

SACRED HEART COLLEGE FOR WOMEN

CHALAKUDY, THRISSUR, KERALA



AQAR 2020-21

CRITERION I - CURRICULAR ASPECTS

SUB CRITERION - 1.3.1 - Institution integrates crosscutting issues relevant to Professional Ethics, Gender, Human Values, Environment and Sustainability into the Curriculum.

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SACRED HEART COLLEGE FOR WOMEN

CHALAKUDY, THRISSUR, KERALA



AQAR 2020-21 ECONOMICS

CRITERION I - CURRICULAR ASPECTS

SUB CRITERION - 1.3.1 - Institution integrates crosscutting issues relevant to Professional Ethics, Gender, Human Values, Environment and Sustainability into the Curriculum.

DEPARTMENT OF ECONOMICS
SACRED HEART COLLEGE, CHALAKUDY

1.3.1 Department integrates crosscutting issues relevant to professional ethics, gender, human values, environment and sustainability into the curriculum

SL. NO.	NAME OF THE COURSE	COURSE CODE	NAME OF THE PROGRAMME	THE AREA DEALT WITH
1	Modern Banking and Insurance	ECO3 B03	BA Economics	Human Values
2	Development Economics	ECO6 B13	BA Economics	Gender, Environment and Sustainability
3	Applied Theory of Markets	ECO6 E02	BA Economics	Professional Ethics
4	Indian Constitution and Politics: Basic Features	ICP1 CO1	BA Economics	Human Values
5	Indian Constitution and Politics: Governmental Structures	ICP2 CO2	BA Economics	Human Values
6	Indian Constitution and Politics: Political Dynamics	ICP3 CO3	BA Economics	Human Values
7	Indian Constitution and Politics: Federal Dynamics	ICP4 CO4	BA Economics	Human Values
8	Environment Studies	AUD1E01	BA Economics	Environment and Sustainability
9	Disaster Management	AUD2E02	BA Economics	Environment and Sustainability
10	Human Rights/ Intellectual Property/ Consumer Protection	AUD3E03	BA Economics	Human Values and Professional Ethics
11	Gender Studies	AUD4E04	BA Economics	Gender
12	Indian Economy :	ECO1C03	MA Economics	Environment and

	Problems and Policies			Sustainability
13	Growth and Development	ECO3C10	MA Economics	Gender, Environment and Sustainability
14	Agricultural Economics	ECO4E02	MA Economics	Environment and Sustainability

DEPARTMENT OF ECONOMICS

Semester III

Course Category: Core Course 4
Course Title and Code: Modern Banking and Insurance, ECO3 B04
No. of Credits: 4
No. of Contact Hours: 72

Modern Banking and Insurance

Objectives

This course provides students the latest development in the field of banking and financial system. It also helps to familiarise the students with the changing scenario of Indian banking. The insurance part of the course aims at providing a basic understanding of the mechanics of insurance. It explains the concept of insurance and how it is used to cover risk. Some commonly used insurance terms are included. An overview of major life insurances and general insurance products are added as well.

Module -1

Brief history of banking - Unit banking - Branch banking - Mixed banking - Commercial banks - Central bank - Development banks, IFCI, IDBI, SFC - Money market, components and instruments.

Module - 2

Recent trends in banking - e-banking - Internet banking - Debit card - Credit card, ATM, EFTS - RTGS - Tele banking - Social banking - Banking ombudsman - Banking sector reforms capital adequacy norms - NPA - Consortium banking - cheque truncation system - E - Purse.

Module – 3

Insurance - Definition, Nature, Evolution, Principle, kinds - Types of insurance organisations - Reinsurance

Module – 4

Risk management Risk and uncertainty – need for security against economic difficulties - Risk management process – risk management and insurance (loss, permit, risk, hazard / types etc.) – risk management of life insurance companies – insurance company operations.

Module – 5

Life insurance - Kinds of Policies - Term insurance - Whole life - Endowment - Annuities - Surrender - Revival - Loans and claims - Motor insurance - Kinds of policies - Conditions Settlement of claims - Personal accident insurance - Mediclaim - insurance - Burglary insurance - Fidelity guarantee insurance.

Reference:

1. K.P.M. Sundaram and E.N.Sundaram - Modern Banking - Sulthan Chand and sons - New Delhi.
2. Sekhar and Sekhar - Banking and financial system - Margham publication - Chennai.
3. K.C. Mishra and Mangala Bakshi (2009), Insurance Business Environment and Insurance Company Operations, National Insurance Academy | Cengage Learning, New Delhi.
4. Dr. V.Balu - Banking and financial system Sri. Venkiteswara publications - Chennai.
5. Rejda, Principles of Risk Management and Insurance, 9th Edition, Pearson Education
6. Mishra.M.N - Insurance, Principles and practices - Sulthanchand and company New Delhi.
7. Gupta.O.S - Life Insurance - Frank Brothers - New Delhi.
8. Pamda.G.S. - Principles and practise of insurance - Kalyani publishers - New Delhi.

Semester VI

Course Category: Core Course 14 Course Title and Code: Development Economics, ECO6 B14 No. of Credits: 4 No. of Contact Hours: 90
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Development Economics

Introduction : This course on the political economy of development and planning attempts to answer questions related to economic development in a comprehensive manner. Students who wish to take up position in formulation and implementation of public policy must have a reasonably good understanding of its political economy aspects

Objectives : The main. Objectives of this course is to introduce the students of such fundamental topics in development and planning with their inter relations. This course is expected to provide students a comprehensive approach towards issues related to development and planning

Learning Outcome : The students are expected to develop an interrelated to approach to resource use, the relationship between man and man and man and nature.

Syllabus

Module I: Perspectives on Development Economics Why study Development economics?- Meaning of Growth and Development-measurement of development – Alternative measures of development :GDP, PCI, PQLI, HDI, HPI, GDI, GEM, Multi Dimensional Poverty index etc - (15 hours)

Module II: Theories of Development Rostows (stage theory) - Balanced versus Unbalanced growth theory, Low-level equilibrium trap, vicious circle of poverty, critical minimum effort, Big Push theory. (25 hours)

Module III: Economic Planning Concept, meaning and types of planning, Relevance of planning in the context of globalization Economic Planning in India: Indian planning in a historical perspective:- Bombay plan, Gandhian Plan, People's plan. Five-year plans in India – an overview - Details of current five year plan (25 hours)

Module IV: Issues in development Poverty – measurement and classification, Inequality and its measurement (Kuznet's Ratio, Lorenz curve and Gini coefficient), Gender issues – the concept of missing women. Environment versus development – the concept of sustainable development, limits to growth, global warming. (25 hours)

References Books :

1. Amartya kumar Sen, Growth Economics, Penguin Education,1970
2. Daron Acemoglu, Introduction to modern economic growth, 2008, Princeton university press
3. A N Agarwala and S P Singh, The economics of underdevelopment, Oxford university press, 1958.
4. Neri salvadori, Old and New growth theories An Assessment, Edward Elgar Publishing limited, 2003
5. A P Thirlwall, Growth and development, with special reference to developing countries, (8 Ed), Palgrave Macmillian, 2006
6. Debraj Ray, Development Economics, Oxford university press, 2009.
7. Partha Das Gupta, Economics A very short introduction, OUP, 2007.
8. Kaushik Basu, The new oxford companion to Economics in India, OUP, 2012.

