitivity analysis. Networking. Introduction to Game theory.	● Lecture ● Discussion ● Participative learning ● Problem solving	Seminar by students on sensitivity analysis. Methods to solve flow and network. Game theory problem solving.	Discussion on sensitivity analysis. To solve networks and problems on game theory.	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about convex functions
CO2	To learn about methods to solve LPP and transportation problems
CO3	To know about sensitivity in LPP and methods to solve networks. To understand game theory.

Faculty in charge:

Ms. Smitha Davis

Dr. Nidhin T J

MTH2C07: REAL ANALYSIS II
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the advanced concepts of real analysis.

MODULE I

The Real Numbers: Sets, Sequences and Functions, Sigma Algebra, Borel sets, Lebesgue Measure, Lebesgue Measurable Functions

MODULE II

Lebesgue Integration, Lebesgue Integration: Further topics

MODULE III

Differentiation and Integration, The L^p spaces : Completeness and Approximation

TEXT:

H. L.Royden ,P. M. FitzpatrickH.L. REAL ANAYLSIS (4th Edn.), Prentice Hall of India, 2000.

REFERENCES :

[1] K B. Athreya and S N Lahiri:,Measure theory,Hindustan Book Agency,New Delhi,(2006).

[2] R G Bartle:, The Elements of Integration and Lebsgue Mesure , Wiley(1995).

[3] S K Berberian: ,measure theory and Integration,The Mc Millan Company,New York,(1965).

[4] L M Graves: ,The Theory of Functions of Real Variable Tata McGraw-Hill Book Co(1978)

[5] P R Halmos: , Measure Theory, GTM ,Springer Verlag [6] W Rudin:, Real and Complex Analysis,Tata McGraw Hill,New Delhi,2006

[7] I K Rana:,An Introduction to Measure and Integration,Narosa Publishing Company,New York.

[8] Terence Tao: ,An Introduction to Measure Theory,Graduate Studies in Mathematics,Vol 126 AMS

OBJECTIVES

a) **To understand the basic concepts of Sigma Algebra, Borel sets.**

b) **To understand Lebesgue Measure and Lebesgue Measurable Functions and its properties**

c) **To understand the concept of Lebesgue Integration,**

d) **To perform differentiation and Integration**

e) **To study about the L^p spaces : Completeness and Approximation**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (30 hours)	Sets, Sequences and Functions, Sigma Algebra, Borel sets, Lebesgue Measure, Lebesgue Measurable Functions	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on Lebesgue measure and Lebesgue measurable functions	To understand: •the basics of sigma algebra •notion of Lebesgue measure and measurable functions	Evaluation through interaction with students and test papers
Module I1 (30 hours)	Lebesgue Integration	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars on some topics of Lebesgue integration	To understand: •Concepts of Lebesgue integration	Evaluation through test paper
Module II1 (30 hours)	Differentiation and Integration, The L^p spaces : Completeness and	• Lecture • Discussion • Participative learning	• Assignments on Differentiatio	To understand: •Concepts of L^pspaces	Evaluation through test paper

	Approximation	• Problem solving	n and Integration		

Course Outcomes

CO1	To introduce the concept of Sigma Algebra, Borel sets, Lebesgue Measure, Lebesgue Measurable Functions
CO2	To understand the concept of Lebesgue integration, the L^p spaces : Completeness and Approximation
CO3	To understand the concept of differentiation and integration.

Faculty in charge:
Dr. Nidhin T J

MTH2C08: TOPOLOGY
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the motivation and concepts of topology.

MODULE I

A Quick Revision of Chapter 1,2 and 3. Topological space, basic concepts [Chapter 4 and Chapter5 Section 1, Section 2(excluding 2.11 and 2.12) and Section 3 only]

MODULE II

Making Functions Continuous, quotient spaces, spaces with special properties [Chapter 5 Section 4 and Chapter 6]

MODULE III

Separation axioms: Hierarchy of separation axioms, Compactness and separation axioms, The Urysohn characterization of normality, Tietze characterization of normality.[Chapter 7 Section 1 to 3 and Section 4 up to and including 4.6]

TEXT:

JOSHI K D, INTRODUCTION TO GENERAL TOPOLOGY (Revised Edn.), New Age International (P) Ltd., New Delhi, 1983

Inc., 2003.

REFERENCES :

[1] M A Armstrong: Basic Topology, Springer- Verlag New York; 1983.

[2] J Dugundji: Topology; Prentice hall of India; 1975.

[3] M Gemignani: Elementary Topology; Addison Wesley Pub Co Reading Mass, 1971

[4] M G Murdeshwar: General Topology(2nd Edn);Wiley Eastern Ltd, 1990

[5] G F Simmons: Introduction to Topology and modern analysis; McGraw-Hill international student Edn;1963.

OBJECTIVES

a) **To understand the basic concepts of Topological Spaces.**

b) **To get familiarize with making functions continuous, Quotient Spaces.**

c) **To understand the separation axioms, Hierarchy of separation axioms, compactness and separation axioms.**

d) **To study the Urysohn characterization of normality, Tietze characterization of normality.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (30 hours)	Topological Spaces, Basic concepts	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on basic topology and topological space	To understand: ●the basics of topology ●topological spaces ●different types of topologies	Evaluation Through MCQ
Module I1 (30 hours)	Making functions continuous, quotient spaces, spaces with special properties	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain about making functions continuous	To understand: ●Compact Lindeloff spaces ●Connectedness Local Connectedness	Evaluation Through test paper

				Path Connectedness	
Module III (30 Hours)	Separation axioms: Hierarchy of separation axioms, compactness and separation axioms, The Urysohn characterization of normality, Tietze characterization of normality	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on separation axioms	To understand: • Separation axioms • Urysohn characterization of normality	Evaluation through test paper

Course Outcomes

CO1	To introduce the concept of basic topology, topological space, different types of topologies.
CO2	To understand the concept of making functions continuous, quotient spaces
CO3	To understand the separation axioms, the Urysohn characterization of normality, Tietz characterization of normality

Faculty in charge:
Ms. Smitha Davis

MTH3C12: COMPLEX ANALYSIS
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the ideas and concepts of analytic functions and singularities..

MODULE I

The extended plane and its spherical representation, Power series, Analytic functions, Analytic functions as mappings, Mobius transformations, Riemann-Stieltijes integrals [Chapt. I Section 6; Chapt. III Sections 1, 2 and 3; Chapter IV Section 1]

MODULE II

Power series representation of analytic functions, Zeros of an analytic function, The index of a closed curve, Cauchy's Theorem and Integral Formula, The homotopic version of Cauchys Theorem and simple connectivity, Counting zeros; the Open Mapping Theorem and Goursats Theorem.

MODULE III

The classification of singularities, Residues, The Argument Principle and The Maximum Principle, Schwarz's Lemma, Convex functions and Hadamards three circles theorem [Chapt. V: Sections 1, 2, 3; Chapter VI Sections 1, 2, 3]

TEXT: JOHN B. CONWAY, FUNCTIONS OF ONE COMPLEX VARIABLE (2nd Edn.);
Springer International Student Edition; 1992.

REFERENCES :

[1] H. Cartan: Elementary Theory of analytic functions of one or several variables;
Addison - Wesley Pub. Co.; 1973
[2] T.W. Gamelin: Complex Analysis; Springer-Verlag, NY Inc.; 2001
[3] T.O. Moore and E.H. Hadlock: Complex Analysis, Series in Pure Mathematics - Vol. 9; World Scientific; 1991
[4] L. Pennisi: Elements of Complex Variables (2nd Edn.); Holf, Rinehart & Winston; 1976
[5] R. Remmert: Theory of Complex Functions; UTM , Springer-Verlag, NY; 1991
[6] W. Rudin: Real and Complex Analysis (3rd Edn.); Mc Graw - Hill International Editions; 1987
[7] H. Sliverman: Complex Variables; Houghton Mifflin Co. Boston; 1975 [11] I. Stewart: Galois theory (3rd edn); Chapman & Hall/CRC; 2003

OBJECTIVES

a) **To understand the basic concepts of** Power series, Analytic functions, Analytic functions as mappings and Mobius transformations.

b) **To get familiarize with** Riemann-Stieltijes integrals**.**

c) **To understand the** Power series representation of analytic functions, Zeros of an analytic function, The index of a closed curve, Cauchy's Theorem and Integral Formula and the classification of singularities.

LESSON PLAN

Unit/ session/ hours (time required)	**Topics to be taught (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module 1 (30 hours)	The extended plane and its spherical representation, Power series, Analytic functions, Analytic functions as mappings, Mobius transformations, Riemann-Stieltijes integrals	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on Power series and Analytic functions	To understand: • Analytic functions as mappings • Riemann-Stieltijes integrals	Evaluation through MCQ
Module I1 (30 hours)	Power series representation of analytic functions, Zeros of an analytic function, The index of a closed curve, Cauchy's Theorem and Integral Formula, The homotopic version of Cauchys Theorem and simple connectivity, Counting zeros; the Open Mapping Theorem and Goursat's Theorem.	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain about Power series representation of analytic functions	To understand: • Cauchy's Theorem and Integral Formula • Open Mapping Theorem and Goursat's Theorem.	Evaluation through test paper

Module III (30 hours)	The classification of singularities, Residues, The Argument Principle and The Maximum Principle, Schwarz's Lemma, Convex functions and Hadamard's three circles theorem.	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on classification of singularities	To understand: • Maximum Principle, Schwarz's Lemma, Convex functions	Evaluation through test paper

Course Outcomes

CO1	To introduce the concept of Power series and Analytic functions
CO2	To understand the concept of Cauchy's Theorem and Integral Formula, Open Mapping Theorem and Goursat's Theorem.
CO3	To understand the Argument Principle, the Maximum Principle and Schwarz's Lemma.

Faculty in charge:
Ms. Linet Roslin Antony

MTH3E02 – CRYPTOGRAPHY

Number of hours of lectures per week : 5 hrs

Number of credits : 4

OBJECTIVE

To understand concepts in Cryptosystems, it's working and Hash functions.

MODULE I

Classical Cryptography: Some Simple Cryptosystems, Shift Cipher, Substitution Cipher, Affine Cipher, Vigenere Cipher, Hill Cipher, Permutation Cipher, Stream Ciphers. Cryptanalysis of the Affine, Substitution, Vigenere, Hill and LFSR Stream Cipher.

MODULE II

Shannons Theory:- Elementary Probability Theory, Perfect Secrecy, Entropy, Huffmann Encodings, Properties of Entropy, Spurious Keys and Unicity Distance, Product Cryptosystem.

MODULE III

Block Ciphers: Substitution Permutation Networks, Linear Cryptanalysis, Differential Cryptanalysis , Data Encryption Standard (DES), Advanced Encryption Standard (AES). Cryptographic Hash Functions: Hash Functions and Data integrity, Security of Hash Functions, iterated hash functions- MD5, SHA 1, Message Authentication Codes, Unconditionally Secure MAC s.

TEXTBOOKS

Douglas R. Stinson, Cryptography Theory and Practice, Chapman & Hall, 2nd Edition.

REFERENCES

[1] Jeffrey Hoffstein: Jill Pipher, Joseph H. Silverman, An Introduction to Mathemaical Cryptography, Springer International Edition

.

[2] H. Deffs & H. Knebl: Introduction to Cryptography, Springer Verlag, 2002.

[3] Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone: Handbook of Applied Cryptography, CRC Press, 1996.

[4] William Stallings: Cryptography and Network Security Principles and Practice, Third Edition, Prentice-hall India, 2003.

OBJECTIVES

- To understand various cryptosystems and its crpytanalysis.

- To learn Shannons Theory AES and DES in detail
- To learn about Huffmann encodiungs and product cryptosystem.
- To understand block ciphers and its construction.
- To study in detail about Hash functions and its variations.

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I (15 hours)	Crpytosystem definition, Important cryptosystems and its Cryptanalysis	• Discussion • Participative learning • Problem solving	Discussions Lectures and Quizzes	To study about Cryptosystems and its constructions and breaking.	Evaluation through test paper.
MODULE II (18 hours)	Concepts of perfect secrecy, Shannon's theory, Unicity distance and spurious keys and product cryptosystem	• Lecture • Discussion • Participative learning • Problem solving	. Discussion about perfect secrecy .	To learn Shannon's theory, constructions and product cryptosystem.	Evaluation through test paper.
MODULE III (22 hours)	Block Ciphers, DES, AES, Hash functions, iterated hash functions, MAC's	• Lecture • Discussion • Participative learning • Problem solving	Discussion on Hash functions and block ciphers	Construction of DES, AES, Iterated Hash functions	Evaluation through MCQ.

COURSE OUTCOME

CO1	To study about classical cryptosystems and its cryptanalysis.
CO2	To learn Shannon's theory and perfect secrecy To study about product cryptosystems
CO3	To know about construction of various block ciphers To learn about iterated hash functions

Faculty in Charge

Ms. Smitha Davis

MTH3C13 – FUNCTIONAL ANALYSIS

Number of hours of lectures per week : 5 hrs

Number of credits : 4

OBJECTIVE

To understand various linear spaces and their corresponding properties.

MODULE I

Linear Spaces; normed spaces;first examples: Linear spaces, Normed spaces;first examples, Holder's inequality, Minkowski's ineaquality, Topological and geometric notions, Quotient normed space, Completeness;completion.

MODULE II

Hilbert spaces: Basic notions; first examples, Cauchy- Schwartz inequality and Hilbertian norm,Bessels inequality,Complete systems, Gram-Schmidt orthogonalization procedure, orthogonal bases, Parseval' identity; Projection; orthogonal decompositions; Separable case, The distance from a point to a convex set, Orthogonal decomposition; linear functionals; Linear functionals in a general linear space, Bounded linear functionals, Bounded linear functionals in a Hilbert space, An example of a non separable Hilbert space

MODULE III

The dual space; The Hahn Banach Theorem and its first consequences, corollaries of the Hahn Banach theorem, Examples of dual spaces. Bounded linear Operators; Completeness of the space of bounded linear operators, Examples of linear operators, Compact operators, Compact sets, The space of compact operators, Dual operators ,Operators of finite rank, Compactness of the integral operators in L2, Convergence in the space of bounded operators, Invertible operators

TEXTBOOK

YULI EIDELMAN, VITALI MILMAN & ANTONIS TSOLOMITIS; FUNCTIONAL ANALYSIS AN INTRODUCTION; AMS, Providence, Rhode Island 2004

REFERENCES

[1] B. V. Limaye: Functional Analysis, New Age International Ltd, New Delhi, 1996.

[2] G. Bachman and L. Narici: Functional Analysis; Academic Press, NY; 1970

[3] J. B. Conway: Functional Analysis; Narosa Pub House, New Delhi; 1978

[4] J. Dieudonne: Foundations of Modern analysis; Academic Press; 1969

OBJECTIVES

- To define normed spaces with examples and its completeness.
- To study about quotient spaces.
- To understand Hilbert spaces and its completeness along with examples
- To study about Projection and linear functionals.
- To understand the concept of duality of these spaces.
- To learn about compact linear operators.

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I	Normed spaces and examples. Quotient space. Completeness.	• Discussion • Participative learning • Problem solving • Lecture	Assignments on examples of normed spaces	To study about normed spaces and its completeness. To define quotient spaces.	Evaluation through test paper.
MODULE II	Hilbert spaces. Projection and Bounded linear functionals. Seperability.	• Lecture • Discussion • Participative learning • Problem solving	Assignments on Projection mapping. Seminar by students on examples	To learn about Hilbert spaces, Projection and linear functionals along with its properties	Evaluation through test paper.
MODULE III	Dual spaces and examples. Hahn Banach theorem. Operators and its properties	• Lecture • Discussion • Participative learning • Problem solving	Seminar by students Assignment on examples of operators.	To study Dual Spaces and operators. To learn about Hahn Banach theorem.	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about normed spaces and its properties
CO2	To learn about Hilbert spaces, Projection and Linear functionals.
CO3	To study about duality.

Faculty in charge:

Ms. Amala Mary George

MTH3C11 – MULTIVARIABLE CALCULUS AND GEOMETRY

Number of hours of lectures per week : 5 hrs

Number of credits : 4

OBJECTIVE

To understand concepts in Differential Geometry

MODULE I

Functions of Several Variables Linear Transformations, Differentiation, The Contraction Principle, The Inverse Function Theorem, the Implicit Function Theorem.

MODULE II

What is a curve? Arc-length, Reparametrization, Closed curves, Level curves versus parametrized curves. Curvature, Plane curves, Space curves What is a surface, Smooth surfaces, Smooth maps, Tangents and derivatives, Normals and orientability.

MODULE III

Level surfaces, Ruled surfaces and surfaces of revolution, Applications of the inverse function theorem, Lengths of curves on surfaces, Equiareal maps and a theorem of Archimedes, The second fundamental form, The Gauss and Weingarten maps, Normal and geodesic curvatures. Gaussian and mean curvatures, Principal curvatures of a surface.

TEXTBOOKS

TEXT 1 : RUDIN W., PRINCIPLES OF MATHEMATICAL ANALYSIS, (3rd Edn.), Mc. Graw Hill, 1986.

TEXT 2: ANDREW PRESSLEY, ELEMENTARY DIFFERENTIAL GEOMETRY(2nd Edn.), Springer-Verlag, 2010.

REFERENCES

[1] M. P. do Carmo: Differential Geometry of Curves and Surfaces;

[2] W. Klingenberg: A course in Differential Geometry;

[3] J. R. Munkres: Analysis on Manifolds; Westview Press; 1997

[4] C. C. Pugh: Real Mathematical Analysis, Springer; 2010

[5] M. Spivak: A Comprehensive Introduction to Differential Geometry-Vol. I; Publish

or Perish, Boston; 1970

[6] M. Spivak: Calculus on Manifolds; Westview Press; 1971

[7] V.A. Zorich: Mathematical Analysis-I; Springer; 2008

OBJECTIVES

- To understand functions of several variables and its differentiation
- To study curves, level curves and curvature.
- To learn about surfaces and its properties as normal, orientablity and tangents.
- To understand the definition Guass Weingarten maps
- To study about Guassian, mean curvatures

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I	The Contraction Principle, The Inverse Function Theorem, the Implicit Function Theorem.	• Discussion • Participative learning • Problem solving	Seminars by students	To study about Functions of Several Variables Linear Transformations and its properties	Evaluation through test paper.
MODULE II	Arc-length, Reparametrization, Level curves versus parametrized curves. Curvature, Tangents and derivatives, Normals and orientability.	• Lecture • Discussion • Participative learning • Problem solving	Assignments on Tangents and derivatives. Discussion about various definitions.	To learn basics about Curves, Level curves, curvature, Smooth maps,Tangents, Normals.	Evaluation through MCQ

MODULE III	Level surfaces, Applications of the inverse function theorem, Normal and geodesic curvatures. Gaussian and mean curvatures, Principal curvatures of a surface.	• Lecture • Discussion • Participative learning • Problem solving	Discussion on Surfaces and its properties.	To know the about Level, ruled surfaces, Guassian, mean, principal curvatures. The Gauss and Weingarten maps,	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about functions of several variables
CO2	To learn about the analytical and geometric concepts of curves and its variations To study about cuvature and sufaces
CO3	To know The Gauss and Weingarten maps, To learn Guassian and mean curvature.

Faculty in Charge

Dr. Nidhin T J

MTH3C14: PDE and Integral Equations
Number of hours of Lectures per week: 5
Number of Credits: 4

Objectives

To understand the basic theory of PDE and Integral Equations.

MODULE I

First-order equations: Introduction, Quasilinear equations, The method of characteristics, Examples of the characteristics method, The existence and uniqueness theorem, The Lagrange method, Conservation laws and shock waves, The eikonal equation, General nonlinear equations, Exercises. Second-order linear equations in two indenpendent variables: Introduction, Classification, Canonical form of hyperbolic equations, Canonical form of parabolic equations, Canonical form of elliptic equations, Exercises ,The one-dimensional wave equation: Introduction, Canonical form and general solution, The Cauchy problem and d'Alemberts formula, Domain of dependence and region of influence, The Cauchy problem for the nonhomogeneous wave equation, Exercises

MODULE II

The method of separation of variables: Introduction, Heat equation: homogeneous boundary condition, Separation of variables for the wave equation, Separation of variables for nonhomogeneous equations, The energy method and uniqueness, Further applications of the heat equation, Exercises Elliptic equations: Introduction, Basic properties of elliptic problems, The maximum principle, Applications of the maximum principle, Greens identities, The maximum principle for the heat equation, Separation of variables for elliptic problems, Poissons formula, Exercises Greens functions and integral representations:Introduction, Greens function for Dirichlet problem in the plane, Neumanns function in the plane, The heat kernel, Exercises

MODULE III

Integral Equations: Introduction, Relations between differential and integral equations, The Green's functions, Fredholom equations with separable kernels, Illustrative examples, Hilbert- Schmidt

Theory, Iterative methods for solving Equations of the second kind. The Newmann Series, Fredholm Theory

TEXT 1: AN INTRODUCTION TO PARTIAL DIFFERENTIAL EQUATIONS, YEHUDA PINCHOVER AND JACOB RUBINSTEIN, Cambridge University Press

TEXT 2: HILDEBRAND, F.B., METHODS OF APPLIED MATHEMATICS (2nd Edn.), Prentice-Hall of India, New Delhi, 1972.

REFERENCES :

[1] Amaranath T.:Partial Differential Equations, Narosa, New Delhi, 1997.
[2] A. Chakrabarti: Elements of ordinary Differential Equations and special functions; Wiley Eastern Ltd, New Delhi; 1990
[3] E.A. Coddington: An Introduction to Ordinary Differential Eqution Printice Hall of India ,New Delhi; 1974
[4] R. Courant and D.Hilbert: Methods of Mathematical Physics-Vol I; Wiley Eastern Reprint; 1975
[5] P. Hartman: Ordinary Differential Equations; John Wiley & Sons; 1964
[6] F. John: Partial Differential Equations; Narosa Pub House New Delhi; 1986
[7] Phoolan Prasad Renuka Ravindran: Partial Differential Equations; Wiley Eastern Ltd, New Delhi; 1985
[8] L.S. Pontriyagin: A course in ordinary Differential Equations; Hindustan Pub. Corpporation, Delhi; 1967
[9] I. Sneddon: Elements of Partial Differential Equations; McGraw-Hill International Edn.;1957

OBJECTIVES

a) **To study the basic concepts of solving partial differential equations analytically.**

b) **To study different methods for solving second order linear and nonlinear pde**

c) **To understand the relation between integral equations and differential equations and to study different methods to solve integral equations.**

d) **To understand the nature of solutions of PDEs.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (35 hours)	Quasilinear equations, method of characteristics, the Lagrange method, general nonlinear equations	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on solutions of pde and transversality condition	To understand: • the nature of solution of PDE • graphical method to solve pde • the nature of solution of nonlinear PDE	Evaluation through test paper and interaction with students
Module I1 (30 hours)	Separation of variables, canonical form, energy method and elliptic equations	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to understand the method of separation of variables	To understand: • Methods to solve second order PDE • Solutions of elliptic equations • Energy method	Evaluation Through test paper
Module III (25 Hours)	Integral equations, Fredholm and Volterra equations, Resolvent kernel,Neumann series, Fredholm Schmidt theory	• Lecture • Discussion • Participative learning • Problem solving	• Assignment and problem solving sessions on Integral equations	To understand: • Relation between integral equation and differential equation • Methods to solve integral	Evaluation through test paper

				equations of different kinds	

Course Outcomes

CO1	To study solutions of PDE and to understand the nature of solutions via characteristic curves, graphical method.
CO2	To study methods of solving second order PDE, elliptic PDEs and energy method
CO3	To understand the relation between differential equation and integral equations, also different methods to solve integral equations.

Faculty in charge:
Dr. Vijitha Mukundan

MTH4E06: Algebraic Number Theory
Number of hours of Lectures per week: 5
Number of Credits: 3

Objectives

To understand the concepts of Algebraic Number Theory.

MODULE I

Symmetric polynomials, Modules, Free abelian groups, Algebraic Numbers, Conjugates and Discriminants, Algebraic Integers, Integral Bases, Norms and Traces, Rings of Integers, Quadratic Fields, Cyclotomic Fields

MODULE II

Historical background, Trivial Factorizations, Factorization into Irreducibles, Examples of Nonunique Factorization into Irreducibles, Prime Factorization, Euclidean Domains, Euclidean Quadratic fields Ideals Historical background, Prime Factorization of Ideals, The norm of an ideal

MODULE III

Lattices, The Quotient Torus, Minkowski theorem, The Space Lst, The Class-Group An Existence Theorem, Finiteness of the Class-Group, Factorization of a Rational Prime, Fermats Last Theorem Some history, Elementary Considerations, Kummers Lemma, Kummers Theorem.

TEXT : I. N. STEWART & D.O. TALL, ALGEBRAIC NUMBER THEORY, (2nd Edn.), Chapman & Hall, (1987)

REFERENCES :

[1] P. Samuel : Theory of Algebraic Numbers, Herman Paris Houghton Mifflin, NY, (1975)
[2] S. Lang : Algebraic Number Theory, Addison Wesley Pub Co., Reading, Mass, (1970)
[3] bf D. Marcus : Number Fields, Universitext, Springer Verlag, NY, (1976)
[4] 4T.I.FR. Pamphlet No: 4 : Algebraic Number Theory (Bombay, 1966)
[5] Harvey Cohn : Advanced Number Theory, Dover Publications Inc., NY, (1980)
[6] Andre Weil : Basic Number Theory, (3rd Edn.), Springer Verlag, NY, (1974)
[7] G.H. Hardy and E.M. Wright : An Introduction to the Theory of Numbers, Oxford University Press.
[8] Z.I. Borevich & I.R.Shafarevich : Number Theory, Academic Press, NY 1966.
[9] Esmonde & Ram Murthy : Problems in Algebraic Number Theory, Springer Verlag 2000

OBJECTIVES

a) **To study the basic concepts of numberfield, quadratic field, Guassian field and their properties.**

b) **To study how factorization into irreducibles hold in different fields.**

c) **To understand the concepts of lattices, the quotient torus and geometric representation of algebraic numbers.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (35 hours)	Factorization into Irreducibles, Examples of Nonunique Factorization into Irreducibles, Prime Factorization, Euclidean Domains, Euclidean Quadratic fields Ideals, Prime Factorization of Ideals,	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on numberfields and its properties	To understand: • the factorization into irreducibles • different types of numberfields • the factorization of ideals • properties of ideals	Evaluation through test paper and interaction with students

Module I1 (30 hours)	Examples of Nonunique Factorization into Irreducibles, Prime Factorization, Euclidean Domains, Euclidean Quadratic fields Ideals Historical background, Prime Factorization of Ideals, The norm of an ideal	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to understand prime factorization and quadratic fields	To understand: • Nonunique Factorization into Irreducibles • Factorization of Ideals and norm of an ideal	Evaluation Through test paper
Module III (25 Hours)	Lattices, The Quotient Torus, Minkowski theorem, The Space Lst, The Class-Group An Existence Theorem, Finiteness of the Class-Group, Factorization of a Rational Prime, Kummers Lemma, Kummers Theorem	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion and assignments to understand geometric representation of algebraic numbers	To understand: • The Quotient Torus • The class group	Evaluation through test paper

Course Outcomes

CO1	Awareness about different types of numberfield and their properties
CO2	Able to check unique factorization in fields and also can provide examples of nonunique factorizations
CO3	To understand the geometric representation of algebraic numbers

Faculty in charge:
Dr. Vijitha Mukundan

MTH4C15 – ADVANCED FUNCTIONAL ANALYSIS

Number of hours of lectures per week : 5 hrs

Number of credits : 4

OBJECTIVE

To learn about the fundamental and basic theorems in functional analysis.

MODULE I

Spectrum, Fredholm Theory of Compact operators; Classification of spectrum, Fredholm Theory of Compact operators. Self adjoint operators; General properties, Self adjoint compact operators, spectral theory, Minimax principle, Applications to integral operators.

MODULE II

Order in the space of self-adjoint operators, properties of the ordering; Projection operators; properties of projection in linear spaces, Orthoprojections. Functions of Operators spectral decomposition; Spectral decomposition, The main inequality, Construction of the spectral integral, Hilbert Theorem.

MODULE III

The fundamental theorems and the basic methods; Auxiliary results, The Banach open mapping Theorem, The closed graph Theorem, The Banach- Steinhaus theorem, Bases in Banach spaces, Linear functionals; the Hahn Banach theorem, Separation of Convex sets. Banach Algebras; Preliminaries, Gelfand's theorem on maximal ideals

TEXTBOOK

YULI EIDELMAN, VITALI MILMAN & ANTONIS TSOLOMITIS; FUNCTIONAL ANALYSIS AN INTRODUCTION; AMS, Providence, Rhode Island 2004

REFERENCES

[1] B. V. Limaye: Functional Analysis, New Age International Ltd, New Delhi, 1996.