II. ECO6 E02, Applied Theory of Markets

Course Category: Elective Course Course Title and Code: Applied Theory of Markets, ECO6 E02 No. of Credits: 2 No. of Contact Hours: 54

Objectives: In the traditional economics courses, the theory of markets is a theoretical discussion. Its applied side is marketing the products, for which the understanding of the behavior of the consumer is essential. This course is intended to introduce the students to the basics of marketing and consumer behavior.

Module 1: Markets and marketing (20 Hours)

Classification of Markets – criteria for classification - Markets with competition Vs markets without competition (general discussion only, no need to discuss market forms in detail) – Marketing – Definition, Concepts, Significance & functions of Marketing - Approaches to the study of Marketing - Marketing and E-Commerce Market segmentation – definition - needs & benefits - bases for segmentation for consumer goods, industrial goods & services - effective segmentation criteria; definition of Target Marketing, evaluating market segments, target market strategies - undifferentiated, differentiated, and concentrated. Marketing Environment:-Analyzing needs and trends - Macro Environment- political, economic, sociocultural and technical environment - PEST analysis, concept of market potential & market share - Marketing in Indian Context

Module II – Consumer Behaviour (15 Hours)

Consumer Behaviour-Assumptions: 1. Rational Consumer 2. Budget Constraints 3. Consumer Preferences Consumer Behaviour:- concept, characteristics of consumer and organizational markets, Five step Buyers decision process. Factors influencing buying decision—cultural, social, personal and psychological factors—buying process—consumeradaptation process—changing patter of consumer behaviour in global economy.

Module III - Product and pricing decisions (15Hours)

Product and pricing decisions- Concept of product; product line and product mix; new product development; packaging and branding; brand extensions; Pricing decisions factors influencing price BA Economics Curriculum: CBCSS 2014 The Board of Studies in Economics (UG), University of Calicut Page 80 decisions; pricing strategies; Product life cycle stages and strategic marketing decisions. Sales promotion - objectives, tools and techniques.

Module IV: Distribution decisions (10 hours)

Distribution decisions-marketing channels, structure, types and criteria of selecting a channel, wholesaling, retailing, and physical distribution. e – Marketing distribution

Module V: Promotion (12 Hrs)

Promotion- An overview. Advertising, sales promotion, personal selling and sales management. Public and customer relations, direct and online marketing, multilevel marketing-the new marketing model.

REFERENCES:

1. Philip Kotler, Marketing Managementl Pearson Education 13 th Edition.
2. Joel R. Evans and Barry Berman —Marketing in 21st centuryl, Biztantra 2003.
3. William Pride and O.C. Ferrel —Marketing concepts and strategies, Boston, Houghton Mifflin 1993l.
4. David W. Cravens, Gerald Hills, and Robert B. Woodruff —Marketing management, AITBS publishers 1996.
5. Arun Kumar and N Meenakshi, —Marketing Managementl, Vikas Publishers
6. Hawkins, Best and Coney: Consumer Behaviour, Tata McGraw Hill, New Delhi 2004.
7. Schiffman, L.G. and Kanuk, L.L.: Consumer Behaviour, Pearson, New Delhi, 2011.
8. Laudon, David L and Bitta Albert J Della: Consumer Behaviour, Tata McGraw Hill, New Delhi 2005.
9. Rajendra P. Maheswari, Marketing Management, International Book House, 2012
10. Neelamegham, S, Marketing in India; Cases and Readings, Vikas New Delhi, 1988.
11. William G. Zikmund& Michael D'Amico, —Marketing; Craeting and Keeping —Customers in an E-CommerceWorldl, Thomson Learning

I SEMESTER.

ICP1 CO1: INDIAN CONSTITUTION AND POLITICS: Basic Features

MODULE I

Making of the Constitution: A brief analysis of National Movement. Constitutional Development with reference to Government of India Act 1909, 1919, 1935 and Indian Independence of India Act 1947. The Constituent Assembly of India.

MODULE II.

(a) Basic features of the Indian Constitution the Preamble

(b) Fundamental Rights

MODULE III.

Directive Principles of State Policy Fundamental Duties.

II SEMESTER

ICP2 CO2: INDIAN CONSTITUTION AND POLITICS: Governmental Structures

MODULE.I

. Government of the Union (a) The Union Executive the President and the Vice President The Council of Ministers and the Prime Minister Powers and functions (b) The Union Legislature - The Parliament The Lok Sabha and the Rajya Sabha, composition, powers and functions - the role of the Speaker.

MODULE.II

Government of the States (a) The Governor the Council of Ministers and the Chief Minister Powers and functions (b) the State Legislature composition, powers and functions.

MODULE.III

The Indian Judicial System the Supreme Court and the High Court composition, jurisdiction and functions, Judicial review, Judicial activism, Independence of Judiciary in India. 42

III SEMESTER

ICP 3 CO3: INDIAN CONSTITUTION AND POLITICS: Political Dynamics

MODULE.I

Indian Party System: Features A brief study of National political parties. Regionalism and regional political parties.

MODULE.II

Electoral Process The Election Commission of India composition, powers and functions

MODULE.III

(a) Procedure for the amendment of the Constitution.

(b) The Civil Services All India Services Central Services – State Services – Union Public Service Commission State Public Service Commission composition, powers and functions

IV SEMESTER

ICP4 CO4: INDIAN CONSTITUTION AND POLITICS: Federal Dynamics and Decentralization

MODULE.I

(a) Indian Federalism Constitutional provisions Centre State relations Legislative, Administrative and Financial relations between the Union and the States.

(b) Panchayathi Raj in India. Significance of 73 and 74 Amendment Acts. (c) Reservation issues

MODULE.II

Challenges to Indian Democracy Communalism, Religious Fundamentalism and Criminalization of Politics.

MODULE.III

43 Inter State Consultative Machinery The Finance Commission, The Planning Commission, National Development Council composition and functions

Books and references.

1 D. D. Basu. Introduction to the Constitution of India. (Prentice Hall)

2 J. R. Siwach. Dynamics of Indian Govt. and Politics (Sterling)

3 Norman D. Palmer. The Indian Political System

4 Dr. M. V. Pylee. India's Constitution (Vikas new Delhi 2010)

5. Dr. B. L. Fadia. Indian Government and Politics. (Sahitya Bhavan

Publications)

6. Dr. A. P. Avasthi. Indian Government and Politics. (Lakshmi Narayan

Agarwal)

7. J.C.Johari. Indian Politics (Vishal Publications)
8. J.C.Johari. Indian Political System (Anmol Publications)
9. Grenville Austin. Indian Constitution: A cornerstone of a Nation. (Oxford)
10. C.P.Bambri. Indian Politics since Independence. (Shirpa Publications)
11. Dr. M. V. Pylee. Introduction to India's Constitution
12. Brij Kishore Shama. Introduction to the Constitution of India. Prentice Hall, New Delhi, 2007
13. Bidyut Chakrabarthy & RajendraKumar Pandey. Indian Government and Politics. Sage, New Delhi 2008
14. Abbas Kumar & Alal: Indian Government and Politics, Pearson

AUD1E01 ENVIRONMENTAL STUDIES

Module 1:

Introduction – Environment in the Indian context: Concept of an ecosystem, Multidisciplinary nature of environmental studies. Components of environment- Atmosphere, hydrosphere, lithosphere and biosphere. Definition, scope and importance. Concept of sustainability and sustainable development.

Module 2:

Natural Resources : Renewable and non-renewable resources : Natural resources and associated problems. a) Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e) Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies. f) Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification. • Role of an individual in conservation of natural resources. •Carbon footprint Water conservation, rain water harvesting, watershed management

Module 3:

Structure and function of an ecosystem. • Producers, consumers and decomposers. •

Energy flow in the ecosystem. • Ecological succession. • Food chains, food webs and ecological pyramids. • Introduction, types, characteristic features, structure and function of the following ecosystem :- a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Module 4:

Biodiversity and its conservation • Introduction – Definition : genetic, species and ecosystem diversity. • Biogeographical classification of India • Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values • Biodiversity at global, National and local levels. • Hot-spots of biodiversity. • Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts. • Endangered and endemic species of India • Conservation of biodiversity :

Module 5:

Environmental Pollution Definition • Cause, effects and control measures of :- a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards • Solid waste Management : Causes, effects and control measures of urban and industrial wastes. • Role of an individual in prevention of pollution.

Module 6:

Environmental Policies and practices: Climate change, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents.

Essential Reading

1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad 380 013, India, Email:mapin@icenet.net (R)
2. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
3. Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt.
4. Gadgil, M., & Guha, R.1993. This Fissured Land: An Ecological History of India. Univ. of California Press.
5. Gleeson, B. and Low, N. (eds.) 1999. Global Ethics and Environment, London, Routledge

AUD2E02 DISASTER MANAGEMENT

Module 1:

Introduction – Hazard and Disaster. Concepts of Hazard, Vulnerability, Risks. Different Types of Disaster : A) Natural Disaster: such as Flood, Cyclone, Earthquakes, Landslides etc B) Man-made Disaster: such as Fire, Industrial Pollution, Nuclear Disaster, Biological Disasters, Accidents (Air, Sea, Rail & Road), Structural failures(Building and Bridge), War & Terrorism etc. Slow Disasters (famine, draught, epidemics) and Rapid Onset Disasters(Air Crash, tidal waves, Tsunami) Causes, effects and practical examples for all disasters.

Water and Climate Disaster: flood, hail storms, cloudburst, cyclones, heat and snow avalanches, cold waves, droughts, sea erosion, thunder and lightning. Geological Disaster: landslides, earthquakes, Tsunami, mine fires, dam failures and general fires. Biological Disaster: epidemics, pest attacks, cattle epidemic and food poisoning. Nuclear and Industrial Disaster: chemical and industrial disasters , nuclear accidents. Accidental Disaster: urban and forest fires, oil spill, mine flooding incidents, collapse of huge building structures.

Module 2:

Natural disasters- Earthquakes, Tsunami, Floods, Drought, Landslides, Cyclones and Volcanic eruptions. Their case studies. Coastal disasters. Coastal regulation Zone.

Risk and Vulnerability Analysis 1. Risk : Its concept and analysis 2. Risk Reduction 3.

Vulnerability : Its concept and analysis 4. Strategic Development for Vulnerability Reduction

. Disaster Prevention and Mitigation. Refugee operations during disasters, Human Resettlement and Rehabilitation issues during and after disasters, Inter-sectoral coordination during disasters,

Models in Disasters.

Module 3:

Disaster Preparedness and Response Concept and Nature Disaster Preparedness Plan
Prediction, Early Warnings and Safety Measures of Disaster. Role of Information, Education,
Communication, and Training,
Disaster Management : Role of Government, International and NGO Bodies. Role of IT in
Disaster Preparedness Role of Engineers on Disaster Management. Response Disaster Response :
Introduction Disaster Response Plan Communication, Participation, and Activation of
Emergency Preparedness Plan Search, Rescue, Evacuation and Logistic Management Role of
Government, International and NGO Bodies Psychological Response and Management
(Trauma, Stress, Rumor and Panic) Relief and Recovery Medical Health Response to Different
Disasters.

Module 4:

Rehabilitation, Reconstruction and Recovery Reconstruction and Rehabilitation as a Means of
Development. Damage Assessment Post Disaster effects and Remedial Measures. Creation of
Long-term Job Opportunities and Livelihood Options, Disaster Resistant House Construction
Sanitation and Hygiene Education and Awareness, Dealing with Victims' Psychology, Long-
term Counter Disaster Planning Role of Educational Institute.

Module 5:

The vulnerability atlas of India. Disaster Prevention and Mitigation. Agencies involved in

Disaster Management. Warning and Prediction

Essential Reading:

1. Pandey, M., 2014. Disaster Management, Wiley India Pvt. Ltd., 240p.
2. Tushar Bhattacharya, Disaster Science and Management, McGraw Hill Education (India) Pvt. Ltd
3. Jagbir Singh, Disaster, Management: Future Challenges and Opportunities, K W Publishers Pvt. Ltd.
4. J.P. Singhal, Disaster Management, Laxmi Publications
5. C. K. Rajan, Navale Pandharinath, Earth and Atmospheric Disaster Management : Nature and Manmade, B S Publication
6. Shailesh Shukla, Shamna Hussain, Biodiversity, Environment and Disaster Management,

AUD4E06-Gender Studies

Aim of this course is to introduce the significance and relevance of gender studies

Objectives

- To provide the relevance and significance of the ideas of gender equality and gender justice in our society
- To develop an understanding about the basic concepts of gender studies
- To provide a historical background of women's movements and its relevance
- To understand the major debates around gendered ways of violence and to introduce gender perspectives on popular culture

Course - Outcomes

1. It helps the student to acquire knowledge about the importance of gender equality and women's rights
2. It helps the student to develop gender sensitivity through an analysis of contemporary social issues at the global, national and local levels
3. It helps the student to familiarise with analysing the popular culture and media with a gender perspective
4. It equips the student to acquire knowledge about the various organs, conventions, Constitutional provisions and redressal systems to combat gender discrimination

Module I

Introducing the concepts of sex and gender, gender division of labour, patriarchy, sexualities
And sexual orientations, gender stereotypes, masculinities, intersectionalities of race, class,

Caste and gender in family and society

Suggested Readings

1. 50 Key concepts in Gender Studies, Jane Pilcher and Imelda Whelehan, Sage Publications, 2005
2. Understanding Gender: Kamala Bhasin, Women Unlimited, New Delhi, 2003.
3. What is Patriarchy? Kamala Bhasin, Women Unlimited, New Delhi, 2003.
4. Exploring Masculinity, Kamala Bhasin, Women Unlimited, New Delhi, 2003.