[2] R. Bhatia: Notes on Functional Analysis TRIM series, Hindustan Book Agency

[3] Kesavan S: Functional Analysis TRIM series, Hindustan Book Agency

[4] S David Promislow: A First Course in Functional Analysis, John wiley & Sons, INC., (2008)

OBJECTIVES

- To define spectrum and learn its properties.
- To learn about self adjoint operators and compact operators.
- To learn orthoprojections and spectral decomposition.
- To understand important theorems and its applications

LESSON PLAN

Unit/Session (hours required)	**Topics to be taught (input)**	**Procedure(process) Student centric method of teaching**	**Activity**	**Learning Outcome (output)**	**Assessment**
MODULE I	Spectrum definition. Self adjoint operators. Minmax principle	• Discussion • Participative learning • Problem solving • Lecture	Assignments on properties of spectrum and compactness	To study about spectrum and its properties. Understand self adjoint operators	Evaluation through test paper.
MODULE II	Orthoprojections. Spectral decomposition and Hilbert theorem.	• Lecture • Discussion • Participative learning • Problem solving	Assignments on Ortho projections. Construction of spectral integral.	To learn about projections and orthoprojections. To formulate the spectral integral.	Evaluation through test paper.
MODULE III	Open Mapping theorem. Closed graph theorem. Hahn Banach theorem. Gelfand's theorem.	• Lecture • Discussion • Participative learning • Problem solving	Seminar by students on Corollaries of Hahn Banach theorem	To study Hahn Banach theorem and its corollaries	Evaluation through test paper.

COURSE OUTCOME

CO1	To study about spectrum and self adjoint operators
CO2	To learn about orthoprojection and spectral integral.
CO3	To learn Hahn Banach theorem and its corollaries.

Faculty in charge:

Ms. Amala Mary George

MTH4C11: GRAPH THEORY
Number of hours of Lectures per week: 5
Number of Credits: 3

Objectives

To understand the basic concepts of Graph theory.

Module 1

Basic concepts of Graph. Trees, Cut edges and Bonds, Cut vertices, Cayleys Formula, The Connector Problem, Connectivity, Blocks, Construction of Reliable Communication Networks, Euler Tours, Hamilton Cycles, The Chineese Postman Problem, The Travelling Salesman Problem.

Module 2

Matchings, Matchings and Coverings in Bipartite Graphs, Perfect Matchings, The Personnel Assignment Problem, Edge Chromatic Number, Vizings Theorem, The Timetabling Problem, Independent Sets, Ramseys Theorem

Module 3

Vertex Colouring-Chromatic Number, Brooks Theorem, Chromatic Polynomial, Girth and Chromatic Number, A Storage Problem, Plane and Planar Graphs, Dual Graphs, Eulers Formula, Bridges, Kuratowskis Theorem, The Five-Colour Theorem, Directed Graphs, Directed Paths, Directed Cycles.

TEXT : J.A. Bondy and U.S.R.Murty : Graph Theory with applications. Macmillan

References

[1] F. Harary : Graph Theory, Narosa publishers, Reprint 2013.
[2] Geir Agnarsson, Raymond Greenlaw: Graph Theory Modelling, Applications and Algorithms, Pearson Printice Hall, 2007.
[3] John Clark and Derek Allan Holton : A First look at Graph Theory, World Scientific (Singapore) in 1991 and Allied Publishers (India) in 1995
[4] R. Balakrishnan & K. Ranganathan : A Text Book of Graph Theory, Springer Verlag, 2nd edition 2012.

OBJECTIVES

a) **To understand the basic concepts of graphs, Trees, Cut edges and Bonds, Cut vertices, Euler Tours, Hamilton Cycles**

b) **To get familiarize with Matchings and Coverings in Bipartite Graphs, Perfect**

Matching, Independent Sets, Ramseys Theorem

c) **To understand the concept of Vertex Colouring-Chromatic Number, Edge Chromatic Number , The Five-Colour Theorem, Directed Graphs.**

d) **To study more about Chromatic Polynomial, Girth and Chromatic Number**

e) **To understand The Five-Colour Theorem, Directed Graphs, Directed Paths, Directed Cycles.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module 1 (30 hours)	Basic concepts of graph, Trees, Cut edges and Bonds, Cut vertices, Connectivity, Blocks, Euler Tours, Hamilton Cycles	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on basic concepts of graph	To understand: •the basics of graph, trees •Concepts of cut edges, cut vertices, Euler tour and Hamilton cycles	Evaluation Through MCQ
Module I1 (30 hours)	Matchings and Coverings, Perfect Matchings, Edge Chromatic Number, Vizings Theorem, Independent Sets, Edge colouring,Ramseys Theorem	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars to explain the Personnel Assignment Problem and The Timetabling Problem	To understand: •differentiation of matchings and covering •Concepts of edge colouring and Ramseys theorem	Evaluation Through test paper
Module III (30 Hours)	Vertex Colouring-Chromatic Number, Brooks Theorem, , Plane and Planar Graphs, Dual Graphs, Eulers Formula, Bridges,	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on Storage Problem	To understand: • Vertex colouring and it's important results • Planar	Evaluation through test paper

	Kuratowskis Theorem, The Five-Colour Theorem, Directed Graphs,			graphs, dual graphs and it's important result	

Course Outcomes

CO1	To introduce the concept of basic graph theory, trees, cut vertices and cut edges, Euler tour and Hamilton cycles
CO2	To understand the concept of matchings and covering, Edge colouring.
CO3	To understand the concepts of vertex colouring and it's important results. Planar graphs and dual graphs.

Faculty in charge:
Ms. Linet Roslin Antony

MTH4E09: DIFFERENTIAL GEOMETRY
Number of hours of Lectures per week: 5
Number of Credits: 3

Objectives

To understand the basic concepts of differential geometry.

MODULE I

Graphs and Level Set, Vector fields, The Tangent Space, Surfaces, Vector Fields on Surfaces, Orientation. The Gauss Map .

MODULE II

Geodesics, Parallel Transport, The Weingarten Map, Curvature of Plane Curves, Arc Length and Line Integrals.

MODULE III

Curvature of Surfaces, Parametrized Surfaces, Local Equivalence of Surfaces and Parametrized Surfaces.

TEXT:

J.A.THORPE : ELEMENTARY TOPICS IN DIFFERENTIAL GEOMETRY

REFERENCES :

1) M. de Carmo : Differential Geometry of Curves and Surfaces, Prentice Hall Inc Englewood Cliffs NJ (1976).
2) V. Grilleman and A. Pollack : Differential Topology, Prentice Hall Inc Englewood Cliffs NJ (1974)
3) B. O'Neil : Elementary Differential Geometry, Academic Press NY (1966)
4) M. Spivak : A Comprehensive Introduction to Differential, Geometry, (Volumes 1 to 5), Publish or Perish, Boston (1970, 75)
5) R. Millmen and G. Parker : Elements of Differential Geometry, Prentice Hall Inc Englewood Cliffs NJ (1977)
6) I. Singer and J.A. Thorpe : Lecture Notes on Elementary Topology and Geometry, UTM, Springer Verlag, NY (1967)

7) W.L.Burke: Applied Differential Geometry , Cambridge University Press (1985).

OBJECTIVES

a) **To understand the basic concepts of level sets, surfaces and its curvature, geodesics,and parametrized surfaces .**

b) **To get familiarize with covariant derivatives and its properties.**

c) **To understand the concept of local and global parametrization.**

d) **To study more about parametrized surfaces and local equivalence of surface and parametrized surfaces.**

LESSON PLAN

Unit/ session/ hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I (30 hours)	Level sets,vector fields, the tangent space, surfaces and the gauss map.	● Lecture ● Discussion ● Participative learning ● Problem solving	● Peer group discussion on vector fields and level sets.	To understand: ●the basics of surfaces ●notion of tangent space and the gauss map	Evaluation Through MCQ
Module II (30 hours)	Geodesics, Parallel transport, The Weingarten map, Arc length and line integrals.	● Lecture ● Discussion ● Participative learning ● Problem solving	● Student seminars to explain the properties of derivatives of smooth vector field and covariant	To understand: ●Local and global parametrization . ●Concept of parallel transport.	Evaluation Through test paper

			derivative.		
Module III (30 Hours)	Curvature of surfaces, First and second fundamental forms,Parametrized surfaces and its local equivalence with surfaces.	• Lecture • Discussion • Participative learning • Problem solving	• Seminar and assignment on local equivalence of surfaces and parametrized surfaces.	To understand: • Principal, Gaussian, Gauss Kronecker and Mean curvature • Inverse function theorems.	Evaluation through test paper

Course Outcomes

CO1	To introduce the concept of graphs and level sets, basics of surfaces and notion of tangent space anf gauss map.
CO2	To understand the concept of parallel transport, local and global parametrization, arc length and line integral.
CO3	To understand the principal ,Gaussian ,Gauss Kronecker and Mean curvature, and parametrized surfaces.

Faculty in charge:
Dr. Nidhin T J

STA 1C 01 INTRODUCTORY STATISTICS

Lecture Hours per week: 4, Credits: 3

Internal: 15, External: 60, Examination 2 Hours

Objectives

To introduce basic concepts of statistics

Module I (7 hrs)

Official statistics: The Statistical system in India: The Central and State Government organizations, functions of the Central Statistical Office (CSO), National Sample Survey Organization (NSSO) and the Department of Economics and Statistics.

Module II (30 hrs)

Introduction to Statistics: Nature of Statistics, Uses of Statistics, Statistics in relation to other disciplines, Abuses of Statistics,Concept of primary and secondary data. Designing a questionnaire and a schedule. Concepts of statistical population and sample from a population, quantitative and qualitative data, Nominal, ordinal and time series data, discrete and continuous data. Presentation of data by table and by diagrams, frequency distributions by histogram and frequency polygon, cumulative frequency distributions (inclusive and exclusive methods) and ogives. Measures of central tendency (mean, median, mode, geometric mean and harmonic mean) with simple applications. Absolute and relative measures of dispersion (range, quartile deviation, mean deviation and standard deviation) with simple applications. Co-efficient of variation, Box Plot. Importance of moments, central and non-central moments, and their interrelationships. Measures of skewness based on quartiles and moments; kurtosis based on moments.

Module III (15 hrs)

Correlation and Regression: Scatter Plot, Simple correlation, Simple regression, two regression lines, regression coefficients. Fitting of straight line, parabola, exponential, polynomial (least square method).

Module IV (20 hrs)

Time series: Introduction and examples of time series from various fields, Components of times series,

Additive and Multiplicative models. Trend: Estimation of trend by free hand curve method, method of semi averages, method of moving averages and fitting various mathematical curves. Seasonal Component: Estimation of seasonal component by Method of simple averages, Ratio to Trend. Index numbers: Definition, construction of index numbers and problems thereof for weighted and unweighted index numbers including Laspeyre's, Paasche's, Edgeworth-Marshall and Fisher's.

Reference Books:

1) S.C. Gupta and V.K. Kapoor. Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi
2) Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I & II, 8th Edn. The World Press, Kolkata.
3) Mukhopadhyay P. (2011): Applied Statistics, 2nded. Revised reprint, Books and Allied
4) Hoel P.G. Introduction to mathematical statistics, Asia Publishing house.
5) Chatfield.C. The Analysis of Time Series: An Introduction, Chapman & Hall
6) Guide to current Indian Official Statistics, Central Statistical Office, GOI, New Delhi.
7) www.mospi.gov.in
8) www.ecostat.kerala.gov.in

OBJECTIVES

1) To learn basic concepts of statistical system in India
2) To understand nature and uses of statistics
3) To understand correlation and regression
4) To expose statistics students to the areas of time series and index numbers

LESSON PLAN

Unit/ session / hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment

Module I **7 Hours**	The Statistical system in India: The Central and State Government organizations, functions of the Central Statistical Office (CSO), National Sample Survey Organization (NSSO) and the Department of Economics and Statistics.	• Lecture • Discussion • Participative learning • Problem solving	• Student seminars related to the central and government organizations	• To understand central and government organizations in India • To understand the functions of CSO and NSSO	Evaluation through test paper and viva
Module II **30 Hours**	Nature of Statistics, Uses of Statistics, Statistics in relation to other disciplines, Abuses of Statistics,Concept of primary and secondary data, Concepts of statistical population and sample from a	• Lecture • Discussion • Participative learning • Problem solving	• Assignments in finding measures of central tendency	• To understand the nature, uses and abuses of statistics • To understand measures of central tendency and measures of	Evaluation through test paper

	population, Nominal, ordinal and time series data, discrete and continuous data, cumulative frequency distributions and ogives. Measures of central tendency with simple applications, Absolute and relative measures of dispersion with simple applications,Co-efficient of variation, Importance of moments, central and non-central moments, and their interrelationships, Measures of skewness based			dispersion and their applications	

	on quartiles and moments; kurtosis based on moments				
Module III **15 Hours**	Scatter Plot, Simple correlation, Simple regression, two regression lines, regression coefficients. Fitting of straight line, parabola, exponential, polynomial	• Lecture • Discussion • Participative learning • Problem solving	• Assignments related to find correlation and regression coefficients	• To understand correlation and regression	Evaluation through test paper
Module IV **20 Hours**	Introduction and examples of time series from various fields, Components of times series, Estimation of trend by free hand curve method, method of semi averages, method of moving	• Lecture • Discussions • Problem solving	• Student seminars related to components of time series	• To understand time series, seasonal indices and index numbers	Evaluation through test paper

	averages and fitting various mathematical curves, Estimation of seasonal component by Method of simple averages, Ratio to Trend,Definition , construction of index numbers and problems thereof for weighted and unweighted index numbers including Laspeyre's, Paasche's, Edgeworth-Mar shall and Fisher's.				

Course Outcomes

CO1	To understand central and government organizations in India and learn the functions of CSO and NSSO
CO2	To understand the nature, uses and abuses of statistics

CO3	To learn the concepts of correlation and regression
CO4	To understand time series, seasonal indices and index numbers

Teacher in Charge:

Ms. Nima Maria

STA 2C 02- PROBABILITY THEORY
Lecture Hours per week:4 , Credits: 3
Internal: 20, External: 80, Examination 3 Hours

Objectives

Give knowledge to conceptualise probabilities of an event including frequentist and axiomatic approach also the idea about mathematical expectation and conditional probability.

Module I (25 hrs)

Introduction to Probability: Random experiment, Sample space, events, classical definition of probability, statistical regularity, field, sigma field, axiomatic definition of probability and simple properties, addition theorem (two and three events), conditional probability of two events, multiplication theorem, independence of events-pair wise and mutual, Bayes theorem and its applications.

Module II (12 hrs)

Random variables: Discrete and continuous, probability mass function (pmf) and probability density function (pdf)-properties and examples, Cumulative distribution function and its properties, change of variables (univariate case only).

Module III (15 hrs)

Mathematical expectations (univaraite): Definition, raw and central moments(definition and relationships), moment generation function and properties, characteristic function (definition and use only), Skewness and kurtosis using moments.

Module IV (20 hrs)

Bivariate random variables: Joint pmf and joint pdf, marginal and conditional probability, independence of random variables, function of random variable. Bivariate Expectations, conditional mean and variance, covariance, Karl Pearson Correlation coefficient, independence of random variables based on expectation.

Reference Books:

1. Rohatgi V. K. and Saleh, A.K. Md. E. (2009): An Introduction to Probability and Statistics. 2ndEdn. (Reprint) John Wiley and Sons.
2. . S.C.Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons.
3. Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Edn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.
4. . John E Freund, Mathematical Statistics, Pearson Edn, New Delhi
5. Hoel P.G. Introduction to mathematical statistics, Asia Publishing house.

OBJECTIVE

- Ability to distinguish between random and non random experiments.
- Understand the classical and axiomatic definition of probability, also the noation of conditional probability including the concept of Baye's theorem
- Give knowledge related to the concept of uni variate, Bivariate Discrete and continuous random variable including expectation moments and mgf

LESSON PLAN

Unit/ session/ hours (Time Required)	**Topics for student preparation (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Module I **25 Hours**	Random experiment, Sample space, events, classical definition of probability, statistical regularity, field, sigma field, axiomatic definition of probability and simple properties, addition theorem, conditional probability of two events, multiplication theorem, independence of events-pair wise and mutual, Bayes theorem and its applications.	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on axiomatic definition of probability and simple properties.	• Understand the basic definition and properties related to probability.	Evaluation through test paper and viva.
Module II	probability mass	• Lecture	• Seminar on	• Understand	Evaluation

12 Hours	function and probability density function properties and examples, Cumulative distribution function and its properties, change of variables.	• Discussion • Participative learning • Problem solving	the topic Cumulative distribution function and its properties	the concept of pmf, pdf and cdf in statistics.	through test paper and viva
Module III **15 Hours**	Mathematical expectations Definition, raw and central moment, mgf and properties, characteristic function, Skewness and kurtosis using moments.	• Lecture • Discussion • Participative learning • Problem solving	• Assignments related to mathematical expectation, raw and cenral moments, mgf	• Understand the definition of moments and mgf • Enable to find Skewness and kurtosis using moments.	Evaluation through test paper.
Module IV **20 Hours**	Bivariate random variables: Joint pmf and joint pdf, marginal and conditional probability, independence of random variables, function of random variable. Bivariate Expectations, conditional mean and variance, covariance, Karl Pearson Correlation coefficient, independence of random variables based on expectation.	• Lecture • Discussions • Problem solving	• Student seminars on the topic bivariate Expectations, conditional mean variance, and covariance.	• Give knowledge related to the concept of Bivariate random variable including expectation moments and mgf.	Evaluation through test paper.

Course Outcomes

CO1	Ability to distinguish between random and non-random experiment
CO2	Undestand the probabilities of an events including frequentist and axiomatic approach. Simultaneously learned the notion of conditional probability including the concept of Bayes' Theorem.
CO3	Understand the concept of univariate, Bivariate Discrete and continuous random variable including expectation moments and mgf.

Teacher in Charge:

Ms. Athira V

Ms. Anjana Rajan

STA 3C 03- PROBABILITY DISTRIBUTIONS AND SAMPLING THEORY

Lecture Hours per week: 4, Credits: 3

Internal: 15, External: 60, Examination 2 Hours

Objectives

To introduce the standard and sampling distributions , also the different type of sampling methods.

Module I (30 hrs)

Standard distributions*:* Discrete type-Bernoulli, Binomial, Poisson, Geometric, Negative Binomial (definition only), Uniform (mean, variance and mgf). Continuous type-Uniform, exponential and Normal (definition, properties and applications);Gamma (mean, variance, mgf); Lognormal, Beta, Pareto and Cauchy (Definition only)

Module II (25 hrs)

Limit theorems*:* Chebyshev's inequality, Sequence of random variables, parameter and Statistic, Sample mean and variance, Convergence in probability (definition and example only), weak law of large numbers (iid case), Bernoulli law of large numbers, Convergence in distribution (definition and examples only), Central limit theorem (Lindberg levy-iid case)

Module III (10 hrs)

Sampling methods: Simple random sampling with and without replacement, systematic sampling (Concept only), stratified sampling (Concept only), Cluster sampling(Concept only)

Module IV (25 hrs)

Sampling distributions: Statistic, Standard error, Sampling from normal distribution, distribution of sample mean, sample variance, chi-square distribution, t distribution, and F distribution (definition, derivations and relationships only).

Reference Books:

1. Rohatgi V. K. and Saleh, A.K. Md. E. (2009): An Introduction to Probability and Statistics. 2ndEdn. (Reprint) John Wiley and Sons.
2. S.C.Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons.
3. Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Edn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.
4. John E Freund, Mathematical Statistics, Pearson Edn, NewDelhi

5. Cochran W.G. (1984):Sampling Techniques(3rdEd.), Wiley Eastern

OBJECTIVES

1. Enable one to identify and classify different type of standard distribution.
2. To understand the weak law of large numbers, Bernoulli law of large numbers, Central limit theorem and its applications.
3. Describe different type of sampling methods.

   Enable one to understand different type of sampling distribution.

LESSON PLAN

Unit/ session/ hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I **30 Hours**	Bernoulli, Binomial, Poisson, Geometric, Negative Binomial , Uniform, exponential , Normal, Gamma, Lognormal, Beta, Pareto and Cauchy distribution.	• Lecture • Discussion • Participative learning • Problem solving	• Peer group discussion on discrete and Continuous distribution.	• Enable to understand different type of distribution.	Evaluation through test paper
Module II **25 Hours**	Chebyshev's inequality, Sequence of random variables, parameter and Statistic, Sample mean and variance, Convergence in probability, weak law of large numbers, Bernoulli law of large numbers, Convergence in distribution , Central limit theorem	• Lecture • Discussion • Participative learning • Problem solving	• Assignment on the topic sample mean and variance.	• Understand the weak law of large numbers, Bernoulli law of large numbers, Central limit theorem and its applications	Evaluation through test paper

	(Lindberg levy-iid case)				
Module III **10 Hours**	Sampling methods: Simple random sampling with and without replacement, systematic sampling, stratified sampling, Cluster sampling	• Lecture • Discussion • Participative learning • Problem solving.	• Seminar on different type of sampling methods.	• Understand the sampling methods and its relevants.	Evaluation through test paper.
Module IV **25 Hours**	Sampling distributions: Statistic, Standard error, Sampling from normal distribution, distribution of sample mean, sample variance, chi-square distribution, t distribution, and F distribution.	• Lecture • Discussion • Participative learning. • Problem solving.	• Peer group discussion on t distribution, and F distribution.	• understand different sampling distributions.	Evaluation through test paper and viva.

Course Outcomes

CO1	Enable one to identify and classify different type of standard distribution.
CO2	Understand the weak law of large numbers, Bernoulli law of large numbers, Central limit theorem and its applications.
CO3	Understand to Describe different type of sampling methods.
CO4	Enable one to understand different type of sampling distribution.

Teacher in Charge:

Anjana Rajan.

STA 4C 04 - STATISTICAL INFERENCE AND QUALITY CONTROL

Lecture Hours per week: 4, Credits: 3

Internal: 15, External: 60, Examination 2 Hours

Objectives

To learn basic concepts of statistical inference and quality control

Module I (30 hrs)

Estimation theory: Parametric space, sample space, point estimation. Nayman Factorization criteria, Requirements of good estimator: Unbiasedness, Consistency, Efficiency, Sufficiency and completeness. Minimum variance unbiased (MVU) estimators. Cramer-Rao inequality ,Minimum Variance Bound (MVB) estimators. Methods of estimation: Maximum likelihood estimation and Moment estimation methods , Properties of maximum likelihood estimators ,Least squares and minimum variance ,Interval estimation: Confidence interval (CI);CI for mean and variance of Normal distribution; Confidence interval for binomial proportion and population correlation coefficient when population is normal.

Module II (35 hrs)

Testing of Hypothesis: Level of significance, Null and Alternative hypotheses, simple and composite hypothesis ,Types of Errors, Critical Region, Level of Significance, Power and p-values. Most powerful tests, Neyman-Pearson Lemma , Uniformly Most powerful tests. Large sample tests: Test for single mean, equality of two means, Test for single proportion, equality of two proportions. Small sample tests: t-test for single mean, unpaired and paired t-test. Chi-square test for equality of variances, goodness of fit, test of independence and association of attributes. Testing means of several populations: One Way ANOVA, Two Way ANOVA

Module III (10 hrs)

Non-parametric methods: Advantages and drawbacks; Test for randomness, Median test, Sign test, Mann-Whiteny U test and Wilcoxon test; Kruskal Wallis test

Module IV (15 hrs)

Quality Control: General theory of control charts, causes of variations in quality, control limits, sub-grouping, summary of out-of-control criteria. Charts of variables - X bar chart, R Chart and sigma chart. Charts of attributes – c-charts, p-chart and np-chart.

Reference Books:

1) Rohatgi V. K. and Saleh, A.K. Md. E. (2009): An Introduction to Probability and Statistics. 2ndEdn. (Reprint) John Wiley and Sons.
2) Gupta, S.P. Statistical Methods. Sultan Chand and Sons: New Delhi. .
3) S.C.Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons
4) Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rdEdn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.
5) John E Freund, Mathematical Statistics, Pearson Edn, NewDelhi
6) Grant E L, Statistical quality control, McGraw Hill
7) Montogomery, D. C. (2009): Introduction to Statistical Quality Control, 6th Edition, Wiley India Pvt. Ltd.

OBJECTIVES

1) To understand point estimation and interval estimation
2) To learn the basic concepts and results of the theory of testing statistical hypothesis.
3) To study non parametric tests.
4) To understand statistical quality control and control charts

LESSON PLAN

Unit/ session / hours (Time Required)	Topics for student preparation (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Module I 30	Point estimation, Properties of estimators,	• Lecture • Discussion	• Group discussion on methods	Understand point estimation	Evaluation through test paper

Hours	Factorisation theorem, Crammer -Rao inequality, Methods of estimation: methods of moments , method of maximum likelyhood, Interval estimation, confidence interval for population mean and varience	• Participative learning • Problem solving	of estimation	and properties of good estimators	
Module II 35 Hours	Level of significance, Null and Alternative hypotheses, simple and composite hypothesis ,Types of Errors, Critical Region, Level of Significance, Most powerful tests, Neyman-Pearson Lemma , Uniformly Most	• Lecture • Discussion • Participative learning • Problem solving	• Assignments in finding level of significance	Understand large sample tests and small sample tests	Evaluation through test paper and viva

	powerful tests. Large sample tests: Test for single mean, equality of two means, Test for single proportion, equality of two proportions. Small sample tests: t-test for single mean, unpaired and paired t-test. Chi-square test for equality of variances, goodness of fit, test of independence and association of attributes.,Testing means of several populations: One Way ANOVA, Two Way ANOVA				
Module III **10 Hours**	Advantages and drawbacks of non parametric tests, Test for randomness,Medi	• Lecture • Discussion • Participative	• Group discussion on advantages and	Understand various nonparametric tests	Evaluation through Test paper and Group Discussion

	an test, Sign test, Mann-Whiteny U test and Wilcoxon test; Kruskal Wallis test	learning • Problem solving	drawbacks of non parametric tests		
Module IV **15 Hours**	General theory of control charts, causes of variations in quality, control limits, sub-grouping, summary of out-of-control criteria. Charts of variables - X bar chart, R Chart and sigma chart. Charts of attributes - c-charts, p-chart and np-chart.	• Lecture • Discussions • Problem solving	• Seminar on control charts of variables and attributes	Understand statistical quality control and its uses	Evaluation through test paper

Course Outcomes

CO1	To understand point estimation and interval estimation
CO2	To learn the basic concepts and results of the theory of testing statistical hypothesis
CO3	To study non parametric tests.
CO4	To understand statistical quality control and control charts

Teacher in Charge:

Athira V

Department of Computer Science

Course: BSc. Computer Science (Complementary)

CSC1C01 – Computer Fundamentals

Semester: 1

Course Number: 1

Contact Hours: 2T+2L

Number of Credits: 2

Number of Contact Hours: 64

Course Evaluation: Internal – 15 Marks + External – 60 Marks

Aim of the Course:

To impart the students with fundamental principles and operations of various units of computer and to impart them with the basic skill in application packages.

Objectives of the Course:

· To learn the basics of computer hardware units and how they work together

· To acquire basic skill with office packages

Prerequisites: Background of the basic science at +2 level

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Course Outline

UNIT I [7T+6L]

Number systems- Non-positional number systems and positional number systems (Binary, Octal and Hexadecimal), Converting from one number system to another- decimal to a new base, converting to decimal from another bases, converting from base other than ten to base other than ten, short cut method for converting from binary to octal, octal to binary, binary to hexadecimal and hexadecimal to binary, Computer Codes (BCD, EBCDIC, ASCII) error detecting and correcting codes, parity bit, Hamming Code, computer arithmetic ,importance of binary, binary addition and subtraction.