Module II

Women's Experiences in family & work, community, public sphere kinship structures, Various forms of violence against women – female foeticide, infanticide, dowry, domestic violence, sexual assaults, rape, sexual harassment at workplace, honour killings – Government mechanisms to combat Violence against women in India

1. An overview of the status of women in India: Neera Desai and Maithreyi Krishnaraj, P 296-319, Class, Caste, Gender- Readings in Indian Government and Politics-5, Ed. Manoranjan Mohanty, Sage Publications, New Delhi, 2004
2. 'Towards Equality', Report of the Committee on the Status of Women in India, 1975

Module III

Historical Roots of Women's Movements in India and global – Right to vote – Women's Question and social reform in 19th early 20th Century in India and Kerala – Women in National Movement – Left Movement- The Contemporary Women's Movements in India – Queer movements – International human rights instruments & UN conventions on gender rights, Indian Constitutional guarantees of equality and citizenship rights – gender in higher education

1. History of Doing, Radha Kumar, Kali for Women, New Delhi

2. Mapping of Women's Movement, Threfall. M. (Ed.). Verso, London
3. Women, Ecology and Culture: Gabriele Dietrich, P. 72- 95, Gender and Politics in India, Kali for Women
4. Saksham Report on Measures for Ensuring the Safety of Women and Programmes for Gender Sensitisation on Campuses, 2013,
https://www.ugc.ac.in/pdfnews/5873997_saksham-book.pdf

Module IV

Gender perspectives on popular culture, discourse and practices of cinema, television, popular music, magazines and advertisements, representations of women and gender/sexual minorities in media, gendered dimensions of social media – analysis of gender in news – print, television, web and women's media initiatives

Suggested Readings

1. Whose News: The Media and Women's Issues, Ammu Joseph & Kalpana Sharma (Ed), Sage Publishing, 2006
2. Films and Feminism - Essays in Indian Cinema - Jasbir Jain

Core Course-III
MA ECONOMICS (CBCSS)
I SEMESTER
ECO1C03 INDIAN ECONOMY: PROBLEMS AND POLICIES

(Credit 5)

Total Hours: 90

Lecture Hours: 70

Seminar Hours: 20

Module I:

Growth, Structural Changes and Challenges of the Indian Economy

Economic growth in India- CSO and national income related aggregates- Contribution of different sectors to GVA, GDP and Employment- Trends in savings and investment since reforms- Migration, diaspora and remittance - Regional disparity in growth and development- Analysis of poverty, unemployment and inequality in India

Module II:

Review of Economic Development Assessment of Indian agriculture sector and recent initiatives by the government for its growth-Inter regional dimensions of industrial growth in India- Make in India initiative- Service sector: growth rate, share in exports and imports, software exports- Infrastructure at cross roads -Prices: Headline inflation-Inflation based on WPI and CPI combined, food inflation, core inflation- Monetary management in India prior to 1990 and

position after 1990s-New initiatives of the government towards black money-Inclusive policies of the government-A global deal on climate change: possible role for India.

Module III:

Economic Planning in India Planning and economic development-Objectives of planning- Techniques of planning- Achievements of planning- Bottom up and Step down approaches in planning- Evaluation of Five Year Plans-NITI Aayog and its Vision Documents- Welfare programmes announced in the last two Union Budgets.

Module IV:

Economic Reforms Since 1991 Background of economic reforms- Washington Consensus- Industrial policy reforms- Trade policy reforms- Fiscal policy reforms- Financial sector reforms- Foreign investment policy reforms- Second generation economic reforms-An appraisal of India's economic reforms- Post reform Infrastructure Investment Models-PPP- Cooperative federalism with special reference to GST.

Module IV:

Kerala Economy Economic liberalization and economic growth in Kerala- Kerala model of development- Agricultural performance-Industrial backwardness- Health and education - Migration of casual workers to Kerala- Decentralization-Achievements of decentralization- Poverty and unemployment in Kerala - State finances of Kerala- Causes of acute fiscal crisis of Kerala

References

1. Vijay Joshi and IMD Little: India: Macroeconomics and Political Economy: 1964-1991- Oxford University Press, New Delhi 1994.
2. Uma Kapila (ed): Indian Economy Since Independence- Academic Foundation, New Delhi 2004.
3. Vijay Joshi and I. M.D Little: India's Economic Reforms: 1991- 2001- Oxford University Press, New Delhi, 1996.
4. VM Dandekar and Nilakant Rath: Poverty in India- Indian School of Political Economy, Pune, 1971.

5. Jagdish Bhagwati: India in Transition- Oxford University Press, Delhi, 1994.
6. Dr. S Murthy: Structural Reforms of Indian Economy- Atlantic Publishers, 1995.
7. H W Singer, Neelambar Hatti and Rameshwar Tandon (eds): Trade Liberalisation in the 1990's- Indus Publishing Company, New Delhi, 1990.
8. Jagdish Bhagwati and TN Srinivasn: Foreign Trade Regimes and Economic Development: India- NBER, New York, 1986.
9. Isher Judge Ahluwalia and IMD Little (ed): India's Economic Reforms and Development: Essays for Manmohan Singh- Oxford University Press, Delhi, 1998.
10. KR Gupta (Ed): Liberalization and Globalization of Indian Economy- Atlantic Publishers, New Delhi 1995.

Core Course-X
MA ECONOMICS (CBCSS)
III SEMESTER

ECO3C10 GROWTH AND DEVELOPMENT

(Credit 5)

Total Hours: 90

Lecture Hours: 70

Seminar Hours: 20

Module I: Concepts and Measurements of Economic Growth and Development

Concepts of growth and development-Indicators of Economic Development: National Income, per capita Income, PQLI, Human Development Index, Gender Development Index, Human Poverty Index and Deprivation Index. Measures of Inequality: Kuznets Inverted U Hypothesis, Lorenz Curve and Gini-coefficient, Atkinson, Theil, Palma ratio.

Module II: Theories of Economic Growth

Harrod-Domar Growth Model- Contributions of Kaldor-Mirrlees and Joan Robinson, Hirofumi Uzawa model, Solow's Growth Model and the Convergence Hypothesis, Endogenous Growth Theory and the role of Human Capital; Indian Plan Models of Mahalanobis and Wage-goods model.

Module III: Partial Theories of Economic Growth and Development

Basic Features of Underdeveloped Countries, Population Growth and the Theory of Low-Level Equilibrium Trap, Critical Minimum Effort Thesis, Theory of Big-Push; Balanced

Versus Unbalanced Growth Theories- Concepts of linkages.

Module IV: Stage Theories

Marxian Stage theory, Rostow's Stage Theory. Theory of Growth and Structural Change. Concept of Dualism: Technological, Social, Geographical and Financial. Myrdal and Circular Causation, Backwash and Spread Effect. Institutions and Economic Growth.

Module V: Financing Economic Development

Domestic Resource Mobilisation: Prior-Savings Approach, The Keynesian and Quantity Theory Approaches to the Financing of Economic Development. Foreign Resource: Dual Gap Analysis.

References

1. Adelman, Irma (1961): 'Theories of Economic Growth and Development', Stanford University Press
2. Ahluwalia and I.M.D Little: India's Economic Reforms and Development: Essays for Manmohan Singh
3. Hollis, Chenery, and T. N. Srinivasan: "Handbook of Development Economics, Vol. 1." (1988).
4. Fortado (1964): Development and Underdevelopment', University of California Press, Berkley
5. Ghatak, Subrata: Introduction to Development Economics. Routledge (4th edn.)
6. Gill, Richard T: Economic Development: Past and Present. No. HD82 G52. 1963.
7. Hagen, Everett (1975): The Economics of Development Richard D. Irwin Illinois
8. Higgins, Benjamin (1976): Principles of Economic Development, Universal Book Stall, New Delhi. 33

9. Jones, Hywel G: An Introduction to Modern Theories of Economic Growth. London: Nelson, 1975.
10. Kindleberger, C.P (1958): Economic Development, Tata McGraw-Hill, NY
11. Kuznets S (1972): Modern Economic Growth, Oxford and IBH, New Delhi.
12. Little, Ian Malcolm David: Economic Development: Theory, Policy, and International Relations. (1982).
13. Meier, Gerald M., and James E. Rauch: Leading Issues in Economic Development. 5th ed. New York: Oxford University Press, 1989.
14. Ray, Debraj (2003): 'Development Economics', Oxford India Paperbacks, OUP

Elective Course II
MA ECONOMICS (CBCSS)
IV SEMESTER

ECO4E02 AGRICULTURAL ECONOMICS

(Credit 4)

Total Hours: 90

Lecture Hours: 70

Seminar Hours: 20

Module I: Agriculture in Economic Development

Nature and scope of agricultural economics- Agriculture and economic development, Models of agricultural development (Schultz, Lewis, Fei & Ranis, Jorgenson, Todaro, Mellor, and Boserup) - Interdependence between agriculture and industry- Terms of trade between agriculture and industry.

Module II: Economic Decisions in Agriculture

Production- Factor-product relationship - Production functions- Cobb Douglas, CES & Spillman- Factor-factor relationship- Product-product relationship- Resource-use efficiency- Farm-size productivity debate- Capital formation in agriculture- Public versus private investment- Complimentarily versus substitutability debate- Classification of costs- Farm planning and farm budgeting- Systems of farm organization.

Module III: Behaviour of Demand, Supply and Agricultural Prices

Price determination of agricultural commodities-Elasticity of demand and supply of agricultural commodities- Cob-web theorem- Nerlovian supply response model-Prices instability- Role of public intervention in price determination and distribution of agricultural commodities- Agricultural price policy in India- Instruments of price policy- Crop insurance- CACP- Output subsidy- PDS- Food inflation.

Module IV: Agricultural Marketing

Agribusiness- Market structure of agricultural commodities- Marketed and marketable surplus- Distress sales- Defects of markets- Regulated markets- Co-operative markets- Market intelligence- Futures trading.

Module V: Structural and Institutional Changes in Indian Agriculture

Area, production & productivity trends- Changing cropping pattern- Factors affecting cropping pattern- Agricultural development under five year plans- Green revolution- Agricultural inputs- HYV seeds- Farm mechanization- Fertilizer use efficiency- Crop irrigation technology- Input subsidies- Second green revolution- Ever green revolution- ICAR-Land reforms- Institutional and non-institutional sources of agricultural credit- NABARD- Co-operative credit, Rural indebtedness- Agricultural labour and wages- National Agricultural Policy 2000- National Commission on Farmers- WTO and Indian agriculture- DOHA Agreement.

References

1. Drummond and Goodwin: Agricultural Economics- Pearson, New Delhi, Ed.2, 2004.
2. Christopher Ritson: Agricultural Economics- Gosby Lockwood Staples, London, 1977.
3. Mellor J.W: The Economics of Agriculture Development- Vora & Co Bombay.
4. Bishop C.E. & Toussiant W.D: Introduction to Agricultural Economic Analysis- John Wiley & Sons, New York, 1958.

SACRED HEART COLLEGE FOR WOMEN

CHALAKUDY, THRISSUR, KERALA



AQAR 2020-21 MATHEMATICS

CRITERION I - CURRICULAR ASPECTS

SUB CRITERION - 1.3.1 - Institution integrates crosscutting issues relevant to Professional Ethics, Gender, Human Values, Environment and Sustainability into the Curriculum.

FIRST SEMESTER

MTS1 B01 BASIC LOGIC & NUMBER THEORY

4 hours/week

4 Credits

100 Marks Int:20+Ext:80]

Aims, Objectives and Outcomes

Logic, the study of principles of techniques and reasoning, is fundamental to every branch of learning. Besides, being the basis of all mathematical reasoning, it is required in the field of computer science for developing programming languages and also to check the correctness of the programmes. Electronic engineers apply logic in the design of computer chips. The first module discusses the fundamentals of logic, its symbols and rules. This enables one to think systematically, to express ideas in precise and concise mathematical terms and also to make valid arguments. How to use logic to arrive at the correct conclusion in the midst of confusing and contradictory statements is also illustrated.

The classical number theory is introduced and some of the very fundamental results are discussed in other modules. It is hoped that the method of writing a formal proof, using proof methods discussed in the first module, is best taught in a concrete setting, rather than as an abstract exercise in logic. Number theory, unlike other topics such as geometry and analysis, doesn't suffer from too much abstraction and the consequent difficulty in conceptual understanding. Hence, it is an ideal topic for a beginner to illustrate how mathematicians do their normal business. By the end of the course, the students will be able to enjoy and master several techniques of problem solving such as recursion, induction etc., the importance of pattern recognition in mathematics, the art of conjecturing and a few applications of number theory. Enthusiastic students will have acquired knowledge to read and enjoy on their own a few applications of number theory in the field of art, geometry and coding theory. Successful completion of the course enables students to

- Prove results involving divisibility, greatest common divisor, least common multiple and a few applications.
- Understand the theory and method of solutions of LDE.
- Solve linear congruent equations.
- Learn three classical theorems *viz.* Wilson's theorem, Fermat's little theorem and Euler's theorem and a few important consequences.

Syllabus

Text (1)	Discrete Mathematics with Applications : Thomas Koshy, <i>Elsever Academic Press(2004) ISBN:0-12-421180-1</i>
Text:(2)	Elementary Number Theory with Applications (2/e) :Thomas Koshy, <i>Elsever Academic Press(2007) ISBN:978-0-12-372487-8</i>

Module- I **Text (1)** **(15 hrs)**

1.1: Propositions- definition, Boolean (logic) variables, Truth Value, Conjunction, Boolean expression, Disjunction (inclusive and exclusive), Negation, Implication, Converse, Inverse and Contra positive, Biconditional statement, Order of Precedence, Tautology Contradiction and Contingency [**‘Switching Networks’ omitted**]

1.2 : Logical equivalences- laws of logic [**‘Equivalent Switching Networks’ ‘Fuzzy logic’ & ‘Fuzzy decisions’ omitted**]

1.3 : Quantifiers- universal & existential, predicate logic

1.4 : Arguments- valid and invalid arguments, inference rules

1.5: Proof Methods – vacuous proof, trivial proof, direct proof, indirect proof-contrapositive & contradiction, proof by cases, Existence proof- constructive & non constructive, counter example

Module- II **Text (2)** **(12 hrs)**

1.3 : Mathematical induction- well ordering principle, simple applications, weak version of principle of mathematical induction, illustrations, strong version of induction (second principle of MI), illustration

1.4 : Recursion- recursive definition of a function, illustrations.

2.1: The division algorithm – statement and proof, div & mod operator, card dealing, The two queens puzzle (simple applications), pigeonhole principle and division algorithm, divisibility relation, illustration, divisibility properties, union intersection and complement-inclusion-exclusion principle & applications, even and odd integers.

2.5: Prime and Composite Numbers- definitions, infinitude of primes, [**‘algorithm 2.4’ omitted**] The sieve of Eratosthenes, a number theoretic function, prime number theorem (statement only), distribution of primes (**upto and including Example 2.25**) . [**rest of the section omitted**]

Module- III**Text (2)****(17 hrs)**

3.1 : 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.