UNIT II [6T+7L]

Boolean Algebra and Logic circuits- fundamental concepts of Boolean Algebra, postulates, Principle of duality, theorems of Boolean Algebra, Boolean functions, minimization, complement, canonicals forms, conversion between canonical forms. Logic Gates- AND, OR, NOT, NAND, NOR, XOR and XNOR, logic circuits, converting expression to logic circuit,

universal NAND and NOR gates, Exclusive OR and equivalence functions, Design of Combinational circuits (Half Adder, Subtractor and Full Adder)

UNIT III [6T+7L]

Basic Computer Organization-Input Unit, Output Unit, Storage Unit (Direct, Sequential and Random Access), CPU organization, Control Unit (micro programmed and hardwired control), primary storage, memory hierarchy, storage locations and addresses, storage capacity, bit, byte, nibble, RAM, ROM, PROM and EPROM, cache memory, registers. Secondary storage devices (Magnetic tape, Hard disk and CD drive)

UNIT IV [7T+6L]

I/O devices - Input Devices-identification and its use, keyboard, pointing devices (mouse, touch pad and track ball), Video digitizer, remote control, joystick, magnetic stripes, scanner, digital camera, microphone, sensor, and MIDI instruments, Output Devices identification and its use, monitor, printer (laser, inkjet, dot-matrix), plotter, speaker, control devices (lights, buzzers, robotic arms, and motors)

UNIT V [6T+6L]

Planning a Computer program, purpose of program planning, algorithm, flowchart - symbols, sample flowcharts, advantages and limitations.

Text Books:

1. Pradeep K. Sinha and Priti Sinha, Computer Fundamentals, BPB

References:

1. Peter Nortorn, Introduction to Computer, TMH
2. Rajaraman, V, Fundamental of Computers, Prentice Hall India
3. B. Ram, Computer Fundamentals

Lab List

Word Processing

· Paragraph formatting

· Newspaper style Document

· Table creation

· Mail merge

· Page formatting and printing

Spreadsheet

· Worksheet entries, including formula

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· Formatting cells

· Chart creation

· Functions

Presentation Software

· Creating presentation

· Animations

· Sound

· Inserting picture

Course Plan

Unit/hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Unit I (13 hours)	Number Systems, Converting from one number system to another, short cut method for converting from binary to octal, octal to binary, binary to hexadecimal and hexadecimal to binary, Computer Codes, Computer Arithmetic	● Lecture ● Problem-Solving	● Discussion ● Extra Problems as Assignments	Understanding the Basics of ● Number Systems ● Computer Codes ● Binary Arithmetic	● Evaluating Problem-Solutions ● Q and A
Unit II (13 hours)	Boolean Algebra and	● Lecture ● Problem-	● Discussion ● Simplificatio	Understanding ● Simplificatio	● Evaluating

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	Logic circuits- Logic Gates, universal gates, Exclusive OR and equivalence functions, Design of Combinational circuits.	Solving ● Illustrations	ns ● Designing Circuits	ns of Boolean Algebra ● Logic Gates ● Circuit Designing	Problem-Solutions ● Test
Unit III (13 hours)	Basic Computer Organization -Input Unit, Output Unit, Storage Unit, CPU organization, primary storage, memory hierarchy, storage locations and addresses, storage capacity, bit, byte, nibble, RAM, ROM, PROM and EPROM, cache memory, registers. Secondary storage devices	● Lecture ● Lab Sessions ● Illustrating Block Diagrams	● Discussion ● Drawing Block Diagrams	Understanding Basic Computer Organization	● MCQ ● Q and A
Unit IV (13 hours)	I/O devices - Input Devices- identification and its use, keyboard, pointing	● Lecture ● Seminar	● Discussion ● Identification of I/O devices	Understand the functions and working of various I/O devices	● Quiz

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	devices (mouse, touch pad and track ball), Video digitizer, remote control, joystick, magnetic stripes, scanner, digital camera, microphone, sensor, and MIDI instruments, Output Devices identification and its use, monitor, printer (laser, inkjet, dot-matrix), plotter, speaker, control devices (lights, buzzers, robotic arms, and motors)				
Unit V (12 hours)	Planning a Computer program, purpose of program planning, algorithm, flowchart - symbols, sample flowcharts, advantages	• Lecture • Lab Sessions • Illustrations	• Discussion • Writing Algorithms • Draw Flowcharts	Understand the Basics of Programming	• Evaluating Algorithms and Flowcharts • Test

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	and limitations.				

Faculty In-charge



Dr Jisha Jose Panackal

Dept. of Computer Science

CSC2C02 – Fundamentals of System Software, Networks and DBMS

Semester: 2

Course Number: 2

Contact Hours: 2T+2L

Number of Credits: 2

Number of Contact Hours: 64

Course Evaluation: Internal – 15 Marks + External – 60 Marks

Aim of the Course:

To impart the students with the basic concepts of system software, Computer Networks and Database.

Objectives of the Course:

· To learn the basic concepts of various system software

· To learn the basics of Computer Networks

· To learn the basics of Databases

Prerequisites: Background of the basic science at +2 level

Course Outline

UNIT I [6 T+6L]

System software - classification of programming languages (Machine, assembly & High level), Characteristics and Comparison, language processors (Assembler, Interpreter and Compiler), Operating Systems- Functions, types of OS (batch, multiprogramming, time sharing, real time and distributed)

UNIT II [7 T+6L]

Computer networks- goals of networking, network topologies, types of networks (LAN, MAN and WAN), network model, OSI model- 7 layers, Internet Layer- 5 layers, Communication Media-Guided (Twisted Pair, Coaxial Cable and Fiber Optic) and Unguided (microwave, satellite).

UNIT III [6 T+7L]

Database Management Systems-definition, structure of Database, data models (Record based Data model, Network model: - Basic Components, Record types, data types, links, relationships, Hierarchical model and Relational model)

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UNIT IV [6 T+7L]

Structured query language - Create, insert, select, update, delete, alter, drop commands

UNIT V [7 T+6L]

HTML-hypertext, hyper media, understanding basic HTML tools- HTML editor, web browser, General structure of HTML document, different types of elements-doc type, comment element, structural element, HTML tags and attributes: <html>, <body>, <head>, <title>, <h1>,... ,<h6>, <br>, <table>, <img>, <hr>, adding links, background image to the body, creating lists.

References:

1. P. K Sinha, Fundamentals of Computers
2. D. M Dhamdhere, Operating System: A concept based Approach
3. Behrouz A Forouzan, Data Communication & Networking, MC Graw Hill
4. Joel Sklar,Principles of Web Page Design, Vikas Publications

Lab List

HTML

1. Simple HTML document creation
2. HTML document with tables
3. HTML document with various lists
4. HTML document with links to different parts of the same
5. documents and to separate documents

MySQL

1. Table creation
2. Data insertion and deletion
3. Data retrieval
4. Alteration of tables

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Course Plan

Unit/hours (time required)	**Topics to be taught (input)**	**Procedure (process)** **Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Unit I (12 hours)	System software, Classification of	● Lecture ● Illustrations	● Discussion ● Comparative Study	Understanding the Basics of	● MCQ ● Q and A

	programming languages Characteristics and Comparison, language processors, Operating Systems- Functions, types of OS			• Software • Computer Languages • Pre-processors • OS	
Unit II (13 hours)	Computer networks- goals of networking, network topologies, types of networks, network model, OSI model- 7 layers, Internet Layer- 5 layers, Communication Media.	• Lecture • Illustrations	• Discussion • Drawing various topologies, Layers of Network Models	Understanding • Computer Networks • Network Models	• Test • Q and A
Unit III (13 hours)	Database Management Systems- definition, structure of Database, data models	• Lecture • Illustrations	• Discussion • Comparative Study	Understanding DBMS	• Q and A • Test
Unit IV (13 hours)	Structured query language - Create, insert, select, update, delete, alter, drop	• PPT • Lab Sessions	• Discussion • Hands-on Experience	Understand SQL using MySQL	• Verification of Lab Exercises • Q and A

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	commands				
Unit V (13 hours)	HTML- hypertext, hyper media, understanding basic HTML tools- HTML editor, web browser, General structure of HTML document, different types of elements- doc type, comment element, structural element, HTML tags and attributes, adding links, background image to the body, creating lists.	• PPT • Lab Sessions	• Discussion • Hands-on Experience • Creative Learning	Understand the Basics of Web Designing using HTML	• Evaluating Web sites • MCQ

Faculty In-charge



Dr Jisha Jose Panackal

Dept. of Computer Science

CSC3C03 – Problem Solving Using C

Semester: 3

Course Number: 3

Contact Hours: 3T+2L

Number of Credits: 2

Number of Contact Hours: 80 Hrs.

Course Evaluation: Internal – Internal – 15 Marks + External – 60 Marks

Aim of the Course:

To equip the students with the basic concepts of problem solving using computers.

Objectives of the Course:

· To learn the concepts of programming.

· To learn the C language

Prerequisites:

· Background of the basic science at +2 level

Course Outline

UNIT I [9 T+7L]

Introduction to C- Structure of C program, Character Set, Keywords, Identifiers, Data Types, Qualifiers, Variables, Declarations, Symbolic Constants, Expressions, Statements, Different Types of Operators (Arithmetic, Logical, Relational & Equality, Unary and Conditional), Operator Precedence and Associativity, Library Functions, Comments, I/O functions-(Formatted scanf() &printf(), getchar (), putchar (), getche(), gets(), puts())

UNIT II [9 T+7L]

Control Statements- Selection Statements (if, if-else, else if ladder, switch), iteration (while, do while, for), jumping (goto, break, continue), Nested Control Statements

UNIT III [10 T+6L]

Structured Data types - Arrays (One dimensional and Two Dimensional), Character and String Functions, Structure (Definition, Processing-period Operator), Union

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UNIT IV [10 T+6L]

User defined Functions - Advantages, Definition, Accessing functions, formal and Actual Parameters, Recursion, Storage Classes- Automatic, External, Static and Register Variable, Argument Passing Mechanism

UNIT V [11T+6L]

Pointers and data files- Pointers, advantages, declaration, operations on pointers, pointers and one dimensional arrays, dynamic memory allocation. Data files (sequential), file handling functions (fopen(), fclose(), fputc(), fgetc(), fgets(), fputs(), fscanf(), fprintf()

Text Book:

1. E Balagurusamy, Programming in Ansi C, Tata McGraw Hill

References:

1. Byran Gotfried, Programming with C, Schaum Series
2. Kezningham & Ritchie,Programming in C
3. Yashvant Kanetkar, Let us C, BPB publications
4. Mullish Cooper, The spirit of C, Jasco books
5. Herbert Schildt, The Complete reference C, Tata McGraw Hill

Course Plan

Unit/hours (time required)	**Topics to be taught (input)**	**Procedure (process)** **Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Unit I (16 hours)	Introduction to C- Structure of C program, Character Set, Keywords, Identifiers, Data Types, Qualifiers, Variables, Declarations, Symbolic Constants, Expressions, Statements,	• Lecture • Lab Sessions	• Discussion • Hands-on Learning	Understanding the Basics of • Programming using C • Tokens • Operators • I/O functions	• Evaluating Programs • Q and A

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	Different Types of Operators, Operator Precedence and Associativity, Library Functions, Comments, I/O functions				
Unit II (16 hours)	Control Statements- Selection Statements (if, if-else, else if ladder, switch), iteration (while, do while, for), jumping, Nested Control Statements	• Lecture • Illustrations • Program Logic Sharing	• Discussion • Hands-on Learning	Understanding • Control Statements • Program Implementations	• Program Test • MCQ
Unit III (16 hours)	Structured Data types - Arrays, Character and String Functions, Structure, Union	• Lecture • Lab Sessions	• Discussion • Hands-on Learning	Understanding Basic Data Structures	• Evaluating Programs • Q and A • Test
Unit IV (16 hours)	User defined Functions - Advantages, Definition, Accessing functions, formal and Actual	• Lecture • Lab Sessions	• Discussion • Hands-on Learning • Comparative Study	Understand the functions and working of various programs	• Evaluating Programs • Quiz

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	Parameters, Recursion, Storage Classes- Automatic, External, Static and Register Variable, Argument Passing Mechanism				
Unit V (16 hours)	Pointers and data files- Pointers, advantages, declaration, operations on pointers, pointers and one dimensional arrays, dynamic memory allocation. Data files, file handling functions	• Lecture • Lab Sessions • Illustrations	• Discussion • Writing Programs • Hands-on Learning	Understand the Basics of Dynamic Programming and use of Pointers	• Evaluating Programs • Q and A • Test

Faculty In-charge



Dr. Sr. Mini T V

Dept. of Computer Science

CSC4C04 – Data Structure Using C

Semester: 4

Course Number: 4

Contact Hours per Week: 5(3T+2L)

Number of Credits:2

Number of Contact Hours: 80 hrs

Course Evaluation: Internal – 15 Marks + External – 60 Marks

Objectives of the Course:

- To introduce the concept of data structures
- To make the students aware of various data structures
- To equip the students implement fundamental data structures

Prerequisites:

- Knowledge in C Programming Language

Course Outline:

Unit I [11 T+6L]

Primitive Data types and Abstract Data Types(ADT) - Introduction to data structures – definition - characteristics of data structures - categories of data structures – algorithm - space complexity and time complexity of an algorithm (concept only).

Unit II [7 T+6L]

Arrays and Singly Linked Lists - 1D, 2D and Multi-dimensional arrays – operations on arrays - Sparse Matrix Representation

Unit III [9 T+7L]

Lists- Linked List- Definition –Creation- Operations, Basics of Doubly Linked List, Circular Linked List.

Unit IV [11 T+7L]

Stack and Queues – Definition and Operations on stack - Implementation of Stack using arrays and linked lists - Applications of Stacks - Polynomial Addition Queues – Definition, Implementations of queue using arrays and linked lists – basics of Circular queue, Dequeue - Applications of queues.

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Unit V [10 T+7L]

Searching and Sorting: Searching: Linear search & Binary search. Sorting – Linear sort - Bubble sort - Selection sort - Insertion sort - Quick sort - Merge sort – Comparisons and implementations.

Text Books:

1. SeymourLipschutz,"Data Structures",TataMcGraw Hill Publishing Company Limited, Schaum"s Outlines, New Delhi.
2. YedidyanLangsam,MosheJ.Augenstein,and AaronM.Tenenbaum, "Data Structures Using C", Pearson Education., New Delhi.
3. Horowitz and Sahani, "FundamentalsofdataStructures",GalgotiaPublicationPvt.Ltd.,NewDelhi.

Reference Books:

1. Trembley, J.P. And Sorenson P.G., "An Introduction to Data Structures With Applications", Mcgraw- Hill International Student Edition, New York.
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Addison- Wesley, (An Imprint of Pearson Education), Mexico City

Course Plan

Unit/hours (time required)	**Topics to be taught (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Unit I (17 hours)	Primitive Data types and Abstract Data Types(ADT) - Introduction to data structures – definition - characteristics of data structures - categories of data structures – algorithm - space complexity and time	• Lecture • Lab Sessions	• Discussion • Hands-on Learning	Understanding the Basics of • Data Structures • Algorithms	• Q and A • Test

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	complexity of an algorithm				
Unit II (13 hours)	Arrays and Singly Linked Lists - 1D, 2D and Multi-dimensional arrays – operations on arrays - Sparse Matrix Representation	• Lecture • Illustrations • Program Logic Sharing	• Discussion • Hands-on Learning	Understanding • Arrays • Matrices	• Program Test • MCQ
Unit III (16 hours)	Lists- Linked List- Definition –Creation- Operations, Basics of Doubly Linked List, Circular Linked List.	• Lecture • Lab Sessions	• Discussion • Hands-on Learning	Understanding Data Structures Using Linked Lists	• Evaluating Programs • Q and A • Test
Unit IV (18 hours)	Stack and Queues – Definition and Operations on stack - Implementation of Stack using arrays and linked lists - Applications of Stacks - Polynomial Addition Queues – Definition, Implementations of queue using arrays and linked lists – basics of Circular queue, Dequeue - Applications of queues.	• Lecture • Lab Sessions	• Discussion • Hands-on Learning • Comparative Study	Understand the functions of • Stacks • Queues And its implementations	• Evaluating Programs • Quiz
Unit V (17 hours)	Searching and Sorting:	• Lecture • Lab	• Discussion • Writing	Understand the Basics of	• Evaluating

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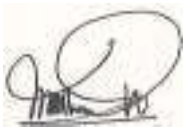
	Searching: Linear search & Binary search. Sorting – Linear sort - Bubble sort - Selection sort - Insertion sort - Quick sort - Merge sort – Comparisons and implementations.	Sessions • Illustrations	Programs • Hands-on Learning	• Searching • Sorting	Programs • Q and A • Test

Faculty In-charge



Dr. Sr. Mini T V

Dept. of Computer Science

Course: **MSc Computer Science (First Semester)**

Programme: CSS1C01 - Discrete Mathematical Structures

No. of lecture hours per week	4 Hrs
No.of credits for Theory	4

Aim of the course

To introduce discrete mathematics concepts necessary to understand basic foundation of Computer Science.

Course Outline

Unit I: Sets and Mathematical Logic: Set Theory - Types of sets, Set operations, Principles of Inclusion and Exclusion. Mathematical Logic - Propositional Calculus - Statement, Connectives, Conditional and Biconditional, Equivalence of Formula, Well Formed Formula, Tautologies, Duality Law, Functionally Complete Sets of Connectives, Normal Forms, Theory of Inference for the Statement Calculus, Predicate Calculus - Statement Functions, Variables and Quantifiers, Free and Bound Variables, Theory of Inference for the Predicate Calculus.

Unit II: Functions and Relations: Functions – Types of Functions, Composition of Functions and Inverse Functions. Relations - Relations and Their Properties, Functions as relations, Closure of Relations, Composition of relations, Equivalence Relations and Partitions. Partial Ordering, Hasse Diagram. The Pigeon Hole Principle.

Unit III: Lattices and Boolean Algebra - Lattices and Algebraic Systems, Principles of Duality, Basic Properties of Algebraic Systems Defined by Lattices, Distributive Lattices and Complemented Lattices. Boolean Lattices and Boolean Algebras. Boolean Functions and Boolean Expressions

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Unit IV: Group Theory – Definition and Elementary Properties - Permutation Groups, Cyclic Groups – Subgroups - Cosets and Lagrange's Theorem, Semigroup and Monoid. Homeomorphism and Isomorphism. Rings, Integral Domains and Fields

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Unit V: Graph Theory – Introduction, Directed Graph, Undirected Graph, Connected and Disconnected Graphs, Bipartite Graph, Complete Bipartite Graph, Isomorphic Graphs, Subgraph. Paths and Circuits. Shortest Paths in Weighted Graphs - Dijkstra's Algorithm. Eulerian Paths and Circuits, Hamiltonian Paths and Circuits. Trees - Spanning Trees and Cut-Sets, Minimum Spanning Trees - Kruskal's Algorithm, Prim's Algorithm.

References:

1. C Liu and D. Mohapatra, Elements of Discrete Mathematics - A Computer Oriented Approach, TMH, ISBN: 1259006395.
2. Alan Doerr and Kenneth Levassur, Applied Discrete Structure for Computer Science,

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Galgotia Publications Pvt. Ltd, ISBN: 9780574217554.
3. J. K. Sharma, Discrete Mathematics, Macmillan Publishers India Limited, ISBN: 1403924759.
4. J. P. Tremblay and R. Manohar, Discrete Mathematical Structures with Application to Computer Science, McGraw-Hill Companies, ASIN: B001FPXR5Y.

Curriculum Plan

Unit/Hours (time required)	**Topics to be Taught (Input)**	**Procedure (process) student centric method of teaching**	**Activity**	**Learning outcome (outcome)**	**Assessment**
Unit1(18 Hour)	Sets and Mathematical Logic: Set Theory - Types of sets, Set operations, Principles of Inclusion and Exclusion. Mathematical Logic - Propositional Calculus - Statement, Connectives, Conditional and Biconditional, Equivalence of Formula, Well Formed Formula, Tautologies, Duality Law, Functionally Complete Sets of Connectives, Normal Forms, Theory of Inference for the Statement Calculus, Predicate Calculus - Statement Functions,	• Lecture using ICT tools	Peer group discussion on different types of sets	To Understand • Concept of different types of sets	• Assignment • MCQ evaluation

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	Variables and Quantifiers, Free and Bound Variables, Theory of Inference for the Predicate Calculus.				
Unit 2 (20 Hours)	Functions and Relations: Functions – Types of Functions, Composition of Functions and Inverse Functions. Relations - Relations and Their Properties, Functions as relations, Closure of Relations, Composition of relations, Equivalence Relations and Partitions. Partial Ordering, Hasse Diagram. The Pigeon Hole Principle.	• Lecture using ICT Tools • Illustrations • Hands on sessions	• Seminar • Group stud	To Understand • Relations • Functions • Equivalence Relations • Partitions.	• Q&A exams.
Unit3 (18 Hours)	Lattices and Boolean Algebra - Lattices and Algebraic Systems, Principles of Duality, Basic Properties of Algebraic Systems Defined by Lattices, Distributive Lattices and Complemented Lattices. Boolean Lattices and	• Lecture using ICT tools • Illustrations	• Hands on sessions • Illustrations	To Understand Lattices and Boolean Algebra	• Q&A exams

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	Boolean Algebras. Boolean Functions and Boolean Expressions.				
Unit4 (14 Hours)	Group Theory – Definition and Elementary Properties - Permutation Groups, Cyclic Groups – Subgroups - Cosets and Lagrange's Theorem, Semigroup and Monoid. Homeomorphism and Isomorphism. Rings, Integral Domains and Fields.	• Lecture using ICT tools • Illustrations • Hands on Session	• Hands on sessions • Illustrations	To understand Group Theory	• Q&A exams
Unit5(20 Hours)	Graph Theory – Introduction, Directed Graph, Undirected Graph, Connected and Disconnected Graphs, Bipartite Graph, Complete Bipartite Graph, Isomorphic Graphs, Subgraph. Paths and Circuits. Shortest Paths in Weighted Graphs - Dijkstra's Algorithm. Eulerian Paths and Circuits, Hamiltonian Paths and Circuits. Trees - Spanning Trees and	• Lecture using ICT tools • Illustrations • Hands on Session	• Seminar • Group study	To understand Graph Theory	• Assignments • Exams

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	Cut-Sets, Minimum Spanning Trees - Kruskal's Algorithm, Prim's Algorithm.				

Course Outcomes:

CO:1	CO1: Summarize different types of Sets
CO:2	CO2: Describe Inclusion Exclusion Principle
CO:3	CO3: Discuss Functions and Relations.
CO:4	CO4: Describe Equivalence relations and partitions.
CO:5	CO5: Discuss Lattice and Boolean algebra.
CO:6	CO6: Describe Boolean expressions and functions
CO:7	CO7: Discuss Integral Domain and Rings
CO:8	CO8: Describes Kruskal's Algorithm, Prim's Algorithm.

Faculty in Charge:



Julie P.A

Programme: CSS1C02 –ADVANCED DATA STRUCTURES

Number of Lecture hours per week: 3Hrs Number of practical hours:4Hrs

Number of credits for theory:5 Number of credits for practical:1

Aim of the course

To introduce basic and advanced data structures dealing with algorithm development and problem solving.

Course Outline

Unit I: Data structure - definition - types & operations, characteristics of data structures - Abstract Data Type (ADT) – algorithms - concepts - definition - bjectives of algorithms - quality of an algorithm - space complexity and time complexity of an algorithm.

Unit II: Counting Techniques: Basic counting techniques - permutations and combinations, asymptotic behaviour of functions. Linear data structures - Arrays records - representation - data structure operations - traversing, inserting and deleting - sorting and searching - sorting algorithms - linear search & binary search - complexity. Linked lists -

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operations and implementations, - Stack - operations and its implementations (both array and linked list) - Applications - parsing arithmetic expressions, conversion and evaluating expressions. Recursion - characteristics of recursion, types of recursion applications of recursion in algorithms - comparison of recursive and non-recursive algorithms. Queue - operations and its implementations (both array and linked list) - circular queue - dequeue - priority queues, recursive lists, heterogeneous lists, deterministic skip lists, doubly linked lists and circular lists sparse matrix- representation.

Unit III: Non-linear Data Structures - trees - terminology - tree traversals algorithms Binary trees - threaded binary trees - binary search trees - traversals and operations on BST heap Tree - balanced trees - M-way trees - B and B+ trees, Red Black Tree, Digital Search Tree, Tries, Treaps, Huffman algorithm for extended binary tree - operations and their implementation. Graphs - representation of graphs – operations - traversals and their implementation.

Unit IV: Hashing - overview of hashing - hash tables - hash functions and their computations open addressing - linear probing - quadratic probing - double hashing algorithms and their implementations - rehashing - extendable hashing - separate chaining - hashing efficiency - heaps - overview of heaps - implementation and operations.

Unit V: Heap structures - Min-Max heaps - Deaps - leftist heaps - binomial heaps -Fibonacci heaps -binary heaps - skew heaps - pairing heaps - applications - amortized analysis an unrelated puzzle - Binomial queues - skew heaps - Fibonacci heaps - Splay trees.

References:

1. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, *Data Structures andAlgorithms*, Addison-Wesley, ISBN: 978-0201000238.
2. Horowitz E and Sahni S, *Fundamentals of Data Structures*, Computer Science Press, ISBN: 9780716780427.
3. Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed, *Fundamentals of Data Structures in C*, Silicon Press, ISBN: 0929306406.
4. Richard F. Gilberg and Behrouz A. Forouzan, *Data Structures: A Pseudocode Approach With C*, Thomson Brooks/Cole Publications, Course Technology, ISBN: 9780534390808.
5. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein, *Data Structure using C*, Prentice- Hall, ISBN: 9780131997462.
6. Robert Kruse, Tondo C L and Bruce Leung, *Data Structures & Program Design in C*, Pearson India, 2nd Edition, ISBN: 9788177584233.
7. U. A. Deshpande and O. G. Kakde, *Data Structures & Algorithms*, ISTE Learning Materials Centre, New Delhi, ISBN: 9788188057054.
8. Thomas H Cormen, Charles E Leiserson, and Ronald L Rivest, *Introduction to Algorithms*, 3rd Edition, Prentice Hall of India Private Limited, New Delhi, ISBN: 978-0262033848.
9. Seymour Lipschutz, *Data Structures With C*, 1st Edition, Tata Mcgraw Hill Education Private Limited, ISBN: 0070701989.
10. Jean-Paul Tremblay, Paul G. Sorenson, P. G. Sorenson, *Introduction to Data Structures with Applications*, 2nd Edition, Mcgraw-Hill College, ISBN: 0070651574.

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Curriculum Plan

Unit/hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Unit I	Data structure - definition - types & operations, characteristics - Abstract Data Type – algorithms concepts – quality and complexity of an algorithm -	• Lecture using ICT tools • Problem Solving	Peer group discussion on different algorithm	To Understand • Concept of data structure • Criteria for choosing good algorithms	• Assignment • MCQ evaluation
Unit II	Counting Techniques: asymptotic behaviour of functions. Linear data structures - Arrays records - sorting algorithms - linear search & binary search Linked lists - Stack -s. Recursion - Queue - recursive lists, heterogeneous lists, deterministic skip lists, doubly linked lists and circular lists sparse matrix-representation.	• Lecture using ICT Tols • Illustrations • Hands on sessions	• Seminar • Group study	To Understand • Counting techniques • Linear data structures • Recursion • Linked list	• Lab tests • Q&A exams
Unit III	Non-linear Data Structures - trees - terminology - tree traversals	• Lecture using ICT tools • Illustrati	• Hands on sessions • Illustrations	To Understand • Non linear	• Lab tests • Q&A exams

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	algorithms Binary trees - threaded binary trees - binary search trees - traversals and operations on BST heap Tree - balanced trees - M-way trees - B and B+ trees, Red Black Tree, Digital Search Tree, Tries, Treaps, Huffman algorithm for extended binary tree - operations and their implementation. Graphs - representation of graphs – operations - traversals and their implementation	ons • Lab sessions		data structures • Huffman Algorithm	
Unit IV	Hashing - - linear probing - quadratic probing - double hashing - rehashing - extendable hashing - separate chaining - hashing efficiency - heaps -	• Lecture using ICT tools • Illustrations • Hands on Session	• Hands on sessions • Illustrations	To understand • Hashing and its types	• Lab tests • Q&A exams
Unit V	Heap structures - Deaps - leftist heaps - binomial heaps - Fibonacci heaps -binary heaps - skew heaps - pairing heaps - Binomial queues - skew	• Lecture using ICT tools • Illustrations • Hands on Session	• Seminar • Group study	To understand • Heap data structure • Binomial queues • Splay	• Assignments

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	heaps - Fibonacci heaps - Splay trees.			trees	

Course Outcomes:

CO:1	Summarize different categories of data structures.
CO:2	CO2: Design algorithms to perform operations with linear and non – linear data structures.
CO:3	CO3: Describe how arrays, linked lists, stacks, queues, trees and graphs are represented in memory and used by algorithms.
CO:4	CO4: Describe common applications for arrays, linked lists, stack, queue, tree and graphs.
CO:5	CO5: Demonstrate different methods for traversing trees.
CO:6	CO6: Design and implement an appropriate hashing function for an application
CO:7	CO7: Discuss the computational efficiency of the principal algorithms for sorting, searching and hashing.
CO:8	CO8: Describes various types of trees and heap structures

Faculty in Charge:



Sindhu T

Programme: CSS1C03 – THEORY OF COMPUTATION

No. of lecture hours per week	4 Hrs
No.of credits for Theory	4

Aim of the course

To provide the students with an understanding of basic concepts in the theory of computation.

Course Outline

Unit I: Preliminaries - Introduction to formal proof and inductive proofs - The central concepts of Automata Theory - Alphabets, Strings, .Languages - Introduction to automata and grammar - Deterministic Finite Automata, Non-deterministic Finite Automata - Equivalence of Deterministic and Nondeterministic Finite Automata - Finite Automata with Epsilon Transitions - Equivalence of NFA with and without epsilon moves.

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Unit II: Regular Expressions, Finite Automata and Regular Expressions, Properties of Regular Languages - Pumping lemma and proof for existence of non-regular languages, Closure properties, homomorphism, substitution - Decision Properties - Equivalence and Myhill Nerode and DFA state minimization - Regular Grammar.

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Unit III: Context Free Languages - Equivalence of CFG and PDA - Normal forms (CNF and GNF) - Closure properties of CFL's - DCFL's and their properties - Decision procedures - CYK algorithm - Pumping lemma and proof for existence of non-context - free languages - Context sensitive languages: Equivalence of LBA and Context Sensitive Grammar (CSG).

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Unit IV: Turing machines - TM computations - Equivalence of standard TM with multitape and non deterministic TM's - Turing acceptable, Turing decidable and Turing enumerable language classes - Equivalence of type 0 grammars with TM's - Church thesis -Chomsky hierarchy - Closure properties of recursive and recursively enumerable languages.

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Unit V: Computability and Decidability - halting problem - reductions – post correspondence problem. Computational complexity - Time and space bounded simulations
- Classes P and NP - NP completeness - Cook's theorem.

References:

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Introduction to Automata Theory, Languages of Computation, 3rd Edition, Prentice Hall, ISBN: 0321455363.
2. Linz P, An Introduction to Formal Languages and Automata, Narosa Publishing House Pvt. Ltd., New Delhi, ISBN: 9788173197819.
3. Michael Sipser, Introduction to Theory of Computation, Cengage Learning India Private Limited, Indian Edition, ISBN: 8131505138.
4. H.R. Lewis and C.H. Papadimitriou, Elements of Theory of Computation, 2nd Edition, Prentice Hall, ISBN: 0132624788.
5. J. E. Savage, Models of Computation, Exploring the Power of Computing, Addison Wesley, 1998, Available at http://cs.brown.edu/~jes/book/.
6. Martin J.C, Introduction to Languages and Theory of Computation, Tata McGraw Hill, 3rd Edition, ISBN: 9780070660489.

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Curriculum Plan

Unit/Hours (time required)	Topics to be Taught (Input)	Procedure (process) student centric method of	Activity	Learning outcome (outcome)	Assessment

		teaching			
Unit1(18 Hour)	Preliminaries - Introduction to formal proof and inductive proofs - The central concepts of Automata Theory - Alphabets, Strings, .Languages - Introduction to automata and grammar - Deterministic Finite Automata, Non-deterministic Finite Automata - Equivalence of Deterministic and Nondeterministic Finite Automata - Finite Automata with Epsilon Transitions - Equivalence of NFA with and without epsilon moves.	• Lecture using ICT tools	Peer group discussion on different types of sets	To Understand • Concept of DFA and NFA	• Assignment • MCQ evaluation
Unit 2 (20 Hours)	Regular Expressions, Finite Automata and Regular Expressions, Properties of Regular Languages - Pumping lemma and proof for existence of non-regular languages, Closure properties, homomorphism, substitution - Decision Properties - Equivalence and Myhill Nerode and DFA state minimization - Regular Grammar.	• Lecture using ICT Tools • Illustrations • Hands on sessions	• Seminar • Group stud	To Understand • Regular languages • Pumping Lemma • Regular Grammer .	• Q&A exams.

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Unit3 (18 Hours)	Context Free Languages - Equivalence of CFG and PDA - Normal forms (CNF and GNF) - Closure properties of CFL's - DCFL's and their properties - Decision procedures - CYK algorithm - Pumping lemma and proof for existence of non-context - free languages - Context sensitive languages: Equivalence of LBA and Context Sensitive Grammar (CSG).	• Lecture using ICT tools • Illustrations	• Hands on sessions • Illustrations	To Understand CFL and CFG	• Q&A exams
Unit4 (14 Hours)	Turing machines - TM computations - Equivalence of standard TM with multi tape and non deterministic TM's - Turing acceptable, Turing decidable and Turing enumerable language classes - Equivalence of type 0 grammars with TM's - Church thesis - Chomsky hierarchy - Closure properties of recursive and recursively enumerable languages.	• Lecture using ICT tools • Illustrations • Hands on Session	• Hands on sessions • Illustrations	To understand Turing machines	• Q&A exams

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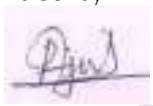
Unit5(20 Hours)	Computability and Decidability - halting problem - reductions - post correspondence problem. Computational complexity - Time and space bounded simulations - Classes P and NP - NP completeness - Cook's theorem.	• Lecture using ICT tools • Illustrations • Hands on Session	• Seminar • Group study	To understand Computability and decidability	• Assignments • Exams

Course Outcomes:

CO:1	CO1:Concepts of Automata Theory
CO:2	CO2: Describe Finite Automata
CO:3	CO3: Discuss Regular Expressions.
CO:4	CO4: Describe Context free languages
CO:5	CO5: Discuss Push down Automata
CO:6	CO6: Describe Turing Machine
CO:7	CO7: Discuss Computability and decidability
CO:8	CO8: Describes NP completeness.

Faculty in Charge:



Julie P.A

Dept. of Computer Science

Programme: CSS1C04 – THE ART OF PROGRAMMING METHODOLOGY

Number of Lecture hours per week: 2Hrs
Number of practical hours: 4Hrs
Number of credits for theory:4
Number of credits for practical:1

Aim of the course

- To learn the art of designing algorithms and flowcharts.
- To introduce the concept of algorithmic approach for solving real-life problems.
- To develop competencies for the design and coding of computer programs.
- To learn designing programs with advanced features of C.

Course Outline

Unit I: Part A: Problem Solving - Flow Chart for Structured Programming – Program Charts System Charts - Variables, data names, programming statements - Flow Chart Symbols - Terminal Symbols - I/O - Comments - Connectors - Process - Decision – Loops - Flow Charts of Fundamental Algorithms (mentioned in Part B). **Part B:** Algorithm Design - Problem Solving Aspect - Top down Design - Formal Conventions Writing Algorithms - Fundamental Algorithms (Discuss the Design of Algorithms only). **Part C:** Program, Characteristics of a good program - Modular Approach - Programming style - Documentation and Program Maintenance - Compilers and Interpreters - Running and Debugging Programs - Syntax Errors - Run-Time Errors - Logical Errors - Concept of Structured Programming.

Unit II: Introduction to C Programming - overview and importance of C - C Program Structure and Simple programs - Creation and Compilation of C Programs under Linux and Windows Platforms. Elements of C Language and Program constructs - structure of C program - character set, tokens, keywords, identifier - Data types, constants, symbolic constants, variables, declaration, data input and output, assignment statements. Operators in C - arithmetic operators, relational operators, logical operators, assignment operators,increment and decrement operators, conditional operators, special operators, precedence of operators - arithmetic expressions - evaluation of expressions, type conversion in expressions - precedence and associativity - mathematical functions - I/O operations.

Unit III: Decision making - if statement, if else statement, nesting of if else and else if ladder, switch statement, break statement, continue statement, goto statement, return statement. looping - while, do-while, and for loops, nesting of loops, skipping & breaking loops. Arrays - single dimension arrays - accessing array elements - initializing an array, two dimensional & multi-dimensional arrays - memory representation - strings - processing of strings - string manipulation functions.

Unit IV: The Concept of modularization - defining function - types of functions – User defined functions - function prototype and definition - arguments - passing parameters – call by reference - call by value - returning - nesting of functions and recursion - passing arrays & strings to function - returning multiple values - recursion - scope and life time of variables storage class specifiers - automatic, extern, static storage, register storage. Structures & Union definition, giving values to members, structure initialization, comparison of structure variables, arrays of structures, arrays within structures, structures within arrays, structures and functions, Unions, bit-fields.

Unit V: Pointer - pointer operator - pointer expression - declaration of pointer – initializing pointer - de-referencing - pointer to pointer, constant pointer, array of pointers, pointer to

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function. Files - file handling - defining & opening a file - closing a file - Input/output operations on files - error handling, random access to files, command line arguments - dynamic memory allocation - linked lists (concepts only) - preprocessor directives: macro substitution directives - simple macros - macros with arguments - nesting of macros, compiler control directives.

References:

1. Martin M. Lipschutz and Seymour Lipschutz, *Schaum's Outline of Theory and Problems of Data Processing*, ISBN: 9780070379831 (Unit I Part A).
2. Anil Bikas Chaudhuri, *The Art Of Programming Through Flowcharts & Algorithms*, Laxmi Publications, New Delhi (Unit I Part A).
3. Jean Paul Trembley and Pual G Sorenson, *An Introduction to Data Structures with Applications*, Tata McGraw Hill (Unit I Part B).
4. R G Dromey, *How to Solve by Computer*, Pearson Education, 5th Edition, ISBN: 0134340019 (Unit I Part B).
5. J.B Dixit, *Computer Fundamentals and Programming in C*, Firewall Media, ISBN: 8170088828. (Unit I Part C).
6. Dennie Van Tassel, Program Style, *Design, Efficiency, Debugging, and Testing*, PHI, ISBN: 0137299478 (Unit I Part C).
7. E Balagruswamy, *Programming in ANSI C*, TMH, 5th Edition, ISBN: 0070681821.
8. Kamthane, *Programming in C*, 2nd Edition, Pearson India, ISBN: 8131760316.
9. Brian W. Kernighan and Dennis M. Ritchie, *C Programming Language*, PHI, ISBN: 0131103628.
10. Kanetkar, *Let Us C*, BPB Publications, 8th Edition, ISBN: 1934015253.

Curriculum Plan

Unit/hours (time required)	**Topics to be taught (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Unit I	**Part A**: Problem Solving - Flow Chart for Structured Programming – **Part B:** Algorithm Design - Problem Solving Aspect - Top down Design - Formal Conventions Writing Algorithms – **Part C:** Program, Modular Approach - Compilers and	• Lecture using ICT tools • Problem Solving	Peer group discussion on different algorithm	To Understand • Concept Flowchar and algorithms • Modular approach • Errors in programing	• Assignment • Q & A Tests

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	Interpreters - Syntax Errors - Run-Time Errors - Logical Errors - Concept of Structured Programming.				
Unit II	Introduction to C ProgrammingOperators in C - evaluation of expressions, type conversion in expressions - precedence and associativity - mathematical functions - I/O operations.	• Lecture using ICT Tols • Illustrations • Hands on sessions	• Seminar • Group study	To Understand • Basics of C programming	• Lab tests • Q&A exams
Unit III	Decision making - if statement, if else statement, nesting of if else and else if ladder, switch statement, break statement, continue statement, goto statement, return statement. looping - while, do-while, and for loops, nesting of loops, skipping & breaking loops. Arrays - single dimension arrays - accessing array elements - initializing an array, two dimensional & multi-dimensional arrays - memory representation - strings - processing of strings -	• Lecture using ICT tools • Illustrations • Lab sessions	• Hands on sessions • Illustrations • Hands on sessions	To Understand • Decision making • Looping • Arrays	• Lab tests • Q&A exams

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Unit IV	The Concept of modularization - defining function - types of functions – arguments - passing parameters – call by reference - call by value - recursion - storage class specifiers - Structures & Union	• Lecture using ICT tools • Illustrations • Hands on Session	• Hands on sessions • Illustrations	To understand • Modularisation • Argument passing • Storage class	• Lab tests • Q&A exams
Unit V	Pointer - Files - file handling - error handling, command line arguments - dynamic memory allocation - preprocessor directives:	• Lecture using ICT tools • Illustrations • Hands on Session	• Seminar • Group study	To understand • Pointers in C • File handling • Dynamic memory allocation	• Assignments • Lab tests • Q and A tests

Course Outcomes:

CO:1	Improve ability to develop effective algorithms.
CO:2	Understand the fundamental principles of problem-solving using computers.
CO:3	Demonstrate the applications of the programming constructs including decision making, looping, arrays and strings
CO:4	Conceptualize modular programming basics using functions, structures and Unions
CO:5	Understand features like pointers and macros and to become familiar with programming with files
CO:6	Design, develop, implement, test and document well-structured and reliable computer programs

Faculty in Charge:



Sindhu T

Dept. of Computer Science

Programme: CSS1C05 – COMPUTER ORGANIZATION & ARCHITECTURE

Number of Lecture hours per week: 4Hrs

Number of credits for theory:4

Objectives: To familiarize with the digital fundamentals, computer organization, computer architecture and assembly language programming.

Course Outline

Unit I: Number systems and Conversions, Boolean Algebra - Truth Tables - Logic gates and Map simplification - flip-flops - design of combinational and sequential circuits - examples of digital circuits - adders, multiplexers, decoders, counters, shift registers – register transfer language and micro operations - data representation - data types, sign and magnitude, complements, fixed-point representation, floating-point representation, other binary codes, error detection codes.

Unit II: Basic computer organization - machine instructions - classification, function, addresses, size, addressing modes - instruction cycle - instruction sequencing. Fundamental concepts - registers, register transfers, performing arithmetic or logic operations, memory read and write, execution of a complete instruction, branch instruction, single bus, two bus, three bus organization, a complete processor - Control unit - hardwired control, micro programmed control, micro instructions-types.

Unit III: Arithmetic & Logic Unit - addition of positive numbers - fast adders – signed addition and subtraction - addition/subtraction logic unit - multiplication of positive numbers - array multiplier, sequential multiplier - signed number multiplication - multiplication using Booth's algorithm - fast multiplication - bit pair recording of multiplication, division-restoring and non-restoring algorithms, floating point numbers and operations.

Unit IV: Main Memory - memory hierarchy - main memory - RAM, ROM - memory cells - cell organization - working - performance considerations - cache memory - virtual memory - memory management requirements - secondary storage - memory interleaving. Input / Output Organization - Accessing I/O ,d&Vices - programmed I/O, interrupt I/O - interrupts - interrupt processing - hardware interrupts - programmable interrupt controller - vectored interrupts - interrupt nesting - daisy chaining - direct memory access (DMA) - DMA operations & DMA Controller, Introduction to I/O interfaces, I/O channels, IO Processors.

Unit V: Architecture - General 8-bit microprocessor and its architecture - 8085 - Functional block diagram - architecture functions of different sections - architecture of 8086 CPU. Instruction Sets - Instruction format - addressing modes - instruction set of 8085 CPU - Instruction cycle - timing diagrams - different machine cycles - fetch and execute operations - estimation of execution time - estimation of execution time. Intel 8051 Micro controller - Architecture - basic instructions - basic assembly language programs peripherals: interrupts, timers, parallel port, serial port.

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References:

1. V Carl Hamacher, Zvonko Vranesic and Safwat Zaky, *Computer Organization*, Mc-Graw Hill International Edition, 5th Edition, ISBN: 9780071122184.
2. Morris Mano, *Digital Logic and Computer Design*, Prentice Hall of India, ISBN: 0876924178.
3. M Morris Mano, *Computer System Architecture*, Prentice Hall, 3rd Edition. ISBN: 0131755633.
4. William Stallings, *Computer Organization and Architecture*, 9th Edition, Prentice Hall, ISBN: 013293633X.
5. Andrew S Tanenbaum, *Structured Computer Organization*, Prentice Hall, 6th Edition,ISBN: 0132916525.
6. Floyd Thomas L, *Digital Fundamentals*, Pearson Education, 10th Edition, Prentice Hall, ISBN: 0132359235.
7. Albert Paul Malvino, Donald P Leach, *Digital Principles and Applications*, McGraw Hill, 4th Edition, ISBN: 0070398836.
8. Thomas C Bartee, *Digital Computer Fundamentals*, McGraw Hill, 6th Edition, ASIN:B004H0SL5K.
9. Ramesh. S. Gaonkar, *Microprocessor Architecture*, Programming, and Applications with the 8085, 6th Edition, Wiley Eastern Ltd, New Delhi, ISBN: 9788187972884.
10. Mohamed Rafiquzzaman, *Introduction to Microprocessors and Microcomputer Based System Design*, 2nd Edition, CRC Press, ISBN: 9780849344756.
11. Muhammad Ali Mazidi, Janice Mazidi, Rolin Mckinlay, Janice M. Mazidi, Janice Gillispie Mazidi and Rolin D., *The 8051 Microcontroller and Embedded Systems*, Pearson Education Asia, 5th Indian Reprint, ISBN: 013119402X.

Curriculum Plan

Unit/hours (time required)	**Topics to be taught (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Unit I	Number systems Boolean Algebra flip-flops - design of combinational and sequential circuits - adders, multiplexers, decoders, counters, shift registers – register transfer language and micro operations -	• Lecture using ICT tools • Problem Solvin • Demonstrations	• Peer group discussion on NS • Seminar	To Understand • Number systems • Boolean Algibra • Circuits,Registers	• Assignment • MCQ evaluation

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	data representation- binary codes, error detection codes.				
Unit II	Basic computer organization - machine instructions - classification, function, addresses, size, addressing modes - instruction cycle - instruction sequencing. Fundamental concepts - registers, performing arithmetic or logic operations, memory read and write, execution of a complete instruction, branch instruction, bus organization, a complete processor - Control unit -, micro instructions-types.	• Lecture using ICT Tols • Illustrations • Problem solving	• Seminar • Group study	To Understand • Working of machine instructions • Arithemetic and logic operations	• Q&A exams • Assignments
Unit III	Arithmetic & Logic Unit - addition of positive numbers - - array multiplier, sequential multiplier - signed number multiplication -	• Lecture using ICT tools • Illustrations • Problem solving	• Illustrations • Drawing sessions	To Understand • ALU-addition multiplication ,division	• Assignments • Q&A exams

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	division-				
Unit IV	Main Memory - memory hierarchy - main memory - RAM, ROM - memory cells - cell organization - working - performance considerations - cache memory - virtual memory- memory interleaving. Input / Output Organization - Accessing I/O devices - interrupts - interrupt processing Introduction to I/O interfaces, I/O channels, IO Processors.	• Lecture using ICT tools • Illustrations •	• Illustrations • Drawing sessions	To understand • Memory hierarchy • Cache and virtual memory • How i/o devices accessed	• Assignments • Q&A exams
Unit V	Architecture - General 8-bit microprocessor and its architecture - 8085 - Intel 8051 Micro controller - interrupts, timers, parallel port, serial port	• Lecture using ICT tools • Illustrations •	• Seminar • Group study	To understand • Microprocessor-8085-8086 • Microcontroller-8051	• Assignments

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Course Outcomes:

CO:1	Identify, understand and apply different number systems and codes.
CO:2	Understand the digital representation of data in a computer system.
CO:3	Understand the general concepts in digital logic design and their use in sequential and combinational circuit design.
CO:4	Describe fundamental organization of a computer system

CO:5	Explain addressing modes, instruction formats and program control statements.
CO:6	Understand computer arithmetic formulae and solve problems
CO:7	Distinguish the organization of various parts of a system memory hierarchy.
CO:8	Identify and compare different methods for computer I/O

Faculty in Charge:



Sindhu T

Dept. of Computer Science

Course: **MSc Computer Science (Second Semester)**

Programme: **CSS2C06 – DESIGN AND ANALYSIS OF ALGORITHMS**

No. of lecture hours per week	4 Hrs
No.of credits for Theory	4

Aim of the course

- To introduce the concept of algorithmic approach for solving real-life problems.
- To teach basic principles and techniques of computational complexity.
- To familiarize with parallel algorithms and related techniques.

Course Outline

Unit I: Algorithm Design: Introduction, Steps in developing algorithm, Methods of specifying an algorithm, Decisions prior to designing: based on the capabilities of the device, based on the nature of solutions, based on the most suitable data structures. Model of Computation: RAM model and PRAM model. Important Problem Types (Introductory concepts): Sorting, Searching, String processing, Graph problems, Combinatorial problems, Geometric problems and Numerical problems.

Unit II: Basic Technique for Design of Efficient Algorithm: Brute Force approach (String matching), Divide-and-Conquer approach (Merge sort), Branch-and-Bound technique (Knapsack problem). Greedy approach (Kruskal's algorithm and Prim's Algorithm), Dynamic Programming (Longest Common Subsequence), Backtracking (Sum of subsets problem).

Unit III: Algorithm Analysis: Importance of algorithm analysis, Time and Space Complexity. Growth of Functions: Asymptotic notations, Cost estimation based on key operations- Big Oh, Big Omega, Little Oh, Little Omega and Theta notations, Big Oh Ratio Theorem, Big Theta Ratio Theorem, Big Omega Ratio Theorem. Analyzing Algorithm Control Structures, Solving Recurrences: Iteration Method, Substitution Method, The Recursion Tree Method, Master's Theorem, Problem solving using Master's Theorem Case 1, Case 2 and Case 3. Analysis of Strasser's algorithm for matrix multiplication, Analysis of Merge sort.

Unit IV: Complexity - Complexity Classes: P, NP, NP Hard and NP Complete problems. NP Completeness reductions for Travelling Salesman Problem and Hamiltonian Cycle. P versus NP problem.

Unit V: Analysing Parallel Algorithms: Time Complexity, Cost, Number of Processors, Space Complexity, Speed up, Efficiency, Scalability, Amdahl's Law. Parallel merging and sorting, Euler tour technique, Parallel prefix computation, Determinist c symmetry breaking.

References:

1. Thomas H Cormen, Charles E Leiserson, and Ronald L Rivest, Introduction to Algorithms, 3rd Edition, Prentice Hall of India Private Limited, New Delhi, ISBN: 9780262033848 (Unit I, II, III and IV).
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, The Design and Analysis of Computer Algorithms, 1st Edition. Addison Wesley, ISBN: 0534915728 (Unit I, II, III and IV).
3. Pallaw, V K, Design and Analysis of Algorithms, Asian Books Private Ltd, 2012, ISBN: 8184121687 (Unit I, II, III and IV).
4. Sanjay Razdan, Fundamentals of Parallel Computing, Narosa Publishing House, 2014, ISBN: 9788184873481 (Unit V).
5. Pandey H M, Design and Analysis of Algorithms, University Science Press, 2013, ISBN: 9788131803349 (Unit I, II, III and IV).
6. Upadhyay N, Design and Analysis of Algorithms, SK Kataria & Sons, 2008 (Unit I, II, III and IV).
7. U. Manber, Introduction to Algorithms: A Creative Approach, Addison Wesley, ISBN: 9780201003277 (Unit I, II, III and IV).
8. Gilles Brassard and Paul Bratley, Fundamentals of Algorithmics, Prentice-Hall of India, ISBN: 0133350681 (Unit I, II, III and IV).
9. Goodman S E and Hedetniemi, Introduction to the Design and Analysis of Algorithms, Mcgraw Hill, ISBN: 0070237530 (Unit I, II, III and IV).
10. Horowitz E and Sahni S, Fundamentals of Computer Algorithms, Galgotia Publications Pvt. Ltd, ISBN: 8175152575 (Unit I, II, III and IV).
11. Oded Goldreich, P, NP and NP - Completeness, Cambridge University Press, 2011. ISBN: 0521122546 (Unit V).
12. Donald Knuth, The Art of Computer Programming, Fundamental Algorithms, Volume 1, Addison Wesley, 1997, ISBN: 8177587544 (Unit I).
13. Sanjeev Arora and Boaz Borak, Computational Complexity - A Modern Approach, Cambridge University Press; 2009, ISBN: 0521424267 (Unit III).
14. Daniel Hills W and Bruce M Boghosian, Parallel Scientific Computation, Science, 13 August 1993, Vol. 261 (5123), pp.856-863 (Unit V).

Curriculum Plan

Unit/Hours (time required)	Topics to be Taught (Input)	Procedure (process) student centric	Activity	Learning outcome (outcome)	Assessment

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		method of teaching			
Unit1(18 Hour)	Algorithm Design: Introduction, Steps in developing algorithm, Methods of specifying an algorithm, Decisions prior to designing: based on the capabilities of the device, based on the nature of solutions, based on the most suitable data structures. Model of Computation: RAM model and PRAM model. Important Problem Types (Introductory concepts): Sorting, Searching, String processing, Graph problems, Combinatorial problems, Geometric problems and Numerical problems. .	• Lecture using ICT tools	Peer group discussion on different types of sets	To Understand • Concept of Algorithm designs	• Assignment • MCQ evaluation
Unit 2 (20 Hours)	Basic Technique for Design of Efficient	• Lecture using ICT Tools • Illustrations	• Seminar • Grou	To Understand • Basic	• Q&A exams.

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	Algorithm: Brute Force approach (String matching), Divide-and-Conquer approach (Merge sort), Branch-and-Bound technique (Knapsack problem). Greedy approach (Kruskal's algorithm and Prim's Algorithm), Dynamic Programming (Longest Common Subsequence), Backtracking (Sum of subsets problem).	• Hands on sessions	p stud	techniq ue for design of efficien t algorith m .	
Unit3 (18 Hours)	Algorithm Analysis: Importance of algorithm analysis, Time and Space Complexity. Growth of Functions: Asymptotic notations, Cost estimation based on key operations- Big Oh, Big Omega, Little Oh, Little Omega and Theta notations, Big Oh Ratio Theorem, Big	• Lecture using ICT tools • Illustrations	• Hand s on sessio ns • Illustr ations	To Understand Time and Space complexity	• Q&A exams

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	Theta Ratio Theorem, Big Omega Ratio Theorem. Analyzing Algorithm Control Structures, Solving Recurrences: Iteration Method, Substitution Method, The Recursion Tree Method, Master's Theorem, Problem solving using Master's Theorem Case 1, Case 2 and Case 3. Analysis of Strasser's algorithm for matrix multiplication, Analysis of Merge sort.				
Unit4 (14 Hours)	Complexity - Complexity Classes: P, NP, NP Hard and NP Complete problems. NP Completeness reductions for Travelling Salesman Problem and Hamiltonian Cycle. P versus NP problem.	• Lecture using ICT tools • Illustrations • Hands on Session	• Hands on sessions • Illustrations	To understand P,NP ,NP Hard	• Q&A exams

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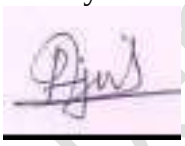
Unit5(20 Hours)	Analysing Parallel Algorithms: Time Complexity, Cost, Number of Processors, Space Complexity, Speed up, Efficiency, Scalability, Amdahl's Law. Parallel merging and sorting, Euler tour technique, Parallel prefix computation, Deterministi c symmetry breaking.	• Lecture using ICT tools • Illustrations • Hands on Session	• Seminar • Group study	To understand Parallel prefix computation	• Assignments • Exams

Course Outcomes:

CO:1	CO1:Concepts of Algorithm Design
CO:2	CO2: Describe Basic Technique for Design of Efficient Algorithm
CO:3	CO3: Discuss Algorithm Analysis
CO:4	CO4: Describe Recursion Tree method and Masters method
CO:5	CO5: Learn Strassen's matrix multiplication
CO:6	CO6: Describe Complexity
CO:7	CO7: Knowledge about Parallel Algorithms
CO:8	CO8: Understand Parallel prefix computation.

Faculty in Charge:



Julie P.A

Dept. of Computer Science

Programme:CSS2C07 – OPERATING SYSTEM CONCEPTS COURSE

Number of Lecture hours per week: 3Hrs	Number of practical hours: 3Hrs
Number of credits for theory:4	Number of credits for practical:1

Aim of the Course

- Introduce the underlying principles of an operating system.
- Exposure of multi programming, virtual memory and resource management concepts.
- Case study of public and commercially available operating systems

Course Outline

Unit I: Operating System Overview - Objectives and functions - Evolution of Operating System- Major Achievements - Process Description and Control - Process, Creation & Termination of Processes, Five State Model, Suspended Process, Process Description,Process Control - Modes of Execution, Process Creation, Process and Mode Switching. Threads - Processes Vs Threads, Multithreading, Thread States, Types of Threads, MultiCore and Multithreading. Case Study - Unix SVR4 Process Management, Linux Process and Thread Management.