3.2: The Euclidean Algorithm- The Euclidean algorithm [algorithm 3.1 omitted], A jigsaw puzzle, Lame's theorem (statement only; proof omitted)

3.3: 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!, [only statement of Theorem 3.14 required; proof omitted] Distribution of Primes Revisited, Dirichlet's Theorem (statement only)

3.4 : Least Common Multiple- definition, canonical decomposition to find lcm, relationship between gcd and lcm, relatively prime numbers and their lcm

3.5: Linear Diophantine Equations – LDE in two variables, conditions to have a solution, Aryabhata's method, number of solutions, general solution, Mahavira's puzzle, hundred fowls puzzle, Monkey and Coconuts Puzzle, ['Euler's method for solving LDE's ' omitted] Fibonacci numbers and LDE, LDE in more number of variables and their solutions- Theorem 3.20

Module- IV**Text (2)****(20 hrs)**

4.1: Congruences - congruence modulo m, properties of congruence, characterization of congruence, least residue, ['Friday-the-Thirteenth' omitted], congruence classes, A Complete Set of Residues Modulo m, properties of congruence, use of congruence to find the remainder on division, ['Modular Exponentiation' method omitted], Towers of Powers Modulo m, further properties of congruence and their application to find remainder ['Monkey and Coconut Puzzle revisited'(example 4.17) omitted] congruences of two numbers with different moduli

4.2: Linear Congruence- solvability, uniqueness of solution, incongruent solutions, Modular Inverses, applications

5.1: Divisibility Tests- Divisibility Test for 10, Divisibility Test for 5, Divisibility Test for 2^1 , Divisibility Tests for 3 and 9, Divisibility Test for 11 [rest of the section from Theorem 5.1 onwards omitted]

7.1: Wilson's Theorem- self invertible modulo prime, Wilson's theorem and its converse ['Factorial, Multifactorial and Primorial Primes' omitted]

7.2: Fermat's Little Theorem (FLT)- FLT and its applications, [Lagrange's alternate proof of Wilson's theorem omitted], inverse of a modulo p using FLT, application-solution of linear congruences [' Factors of $2^n + 1$ ' omitted], extension of FLT in various directions ['The Pollard p-1 factoring method' omitted]

7.4 : Euler's Theorem- motivation, Euler's Phi Function ϕ , Euler's Theorem, applications, generalisation of Euler's theorem (koshy)

References:	
1	Susanna S Epp: Discrete Mathematics with Applications(4/e) Brooks/ Cole Cengage Learning(2011) ISBN: 978-0-495-39132-6
2	Kenneth H. Rosen: Discrete Mathematics and Its Applications(7/e) McGraw-Hill, NY (2007) ISBN: 978-0-07-338309-5
3	David M. Burton : Elementary Number Theory(7/e) McGraw-Hill (2011) ISBN: 978-0-07-338314-9
4	Gareth A. Jones and J. Mary Jones: Elementary Number Theory, Springer Undergraduate Mathematics Series(1998) ISBN: 978-3-540-76197-6
5	Underwood Dudley :Elementary Number Theory(2/e), Dover Publications (2008) ISBN:978-0-486-46931-7
6	James K Strayer: Elementary Number Theory, Waveland Press, inc. (1994), ISBN:978-1-57766-224-2
7	Kenneth H. Rosen: Elementary Number Theory(6/e), Pearson Education (2018)ISBN: 9780134310053

FIFTH SEMESTER

MTS5 B08 LINEAR PROGRAMMING

3 hours/week

3 Credits

75 Marks [Int:15+Ext:60]

Aims, Objectives and Outcomes

Linear programming problems are having wide applications in mathematics, statistics, computer science, economics, and in many social and managerial sciences. For mathematicians it is a sort of mathematical modelling process, for statisticians and economists it is useful for planning many economic activities such as transport of raw materials and finished products from one place to another with minimum cost and for military heads it is useful for scheduling the training activities and deployment of army personnel. The emphasis of this course is on nurturing the linear programming skills of students *via*. the algorithmic solution of small-scale problems, both in the general sense and in the specific applications where these problems naturally occur. On successful completion of this course, the students will be able to

- solve linear programming problems geometrically
- understand the drawbacks of geometric methods
- solve LP problems more effectively using Simplex algorithm *via*. the use of condensed tableau of A.W. Tucker
- convert certain related problems, not *directly* solvable by simplex method, into a form that can be attacked by simplex method.
- understand duality theory, a theory that establishes relationships between linear programming problems of maximization and minimization
- understand game theory
- solve transportation and assignment problems by algorithms that take advantage of the simpler nature of these problems

Syllabus

Text	Linear Programming and Its Applications: James K. Strayer <i>Undergraduate Texts in Mathematics Springer (1989) ISBN: 978-1-4612-6982-3</i>
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Module-I (16 hrs)

Chapter1 Geometric Linear Programming: Profit Maximization and Cost Minimization, *typical motivating examples, mathematical formulation, Canonical Forms for Linear Programming Problems, objective functions, constraint set, feasible solution, optimal solution, Polyhedral Convex Sets, convex set, extreme point, theorems asserting existence of optimal solutions, The Two Examples Revisited, graphical solutions to the problems, A Geometric Method for Linear Programming, the difficulty in the method, Concluding Remarks*

Chapter2 The Simplex Algorithm:- Canonical Slack Forms for Linear Programming Problems; Tucker Tableaus, *slack variables, Tucker tableaus, independent variables or non basic variables, dependent variables or basic variables, .An Example: Profit Maximization, method of solving a typical canonical maximization problem, The Pivot Transformation, The Pivot Transformation for Maximum and Minimum Tableaus, An Example: Cost Minimization, method of solving a typical canonical minimization problem, The Simplex Algorithm for Maximum Basic Feasible Tableaus, The Simplex Algorithm for Maximum Tableaus, Negative Transposition; The Simplex Algorithm for Minimum Tableaus, Cycling, Simplex Algorithm Anti cycling Rules, Concluding Remarks*

Module-II (14 hrs)

Chapter3 Noncanonical Linear Programming Problems:- Unconstrained Variables, Equations of Constraint, Concluding Remarks

Chapter 4 : Duality Theory :- Duality in Canonical Tableaus, The Dual Simplex Algorithm, *The Dual Simplex Algorithm for Minimum Tableaus, The Dual Simplex Algorithm for Maximum Tableaus, Matrix Formulation of Canonical Tableaus ,The Duality Equation, Duality in Noncanonical Tableaus, Concluding Remarks*

Module-III (18 hrs)

Chapter 5 Matrix Games:- An Example; Two-Person Zero-Sum Matrix Games, Domination in a Matrix Game, Linear Programming Formulation of Matrix Games, The Von Neumann Minimax Theorem, The Example Revisited, Two More Examples, Concluding Remarks

Chapter 6 Transportation and Assignment Problems :- The Balanced Transportation Problem, The Vogel Advanced-Start Method (VAM), The Transportation Algorithm, Another Example, Unbalanced Transportation Problems, The Assignment Problem, *The Hungarian Algorithm*, Concluding Remarks, *The Minimum-Entry Method*, *The Northwest-Corner Method*

References:

1	Robert J. Vanderbei: Linear Programming: Foundations and Extensions (2/e) Springer Science+Business Media LLC (2001) ISBN: 978-1-4757-5664-7
2	Frederick S Hiller, Gerald J Lieberman: Introduction to Operation Research (10/e) McGraw-Hill Education, 2 Penn Plaza, New York (2015) ISBN: 978-0-07-352345-3
3	Paul R. Thie, G. E. Keough : An Introduction to Linear Programming and Game Theory (3/e) John Wiley and Sons, Inc. (2008) ISBN: 978-0-470-23286-6
4	Louis Brickman: Mathematical Introduction to Linear Programming and Game Theory UTM, Springer Verlag, NY (1989) ISBN: 0-387-96931-4
5	Jiri Matoušek, Bernd Gartner: Understanding and Using Linear Programming Universitext, Springer-Verlag Berlin Heidelberg (2007) ISBN: 978-3-540-30697-9

SIXTH SEMESTER (Elective)

MTS6 B14 (E01) GRAPH THEORY

3 hours/week

2 Credits

75 Marks [Int:15+Ext:60]

Text	A First Look at Graph Theory: John Clark & Derek Allan Holton, Allied Publishers, First Indian Reprint 1995
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Module-I (16 hrs)

- 1.1 Definition of a graph
- 1.2 Graphs as models
- 1.3 More definitions
- 1.4 Vertex degrees
- 1.5 Sub graphs
- 1.6 Paths and Cycles
- 1.7 Matrix representation of a graph [*up to Theorem 1.6 ; proof of Theorem 1.5 is omitted*]

Module-II (16 hrs)

- 2.1 Definitions and Simple Properties
- 2.2 Bridges [*Proof of Theorem 2.6 and Theorem 2.9 are omitted*]
- 2.3 Spanning Trees
- 2.6 Cut Vertices and Connectivity [*Proof of Theorem 2.21 omitted*]

Module-III (16 hrs)

- 3.1 Euler Tour [*up to Theorem 3.2, proof of Theorem 3.2 omitted*]
- 3.3: Hamiltonian Graphs [*Proof of Theorem 3.6 omitted*]
- 5.1: Plane and Planar graphs [*Proof of Theorem 5.1 omitted*]
- 5.2 Euler's Formula [*Proofs of Theorems 5.3 and Theorem 5.6 omitted*]

References:

1	R.J. Wilson: Introduction to Graph Theory, 4th ed., LPE, Pearson Education
2	J.A. Bondy & U.S.R. Murty : Graph Theory with Applications
3	J. Clark & D.A. Holton: A First Look at Graph Theory, Allied Publishers
4	N. Deo : Graph Theory with Application to Engineering and Computer Science, PHI.

FIFTH SEMESTER (OPEN COURSE)
(For students not having Mathematics as Core Course)

MTS5 D03 LINEAR MATHEMATICAL MODELS

3 hours/week

3 credits

75marks [Int:15+Ext:60]

Text	Finite Mathematics and Calculus with Applications (9/e) Margaret L. Lial, Raymond N. Greenwell & Nathan P. Ritchey Pearson Education, Inc(2012) ISBN: 0-321-74908-1
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Module I 18 hrs

Chapter-1 Linear Functions

- 1.1: Slopes and Equations of Lines
- 1.2: Linear Functions and Applications
- 1.3: The Least Squares Line

Chapter-2 Systems of Linear Equations and Matrices

- 2.1: Solution of Linear Systems by the Echelon Method
- 2.2: Solution of Linear Systems by the Gauss-Jordan Method
- 2.3: Addition and Subtraction of Matrices
- 2.4: Multiplication of Matrices
- 2.5: Matrix Inverses
- 2.6: Input-Output Models

Module II 12 hrs

Chapter-3 Linear Programming: The Graphical Method

- 3.1: Graphing Linear Inequalities
- 3.2: Solving Linear Programming Problems Graphically
- 3.3 : Applications of Linear Programming

Module III 18 hrs

Chapter-4 Linear Programming: The Simplex Method

- 4.1: Slack Variables and the Pivot
- 4.2: Maximization Problems
- 4.3: Minimization Problems; Duality
- 4.4 :Nonstandard Problems

References:

1	Soo T Tan: Finite Mathematics For the Managerial, Life, and social sciences(11/e) <i>Cengage Learning(2015) ISBN: 1-285-46465-6</i>
2	Ronald J. Harshbarger, James J. Reynolds: Mathematical Applications for the Management, Life, and Social Sciences (9/e) <i>Brooks/Cole Cengage Learning(2009) ISBN: 978-0-547-14509-9</i>
3	Stefan Waner, Steven R. Costenoble: Finite Mathematics and Applied Calculus(5/e) <i>Brooks/Cole Cengage Learning(2011) ISBN: 978-1-4390-4925-9</i>
4	Seymour Lipschutz, John J. Schiller, R. Alu Srinivasan: Beginning Finite Mathematics <i>Schaum's Outline Series, McGraw-Hill(2005)</i>
5	Howard L. Rolf: Finite Mathematics <i>Enhanced Edition(7/e) Brooks/Cole, Cengage Learning(2011) ISBN:978-0-538-49732-9</i>
6	Michael Sullivan: Finite Mathematics An Applied Approach(11/e) <i>John Wiley & Sons, Inc(2011)ISBN: 978-0470-45827-3</i>

List of Elective Courses in Third Semester

1. MTH3E01 Coding theory
2. MTH3E02 Cryptography
3. MTH3E03 Measure & Integration
4. MTH3E04 Probability Theory

List of Elective Courses in Fourth Semester

1. MTH4E05 Advanced Complex Analysis
2. MTH4E06 Algebraic Number Theory
3. MTH4E07 Algebraic Topology
4. MTH4E08 Commutative Algebra
5. MTH4E09 Differential Geometry
6. MTH4E10 Fluid Dynamics
7. MTH4E11 Graph Theory
8. MTH4E12 Representation Theory
9. MTH4E13 Wavelet Theory

ABILITY ENHANCEMENT COURSE(AEC)

Successful fulfilment of any one of the following shall be considered as the completion of AEC. (i) Internship, (ii) Class room seminar presentation, (iii) Publications, (iv) Case study analysis, (v) Paper presentation, (vi) Book reviews. A student can select any one of these as AEC.

Internship: Internship of duration 5 days under the guidance of a faculty in an institution/department other than the parent department. A certificate of the same should be obtained and submitted to the parent department.

Class room seminar: One seminar of duration one hour based on topics in mathematics beyond the prescribed syllabus.

Publications: One paper published in conference proceedings/ Journals. A copy of the same should be submitted to the parent department.

Case study analysis: Report of the case study should be submitted to the parent department.

Paper presentation: Presentation of a paper in a regional/ national/ international seminar/conference. A copy of the certificate of presentation should be submitted to the parent department.

Book Reviews: Review of a book. Report of the review should be submitted to the parent department.