Unit II: Concurrency - Principles, Race Condition, Operating System Concerns, Process Interaction, Completion for Resources, Cooperation by Sharing. Mutual Exclusion - Requirements, Hardware Support, Semaphores, Producer Consumer Problem, Monitors,Message Passing, Readers/Writers Problem. Deadlock - Principles, Prevention, Avoidance, Detection, Recovery, Dining Philosophers Problem. Case Study: Unix Concurrency Mechanisms.

Unit III: Memory Management, Address binding, Logical Vs Physical address space, Dynamic Loading, Dynamic Linking and Shared Libraries, Overlays, Swapping, Contiguous Memory allocation, Paging, Segmentation, Virtual memory, Demand paging, Page replacement, Thrashing. Case Study: Windows Memory Management.

Unit IV: Uniprocessor Scheduling - types, scheduling algorithms - criteria, nonpreemptive,preemptive. Comparative study of scheduling algorithms - FCFS, SJF, Priority, RR, Multilevel, Feedback Queue. Multiprocessor Scheduling - Classification, Granularity,Design Issues, Process Scheduling, Thread Scheduling. Real Time Scheduling - Background, Characteristics of Real Time OS, Scheduling, Deadline Scheduling, Rate Monotonic Scheduling, Priority Inversion. Case study: Linux Scheduling .

Unit V: Client/Server Computing - Definition, Applications, Classes, Three-Tier Client/Server Architecture, Middleware. Service-Oriented Architecture- Distributed Message Passing - Remote Procedure Calls - Clusters. Mobile Operating Systems - Characteristics - Comparative Study of the Features of iOS and Android.

Reference

1. William Stallings, *Operating System- Internals and Design Principles*, 7th Edition, Pearson, ISBN: 9780273751502.

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2. Abraham Silberschatz, Peter B. Galvin and, Greg Gagne, *Operating System Concepts*, 9th Edition, John Wiley & SonsTISBN: 9781118063330.
3. Ann Mclver McHoes and Ida M. Flynn, *Understanding Operating Systems*, 6th Edition, Cengage Learning, 2010, ISBN: 9781439079201.
4. Mukesh Singhal and Niranjan G. Shivaratri, *Advanced Concepts in Operating Systems - Distributed, Database, and Multiprocessor Operating Systems*, Tata McGraw-Hill Education Private Limited, ISBN: 9780070575721.
5. Current Literature (for Mobile Operating Systems).

Curriculum Plan

Unit/hours (time required)	**Topics to be taught (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Unit I(18 Hrs)	OS Overview - Evolution of OS Process, Five State Model, Case Study - Unix SVR4 Process Management, Linux Process and Thread Management.	• Lecture using ICT tools • Problem Solving	• Peer group discussion • Seminar	To Understand • Process and thread • Process models • Process management	• Assignment • MCQ evaluation
Unit II (18 Hrs)	Concurrency - Mutual Exclusion - Semaphores, Producer Consumer Problem, Readers/Writers Problem. Deadlock - Dining Philosophers Problem. .	• Lecture using ICT Tols • Illustrations • Lab sessions	• Seminar • Group study • Hands on sessions	To Understand • Concurrency • ME and semaphores • IPC problems and dead lock	• Lab tests • Q&A exams
Unit III	Memory Management, Address binding,	• Lecture using	• Hands on	To Understand	• Lab tests • Q&A exams

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	Logical Vs Physical address space, Dynamic Loading, Contiguous Memory allocation, Paging, Segmentation, Virtual memory, Demand paging, Page replacement, Thrashing.	ICT tools • Illustrations • Lab sessions	sessions • Illustrations	• Memory management • Memory allocation	
Unit IV(18 Hrs)	Uniprocessor Scheduling - Multiprocessor Scheduling - Granularity, Thread Scheduling. Real Time OS, Scheduling, Deadline Scheduling, Rate Monotonic Scheduling,	• Lecture using ICT tools • Illustrations • Hands on Session	• Hands on sessions • Illustrations	To understand • Scheduling • Thread scheduling	• Lab tests • Q&A exams
Unit V(18 Hrs)	Client/Server Computing - Definition, Applications, Classes, Three-Tier Client/Server Architecture, Middleware. Service-Oriented Architecture-Distributed Message Passing - Remote Procedure Calls - Clusters. Mobile Operating Systems -	• Lecture using ICT tools • Illustrations • Hands on Session	• Seminar • Group study	To understand • Cs computing • Middle ware • Android and iOS	• Assignments

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	Characteristics - Comparative Study of the Features of iOS and Android.				

Course Outcomes:

CO:1	Explain the basics of database management system, concepts of relational data model, entity- relationship model, relational database design, relational algebra and calculus
CO:2	Apply the normalization techniques to improve the database design
CO:3	Describe various database manipulation commands in SQL.
CO:4	Understand Transaction Processing & Locking using the concept of Concurrency control.
CO:5	Conceptualize advanced features of Object-Oriented Database Management Systems and Distributed databases

Faculty in Charge:



Sindhu T

Programme: **CSS2C08 – COMPUTER NETWORKS**

No. of lecture hours per week	4 Hrs
No.of credits for Theory	4

Aim of the course

- To provide the student with a top down approach of networking starting from the application layer.
- To introduce computer networking in the back drop of Internet protocol stack.

Course Outline

Unit I:Introduction to Computer networks - introduction - topology - categories of networks Internetwork - Internet - network modes- layered model - OSI and TCP/IP Models Transmission media - Wired and unwired media. Computer networks and Internet – the network edge - the network core - network access - delay and loss - protocol layers and services - history of computer networking and Internet.

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Unit II: Application layer protocols – principles – the web and HTTP – FTP – Email in Internet – DNS. Socket programming – building a Web server - content distribution.

Unit III: Transport layer services – introduction – relationship between Transport and Network layer – UDP – reliable data transfer – TCP - congestion control - Network layer services – routing – IP - routing in Internet - router - IPV6 - multicast routing – mobility.
.
Unit IV: Link layer services - error detection and correction - multiple access protocols – LAN address – ARP – Ethernet – hubs – bridges – switches - wireless links – PPP - ATM.
.
Unit V: Security in Networks – Principles of Cryptography – Authentication – Integrity –Key Distribution and Certification – Firewalls – Attacks and Counter Measures.

References:

1. J. F. Kurose and K. W. Ross, Computer Networking: A Top-Down Approach Featuring Internet, 6th Edition, Perason Education, ISBN: 0132856204.
2. Behrouz Forouzan, Data Communications and Networking, 4th Edition, McGraw-Hill Reprint, ISBN: 0073250325.
3. Peterson L.L. and Davie B .S., Computer Networks, A Systems Approach, 5th Edition, Morgan Kaufmann, ISBN: 9780123850591.
4. Keshav, An Engineering Approach to Computer Networking, Pearson Education Asia, ISBN: 97898123598652000.
5. Andrew S. Tanenbaum, Computer Networks, 5th Edition, PHI, ISBN: 9788131787571.
6. Herbert Scheldt, Java Complete Reference, 7th Edition, McGraw-Hill Osborne Media, ISBN: 9780072263855.

6. Martin J.C, Introduction to Languages and Theory of Computation, Tata McGraw Hill, 3rd Edition, ISBN: 9780070660489.

Curriculum Plan

Unit/Hours (time required)	**Topics to be Taught (Input)**	**Procedure (process) student centric method of teaching**	**Activity**	**Learning outcome (outcome)**	**Assessment**

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Unit1(18 Hour)	Introduction to Computer networks - introduction - topology - categories of networks Internetwork - Internet - network modes- layered model - OSI and TCP/IP Models Transmission media - Wired and unwired media. Computer networks and Internet - the network edge - the network core - network access - delay and loss - protocol layers and services - history of computer networking and Internet.	• Lecture using ICT tools	Peer group discussion on different types of sets	To Understand • Concept of OSI and TCP/IPs	• Assignment • MCQ evaluation
Unit 2 (20 Hours)	Application layer protocols – principles – the web and HTTP – FTP – Email in Internet – DNS. Socket programming – building a Web server - content distribution.	• Lecture using ICT Tools • Illustrations • Hands on sessions	• Seminar • Group stud	To Understand • Application layer protocols .	• Q&A exams.

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Unit3 (18 Hours)	Transport layer services – introduction – relationship between Transport and Network layer – UDP – reliable data transfer – TCP - congestion control - Network layer services – routing – IP - routing in Internet - router - IPV6 - multicast routing – mobility.	• Lecture using ICT tools • Illustrations	• Hands on sessions • Illustrations	To Understand Transport layer protocols	• Q&A exams
Unit4 (14 Hours)	Link layer services - error detection and correction - multiple access protocols – LAN address – ARP – Ethernet – hubs – bridges – switches - wireless links – PPP - ATM.	• Lecture using ICT tools • Illustrations • Hands on Session	• Hands on sessions • Illustrations	To understand Link Layer services	• Q&A exams

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Unit5(20 Hours)	Security in Networks – Principles of Cryptography – Authentication – Integrity – Key Distribution and Certification – Firewalls – Attacks and Counter Measures.	• Lecture using ICT tools • Illustrations • Hands on Session	• Seminar • Group study	To understand Principles of security	• Assignments • Exams

Course Outcomes:

CO:1	CO1:Concepts of Computer networks
CO:2	CO2: Learn about Network Topologies
CO:3	CO3: Discuss Application layer protocols
CO:4	CO4: Describe Transport layer Protocols
CO:5	CO5: Understand Link layer services
CO:6	CO6: Describe Ethernet ,Hub,switches
CO:7	CO7: Discuss Security in Networks
CO:8	CO8: Understand Principles of Cryptography

Faculty in Charge:




Julie P.A , Sindhu T

Dept. of Computer Science

Programme: CSS2C09 – COMPUTATIONAL INTELLIGENCE

Number of Lecture hours per week: 4Hrs
Number of credits for theory:4

Aim of the course

- To introduce concepts of Artificial Intelligence and Machine Learning.

Course Outline

Unit I: Introduction - Artificial Intelligence - problems, scope and applications, problem space and search - production system- characteristics - the predicate calculus, inference rules,structures and strategies for state space search, strategies for space search, using state space to represent reasoning with the predicate calculus.

Unit II: Heuristics Search: control and implementation of state space search, generate and test, hill climbing, Best-first search, problem reduction, constraint satisfaction, means- ends analysis, heuristic in games, complexity issues.

Unit III: Knowledge representation issues, representation and mappings, representing simple facts in logic, representing instances and ISA relationships, computable functions and predicates, resolution, natural deduction, knowledge representation using rules, logic programming, forward versus backward reasoning, symbolic reasoning under uncertaintynon- monotonic reasoning, depth first search, breadth first search.

Unit IV: Game playing - the mini-max search procedure, adding alpha-beta cut-offs,additional refinement, iterative deepening, planning system and its components,understanding, understanding as constrained satisfaction. Slot and filler structures: semantic nets, frames, conceptual dependency, scripts. Definition and characteristics of expert system, representing and using domain knowledge, expert system shells. Knowledge engineering, knowledge acquisition, expert system life cycle & expert system tools, MYCIN & DENDRAL examples of expert system.

Unit V: Machine learning - rote learning, learning by taking advice, learning in problem solving, learning from examples, explanation based learning, analogy, formal learning theory,connectionist models - hopfield networks, learning in neural networks, back propagation, the genetic algorithm, classifier systems and genetic programming, artificial life and society based learning.

References:

1. Elaine Rich, Kevin Knight and Shivshankar B. Nair, *Artificial Intelligence*, 3rd Edition, Tata - McGraw Hill, New Delhi, ISBN: 0070087709.
2. V S Janakiraman, K Sarukesi and P Gopalakrishnan, *Foundations of Artificial Intelligence and Expert System*, Macmillan India Limited, ISBN: 0333926250.
3. Stuart Russell and Peter Norvg, *Artificial Intelligence: A Modern Approach*, 3rd Edition, Prentice Hall, ISBN: 0136042597.'
4. G. F. Luger and W.A Stubblefield, *Artificial Intelligence - Structures and Strategies for Complex Problem Solving*, Addison-Wesley, 6th Edition, ISBN: 9780321545893.
5. P. H. Winston, *Artificial Intelligence*, Addison-Wesley, 3rd Edition, ISBN: 0201533774.
6. Nils J. Nilsson, Artificial Intelligence, A New Synthesis, 1st Edition, Morgan Kaufmann Publishers, Inc, ISBN: 1558604677.

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Curriculum Plan

Unit/hours (time required)	Topics to be taught (input)	Procedure (process) Student centric Method of teaching	Activity	Learning outcome (output)	Assessment
Unit I(18 Hrs)	Introduction - Artificial Intelligence - problems, scope and applications, problem space and search - production system- the predicate calculus,	• Lecture using ICT tools • Problem Solving	• Peer group discussion • Problem solving	To Understand • Concept AI • Production system	• Assignment • MCQ evaluation
Unit II(24 Hrs)	Heuristics Search: state space search, generate and test, hill climbing, Best-first search, problem reduction, constraint satisfaction, means- ends analysis, heuristic in games,	• Lecture using ICT Tols • Illustrations	• Seminar • Group study	To Understand • Various heruristic searches • Heuristic in games	• Lab tests • Q&A exams
Unit III(20 Hrs)	Knowledge representation representing instances and ISA relationships, resolution, natural deduction, knowledge representation using rules, logic programming, forward versus backward reasoning, symbolic reasoning under	• Lecture using ICT tools • Illustrations •	• Illustrations • Problem solving	To Understand • Knowledge representation • Logic programming	• Lab tests • Q&A exams

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	uncertainty				
Unit IV(18Hrs)	Game playing - the mini-max search procedure, adding alpha-beta cut-offs, planning system understanding, Slot and filler structures: semantic nets, frames, conceptual dependency, scripts. Definition and characteristics of expert system,	• Lecture using ICT tools • Illustrations •	• Illustrations • Seminar	To understand • Game playing • Knowledge representation	• Lab tests • Q&A exams
Unit V(10 Hrs)	Machine learning - learning, connectionist models -, learning in neural networks, back propagation, the genetic algorithm, classifier systems and genetic programming, artificial life and society based learning	• Lecture using ICT tools • Illustrations	• Seminar • Group study • Seminar	To understand • Machine learning • Genetic Algorithm	• Assignments • Q & A tests

Course Outcomes:

CO:1	Apply the basic principles, models, and algorithms of AI to recognize, model, and solve problems in the analysis and design of information systems
CO:2	Conceptualize various knowledge representation techniques.
CO:3	Analyze the problem-solving methods and algorithms related to searching, reasoning, game playing and machine learning
CO:4	Understand the functioning of expert systems and its importance .
CO:5	Demonstrate the implementation various AI algorithms to solve real life problems

Faculty in Charge:



Sindhu T

Dept. of Computer Science

Programme: **CSS2C10 – PRINCIPLES OF SOFTWARE ENGINEERING**

No. of lecture hours per week	4 Hrs
No.of credits for Theory	4

Aim of the course

To develop familiarity with software engineering principles and practices.
To have an understanding about the process of product/literature survey, techniques of problem definition, and methods of report writing.

Course Outline

Unit I:Introduction – problem domain - software engineering challenges – approaches –software process and development models – agile models – SDLC - software process.

Unit II: Software requirements analysis & specification - feasibility study - types of feasibility – software requirements - problem analysis – requirement specification –functional specification – metrics. Software design – outcome – cohesion and coupling –layered arrangement of modules – approaches to software design - structured analysis – DFD – extending DFD technique for applying to real-time systems – structured design – detailed design - object oriented modelling – use case model – class diagram – interaction diagram -activity diagram - data diagram – state chart diagram - ER diagram.

Unit III: User Interface (UI) design – characteristics – basic concepts – types –fundamentals of component-based GUI Development – UI design methodology – process planning – cost estimation – project scheduling – configuration management – risk management - software coding – review – documentation – software testing - software testing basics - steps involved in test plan - software testing strategies.

Unit IV: Managing project – time management – setting aims and objectives – techniques for generating ideas – literature survey – types of information sources – writing literature survey.

Unit V: Project story preparation – key deliverables – communicating with experts – forms of communication – presenting ideas – common problems faced by a research scholar – report writing.

References:

1. Pankaj Jalote, An Integrated Approach to Software Engineering, 3rd Edition, Narosa Publishing House, ISBN: 9788173197024.
2. Rajib Mall, Fundamentals of Software Engineering, 3rd Edition, PHI Learning Pvt Ltd, ISBN: 9788120338197.
3. Rohit Khurana, Software Engineering: Principles and Practices, 2nd Edition, Vikas Publishing House Pvt Ltd, ISBN: 8125939466.

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4. Andy Hunt, Your Research Hunt, How to Manage it, Routledge, ISBN: 0415344085.
5. Michael Jay Polonsky, David S. Waller, Designing and Managing a Research Project: A Business Student's Guide, Sage, ISBN: 1412977754.
6. Richard Bullock, Maureen Daly Goggin and Francine Weinberg, The Norton Field Guide to Writing (with Readings and Handbook), 3rd Edition, W. W. Norton & Company, ISBN: 0393919595.
7. Kavadia Garg, Agrawal and Agrawal, An introduction to Research Methodology, Rbsa Publishers ISBN: 8176111651.

Curriculum Plan

Unit/Hours (time required)	**Topics to be Taught (Input)**	**Procedure (process) student centric method of teaching**	**Activity**	**Learning outcome (outcome)**	**Assessment**
Unit1(18 Hour)	Introduction – problem domain - software engineering challenges – approaches – software process and development models – agile models – SDLC - software process.	• Lecture using ICT tools	Peer group discussion on different types of sets	To Understand • Concept of SDLC	• Assignment • MCQ evaluation
Unit 2 (20 Hours)	Software requirements analysis & specification - feasibility study - types of feasibility – software requirements - problem analysis – requirement specification – functional specification – metrics. Software design – outcome – cohesion and	• Lecture using ICT Tools • Illustrations • Hands on sessions	• Seminar • Group stud	To Understand • SRS • DFD • ER Diagram • Activity Diagram.	• Q&A exams.

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	coupling – layered arrangement of modules – approaches to software design - structured analysis – DFD – extending DFD technique for applying to real-time systems – structured design – detailed design - object oriented modelling – use case model – class diagram – interaction diagram - activity diagram - data diagram – state chart diagram - ER diagram.				
Unit3 (18 Hours)	User Interface (UI) design – characteristics – basic concepts – types – fundamentals of component-based GUI Development – UI design methodology – process planning – cost estimation – project scheduling – configuration management – risk	• Lecture using ICT tools • Illustrations	• Hands on sessions • Illustrations	To Understand User Interface	• Q&A exams

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	management - software coding – review – documentation – software testing - software testing basics - steps involved in test plan - software testing strategies.				
Unit4 (14 Hours)	Managing project – time management – setting aims and objectives – techniques for generating ideas – literature survey – types of information sources – writing literature survey.	• Lecture using ICT tools • Illustrations • Hands on Session	• Hands on sessions • Illustrations	To understand Project management	• Q&A exams
Unit5(20 Hours)	Project story preparation – key deliverables – communicating with experts – forms of communication – presenting ideas – common problems faced by a research scholar – report writing.	• Lecture using ICT tools • Illustrations • Hands on Session	• Seminar • Group study	To understand Report writing	• Assignments • Exams

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Course Outcomes:

CO:1	CO1:Concepts of Software Engineering
CO:2	CO2: Describe Software processes
CO:3	CO3: Knowledge About process models

CO:4	CO4: Describe object oriented modelling
CO:5	CO5: Understand User interface Design
CO:6	CO6: Describe Software testing
CO:7	CO7: Discuss Project management
CO:8	CO8: Describes Report Writing

Faculty in Charge:



Julie P.A

Course : MSc Computer Science (Third Semester)

Programme: CSS3C11 – ADVANCED DATABASE MANAGEMENT SYSTEM

Number of Lecture hours per week: 3Hrs	Number of practical hours: 3Hrs
Number of credits for theory:4	Number of credits for practical:1

Aim of the Course

Number of Lecture hours per week: 3Hrs

- To understand the relational model, and know how to translate requirements captured in an Entity-Relationship diagram into a relational schema
- To reason about dependencies in a relational schema.
- To understand normal form schemas, and the decomposition process by which normal forms are obtained.
- To familiarize with advanced SQL' statements
- To understand advanced features of database technologies.

Course Outline

Unit I: Introduction - purpose of database systems, views of data - data abstraction, instances and schemas, data independence, data models - hierarchical data model, network data model, relational data model, ER d&tg9,mg9lei. Database languages - DDL, DML, transaction anagement, storage management, database administrator, database users, overall system structure. Relational data model - relational model concepts, keys, integrity constraints - domain constraints, key constraints, entity integrity constraints, referential integrity constraints. ER data model - basic concepts, constraints, keys, design issues, entity relationship diagram, weak entity sets, extended ER features, design of an ER database schema, reduction of an ER schema to tables. Relational algebra and calculus – relational algebra - selection and projection, set

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operations, renaming, joins, division. Relational calculus - tuple relational calculus, domain relational calculus. Expressive power of algebra and calculus.

Unit II: Relational database design - anomalies in a database - functional dependency -lossless join and dependency- preserving decomposition - normalization - normal forms -first, second and third normal form - Boyce Codd normal form - multivalued, dependency - fourth normal form - join dependency - project join normal form - domain key normal form.

Unit III: Relational database query languages - basics of QBE and SQL. Data definition in SQL data types, creation, insertion, viewing, updation, deletion of tables, mo difying the structure of the tables, renaming, dropping of tables. Data constraints - I/O constraints, primary key, foreign key, unique key constraints, ALTER TABLE command database manipulation in SQL - computations done on table data - SELECT command, logical operators, range searching, pattern matching, grouping data from tables in SQL, GROUP BY, HAVING clauses. Joins - joining multiple tables, joining a table to it. DELETE - UPDATE. Views - creation, renaming the column of a view, destroys view. Program with SQL - data types Using SET and SELECT commands, procedural flow, IF, IF /ELSE, WHILE, GOTO, global variables. Security - locks, types of locks, levels of locks. Cursors - working with cursors, error handling, developing stored procedures, CREATE, A LTER and
DROP, passing and returning data to stored procedures, using stored procedures within queries, building user defined functions, creating and calling a scalar function, implementing triggers, creating triggers, multiple trigger interaction (Use MySQL as the RDBMS).

Unit IV: Transaction management, concurrency control and query processing- concept,definition and states of transactions, ACID properties - concurrency control, serializability - conflict serializability, view serializability, recoverability-recoverable schedules, noncascading schedules, strict schedules. Concurrency control schemes - locking- two phase locking, deadlock, granularity, timestamp ordering protocol. Basics of query processing.

Unit V: Object Oriented Database Management Systems (OODBMS) - concepts, need for OODBMS, composite objects, issues in OODBMSs, advantages and disadvantages of OODBMS. Distributed databases - motivation - distributed database concepts, types of distribution, architecture of distributed databases, the design of distributed databases, distributed transactions, commit protocols for distributed databases.

Reference

1. Elmasri and Navathe, *Fundamentals of Database Systems*, 5th Edition, Pearson, ISBN: 9788131758984.
2. Abraham Silbersehatz, Henry F. Korth and S.Sudarshan, *Database System Concepts*, 6th Edition, Tata McGraw-Hill, ISBN: 0071325220.
3. CJ Date, *An Introduction to Database Systems*, 8th Edition, Addison Wesley, ISBN: 0321197844.
4. Ramakrishnan and Gehrke, *Database Management Systems*, 3rd Edition, McGraw - Hill Education, ISBN: 9339213114.
5. Alexis Leon and Mathews Leon, *Database Management Systems*, 1st Edition, Vikas Publishers, ISBN: 8182092221.

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6. Vikram Vaswani, *MySQL The complete Reference*, 1st Edition, Tata Mcgraw Hill Education Private Limited, ISBN: 0070586845.
7. Joel Murach, *Murach's Mysql*, Mike Murach & Associates Inc, ISBN: 9350237695.
8. Paul DuBois, *MySQL Cookbook*, 2nd Edition, O'Reilly Media, ISBN: 184042809.

Curriculum Plan

Unit/hours (time required)	**Topics to be taught (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Unit I(15 Hrs)	Introduction to DBMS-views of data - data models - Database languages - database users, Relational data model - ER data model - Relational algebra and calculus – relational algebra -	• Lecture using ICT tools • Problem Solving	• Peer group discussion • Seminar	To Understand • DBMS vies • DBMS users • DBMS Languages • DBMS models	• Assignment • MCQ evaluation
Unit II(18 Hrs)	Relational database design - anomalies in a database - functional dependency - lossless join and dependency-preserving decomposition -normalization-	• Lecture using ICT Tols • Illustrations • Lab sessions	• Seminar • Group study • Hands on sessions	To Understand • Anomalies • Dependency preserving • Normalisation	• Lab tests • Q&A exams
Unit III(22 Hrs)	Relational database query languages – SQL query processing	• Lecture using ICT tools • Illustrations • Lab	• Hands on sessions • Illustrations	To Understand • SQL query processing	• Lab tests • Q&A exams

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		sessions			
Unit IV(20 Hrs)	Transaction management, - ACID properties -, serializability schedules, Concurrency control schemes - locking- deadlock, granularity, timestamp ordering protocol.	• Lecture using ICT tools • Illustrations • Hands on Session	• Hands on sessions • Illustrations	To understand • Transactin in DBMS • Concurrency and serialisability • Deadlock	• Lab tests • Q&A exams
Unit V(15 Hrs)	Object Oriented Database Management Systems Distributed databases - distributed transactions, commit protocols for distributed databases.	• Lecture using ICT tools • Illustrations • Hands on Session	• Seminar • Group study	To understand • OODBMS • Distributed Databses	• Assignments

Course Outcomes:

CO:1	Explain the basics of database management system, concepts of relational data model, entity- relationship model, relational database design, relational algebra and calculus
CO:2	Apply the normalization techniques to improve the database design
CO:3	Describe various database manipulation commands in SQL.
CO:4	Understand Transaction Processing & Locking using the concept of Concurrency control.
CO:5	Conceptualize advanced features of Object-Oriented Database Management Systems and Distributed databases

Faculty in Charge:



Sindhu T

Dept. of Computer Science

Programme: **CSS3C12 – Object Oriented Programming Concepts**

No. of lecture hours per week	4 Hrs
No.of credits for Theory	4

Aim of the course

To learn object oriented concepts and programming concepts and methodologies and to learn its implementation using Java.

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Course Outline

Unit I:Introduction to OOPS - basic principles of object orientation (objects , attributes and methods, encapsulation and information hiding, state retention, object identity, messages, class hierarchy, inheritance, polymorphism, genericity) - introduction to Java - history, versioning, the Java Virtual Machine, byte code, features of Java, language components - primitive data types, comments, keywords, literals, variables scope & declarations, control structures - FOR, IF, WHILE, DO WHILE, SWITCH, BREAK, CONTINUE statements - operators - casts and conversions - arrays.

Unit II: Object - oriented programming – classes - class fundamentals - declaring objects -new operator – methods – parameter passing – constructors - parameterized constructors -this keyword – finalize method. Overloading methods and constructors, access controls, static and final, nested and inner classes. Inheritance - extends, member access and inheritance, super keyword, polymorphism, method overriding, dynamic method dispatch, abstract classes, packages and interfaces.

Unit III: Exceptions, threads & IO in Java - The file and standard streams, stream classes and interfaces, using byte streams and character streams, threads - threads vs. processes, creating threads, runnable interface, thread class, inter thread communication, synchronization. Exceptions - basic of Java exception handling, hierarchy, developing user defined exception classes.

Unit IV: Applets, AWT & Swing - applet class, types of applet, skeleton, applet tag, passing parameters, event handling, delegation event model, event classes, listeners, AWT classes and window fundamentals, frames, working with fonts, graphics and colors, AWT controls, layouts and menus, dialogue boxes. Swings - Japplets, icon, labels, buttons, textbox, combo box, tables and panes.

Unit V: Database and sockets - JDBC - introduction, architecture, drivers, connections, statements, resultset and meta data (Use MySQL as the RDBMS). Sockets: introduction to networking, InetAddress, url, socket, server sockets, datagrams. Introduction to Unified Modelling Language (UML), UML diagrams, class diagrams, object interaction diagrams, state and activity diagrams, component diagrams, deployment diagrams. Introduction to analysis - object oriented system analysis, design and implementations.

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.**References:**

1.Herbert Scheldt, Java Complete Reference, 8th Edition, Tata Mcgraw Hill Education Private Limited, ISBN: 1259002462.
2. E Balaguruswamy, Programming in Java: A Primer, 4th Edition, Tata Mcgraw Hill Education Private Limited, ISBN: 007014169X.
3. Kathy Sierra, Head First Java, 2nd Edition, Shroff Publishers and Distributors Pvt Ltd, ISBN: 8173666024.
4. David Flanagan, Jim Farley, William Crawford and Kris Magnusson, Java Enterprise in a Nutshell: A Desktop Quick Reference, 3rd Edition, O'Reilly Media, ISBN: 0596101422.
5. Grady Booch, James Rumbaugh and Ivar Jacobson, The Unified Modeling Language User Guide, 2nd Edition, Pearson, ISBN: 8131715825.

Curriculum Plan

Unit/Hours (time required)	**Topics to be Taught (Input)**	**Procedure (process) student centric method of teaching**	**Activity**	**Learning outcome (outcome)**	**Assessment**
Unit1(18 Hour)	Introduction to OOPS - basic principles of object orientation (objects , attributes and methods, encapsulation and information hiding, state retention, object identity, messages, class hierarchy, inheritance, polymorphism, genericity) - introduction to Java - history, versioning, the Java Virtual Machine, byte	• Lecture using ICT tools	Peer group discussion on different types of sets	To Understand • Concept of OOPS	• Assignment • MCQ evaluation

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	code, features of Java, language components - primitive data types, comments, keywords, literals, variables scope & declarations, control structures - FOR, IF, WHILE, DO WHILE, SWITCH, BREAK, CONTINUE statements - operators - casts and conversions - arrays.				
Unit 2 (20 Hours)	Object - oriented programming – classes - class fundamentals - declaring objects- new operator – methods – parameter passing – constructors - parameterized constructors - this keyword – finalize method. Overloading methods and constructors, access controls, static and final, nested and inner classes. Inheritance - extends, member access and inheritance, super	• Lecture using ICT Tools • Illustrations • Hands on sessions	• Seminar • Group stud	To Understand • Objest • Classes • methods • Interfaces.	• Q&A exams.

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	keyword, polymorphism, method overriding, dynamic method dispatch, abstract classes, packages and interfaces.				
Unit3 (18 Hours)	Exceptions, threads & IO in Java - The file and standard streams, stream classes and interfaces, using byte streams and character streams, threads - threads vs. processes, creating threads, runnable interface, thread class, inter thread communication, synchronization. Exceptions - basic of Java exception handling, hierarchy, developing user defined exception classes.	• Lecture using ICT tools • Illustrations	• Hands on sessions • Illustrations	To Understand Exception Handling	• Q&A exams
Unit4 (14 Hours)	Applets, AWT & Swing - applet class, types of applet, skeleton, applet tag, passing parameters, event handling,	• Lecture using ICT tools • Illustrations • Hands on	• Hands on sessions • Illustrations	To understand AApplet,AWT,Swing	• Q&A exams

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	delegation event model, event classes, listeners, AWT classes and window fundamentals, frames, working with fonts, graphics and colors, AWT controls, layouts and menus, dialogue boxes. Swings - Japplets, icon, labels, buttons, textbox, combo box, tables and panes.	Session			
Unit5(20 Hours)	Database and sockets - JDBC - introduction, architecture, drivers, connections, statements, resultset and meta data (Use MySQL as the RDBMS). Sockets: introduction to networking, InetAddress, url, socket, server sockets, datagrams. Introduction to Unified Modelling Language (UML), UML diagrams, class diagrams, object interaction	• Lecture using ICT tools • Illustrations • Hands on Session	• Seminar • Group study	To understand JDBC	• Assignments • Exams

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	diagrams, state and activity diagrams, component diagrams, deployment diagrams. Introduction to analysis - object oriented system analysis, design and implementations.				

Course Outcomes:

CO:1	CO1: Understand the Concepts of OOPS
CO:2	CO2: Describe Features of Java
CO:3	CO3: Discuss Byte code , JVM
CO:4	CO4: Describe object, class
CO:5	CO5: Discuss Exception Handling and Threads
CO:6	CO6: Describe Applet, AWT ,Swing
CO:7	CO7: Discuss Database and Sockets
CO:8	CO8: Knowledge about UML Diagrams

Faculty in Charge:



Julie P.A

Dept. of Computer Science

Programme: CSS3C13 Principles of Compilers

Number of Lecture hours per week: 3Hrs	Number of practical hours: 3Hrs
Number of credits for theory:4	Number of credits for practical:1

Aim of the Course

To introduce the fundamental concepts and various phases of compiler design.

Course Outline

Unit I: Introduction to compiling - definition of compiler, translator, interpreter, analysis of the source program, the phases of a compiler, compiler construction tools- applications of compiler technology – programming language basics - lexical analysis – role of lexical analyser – input buffering - specification of tokens – recognition of tokens using finite automata - regular expressions and finite automata - from NFA to DFA - Regular Expression to an NFA - Design of a lexical analyser generator.

Unit II: Syntax analysis – role of parser – error handling and recovery – definitions of parsing, top-down parsing and bottom-up parsing - context free grammars – derivations -parse tree – ambiguity – associativity and precedence of operators - writing a grammar – topdown parsing – recursive descent parsing - FIRST and FOLLOW – LL (1) Grammars –recursive predictive parsing - bottom up parsing – reductions – handle pruning – shift reduce parsing - operator precedence parsing, simple LR parsing.

Unit III: Intermediate code generation – DAG – three address code – addresses and instructions – quadruples – triples – Static Simple Assignment form – types and declarations – type expressions - type equivalences – declarations – type checking – rules – type conversion – function and operator overloading – type inference and polymorphic functions – control flow – boolean expressions – short circuit code – flow-control statements – control-flow translation for boolean expressions – BREAK CONTINUE and GOTO statements.

Unit IV: Run time environments – storage optimization – static Vs dynamic allocation –stack allocation of space - activation trees and records – calling sequences – access to non local data on the stack – data access without nested procedures – issues with nested procedures – heap management – the memory manager – the memory hierarchy – locality in programs – reducing fragmentation - manual deallocation requests.

Unit V: Code generation – issues in the design of a code generator – the target language – a simple target machine model – the program and instruction costs – address in the target code – static allocation – stack allocation – run-time address for names – basic blocks and flow graphs – representation of flow graphs. Code optimization - the principal sources of optimization – data flow analysis – abstraction – data flow analysis schema – data flow schemas on basic blocks – reaching definitions – live variable analysis – available expressions. Region based analysis – regions – region hierarchies for reducible flow graphs – overview of a region based analysis.

Reference

1. V Aho A, Ravi Sethi, D Ullman J, *Compilers Principles*, Techniques and Tools, 2nd Edition, Pearson Education Singapore Pte Ltd, ISBN: 8131721019.
2. K. V. N. Sunitha, *Compiler Construction*, Pearson, ISBN:9789332500297.
3. W Appel and Andrew, *Modern Compiler Implementation in C*, 1st Edition,Cambridge University Press, ISBN: 817596071X.
4. Allen I Holub, *Compiler Design in C*, 1st Edition, PHI Learning Pvt Ltd, ISBN: 812030778X.
5. Tremblay and Sorenson, *The Theory and Practice of Compiler Writing*, 1st Edition, BSP Books Pvt Ltd, ISBN: 8178000776.

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6. Torben Ægidius Mogensen, *Basics of Compiler Design*, Department of Computer Science, University of Copenhagen (Online Edition).

Curriculum Plan

Unit/hours (time required)	**Topics to be taught (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Unit I(18 Hrs)	Introduction to compiling - definition of compiler, translator, interpreter, the phases of a compiler, finite automata - regular expressions and finite automata - from NFA to DFA - Regular Expression to an NFA - Design of a lexical analyser generator.	• Lecture using ICT tools • Problem Solving	• Peer group discussion • Seminar	To Understand • Compiler and interpreter • Phases of compiler • Lexical Analysis	• Assignment • MCQ evaluation
Unit II(20 Hrs)	Syntax analysis – role of parser – – ambiguity – associativity and precedence of operators topdown parsing – recursive descent parsing - FIRST and FOLLOW – LL (1) bottom up parsing – LR parsing.	• Lecture using ICT Tols • Illustrations	• Seminar • Group study • Problem solving	To Understand • Syntax analysis • Abiguity • Top down-bottom up parser.	• Assignments • Q&A exams
Unit III(20Hrs)	Intermediate code generation – DAG – three address code –	• Lecture using ICT tools • Illustratio	• Illustrations • Prob	To Understand • ICG- • Three	• MCQ tests • Q&A exams

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	– type expressions - type equivalences – type boolean expressions – short circuit code – flow-control statements – control-flow translation for boolean expressions – BREAK CONTINUE and GOTO statements.	ns	lem solvi ng	address code • Flow control expressi ons	
Unit IV(17 Hrs)	Run time environments – storage optimization – static Vs dynamic allocation – – heap management – the memory manager – the memory hierarchy – locality in programs – reducing fragmentation - manual deallocation requests.	• Lecture using ICT tools • Illustratio ns	• Illus trati ons • Dra wing	To understand • Storage optimis ation • Memor y hierarch y	• Assignments • Q&A exams
Unit V(15 Hrs)	Code generation Code Region based analysis – regions – region hierarchies for reducible flow graphs –	• Lecture using ICT tools • Illustratio ns • Hands on Session	• Sem inar • Gro up stud y	To understand • CG • Region based analysis	• Assignment s • Q & A tests

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Course Outcomes:

CO:1	Understand the major phases of compilation, identify tokens of a typical high -level programming language, define regular expressions for tokens, design and implement a lexical analyzer
CO:2	Develop the parsers and experiment the knowledge of different parsers design without automated tools

CO:3	Construct the intermediate code representations and generation.
CO:4	Explain the role of different types of runtime environments and memory organization for implementation of typical programming languages
CO:5	Apply the optimization techniques to have a better code for code generation

Faculty in Charge:



Sindhu T

Programme: CSS3E01a – COMPUTER GRAPHICS

No. of lecture hours per week	4 Hrs
No.of credits for Theory	4

Aim of the course

- To understand the fundamentals of the modern computer graphics.
- To pipeline the mathematics of affine transformations in three dimensions.
- To understand the common data structures to represent and manipulate geometry,
- colour and light representation and manipulation in graphics systems.
- To have an exposure to programming in Open GL.

Course Outline

Unit I:Introduction – Application of computer graphics, Video Display Devices- refresh CRT, raster and random scan display, color CRT, flat panel, LCD, LED, DVST. Raster -Scan Systems-video controller, display processor, Random-Scan Systems.

Unit II: 2D Graphics: Line drawing algorithms – DDA, Bresenham's – Midpoint Circle drawing algorithm –Filling-Scan line polygon fill algorithm, boundary fill algorithm, floodfill algorithm, 2D Transformations-translation, rotation, scaling, shearing and reflection, composite transformations. 2D Viewing –the viewing pipeline, viewing coordinate reference frame, window-to- viewport coordinate transformation. Clipping-point clipping, Cohen Sutherland line clipping, Sutherland Hodgeman polygon clipping, text clipping.

Unit III: 3D Graphics: 3D Transformations- translation, rotation, scaling, shearing and reflection,3D Viewing-viewing pipeline, viewing coordinates, projections- parallel & perspective projections.

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Unit IV: 3D object representation - wireframe model, curve representation, surfaces, spline representation, bezier curves, cubic spline. Visible surface detection methods- classification, back-face detection, Z-buffer algorithm.

Unit V: Discrete Techniques and OpenGL programming - Texture mapping, Bit and Pixel operations, Compositing, Sampling and Aliasing Techniques. Introduction to OpenGL, Features in OpenGL, OpenGL operations, Abstractions in OpenGL - GL, GLU & GLUT, a few examples of OpenGL programs.

References:

1.Donald Hearn and M. Pauline Baker, Computer Graphics, 2nd Edition, Prentice Hall, ISBN: 0135309247.
2. Donald D. Hearn, M. Pauline Baker and Warren Carithers, Computer Graphics with Open GL, 4th Edition, Prentice Hall, ISBN: 9780136053583
3. Hill, Computer Graphics using OpenGL, 3rd Edition, Prentice Hall of India Private Ltd. New Delhi, ISBN: 8120338294.
4. Mason Woo, Jackie Neider, Tom Davis, Dave Shreiner, Dave Shriner and Tom David, Open GL Programming Guide, 6th Edition, Person, ISBN: 9780201604580.
5. The Official Guide to Learning OpenGL, Version 1.1, Available at http://www.glprogramming.com/red/.
6. Shreiner and Angel, Interactive Computer Graphics: A Top-Down Approach with Shader-Based OpenGL, 6th Edition, Pearson Education, ISBN: 0132545233.

Curriculum Plan

Unit/Hours (time required)	**Topics to be Taught (Input)**	**Procedure (process) student centric method of teaching**	**Activity**	**Learning outcome (outcome)**	**Assessment**
Unit1(18 Hour)	Introduction – Application of computer graphics, Video Display Devices- refresh CRT, raster and random scan display, color CRT, flat panel, LCD, LED, DVST. Raster - Scan Systems-	• Lecture using ICT tools	Peer group discussion on different types of sets	To Understand • Application of computer Graphics	• Assignment • MCQ evaluation

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	video controller, display processor, Random-Scan Systems.				
Unit 2 (20 Hours)	2D Graphics: Line drawing algorithms – DDA, Bresenham's – Midpoint Circle drawing algorithm – Filling-Scan line polygon fill algorithm, boundary fill algorithm, floodfill algorithm, 2D Transformations-translation, rotation, scaling, shearing and reflection, composite transformations. 2D Viewing –the viewing pipeline, viewing coordinate reference frame, window-to-viewport coordinate transformation. Clipping-point clipping, Cohen Sutherland line clipping, Sutherland Hodgeman polygon clipping, text clipping.	• Lecture using ICT Tools • Illustrations • Hands on sessions	• Seminar • Group stud	To Understand • line drawing algorithm • circle drawing • Transformation • Clipping.	• Q&A exams.

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Unit3 (18 Hours)	3D Graphics: 3D Transformations-translation, rotation, scaling, shearing and reflection,3D Viewing-viewing pipeline, viewing coordinates, projections-parallel & perspective projections.	• Lecture using ICT tools • Illustrations	• Hands on sessions • Illustrations	To Understand Transformations	• Q&A exams
Unit4 (14 Hours)	3D object representation - wireframe model, curve representation, surfaces, spline representation, bezier curves, cubic spline. Visible surface detection methods-classification, back-face detection, Z-buffer algorithm.	• Lecture using ICT tools • Illustrations • Hands on Session	• Hands on sessions • Illustrations	To understand 3D object representation	• Q&A exams
Unit5(20 Hours)	Discrete Techniques and OpenGL programming - Texture mapping, Bit and Pixel operations, Compositing, Sampling and Aliasing Techniques. Introduction to OpenGL, Features in	• Lecture using ICT tools • Illustrations • Hands on Session	• Seminar • Group study	To understand OpenGL	• Assignments • Exams

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	OpenGL, OpenGL operations, Abstractions in OpenGL - GL, GLU & GLUT, a few examples of OpenGL programs.				

Course Outcomes:

CO:1	CO1: Understand the Applications of computer Graphics
CO:2	CO2: Differentiate LED , LCD ,DVST
CO:3	CO3: Understand 2D Graphics
CO:4	CO4: Gain knowledge of line and circle drawing algorithm
CO:5	CO5: Understand different methods of clipping
CO:6	CO6: Understand Texture mapping
CO:7	CO7: Familiar about Texture mapping
CO:8	CO8: Understand OpenGL Programming

Faculty in Charge:



Julie P.A

Dept. of Computer Science

Programme: CSS3E02f – DATA WAREHOUSING AND DATA MINING

No. of lecture hours per week	4 Hrs
No.of credits for Theory	4

Aim of the course

To provide the fundamentals on information retrieval and data mining techniques To focus on practical algorithms of textual document indexing, relevance ranking, web usage mining, text analytics, as well as their performance evaluations. To give an exposure to the fundamentals of Data Analytics.

Course Outline

Unit I: Data warehouse - definition - operational database systems Vs data warehouses - multidimensional model - from- tables and spreadsheets to Data Cubes - schemas for multidimensional databases - measures - concept hierarchies - OLAP operations in the multidimensional data model - data warehouse architecture.

Unit II: Data mining - introduction - definition - data mining functionalities - major issues in data mining - data pre-processing - data cleaning - data integration and transformation -data reduction - data discretization and concept hierarchy generation. Association rule mining - efficient and scalable frequent item set mining methods - mining various kinds of association rules - association mining to correlation analysis - constraint- based association mining.

Unit III: Classification and prediction - issues regarding classification and prediction - classification by decision tree introduction - Bayesian classification - rule based classification - classification by back propagation - support vector machines - associative classification - lazy learners - other classification methods - prediction - accuracy and error measures - evaluating the accuracy of a classifier or predictor - ensemble methods - model section.

Unit IV: Cluster analysis - types of data in cluster analysis - a categorization of major clustering methods - partitioning methods - hierarchical methods - density-based methods -grid-based methods - model-based clustering methods - clustering high dimensional data -constraint-based cluster analysis - outlier analysis.

Unit V: Graph mining - mining object, spatial, multimedia, text and web data -multidimensional analysis and descriptive mining of complex data objects - spatial data mining - multimedia data mining - text mining - mining the World Wide Web.

References:

1Jain Pei, Jiawei Han and Micheline Kamber, Data Mining Concepts and Techniques, 3rd Edition, Elsevier, ISBN: 9380931913.
2. Alex Berson and Stephen J. Smith, Data Warehousing, Data Mining & OLAP, Computing Mcgraw-Hill, ISBN: 0070062722.
3. K.P. Soman, Shyam Diwakar and V. Ajay, Insight into Data mining Theory and Practice, 1st Edition, Prentice Hall of India, ISBNy.8120328973.
4. G. K. Gupta, Introduction to Data Mining with Case Studies, 3rd Edition, PHI Learning Pvt. Ltd, ISBN: 8120350022.
5. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Introduction to Data Mining, 1st Edition, Pearson India, ISBN: 9332518653.

Curriculum Plan

Unit/Hours (time required)	Topics to be Taught (Input)	Procedure (process) student	Activity	Learning outcome (outcome)	Assessment

Dept of Computer Science

		centric method of teaching			
Unit1(18 Hour)	Data warehouse - definition - operational database systems Vs data warehouses - multidimensional model - from-tables and spreadsheets to Data Cubes - schemas for multidimensional databases - measures - concept hierarchies - OLAP operations in the multidimensional data model - data warehouse architecture.	• Lecture using ICT tools	Peer group discussion on different types of sets	To Understand • Concept of Data ware house	• Assignment • MCQ evaluation
Unit 2 (20 Hours)	Data mining - introduction - definition - data mining functionalities - major issues in data mining - data pre-processing - data cleaning - data integration and transformation - data reduction - data discretization and concept hierarchy generation. Association rule	• Lecture using ICT Tools • Illustrations • Hands on sessions	• Seminar • Group stud	To Understand • Datamining functionalities • Data integration and transformation .	• Q&A exams.

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	mining - efficient and scalable frequent item set mining methods - mining various kinds of association rules - association mining to correlation analysis - constraint- based association mining.				
Unit3 (18 Hours)	Classification and prediction - issues regarding classification and prediction - classification by decision tree introduction - Bayesian classification - rule based classification - classification by back propagation - support vector machines - associative classification - lazy learners - other classification methods - prediction - accuracy and error measures - evaluating the accuracy of a classifier or predictor - ensemble methods - model section.	• Lecture using ICT tools • Illustrations	• Hands on sessions • Illustrations	To Understand Classification and prediction	• Q&A exams

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Unit4 (14 Hours)	Cluster analysis - types of data in cluster analysis - a categorization of major clustering methods - partitioning methods - hierarchical methods - density-based methods - grid-based methods - model-based clustering methods - clustering high dimensional data - constraint-based cluster analysis - outlier analysis.	• Lecture using ICT tools • Illustrations • Hands on Session	• Hands on sessions • Illustrations	To understand Cluster analysis	• Q&A exams
Unit5(20 Hours)	Graph mining - mining object, spatial, multimedia, text and web data - multidimensional analysis and descriptive mining of complex data objects - spatial data mining - multimedia data mining - text mining - mining the World Wide Web.	• Lecture using ICT tools • Illustrations • Hands on Session	• Seminar • Group study	To understand Graph mining	• Assignments • Exams

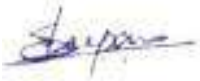
Dept. of Computer Science

Course Outcomes:

CO:1	CO1: Understand Data Warehouse
CO:2	CO2: Familiar about OLAP
CO:3	CO3: Understand Data mining functionalities

CO:4	CO4: Gain knowledge of Classification
CO:5	CO5: Understand Prediction
CO:6	CO6: Understand Clustering
CO:7	CO7: Familiar about Graph mining
CO:8	CO8: Understand OpenGL Programming

Faculty in Charge:



Deepa M

Dept. of Computer Science

Course: **MSc Computer Science (Fourth Semester)**

Programma:CSS4E03c-SYSTEM SECURITY

Number of Lecture hours per week: 5Hrs
Number of credits for theory: 3

Aim of the course

To provide an understanding of the differences between various forms of computer security, where they arise, and appropriate tools to achieve them.

Course Outline

Unit I: Notion of different types of securities - information security - computer security -security goals, relation between security, confidentiality, integrity, availability and authorization, vulnerabilities - principles of adequate protection. Notions of operating security, database security, program security, network security attacks - threats,vulnerabilities and controls. The kind of problems - interception, interruption, modification,fabrication. Computer criminals - amateurs, crackers, career criminals. Methods of defence- control, hardware controls, software controls, effectiveness of controls.

Unit II: Program security - secure programs - fixing faults, unexpected behaviour, types of flaws. Non-malicious program errors - buffer overflows, incomplete mediation. Viruses and other malicious code - kinds of malicious code, how viruses attach, how viruses gain control,prevention, control example - the brain virus, the internet worm, web bugs. Targeted malicious code - trapdoors, Salami attack. Controls against program threats - development controls, peer reviews, hazard analysis**.**

Unit III: Operating system security - protected objects and methods of protection -
memory address protection - fence, relocation, base/bounds registers, tagged architecture,segmentation, paging. Control of access to general objects - directory, access control

list. File protection mechanism - basics forms of protection, single permissions. Authentication - authentication basics, password, authentication process challenge - response, biometrics.Trusted operating systems - security policies for operating systems, models of security -requirement of security systems, multilevel security, access security, limitations of security systems. Trusted operating system design - elements, security features, assurance, system flaws and assurance methods.

Unit IV: Database Security - security requirements - integrity of database, confidentiality and availability, reliability and integrity, sensitive data, interface, multilevel database,proposals for multilevel security.

Unit V: Administrating security - security planning - contents of a security planning, team members, commitment to a security plan, business continuity plans. Risk analysis -the nature of risk, steps of risk analysis. Arguments for and against risk analysis, organizational security policies - purpose and goals of organizational security. Audience, characteristics of a good security policy. Nature of security policies - data sensitivity policy, government agency IT security policy. Physical security - natural disaster, human vandals, interception of sensitive information.

References:

1. C. P. Pfleeger and S. L. Pfleeger, Security in Computing, 4th Edition, Pearson India, ISBN: 9788131727256.
2. Matt Bishop, Computer Security: Art & Science, 1st Edition, Pearson, ISBN: 0201440997.
3. William Stallings, Cryptography and Network Security: Principles and Practice, 6th Edition, Pearson India, ISBN: 9332518777.
4. Michael E. Whitman and Herbert J. Mattord, Principles of Information Security, 4th Edition, Ceneage Learning India Pvt Ltd, ISBN: 8131516458.

Curriculum Plan

Unit/ hours (time required)	**Topics to be taught (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Unit I	Notion of different types of securities - information security - computer security -security goals, relation between security, confidentiality, inte	• Lecture using ICT tools.	Peer group discussion on different types of securities.	To Understand • Concept of different types of securities.	• Assignment • MCQ evaluation

Dept. of Computer Science

	grity, availability and authorization, vulnerabilities - principles of adequate protection. Notions of operating security, database security, program security, network security attacks - threats, vulnerabilities and controls. The kind of problems - interception, interruption, modification, fabrication. Computer criminals - amateurs, crackers, career criminals. Methods of defence - control, hardware controls, software controls, effectiveness of controls.				
Unit II	**s.**Program security - secure programs - fixing faults, unexpected behaviour, types of flaws. Non-malicious program errors - buffer overflows, incomplete mediation. Viruses and other malicious code - kinds of malicious code, how viruses attach, how viruses gain	• Lecture using ICT Tools • Illustrations • Hands on sessions	• Seminar • Group study	To Understand • Flaws • Viruses • Buffer overflows • Program threats and Controls.	• Q&A exams.

Dept. of Computer Science

	control,prevention, control example - the brain virus, the internet worm, web bugs. Targeted malicious code - trapdoors, Salami attack. Controls against program threats - development controls, peer reviews, hazard analysis.				
Unit III	Operating system security - protected objects and methods of protection - memory address protection - fence, relocation, base/bounds registers, tagged architecture,segmentation, paging. Control of access to general objects - directory, access control list. File protection mechanism - basics forms of protection, single permissions. Authentication - authentication basics, password, authentication process challenge - response, biometrics.Trusted operating systems - security policies for operating systems, models of security - requirement of	• Lecture using ICT tools • Illustrations	• Hands on sessions • Illustrations	To Understand • Memory address protection • Trusted OS	• Q&A exams

Dept. of Computer Science

	security systems, multilevel security, access security, limitations of security systems. Trusted operating system design - elements, security features, assurance, system flaws and assurance methods.				
Unit IV	Database Security - security requirements - integrity of database, confidentiality and availability, reliability and integrity, sensitive data, interface, multilevel database,proposals for multilevel security.	• Lecture using ICT tools • Illustrations • Hands on Session	• Hands on sessions • Illustrations	To understand • Database securities	• Lab tests • Q&A exams
Unit V	Administrating security - security planning - contents of a security planning, team members, commitment to a security plan, business continuity plans. Risk analysis - the nature of risk, steps of risk analysis. Arguments for and against risk analysis, organizational security policies - purpose and goals	• Lecture using ICT tools • Illustrations • Hands on Session	• Seminar • Group study	To understand • Security plan • Good security policy • IT security policy	• Assignments

Dept. of Computer Science

	of organizational security. Audience, characteristics of a good security policy. Nature of security policies - data sensitivity policy, government agency IT security policy. Physical security - natural disaster, human vandals, interception of sensitive information.				

Course Outcomes:

CO:1	CO1: Summarize different types of securities.
CO:2	CO2: Describe information security.
CO:3	CO3: Discuss biometric based authentication.
CO:4	CO4: Describe COA triad.
CO:5	CO5: Discuss program security in system security.
CO:6	CO6: Trusted OS design.
CO:7	CO7: Discuss threats of virus and other malicious codes.Explain the working and controlling mechanism of viruses.
CO:8	CO8: Describes various types of system security challenges.

Faculty in Charge:



Deepa M

Dept. of Computer Science

Programme: CSS3E01a – CSS4E04a Digital Image Processing

Number of Lecture hours per week	**5**Hrs
Number of credits for theory	**4**

Aim of the course

To be familiar with processing of the images, recognition of the pattern and their applications.

Course Outline

Unit I: Introduction - digital image representation - fundamental steps in image processing- elements of digital image processing systems - digital image fundamentals - elements of visual perception - a simple image model - sampling and quantization - basic relationship between pixels - image geometry.

Unit II: Image transforms - introduction to Fourier transform - discrete Fourier transform(DFT) - properties DFT- other separable image transforms - Walsh, Hadamard and Discrete Cosine transforms. Hotelling transform.

Unit III: Image enhancement - basic grey level transformation - histogram equalization -image subtraction - image averaging - spatial filtering - smoothing, sharpening filters Laplacian filters. Enhancement in the frequency domain - frequency domain filters smoothing, sharpening filters - homomorphic filtering.

Unit IV:Image restoration - model of Image degradation/restoration process - noise models inverse filtering - least mean square filtering - constrained least mean square filtering. Edge detection - thresholding - region based segmentation - boundary representation.

Unit V: Image compression - fundamental concepts of image compression – compression models - information theoretic perspective. Lossless compression - Huffman coding -arithmetic coding - bit plane coding - run length coding. Lossy compression – transform coding - image compression standards.

References:

1. Richard E Woods and Rafael C Gonzalez, Digital Image Processing, 3rd Edition, Pearson Education Singapore Pte Ltd, ISBN: 8131726959.
2. B. Chanda and D.D. Majumder, Digital Image Processing and Analysis, 2nd Edition, PHI Learning Pvt Ltd, ISBN: 8120343255.
3. A.K. Jain, Fundamentals of Digital Image Processing, 2nd Edition, PHI Learning Pvt Ltd, ISBN: 8120309294.
4. W.K. Pratt, Digital Image Processing: PIKS Scientific Inside, 4th Edition, John Wiley, ISBN: 0471767778.

Dept. of Computer Science

5. Milan Sonka, Vaclav Hlavac and Roger Boyle, Image Processing Analysis and Machine Vision, 3rd Edition, Ceneage Learning India Pvt Ltd, ISBN: 8131518833.

Curriculum Plan

Unit/hours (time required)	**Topics to be taught (input)**	**Procedure (process) Student centric Method of teaching**	**Activity**	**Learning outcome (output)**	**Assessment**
Unit I	Introduction - digital image representation - fundamental steps in image processing - elements of digital image processing systems - digital image fundamentals - elements of visual perception - a simple image model - sampling and quantization - basic relationship between pixels - image geometry.	• Lecture using ICT tools.	Peer group discussion on digital image processing systems.	To Understand • Concept of digital image processing systems.	• Assignment • MCQ evaluation
Unit II	Image transforms - introduction to Fourier transform - discrete Fourier transform(DFT) - properties DFT- other separable image transforms - Walsh, Hadamard and Discrete Cosine transforms. Hotelling transform.	• Lecture using ICT Tools • Illustrations • Hands on sessions	• Seminar • Group study	To Understand • DFT • Cosine transformation. • Hotelling transform	• Q&A exams.
Unit III	Image enhancement - basic grey level transformation - histogram	• Lecture using ICT tools • Illustratio	• Hands on sessions	To Understand • Grey level	• Q&A

Dept. of Computer Science

	equalization - image subtraction - image averaging - spatial filtering - smoothing, sharpening filters Laplacian filters. Enhancement in the frequency domain - frequency domain filters smoothing, sharpening filters - homomorphic filtering.	ns	Illustrations	transformation • Filters	exams
Unit IV	Image restoration - model of Image degradation/restoration process - noise models inverse filtering - least mean square filtering - constrained least mean square filtering. Edge detection - thresholding - region based segmentation - boundary representation.	• Lecture using ICT tools • Illustrations • Hands on Session	• Hands on sessions • Illustrations	To understand • Edge detection	• Lab tests • Q&A exams
Unit V	Image compression - fundamental concepts of image compression - compression models - information theoretic perspective. Lossless compression - Huffman coding - arithmetic coding - bit plane coding -	• Lecture using ICT tools • Illustrations • Hands on Session	• Seminar • Group study	To understand • Image compression • Huffman Coding • Compression standards	• Assignments

Dept. of Computer Science

	run length coding. Lossy compression - transform coding - image compression standards.				

Course Outcomes:

CO:1	CO1: Understand about digital image processing.
CO:2	CO2: Describe Fourier transformation.
CO:3	CO3: Discuss compression methods like Lossless and Lossy compression.
CO:4	CO4: Learn about edge preserving.
CO:5	CO5: Discuss Huffman coding.
CO:6	CO6: Know about Image restoration.
CO:7	CO7: Discuss various filters used for Image processing.
CO:8	CO8: Understand elements of digital image perception.

Faculty in Charge:



Julie P A

Dept. of Computer Science

Department of Language

LESSON PLAN-2016(MALAYALAM)

Semester 1

Course category: Common Course Malayalam

Paper name: Malayala Sahithyam-1

Code: MAL1A01

Course Outcome:

- To understand the change of Malayalam literature in different periods.
- To understand the writings of Malayalam writers.
- To develop interest in mother tongue and literature.
- The cultural upliftment of the students Identify.
- Malayalam literature and language usage of different eras.
- Introduce various literary and discourse forms in Malayalam.

Modules	Contents	Hours	Procedure/ Activity Plan	Assessment
Module-1	Kuchelagathi-(Cherussery Krishnagadha)	4	Lecture	Evaluation through question – answer session
	Sthreeparvam-Ezhuthachan (Mahabharatham Kilippattu)	4	Lecture	Evaluation through question – answer session
	Nchanappana-(Poonthanam)	4	Lecture	Evaluation through question – answer session
	Symanthakam Thullal-Kunchan Nambyar	4	Discussion	Discussion on the topic about Kavithrayas
Module-2	Folks Song	4	Lecture	Evaluation through question – answer session
	Vadakkan Pattu	4	Discussion students seminar	Seminar Evaluation
	Mappilappattu	4	Lecture	Evaluation through question – answer session

Module-3	Vellapokkathil-Thakazhi	4	Lecture	Evaluation through question – answer session
	Bus Kattu-Kesavadev	4	Lecture	Evaluation through question – answer session
	Marappavakal-Karoor	4	Students seminar lecture	Evaluation through question – answer session
Module-4	Kalppantham-M.T.Vasudevan Nair	4	Lecture	Evaluation through question – answer session
	Kaatu Paranja Kadha-O.V.Vijayan	4	Lecture	Evaluation through question – answer session
	Aval Oru Kuttiyayirunnappol-V.R.Sudheesh	4	Lecture	Evaluation through question – answer session
	Rand Eleppanmar-Shihabudeen Poythumkadavu.	4	Lecture Reference	Students reference notes are evaluated
Internal Exam	Two internals of 80 marks and 2.5 hours durations	5	Written exam	Paper are evaluated and mark are taken for CIE feedback are given individually
Assignment	Topic		All students are required to prepare and assignment from any of the topic they are interested, but should avoid repetition	Assignments are corrected and feedbacks are given CIE internal mark is awarded on the basis of assignment too.
Seminar	Topic	10	All students are required to present a topic with the help of presentation preferably.	Feedback are provided and marks are considered for CIE

Reference Materials:

1. Dr. M.Leelavathy, Kavitha Sahithya Charithram, Kerala Sahithya Academy. Thrissur-1998.
2. Dr.Kalppatta Bhalakrishnan , Malayala Sahithya Charithram, Kerala Bhasha Institute, Trivandrum -2000.
3. N.Krishnappilla, Kairaliyde Kadha.
4. Poonthanam Nchanappana.
5. Dr.Ampalappuzha Gopakumar, Kunchan Nambyar (Padanam) SPCS.Kttayam -2015.
6. Elam Kulam Kunjanpilla , Bhashayum Sahithyavum Noottandukalil.
7. M.Achuthan, Cherukadha- Innale ,Innu. DC Books, Kottayam-2007.
8. Dr.M.M.Basheer Malayala Cherukadha Sahithya Charithram.

Semester -2

Course category: Common Course Malayalam

Paper name: Malayala Sahithyam-2

Code: MAL2A02

Course Outcome:

- ❖ To understand the stages of growth in Malayalam poetry.
- ❖ Formulate common ground on the progression of prose and critical literature.

Modules	Contents	Hours	Procedure/ Activity Plan	Assessment
Module-1	Chindavishttayaya Seetha-Kumaranasan	4	Lecture	Evaluation through question – answer session
	Perumthachan-G.Sankarakkuruppu	4	Lecture	Evaluation through question – answer session
	Sahyante makan-Vailoppilli.	4	Lecture	Evaluation through question – answer session
Module-2	Pattupavada-Sugathakumari	4	Lecture	Evaluation through question – answer session
	Rathrikal Pakalukal-Ayyappapanikkar	4	Lecture students seminar	Question answers sessions seminar evaluation
	Ivanekoodi-Sachithanandan	4	Lecture	Evaluation through question – answer session
	Mazhakodumatram-Rafeek Ahammed	4	Lecture	Evaluation through question – answer session
Module-3&4	Ithihasakadhapathrangal-Kuttikrishnamarar	4	Lecture	Evaluation through question – answer session
	Hasyathinte ulppathi-M.P.Paul	4	Lecture	Evaluation through question – answer session
	Srishttavinte Swathanthriavum Srishtiyude	4	Lecture	Evaluation through question – answer session

	Sadhacharavum-M.Thomas Mathew			
	Spandhikkunna Asthimadam-M.K.Sanu	4	Lecture	Evaluation through question – answer session
	Thapante Amma-M.M.Bhasheer	4	Lecture	Evaluation through question – answer session
Internal Exam	Two internals of 80 marks and 2.5 hours durations	4	Written exam	Paper are evaluated and mark are taken for CIE feedback are given individually
Assignment	Topic		All students are required to prepare and assignment from any of the topic they are interested, but should avoid repetition	Assignments are corrected and feedbacks are given CIE internal mark is awarded on the basis of assignment too.
Seminar	Topic	10	All students are required to present a topic with the help of presentation preferably .	Feedback are provided and marks are considered for CIE

Reference Materials:

1. K.P.Appan, Kshobikkunnavurude Suvisesham.
2. Akkitham Achuthan Namboothiri, Akkitham Kavithakal Samboornam.
3. Ayyappa Panikkar, Ayyappa Panikkarude Thiranjedutha Kavithakal.
4. P.K.Rajasekharan, Andhanaya Daivam-Malayalanovalinte100varshangal.
5. Sachidhanandan, Malayala Kavitha Padanangal.

Semester -3

Course category: Common Course Malayalam

Paper name: Malayala Sahithyam-3

Code: MAL3A03

Course Outcome:

- ❖ Get acquainted with the tide of drama, Screen play, and Auto biography.
- ❖ To understand the general knowledge about film art.

Modules	Contents	Hours	Procedure/ Activity Plan	Assessment
Module-1	Nadakasadassu– G.Sankarappilla.	5	Lecture	Evaluation through question – answer session
	Malayala Nadaka Charithrathinoramukham- Dr.L.Thomas Kutty.	5	Lecture	Evaluation through question – answer session
Module-2	Thirakkadha- M.T.Vasudhevan Nair	5	Lecture	Evaluation through question – answer session
	Oridathoru Fayalvan- Padmarajan	5	Lecture	Evaluation through question – answer session
Module-3	Valarnnu Varunnorathmavu- V.T.Bhattathirippadu	5	Lecture	Evaluation through question – answer session
	Sahib Ennamanushyan- M.Rasheed	5	Lecture	Evaluation through question – answer session
	Kandal Jeevitham- Pokkudan	5	Lecture	Evaluation through question – answer session
	Mattu- V.K.Sreeraman	5	Lecture	Evaluation through question – answer session
Module-4	Marubhoomiyude Athmakadha-V.Musafar Ahammed	5	Lecture	Evaluation through question – answer session
Internal Exam	Two internals of 80 marks and 2.5 hours durations	5	Written exam	Paper are evaluated and mark are taken for CIE feedback are given individually

Assignment	Topic		All students are required to prepare and assignment from any of the topic they are interested, but should avoid repetition	Assignments are corrected and feedbacks are given CIE internal mark is awarded on the basis of assignment too.
Seminar	Topic	10	All students are required to present a topic with the help of presentation preferably .	Feedback are provided and marks are considered for CIE

Reference Materials:

1. Kairaliyude Kadha, N.Krishnappilla.
2. Malayala Nadaka Sahithya Charithram- G.Sankarappilla.
3. Malayala Nadakangaliloode- Kattumadan Narayanan.
4. Nadakam- Kanninte Kala, T.P.Sukumaran.
5. Malayala Cinemayude Kadha- Vijayakrishnan.
6. Malayala Cinemayum Sahithyavum- Madhu Iravankara.
7. Cinemayum Samskaravum- K.Gopi Nadhan.

Semester -4

Course category: Common Course Malayalam

Paper name: Malayala Sahithyam-4

Code: MAL4A04

Course Outcome:

- ❖ Gain the ability to translate from Malayalam and English.
- ❖ To understand about novel literature.

Modules	Contents	Hours	Procedure/ Activity Plan	Assessment
Module-1	Sailiyeppatti Chila Chindhakal- S.Gupthan Nair	5	Lecture	Evaluation through question – answer session
	Nattu Bhasha-A.R.Raja Rajavarma	5	Lecture	Evaluation through question – answer session
	Marunna Malayalam-Prabodha Chandran Nair		Lecture	Evaluation through question – answer session
	Saili Chinda-M.N.Karasseri	5	Lecture	Evaluation through question – answer session
Module-2	Ente Kavitha- Akkitham	5	Lecture	Evaluation through question – answer session
	Cheruvakalum Charuthayum-C.Radhakrishnan	5	Lecture	Evaluation through question – answer session
	Kalayum Kalavum-V.Rajeevan	5	Lecture	Evaluation through question – answer session
Module-3	Adivasikalum Avarude Samskaravum-P.K.Gopalakrishnan	5	Lecture	Evaluation through question – answer session
	Marumakkathayathinte Ulbhavam-Elamkulam Kunjanpilla	5	Lecture	Evaluation through question – answer session
	Ayyankali-Velayudhan Panikkasseri	5	Lecture	Evaluation through question – answer session

Module-4	Oru Dalith Yuvathiyude Kadhanakadha- M.Mukundan	5	Lecture	Evaluation through question – answer session
Internal Exam	Two internals of 80 marks and 2.5 hours durations	5	Written exam	Paper are evaluated and mark are taken for CIE feedback are given individually
Assignment	Topic		All students are required to prepare and assignment from any of the topic they are interested, but should avoid repetition	Assignments are corrected and feedbacks are given CIE internal mark is awarded on the basis of assignment too.
Seminar	Topic	10	All students are required to present a topic with the help of presentation preferably .	Feedback are provided and marks are considered for CIE

Reference Materials:

1. M.N.Karassery, Thaimozhi-Dc Books Kozhikode -2009
2. Dr.K.M.Prabhakaravaryar, Bhashayum Manasasthrasvum, Kerala Bhasha Institute-Tvm -1999.
3. Dr.K.A.Kosi, Bhashayum Bhashantharanavum,Dc Books, Koyyayam, 1994.
4. K.P.Sankaran, Navakam, Poorna Publishers, Kozhikkodu, 1938.
5. Omprakash Valmeeki, Echil, (Vivarthanam- Nisha.K.Nair).
6. K.Jayakumar, Roomiyude 100 Kavithakal, Current Books, Thrissur.

Lesson plan-2019(Common Course-Malayalam)

Semester 1

Course category: Common Course Malayalam

Paper name: Malayala Sahithyam-1

Code: MAL1A07 (1)

Course Outcome:

- To Develop interest in mother tongue and literature
- The cultural upliftment of the students Identify
- Malayalam literature and language usage of different eras
- Introduce various literary and discourse forms in Malayalam

Modules	Contents	Hours	Procedure/ ActivityPlan	Assessment
Module-1	Kaliyamardhanam- (Cherussery Krishnagadha)	4	Lecture	Evaluation through question – answer session
	Lakshmana santhwanam (Adhyathmaramayanam)	4	Lecture	Evaluation through question – answer session
	Nchanappana- (Poonthanam)	4	Lecture	Evaluation through question – answer session
	Rugmani Swayamvaram(Ottan Thullal)	4	Discussion	Discussion on the topic about Kavithrayas
Module-2	Folks song	4	Lecture	Evaluation through question – answer session
	Vadakkan pattu	4	Discussion students seminar	Seminar Evaluation
	Mappilappattu	4	Lecture	Evaluation through question – answer session
Module-3	Mothiram- Karoor	4	Lecture	Evaluation through question – answer session

	Double act- K.Saraswathi amma	4	Lecture	Evaluation through question – answer session
	Rachiyamma- P.C. KutiKrishnan	4	Students seminar lecture	Evaluation through question – answer session
Module-4	Ullurukkam- N.P.Mohammad	4	Lecture	Evaluation through question – answer session
	Ottuchedi-C.V.Raman	4	Lecture	Evaluation through question – answer session
	Ghare Bhayire-Geetha	4	Lecture	Evaluation through question – answer session
	Thanthathazhu- Pramod Raman	4	Lecture Reference	Students reference notes are evaluated
Internal Exam	Two internals of 80 marks and 2.5 hours durations	5	Written exam	Paper are evaluated and mark are taken for CIE feedback are given individually
Assignment	Topic		All students are required to prepare and assignment from any of the topic they are interested, but should avoid repetition	Assignments are corrected and feedbacks are given CIE internal mark is awarded on the basis of assignment too.
Seminar	Topic	10	All students are required to present a topic with the help of presentation preferably .	Feedback are provided and marks are considered for CIE

Referance Meterials:

9. Dr. M.Leelavathy, kavitha sahithya charithram, kerala sahithya academy . Thrissur-1998
10. Dr.Kalppatta Bhalakrishnan , Malayala sahithya charithram, Kerala bhasha Institute, Trivendrum -2000
11. N.Krishnappilla, Kairaliyde kadha
12. Poonthanam Nchanappana

13. Dr.Ampalappuzha Gopakumar, Kunchan Nambyar(Padanam)SPCS.Kttayam -2015
14. Ilam kulam Kunjanpilla , Bhashayum sahithyavum noottandukalil.
15. M.Achuthan , Cherukadha- innale ,innu. DC Books, Kottayam-2007
16. Dr.M.M.Basheer Malayala cherukadha sahithya charithram.

Semester -2

Course category: Common Course Malayalam

Paper name: Malayala Sahithyam-2

Code: MAL2A08 (1)

Course Outcome:

- ❖ To understand the stages of growth in Malayalam poetry.
- ❖ Formulate common ground on the progression of prose and critical literature.

Modules	Contents	Hours	Procedure/ ActivityPlan	Assessment
Module-1	Nalini-Kumaranasan	4	Lecture	Evaluation through question – answer session
	Sooryakanthi-G.Sankarakkuruppu	4	Lecture	Evaluation through question – answer session
	Maninadham- Idappalli Raghavan pilla	4	Lecture	Evaluation through question – answer session
Module-2	Kalopasakan- Akkitham	4	Lecture	Evaluation through question – answer session
	Kuthirakkombu-Ayyappapanikkar	4	Lecture students seminar	Question answers sessions seminar evaluation
	Puthganchollu- Attoor	4	Lecture	Evaluation through question – answer session
	Ammayekulippikkumpol-Savithrirajeevan	4	Lecture	Evaluation through question – answer session
Module-3&4	Amba-Kuttikrishnamarar	4	Lecture	Evaluation through question – answer session
	Kalidhasanum Kalathinte dhasan- Mudassery	4	Lecture	Evaluation through question – answer session
	Maranathinte soundharyam-K.P.Appan	4	Lecture	Evaluation through question – answer session

	Sthreeyillatha mathrubhoomi- Kalppatta Narayanan	4	Lecture	Evaluation through question – answer session
	Ezhuthum Adhikaravum- P.K.Rajasekharan	4	Lecture	Evaluation through question – answer session
Internal Exam	Two internals of 80 marks and 2.5 hours durations	5	Written exam	Paper are evaluated and mark are taken for CIE feedback are given individually
Assignment	Topic		All students are required to prepare and assignment from any of the topic they are interested, but should avoid repetition	Assignments are corrected and feedbacks are given CIE internal mark is awarded on the basis of assignment too.
Seminar	Topic	10	All students are required to present a topic with the help of presentation preferably.	Feedback are provided and marks are considered for CIE

Referance Meterials:

6. K.P.Appan,Kshobikkunnavurude Suvisesham.
7. Akkitham Achuthan Namboothiri,Akkitham Kavithakal samboornam.
8. Ayyappa panikkar,Ayyappa panikkarude thiranjedutha kavithakal.
9. P.K.Rajasekharan, Andhanaya Daivam-Malayala novalinte 100 varshangal.
10. Sachidhanandan,Malayala kavitha padanangal.

Semester -3

Course category: Common Course Malayalam

Paper name: Malayala Sahithyam-3

Code: MAL3A09

Course Outcome:

- ❖ Get acquainted with the tide of drama, screen play, auto biography.
- ❖ To understand the general knowledge about film art.

Modules	Contents	Hours	Procedure/ ActivityPlan	Assessment
Module-1	Bharathavakyam – G.Sankarappilla.	5	Lecture	Evaluation through question – answer session
	Thanathu Nadaka dharsanam- Vayala Vasudhevan pilla.	5	Lecture	Evaluation through question – answer session
Module-2	Perumthachan- M.T.Vasudhevan nair	5	Lecture	Evaluation through question – answer session
	Samvidhayakante kala- Adoor Gopalakrishnan	5	Lecture	Evaluation through question – answer session
Module-3	Kedatha theenalangal- V.T.Bhattathirippadu	5	Lecture	Evaluation through question – answer session
	Pushpagopuram – P.Kunjiraman nair	5	Lecture	Evaluation through question – answer session
	Neelakkadalasil pothinja Pchakkuthira- Rosy Thomas	5	Lecture	Evaluation through question – answer session
	Karuthivecha oru ilachoru- EEcharavarriyar	5	Lecture	Evaluation through question – answer session
Module-4	Himavante mukalthattu- Rajan Kakkanadan	5	Lecture	Evaluation through question – answer session
Internal Exam	Two internals of 80 marks and 2.5 hours durations	5	Written exam	Paper are evaluated and mark are taken for CIE feedback are given individually
Assignment	Topic		All students are required to prepare and assignment from any of the topic they are interested, but	Assignments are corrected and feedbacks are given CIE internal mark is awarded on the basis of assignment too.

			should avoid repetition	
Seminar	Topic	10	All students are required to present a topic with the help of presentation preferably .	Feedback are provided and marks are considered for CIE

Referance Meterials:

1. Naduvettam Gopalakrishnan, Athmakadha sahithyam malayalathil, Bhasha Institute,TVM,1998.
2. V.T.Bhattathirippadu,Kannerum kinavum,DC Books,Kottayam.
3. P.KunjiramanNair,Kaviyudekalppadukal,DC.Books , Kottayam,2006.
4. Rossy Thomas,Ivanente priya CJ, DC.Books ,Kottayam,1970.
5. Echaravariyar,Orachante ormmakkurippukal,Current Books , Thrissur,2005.

Semester -4

Course category: Common Course Malayalam

Paper name: Malayala Sahithyam-4

Code: MAL4A10

Course Outcome:

- ❖ Gain the ability to translate from Malayalam and English.

- To understand about novel literature.

Modules	Contents	Hours	Procedure/ ActivityPlan	Assessment
Module-1	Bhashayum asayavinimayavum-K.M.Prabhakara variyar	5	Lecture	Evaluation through question – answer session
	Vrudhasthoolatha-C.V.Vasudhevan Bhattathiri	5	Lecture	Evaluation through question – answer session
	Theettayum Janadhipathyavum,Bhangi vakku-M.N.Karassery	5	Lecture	Evaluation through question – answer session
	Doctormarude Rogam,vendath soundharyathmaka vidhyabyasam- P.Pavithran	5	Lecture	Evaluation through question – answer session
Module-2	Apapyamaya oru vidhanam-K.P.Sankaran	5	Lecture	Evaluation through question – answer session
	Vyajasoochanakal-Roomi	5	Lecture	Evaluation through question – answer session
	Echil-Omprakas Vathmeeki	5	Lecture	Evaluation through question – answer session
Module-3	Arivinte phaalangal—M.Govindan	5	Lecture	Evaluation through question – answer session
	Vyakthinamapadanangal-M.V.Vishnunampoothiri	5	Lecture	Evaluation through question – answer session
	Manushyrellam sodharar-M.K.Sanu	5	Lecture	Evaluation through question – answer session
Module-4	Anubhavangal-Nandhanar	5	Lecture	Evaluation through question – answer session
Internal Exam	Two internals of 80 marks and 2.5 hours durations	5	Written exam	Paper are evaluated and mark are taken for CIE feedback are given individually

Assignment	Topic		All students are required to prepare and assignment from any of the topic they are interested, but should avoid repetition	Assignments are corrected and feedbacks are given CIE internal mark is awarded on the basis of assignment too.
Seminar	Topic	10	All students are required to present a topic with the help of presentation preferably .	Feedback are provided and marks are considered for CIE

Referance Meterials:

7. M.N.Karassery, Thaimozhi-DC Books Kozhikkodu -2009
8. Dr.K.M.Prabhakaravaryar, Bhashayum Manasasthrasvum, Kerala Bhasha Institute-TVM -1999.
9. Dr.K.A.Kosi, Bhashayum Bhashantharanavum,DC Books, Koyyayam, 1994.
10. K.P.Sankaran, Navakam, Poorna Publishers, Kozhikkodu,1938.
11. Omprakash Valmeeki,Echil, (Vivarthanam- Nisha.K.Nair).
12. K.Jayakumar,Roomiyude 100 Kavithakal,Current Books, Thrissur.

LESSON PLAN-2016(MALAYALAM)

Semester I

Course category: Common Course Malayalam

Paper name: Malayala Sahithya Padanam -1

Code: MAL1A01 (1)

Course Outcome:

- Be interested in Literature.
- To understand different literary movements.
- To understand the writings of Malayalam writers.
- To develop interest in mother tongue and literature.
- Understand the importance of the translation and increase your translation skills.

Modules	Contents	Hours	Procedure/ Activity Plan	Assessment
Module-1	Enthinezhuthunnu-M.T.Vasudevan Nair	5	Lecture	Evaluation through question – answer session
	Parithyktharude Rashtreeyam-Sachidhanandan	5	Lecture	Evaluation through question – answer session
	Malayala cinemayude sahithya bandham-Madhu Iravankara.	5	Lecture	Evaluation through question – answer session
	Facisathinte Manasasthram-M.P.veerendrakumar	5	Lecture	Evaluation through question – answer session
Module-2	Tharjamayil Varavunna Apakathakal-Vishnunarayanan Namboothiri	5	Lecture Students Seminar	Question-Answer sessions, Seminar evaluation
	Vanijyasasthram-M.M.Vasudevan namboothirippadu	5	Lecture	Evaluation through question – answer session
Module-3	Kanunnathalla kazhchakal-U.K.Kumaran	5	Lecture Students Seminar	Evaluation through question – answer session
Module-4	Cairo Kathukal-S.K.Pottakkadu	5	Lecture	Evaluation through question – answer session

Internal Exam	Two internals of 80 marks and 2.5 hours durations	5	Written exam	Paper are evaluated and mark are taken for CIE feedback are given individually
Assignment	Topic		All students are required to prepare and assignment from any of the topic they are interested, but should avoid repetition	Assignments are corrected and feedbacks are given CIE internal mark is awarded on the basis of assignment too.
Seminar	Topic	10	All students are required to present a topic with the help of presentation preferably .	Feedback are provided and marks are considered for CIE

Reference Materials:

1. M.T.Vasudevan Nair, Kadikante Panippura, Current Books, Kottayam.
2. M.P.Veerendrakumar, Budhante Chiri, Mathrubhoomi Books, Kozhikkodu.
3. Sugathakumari, Irul Chirakukalude Amukham.
4. Vishnu Narayanan Namboothiri, Vivarthanam, Kerala Bhasha Institute.

Semester -2

Course category: Common Course Malayalam

Paper name: Malayala Sahithya Padanam -2

Code: MAL2A02 (1)

Course Outcome:

- To understand the stages of growth in Malayalam poetry.
- Formulate common ground on the progression of prose and critical literature.

Modules	Contents	Hours	Procedure/ Activity Plan	Assessment
Module-1	Achanum Makalum-Vallathole	5	Lecture	Evaluation through question – answer session
	Safalameeyathra-N.N.Kakkad	5	Lecture	Evaluation through question – answer session
	Jose Josephinte Maranam-G.Kumarappilla	5	Lecture	Evaluation through question – answer session
Module-2	Ottuchedi-C.V.Sreeraman	5	Lecture	Evaluation through question – answer session
	Dhooth-Sethu	5	Lecture	Evaluation through question – answer session
	Jeevachavangal-Punathil Kunjabdhulla	5	Lecture	Evaluation through question – answer session
Module-3	Lanka Lakshmi-C.N.Sreekandannair	5	Lecture	Evaluation through question – answer session
Module-4	Ivanente Priya CJ-Rossy Thomas	5	Lecture	Evaluation through question – answer session
	Prakruthikku Kodukkuka-Dhayabhai	5	Lecture	Evaluation through question – answer session
	Ezhuthinte Eettillam-Lalithampika Antharjanam	5	Lecture	Evaluation through question – answer session

Internal Exam	Two internals of 80 marks and 2.5 hours durations	5	Written exam	Paper are evaluated and mark are taken for CIE feedback are given individually
Assignment	Topic		All students are required to prepare and assignment from any of the topic they are interested, but should avoid repetition	Assignments are corrected and feedbacks are given CIE internal mark is awarded on the basis of assignment too.
Seminar	Topic	10	All students are required to present a topic with the help of presentation preferably.	Feedback are provided and marks are considered for CIE

Reference Materials:

1. M.Leelavathi, Malayala Kavitha Sahithya Charithram.
2. N.Krishnappilla, Kairaliyudekadha.
3. G.Sankarappilla, Malayala Nataka Sahithyacharithram.

LESSON PLAN-2019

Semester 1

Course category: Common Course Malayalam

Paper name: Malayala Sahithya Padanam -1

Code: MAL1A07 (2)

Course Outcome:

- Be interested in Literature.
- To understand different literary movements.
- To develop interest in mother tongue and literature.
- The cultural upliftment of the students Identify.
- Malayalam literature and language usage of different eras.
- Introduce various literary and discourse forms in Malayalam.

Modules	Contents	Hours	Procedure/ Activity Plan	Assessment
Module-1	Soundharya nireekshanam-M.P.Paul	5	Lecture	Evaluation through question – answer session
	Swathiyude Sannidhiyil-S.Gupthan Nair	5	Lecture	Evaluation through question – answer session
	Swarnnamalsyangal-M.N.Vijayan	5	Lecture	Evaluation through question – answer session
	Mathavum Mathangalum-Sukumar Azhikkodu	5	Lecture Students Seminar	Question-Answer sessions, Seminar evaluation
Module-2	Soochi mukhi-Malayattoor	5	Lecture	Evaluation through question – answer session
	Ayal Rajavu-M.Sukumaran	5	Lecture Students Seminar	Evaluation through question – answer session
	Orithal-Manasi	5	Lecture	Evaluation through question – answer session

Module-3	Nooru Simhasanangal-Jayamohan	5	Lecture	Evaluation through question – answer session
Module-4	Kudaku Yathrakal-N.Prabhakaran	5	Lecture discussion	Class test
Internal Exam	Two internals of 80 marks and 2.5 hours durations	5	Written exam	Paper are evaluated and mark are taken for CIE feedback are given individually
Assignment	Topic		All students are required to prepare and assignment from any of the topic they are interested, but should avoid repetition	Assignments are corrected and feedbacks are given CIE internal mark is awarded on the basis of assignment too.
Seminar	Topic	10	All students are required to present a topic with the help of presentation preferably .	Feedback are provided and marks are considered for CIE

Reference Materials:

1. Dr.Kalppatta Bhalakrishnan , Malayala Sahithya Charithram, Kerala Bhasha Institute, Trivandrum -2000.
2. N.Krishnappilla, Kairaliyde Kadha.
3. M.Achuthan, Cherukadha - Innale, Innu. DC Books, Kottayam-2007.
4. Dr.M.M.Basheer Malayala cherukadha Sahithya Charithram.
5. M.P.Paul, Soundharya Nireekshanam.

Semester -2

Course category: Common Course Malayalam

Paper name: Malayala Sahithya padanam -2

Code: MAL2A08 (2)

Course Outcome:

- To understand the stages of growth in Malayalam poetry.
- Formulate common ground on the progression of prose and critical literature.

Modules	Contents	Hours	Procedure/ Activity Plan	Assessment
Module-1	Ente Bhasha-Vallathole	5	Lecture	Evaluation through question – answer session
	Mazhuvinte Kadha-Balamaniyamma	5	Lecture	Evaluation through question – answer session
	Safalameeyathra-N.N.Kakkadu	5	Lecture	Evaluation through question – answer session
Module-2	Bamglavu-T.V.Kochubava	5	Lecture	Evaluation through question – answer session
	Dhushyndhan Mashu-V.K.N	5	Lecture	Evaluation through question – answer session
	Thaykulam- Sara Joseph	5	Lecture Students Seminar	Question-Answer sessions, Seminar evaluation
	Modhasthithanayangu Vasippu Malapole-S.Hareesh	5	Lecture	Evaluation through question – answer session
Module-3	Saketham-C.N.Sreekandan Nair	5	Discussion	Discussion on the topic about Nadaka
Module-3	Sindhoorappottinte Ormmaykk- O.V.Vijayan	5	Lecture	Evaluation through question – answer session
	Sharonile Rosapookal-Vaikkam Chandrasekharan	5	Lecture	Evaluation through question – answer session

	Pavakkutty-Madhavikkutty	5	Lecture Students Seminar	Question-Answer sessions, Seminar evaluation
Internal Exam	Two internals of 80 marks and 2.5 hours durations	5	Lecture	Evaluation through question – answer session
Assignment	Topic		All students are required to prepare and assignment from any of the topic they are interested, but should avoid repetition	Assignments are corrected and feedbacks are given CIE internal mark is awarded on the basis of assignment too.
Seminar	Topic	10	All students are required to present a topic with the help of presentation preferably.	Feedback are provided and marks are considered for CIE

Reference Materials:

4. M.Leelavathi, Malayala Kavitha Sahithya Charithram.
5. N.Krishnappilla, Kairaliyudekadha.
6. G.Sankarappilla,Malayala Nataka Sahithyacharithram.
7. Madhavikkutty, Varshangalkkumunp.
8. O.V.Vijayante Lekhanangal.

Lesson Plan BA/BSC

Semester 1

Course Category : Common course in Hindi

Paper name : Prose & Drama

Code : HINIA07(01)

Course Outcome :

- To acquaint the students with different forms of thoughts and styles used in Hindi prose writing .
- To make them able to express their thoughts in these different forms.
- To intoduce Hindi Drama to the students for appreciation and critical analysis.
- To help them develop their creative thinking and writing.

Modules	Contents	Hours	Procedure/ Activity/ Plans	Assessment
Module - 1	HARI BINDI by MARIDULA GARG SHAVYATRA by OMPRAKASH VATMIKI NAKHUN KYON BADHTE HAI by HAZARI PRASAD DWIVEDI	4	Lecture	Evaluation through question – answer session
Module - 2	SONA by MAHADEI VARMA SADACHAR KAA THAWEEZ by HARISANKAR PARSAI	4	Lecture	Evaluation through question – answer session
Module - 3	SAKKUBAI	4	Lecture	Evaluation through question – answer session
Internal	Two Internal 80 marks and	4	Written Exam	Papers are evaluated,

Examinations	2.5 hours duration			Feedbacks are given individually
Assignments	Any Topic	4	All students are required to prepare an assignment from any of the topics they are interested but should avoid repetition	Assignments are corrected and feedbacks are given. Internal marks is awareded on the basis of assignments too.
Seminars	Any Topic	4	All students are required to present a topic with the help of presentation, preferably.	Feedbacks are provided and marks are considered for

Reference Materials:

1. Sahitya Saptak – Prof. Pratibha Mudaliyar, Aman Prakashan 104A/80C, Rambay, Kanpur
2. Hindi Snatak Adhyan Mandel – Gadhya Aman Prakasan, 104A/8C Rambay, Kanpur
3. Nadira Zahir Babbaar – Sakku Bai – Vani Prakashan, 21-A Dariya Ganj, New Delhi.

Semester II

Course Category : Common Course in Hindi

Paper Name : Grammar & Translation

Code : A08 (1)

Course Outcome :

- To make students able to use Hindi language correctly and efficiently.
- To make them understand various types of letters both personal and business. To facilitate the use of translation as a tool for communication between different languages.
- Grammar is essential to the study of language. Developing a correct grammar sense is very important for written communication.
- A student who successfully complete the course should be able to write in Hindi independently in their personal and professional life.
- Familiarizing the technology of translation with its possibilities.

Modules	Contents	Hours	Procedure/ Activity/ Plans	Assignment
Module - 1	Correct usages of Hindi – Shabdavichar, definition and classification of words – noun, gender, number, karak	4	Lecture	Evalauation through question-answer session
Module - 2	Pronoun, adjective, tense,Voice	4	Lecture	Evalauation through question-answer session
Module - 3	Adverb, Preposition, Conjunction, Interjection	4	Lecture	Evalauation through question-answer session
Module - 4	Translation from English to Hindi	4	Lecture	Evalauation through question-answer session
Internal Examinations	Two Internal 80 marks and 2.5 hours duration	4	Written exam	Papers are evaluated feedbacks are given individually

Assignments	Any Topic	4	All students are required to prepare an assignment from any of the topics they are interested but should avoid repetition	Assignments are corrected and feedbacks are given . Internal marks is awarded on the basis of assignments too.
Seminars	Any Topic	4	All students are required to present a topic with the help of presentation preferably	Feedbacks are provided and marks are considered for DE

Reference Materials

SAMANYA HINDI VYAKARAN TATHA RACHANA : SREEKRISHNA PANDEV, LOKMANGAL PRAKASHAN, B-32, KAILASH COLONY, SHAHDARA, DELHI

Semester III

Course Category : Common Course in Hindi

Paper name : Poetry in Hindi

Code : HIN09(1)

Course Outcome :

- To sensitize the students to the aesthetic cultural and social aspects of literacy appreciation and analysis.
- Appreciation of poetry using the best specimens provided in an anthology.
- Understanding the origin and development of Hindi poetry through selected poems.

Modules	Contents	Hours	Procedure/ Activity/ Plans	Assessment
Module - 1	Ancient Hindi Poetry – A collection of poems of ancient poets	5	Lecture	Evaluation through question – answer session
Module - 2	Modern Hindi Poetry – A collection of poems of different periods representing different styles and themes	5	Lecture	Evaluation through question – answer session
Module - 3	A collection of poems of different periods	5	Lecture	Evaluation through question – answer session
Module - 4	Khandakavya	5	Lecture	Evaluation through question – answer session
Internal Examinations	Two Internal 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated, Feedbacks are given

				individually
Assignments	Any Topic	5	All students are required to prepare an assignment from any of the topics they are interested but should avoid repetition	Assignments are corrected and feedbacks are given. Internal marks is awareded on the basis of assignments too.
Seminars	Any Topic	5	All students are required to present a topic with the help of presentation, preferably.	Feedbacks are provided and marks are considered for

Reference Materials

- PADYA.VIHAR – RAJKAMAL PUBLICATIONS, 1B NETAJI SUBASH MARG, DARIYAGANJ, NEW DELHI.
- KANUPRIYA – BHARATEEYA GYAANPEETH, 18, INDUSTRIAL AREA LODHI ROAD, NEW DELHI.

Semester IV

Course Category : Common Course in Hindi

Paper name : Novel & Short stories

Code : A10

Course Outcome :

- To sensitize the students to aesthetic, cultural and social aspects of literacy appreciation and analysis. To provide them the best specimens of Hindi Fiction of eminent authors of different periods.
- To acquaint the students with different forms of thoughts and styles of Hindi fiction.
- To help them develop their thinking and writing.

Modules	Contents	Hours	Procedure/ Activity/ Plans	Assessment
Module - 1	Short stories from the collection	5	Lecture	Evaluation through question – answer session
Module - 2	Short stories from the collection	5	Lecture	Evaluation through question – answer session
Module - 3	Novel	5	Lecture	Evaluation through question – answer session
Internal Examinations	Two Internal 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated, Feedbacks are given individually
Assignments	Any Topic	5	All students are required to prepare an assignment from any of the topics they are interested but should avoid repetition	Assignments are corrected and feedbacks are given. Internal marks is awareded on the basis of assignments too.

Seminars	Any Topic	5	All students are required to present a topic with the help of presentation, preferably.	Feedbacks are provided and marks are considered for

Reference Materials

1. SADABAHAR KAHANIYAN – RASPAL AND SONS, MADRASA ROAD KASHMIRI GATE, NEW DELHI.
2. SAPNON KEE HOM DELIVERY – MAMATA KAALIAYA, LOK BHARATI PRAKASHAN, DARBARI BUILDING, M.G.ROAD, CIVIL LINES, ALLAHABAAD.

Lesson Plan BCOM

Semester I

Course Category : Common Course in Hindi

Paper Name : PROSE FORMS in HINDI LITERATURE

Code : 07(2)

Course Outcome :

- To sensitize the students to aesthetic, cultural and social aspects of literacy appreciation and analysis.
- To acquaint the students with different forms of thoughts and styles of Hindi prose writing.

Modules	Contents	Hours	Procedure/ Activity/ Plans	Assessment
Module - 1	Selected prose forms,essay, Memoir, Story	5	Lecture	Evaluation through question – answer session
Module - 2	Selected prose forms satire, Sketch, Mini story	5	Lecture	Evaluation through question – answer session
Module - 3	Selected prose forms Travelogue, one act play	5	Lecture	Evaluation through question – answer session
Internal Examinations	Two Internal 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated, Feedbacks are given individually
Assignments	Any Topic	5	All students are required to prepare an assignment from KABIR DAS they are interested but should avoid	Assignments are corrected and feedbacks are given. Internal marks is awareded on the basis of assignments too.

			repetition	
Seminars	Any Topic	5	All students are required to present a topic with the help of presentation, preferably.	Feedbacks are provided and marks are considered for

Reference Materials

GADYA GAGN – VANI PRAKASHAN, 21 – A, DARYA GANJ, NEW DELHI

Semester II

Course Category : Common Course in Hindi

Paper Name : Poetry, Correspondence and Translation

Code : Course No: 09 (2)

Course Outcome:

- To sensitize the students to aesthetic, cultural and social aspects of literacy appreciation and analysis.
- To make them aware of the importance of correspondence and translation. To make them proficient to prepare certain basic kind of letters independently in their personal and professional life.
- Familiarizing the technology of translation with its possibilities.

Modules	Contents	Hours	Procedure/ Activity/ Plans	Assessment
Module - 1	Kabirdas – Five Dohas Soordas – Three Padas Sumitranantan panth – Nauka – Vihar Sooryakaanth Thripathinirala – Juhikeekali Agyey – Naach	5	Lecture	Evaluation through question – answer session
Module - 2	Anamika – Mausiyan Saritha Sharma – Beti Arunkamal – Mukti Gyanendrapathi – pyasaakuan Gagan Gill – is tharah.	5	Lecture	Evaluation through question – answer session
Module - 3	Letters : Personal letter, application letter, letter of order, complaint letter, business letter (bank and bima) technical	5	Lecture	Evaluation through question – answer session

	terminology 1-50			
Module - 4	Translation from English to Hindi	5	Lecture	Evaluation through question – answer session
Internal Examinations	Two Internal 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated, Feedbacks are given individually
Assignments	Any Topic	5	All students are required to prepare an assignment from any of the topics they are interested but should avoid repetition	Assignments are corrected and feedbacks are given.
Seminars	Any topic	5	All students are required to present a topic with the help of presentation, preferably.	Feedbacks are provided and marks are considered for

Reference Materials

- KAYASARGAM – VANI PRAKASHAN, 21-A, DARYA GANJ, NEW DELHI
- ANUVAD EVAM PATRVYAVAHAAN – GOVIND PRAKASHAN

Course Outcome – Hindi

BA/BSC Programme

First Semester

Common Additional Language course in Hindi

HIN1A07(1) Prose and Drama

Course Outcome:

- Approach literary texts in terms of genre, gender and the canon
- Understand and use academic conventions : referencing and bibliography.
- Exposed to the origin and development of Hindi drama and its various themes and forms of different ages and stages.

Second Semester

HIN2A08(1) Grammar and Transilation

- Understand the differences between spoken and written Hindi
- Understand the factors that influence use of grammar and vocabulary in speech and writing.
- Understand the different ways in which grammar has been described.
- Define the link between translation theory and translation practice.
- Defne the effects of translation theories on translation practice.
- Define the contribution of translation practice to translation theory.

Third Semester

HIN3A09 – Poetry in Hindi

- Understand the common techniques underlying free verse and traditional forms of poetry.
- Identify personal experiences that can be used when writing poems.
- Understand the basic terminology and practical elements of poetry.

Fourth Semester

HIN4A10 – Novel and Short Stories

- Enables the students to analyse literature and fiction using appropriate theoretical, historical and cultural apparatus.
- Students get to know various cultures and construction of gender, nation and race throghout the history.
- The prescribed fiction helps the students to learn human values and the behavioural patterns from great works of art, and develops the ability to understand human race.

BCOM/BBA Programme Course Outcome

First Semester

Common Additional Language Course in Hindi

HIN1A07(2) Prose forms in Hindi Literature

- Approach literary texts in trems of genre, gender and the canon.
- Understand and use academic conventions referencing and bibliography
- The learner will be aware of Socio – political and economic conditions of the societry from different periods.

Second Semester

Common Additional Language Course in Hindi

HIN2A08(2) – Poetry; Correspondance and Translation

- Understand the common techniques underlying free verse and traditional forms of poetry.
- Identify personal experiences that can be used when writing poems
- Understand the basic terminology and practical elements of poetry
- Define the link between translation theory and translation practice
- Define the effects of translation theories on translation practice
- Define the contribution of translation practice to translation theory.
- Understand the importance of correspondence

Lesson Plan – BCOM

Semester I

Course Category : Common Course in Hindi

Paper Name : Prose Forms in Hindi Literature

Code : Course No.07 (2)

Course Outcome :

- To Sensitize the students to aesthetic, cultural and social aspects of literacy appreciation and analysis.
- To acquaint the students with different forms thoughts and styles in Hindi prose writing.

Modules	Contents	Hours	Procedure/ Activity/ Plans	Assessment
Module - 1	1. Gasap – Namvar Singh 2. Gurudev – Haribhavu – Upadhay 3. Atmakatha amsh – Bhishma Sahini	5	Lecture	Evaluation through question – answer session
Module - 2	4. Mein narak se bol raha hum – Hari – Sankar Parsai 5. Bhakthin – Mahadevi varma 6. Sava ser gehum – prem chand.	5	Lecture	Evaluation through question – answer session
Module - 3	7. Devathavom ke anchal mein ageya 8. Toothe parivesh – Vishu prabakar 9. Sathi – G.J. Hariseeth.	5	Lecture	Evaluation through question – answer session
	Two Internal			Papers are

Internal Examinations	80 marks and 2.5 hours duration	5	Lecture	evaluated, Feedbacks are given individually
Assignments	Any topic	5	All students are required to prepare an assignment from any of the topics they are interested but should avoid repetition	Assignments are corrected and feedbacks are given.
Seminars	Any topic	5	All students are required to present a topic with the help of presentation, preferably.	Feedbacks are provided and marks are considered for

Reference Materials:

Gady ke vividh aayam – Ed: Dr. Raju Bagalkot, Aman Prakasan, Kanpur.

Semester II

Course Category : Common Course in Hindi

Paper Name : Poetry, Correspondence And Translation

Code : Course No.09 (2)

Course Outcome :

- To Sensitize the students to aesthetic, cultural and social aspects of literacy appreciation and analysis.
- To make them aware of the importance of correspondence and translation. To make them proficient to prepare certain basic kinds of letters independence and translation. To make them proficient to prepare certain basic kinds of letters independently in their personal and professional life.
- Familiarising the technology of translation with its possibilities.

Modules	Contents	Hours	Procedure/ Activity/ Plans	Assessment
Module - 1	1. Kabirdas – First – Five dohas 2. Surdas – First – three padas 3. Prathibimb – panth 4. Kavikah gaye hein - nirala	5	Lecture	Evaluation through question – answer session
Module - 2	5. Kavitha ki bath - agyey 6. Dhabba – Kedar Nath Singh 7. Chidiya, Chittiyam – Ramdarash Mishra 8. Dhoomil ki anthim kavitha – Dhoomil 9. Vakth – Arun Kamal 10. Yah mahaj kora kagz nahi – Bhagavath Ravath 11. Machis – sunitha Jain	5	Lecture	Evaluation through question – answer session

Module - 3	Letters : Personal letter, application letter, letter of order, complaint letter, business letter (bank and bima) technical terminology 1-50	5	Lecture	Evaluation through question – answer session
Module – 4	Translation passage from English to Hindi	5	Lecture	Evaluation through question – answer session
Internal Examinations	Two Internal 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated, Feedbacks are given individually
Assignments	Any topic	5	All students are required to prepare an assignment from any of the topics they are interested but should avoid repetition	Assignments are corrected and feedbacks are given.
Seminars	Any topic	5	All students are required to present a topic with the help of presentation, preferably.	Feedbacks are provided and marks are considered for

Reference Materials:

i. Kavya Sudha – Ed:V. Bhaskar, Jawahar Pusthakalay, Mathura.
ii. Anuvad Evam pathra Vyavahar – Ed: Vanaja Govinda Prakasan

Lesson Plan BA/BSC

Semester I

Course Category : Common Course in Hindi

Paper Name : Prose and Drama

Code : Course No.07 (1)

Course Outcome :

- To Sensitize the students to aesthetic, cultural and social aspects of literacy appreciation and analysis.
- To acquaint the students with different forms thoughts and styles used in Hindi prose writing, to make them able to express their thoughts in these different forms.
- To introduce Hindi Drama to the students for appreciation and critical analysis.
- To help them develop their creative thinking and writing.

Modules	Contents	Hours	Procedure/ Activity/ Plans	Assessment
Module - 1	Introduction : different forms of prose from prescribed text book.	4	Lecture	Evaluation through question – answer session
Module - 2	1. Vapasi – Usha priyamvada 2. Mithratha – Ramachandra sukla 3. Irshya tu na gayi mere man se – Ramshari Singh Dinkar.	4	Lecture	Evaluation through question – answer session
Module - 3	1. Gungiya – Mahadevi Varma. 2. Mein narak se bol raha hum – Harisankar Parsay: 3. Swami – Vivekananda Premchand	4	Lecture	Evaluation through question – answer session

Module – 4	Drama – Bina Deevaron ke khar – Mannu - Bhardari	4	Lecture	Evaluation through question – answer session
Internal Examinations	Two Internal 80 marks and 2.5 hours duration	4	Written Exam	Papers are evaluated, Feedbacks are given individually
Assignments	Any topic	4	All students are required to prepare an assignment from any of the topics they are interested but should avoid repetition	Assignments are corrected and feedbacks are given.
Seminars	Any topic	4	All students are required to present a topic with the help of presentation, preferably.	Feedbacks are provided and marks are considered for

Reference Materials:

1. Sahitya Sapthak – Ed : Prathibha Mudaliar – Aman Prakasan, 104A/80C Rambag, Kanpur.
2. Bina deevaron ke khar – Mannu Bhandari – Radhakrishna Prakasan, New Delhi – 2

Semester II

Course Category : Common Course in Hindi
Paper Name : Grammar Correspondence And Translation
Code : Course No.08 (1)
Course Outcome :

- To make students able to use Hindi language correctly and eficiently. To make them understand various types of letters both personal and business. To facilitate the use of translation as a tool for communication between different languages.
- Grammar is essential to the study of language. Developing a correct grammar sense is very important for written communication.
- A student who successfully complete the course should be able to prepare certain basic kinds of letters independently in their personal and professional life.
- Familiarising the technology of translation with is possibilities.

Modules	Contents	Hours	Procedure/ Activity/ Plans	Assessment
Module - 1	Sabda vichar, Sagya, Ling, vachan, Karak (Chapters – 3,4,5,6,7)	5	Lecture	Evaluation through question – answer session
Module - 2	Sarvanam, viseshan, kriya,Kriya + zeropanthar - Kaal, Vachya (Chapter – 8,9,10,11,12)	5	Lecture	Evaluation through question – answer session
Module - 3	Correspondance, personal letter, order for books, application for job, letter of complaints.	5	Lecture	Evaluation through question – answer session
Module – 4	Translation from English to Hindi	5	Lecture	Evaluation through question – answer session
	Two Internal			Papers are

Internal Examinations	80 marks and 2.5 hours duration	5	Written Exam	evaluated, Feedbacks are given individually
Assignments	Any topic	5	All students are required to prepare an assignment from any of the topics they are interested but should avoid repetition	Assignments are corrected and feedbacks are given.
Seminars	Any topic	5	All students are required to present a topic with the help of presentation, preferably.	Feedbacks are provided and marks are considered for

Reference Materials:

Samanya Hindi Vyakaran Thatha Rachana, Sreekrishna Pandey, Lokmangal Prakasan, B-32, Kailash Colony, Shahdara, Delhi

Semester III

Course Category : Common Course in Hindi

Paper Name : Poetry In Hindi

Code : Course No.09 (1)

Course Outcome :

- To sensitize the students to the aesthetic cultural and social aspects of literacy appreciation and analysis
- Appreciation of poetry using the best specimens provided in a anthology.
- Understanding the origin and development of Hindi poetry through selected poems.

Modules	Contents	Hours	Procedure/ Activity/ Plans	Assessment
Module - 1	1. Kabeerdas (10 dohas) 2. Soordas (4 padas)	5	Lecture	Evaluation through question – answer session
Module - 2	3. Badal raag – Nirala 4. Moh – Panth 5. Samragyi ka Naivedya daan – Agyey	5	Lecture	Evaluation through question – answer session
Module - 3	8. Dhabba – Kedar Nath singh 9. Aparajitha – Kathyayani 10. Otni – Anamika 11. Nadi aur Saabun – Gyanendrapathi 12. Bus bahuth ho chukka – Om Prakash Valmiki	5	Lecture	Evaluation through question – answer session
Module – 4	Khandakavya – Bhoomiosa – Nagarjun for detailed study.	5	Lecture	Evaluation through question – answer session
Internal Examinations	Two Internal 80 marks and 2.5 hours duration	5	Written Exam	Papers are evaluated, Feedbacks are given individually

Assignments	Any topic	5	All students are required to prepare an assignment from any of the topics they are interested but should avoid repetition	Assignments are corrected and feedbacks are given.
Seminars	Any topic	5	All students are required to present a topic with the help of presentation, preferably.	Feedbacks are provided and marks are considered for

Reference Materials:

1. Kaalgartri Kavithayen – Ed:Dr.B. Vijayakumar, Arunoday Prakasan,Dariyaganj, New Delhi – 2
2. Bhoomisa – Nagarjun – Radhakrishna Prakasan, 7/31, Ansari marg, NewDelhi – 2.

Semester III

Course Category : Common Course in Hindi
Paper Name :
Code :
Course Outcome :

- To sensitize the students to aesthetic, cultural and social aspects of literacy appreciation and analysis. To provide them the best specimens of Hindi fiction of eminent authors of different periods.
- To acquaint the students with different forms thoughts and styles of Hindi fiction.
- To help them develop their creative thinking and writing.

Modules	Contents	Hours	Procedure/ Activity/ Plans	Assessment
Module - 1	Introduction of origin and development of Hindi fiction	5	Lecture	Evaluation through question – answer session
Module - 2	1. Poos kiraat Premchand 2. Akash deep – Jayasankar Prasad 3. Dukh – Yashpal	5	Lecture	Evaluation through question – answer session
Module - 3	4. Aparichith – Mohan Rakesh 5. Ikkisvim sadi ka ped mridula garg 6. Dalit Brahman Sathyaprakash	5	Lecture	Evaluation through question – answer session
Module – 4	Novel – Loute huye musafir – Kamaleswar (for non- detailed study – only short questions) and essay type question may be asked for examination	5	Lecture	Evaluation through question – answer session

Internal Examinations	Two Internal 80 marks and 2.5 hours duration		Written Exam	Papers are evaluated, Feedbacks are given individually
Assignments	Any topic	5	All students are required to prepare an assignment from any of the topics they are interested but should avoid repetition	Assignments are corrected and feedbacks are given.
Seminars	Any topic	5	All students are required to present a topic with the help of presentation, preferably.	Feedbacks are provided and marks are considered for

Reference Materials:

1. Samakaleen Kahaniyan – Ed: Dr. K. Vanaja,Rajpal and sons, Delhi
2. Loute huye musafir – Kamaleswar, Lokbharathi Prakasan, Allahabad.

Course Outcome – Hindi

BA/BSC Programme

First Semester

Common Additonal Language Course in Hindi.

HINI A07 (1) Prose and Drama

Course Outcome :

1. To acquaint the students with different forms of thoughts and styles used in Hindi prose writing. To make them able to express their thoughts in these different forms.
2. To introduce Hindi Drama to the students for appreciation and critical analysis.
3. To help them develop their creative thinking and writing.

Second Semester

HIN A08 (1) Grammar and Translation

1. Grammar is essential to the study of language. Developing a correct grammar sense is very important for written communication.
2. A student who successfully complete the course should be able to write in Hindi independently in their personal and professional life.
3. Familiarizing the technology of translation with its possibilities.

Third Semester

HIN 3 A09 – Poetry in Hindi

1. Apprecitaion of poetry using the best specimens provided in an anthology.
2. Understanding the origin and development of Hindi poetry through selected poems.

Fourth Semester

HIN 4 A10 – Novel and Short Stories

1. To acquaint the students with different forms of thoughts and styles of Hindi fiction.
2. To help the develop their thinking and writing.

BCOM/BBA Programme Course Outcome

First Semester

Common Additional Language Course in Hindi

HINI A07 (2) Prose Forms in Hindi Literature

1. To acquaint the students with different forms of thoughts and styles in Hindi prose writing.

Second Semester

Common Additional Language Course in Hindi

HIN2 A08 (2) Poetry Correspondance and Translation

1. To sensitize the students to the aesthetic, cultural and social aspects of literacy appreciation and analysis.
2. To make them aware of the importance of correspondance and translation. To make them proficient to prepare certain basic kinds of letters independently in their personal and professional life.
3. Familiarizing the technology of translation with its possibilities.