PROFESSIONAL COMPETENCY COURSE (PCC)

A student can select any one of the following as Professional Competency course:

1. Technical writing with \LaTeX .
2. Scientific Programming with Scilab.
3. Scientific Programming with Python.

PROJECT

The Project Report (Dissertation) should be self contained. It should contain table of contents, introduction, at least three chapters, bibliography and index. The main content may be of length not less than 30 pages in the A4 format with one and half line spacing. The project report should be prepared preferably in \LaTeX . There must be a project presentation by the student followed by a viva voce. The components and weightage of External and Internal valuation of the Project are as follows:

Components	External(weigtag)	Internal (weightage)
Relevance of the topic & staement of problem	4	1
Methodology & analysis	4	1
Quality of Report & Presentation	4	1
Viva Voce	8	2
Total weigtage	20	5

The external project evaluation shall be done by a Board consisting two External Examiners. The Grade Sheet is to be consolidated and must be signed by the External Examiners.

MTH4V01 VIVA VOCE EXAMINATIONS

The Comprehensive Viva Voce is to be conducted by a Board consisting of two External Examiners. The viva voce must be based on the core papers of the entire programme. There should be questions from at least one course of each of the semesters I, II, and

SEMESTER 2

MTH2C10: OPERATIONS RESEARCH

No. of Credits: 4

No. of hours of Lectures/week: 5

TEXT : K.V. MITAL; C. MOHAN., OPTIMIZATION METHODS IN OPERATIONS RESEARCH AND SYSTEMS ANALYSIS(3rd. Edn.), New Age International(P) Ltd., 1996.

(Pre requisites : A basic course in calculus and Linear Algebra)

Module 1

Convex Functions; Linear Programming [Chapter 2 : Sections 11 to 12 ; Chapter 3 : Sections 1 to 15, 17 from the text]

Module 2

Linear Programming (contd.); Transportation Problem [Chapter 3 : Sections 18 to 20, 22; Chapter 4 Sections 1 to 11, 13 from the text]

Module 3

Integer Programming; Sensitivity Analysis [Chapter 6 : Sections 1 to 9; Chapter 7 Sections 1 to 10 from the text] Flow and Potential in Networks; Theory of Games [Chapter 5 : Sections 1 to 4, 6 7; Chapter 12 : all Sections]

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. Philipps 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
- [5] **H.S. Kasana and K.D. Kumar:** Introductory Operations Research-Theory and Applications; Springer-Verlag; 2003
- [6] **R. Panneerselvam:** Operations Research; PHI, New Delhi(Fifth printing); 2004
- [7] **A. Ravindran, D.T. Philipps and J.J. Solberg:** Operations Research-Principles and Practices(2nd Edn.); John Wiley & Sons; 2000

- [8] **G. Strang:** Linear Algebra and Its Applications(4th Edn.); Cengage Learning; 2006
- [9] **Hamdy A. Taha:** Operations Research- An Introduction(4th Edn.); Macmillan Pub Co. Delhi; 1989

SEMESTER 3(Elective)

MTH3E02: CRYPTOGRAPHY

No. of Credits: 3

No. of hours of Lectures/week : 5

TEXT : Douglas R. Stinson, Cryptography Theory and Practice, Chapman & Hall, 2nd Edition.

Module 1

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 2

Shannons Theory:- Elementary Probability Theory, Perfect Secrecy, Entropy, Huffman Encodings, Properties of Entropy, Spurious Keys and Unicity Distance, Product Cryptosystem.

Module 3

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. [Chapter 1 : Section 1.1(1.1.1 to 1.1.7), Section 1.2 (1.2.1 to 1.2.5) ; Chapter 2 : Sections 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7 ; Chapter 3 : Sections 3.1, 3.2, 3.3(3.3.1 to 3.3.3), Sect.3.4, Sect. 3.5(3.5.1,3.5.2), Sect.3.6(3.6.1, 3.6.2); Chapter 4 : Sections 4.1, 4.2(4.2.1 to 4.2.3), Section 4.3 (4.3.1, 4.3.2), Section 4.4(4.4.1, 4.4.2), Section 4.5 (4.5.1, 4.5.2)]

References

- [1] **Jeffrey Hoffstein:** Jill Pipher, Joseph H. Silverman, An Introduction to Mathematical 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.

SEMESTER 4 (Elective)

MTH4C11: GRAPH THEORY

No. of Credits: 3

No. of hours of Lectures/week : 5

TEXT : J.A. Bondy and U.S.R.Murty : Graph Theory with applications. Macmillan

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 Chinese 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.

[Chapter 2 Sections 2.1(Definitions & Statements only), 2.2, 2.3, 2.4, 2.5; Chapter 3 Sections 3.1, 3.2, 3.3; Chapter 4 Sections 4.1(Definitions & Statements only), 4.2, 4.3, 4.4; Chapter 5 Sections 5.1, 5.2, 5.3, 5.4; Chapter 6 Sections 6.1,6.2,6.3; Chapter 7 Sections 7.1,7.2; Chapter 8 Sections 8.1, 8.2, 8.4, 8.5, 8.6; Chapter 9 Sections (9.1,9.2,9.3 Definitions & Statements only), 9.4, 9.5, 9.6; Chapter 10 Sections 10.1, 10.2, 10.3.

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.

DEPARTMENT OF MATHEMATICS

SACRED HEART COLLEGE FOR WOMEN, CHALAKUDY

1.3.1 Department integrates crosscutting issues relevant to professional ethics, gender, human values, environment and sustainability into the curriculum.

SL NO	NAME OF THE COURSE	COURSE CODE	NAME OF THE PROGRAMME	THE AREA DEALT WITH
1.	Basic Logic and Number Theory	MTS1B01	BSc Mathematics	Human Values
2.	Linear Programming	MTS5B08	BSc Mathematics	Professional Ethics
3.	Graph Theory	MTS6B14(E01)	BSc Mathematics	Environment and Sustainability
4.	Linear Mathematical Models	MTS5D03	BSc Mathematics	Professional Ethics
5.	Ability Enhancement Course	MTH1A01	MSc Mathematics	Human Values
6.	Operations Research	MTH2C10	MSc Mathematics	Professional Ethics
7.	Professional Competency Course	MTH2A02	MSc Mathematics	Professional Ethics
8.	Cryptography	MTH3E02	MSc Mathematics	Professional Ethics
9.	Graph Theory	MTH4E11	MSc Mathematics	Professional Ethics

SACRED HEART COLLEGE FOR WOMEN

CHALAKUDY, THRISSUR, KERALA



AQAR 2020-21 PHYSICS

CRITERION I - CURRICULAR ASPECTS

SUB CRITERION - 1.3.1 - Institution integrates crosscutting issues relevant to Professional Ethics, Gender, Human Values, Environment and Sustainability into the Curriculum.

1.3.1 Courses which address cross cutting issues relevant to Gender, Environment and Sustainability, Human Values and Professional Ethics into the Curriculum

Sl.No	Name of the Course	Course Code	Name of the Programme	Specify the issue(s) dealing with
1.	Non Conventional Energy Sources	PH5 D01(1)	BSc.Physics	Environment and sustainability
2.	Methodology of Science and Basic Mechanics	PHY1 B01	BSc.Physics	Professional Ethics
3.	Environment Studies (Audit course)	EO1	BSc.Physics	Environment and sustainability
4.	Disaster Management (Audit course)	EO2	BSc.Physics	Human Values
5.	Human Rights or Intellectual Property Rights or Consumer protection (Audit course)	EO3	BSc.Physics	Human Values
6.	Gender studies or Gerontology (Audit course)	EO4	BSc.Physics	Gender roles and Human Values

UNIVERSITY OF CALICUT

B.Sc. PHYSICS

(CORE AND COMPLEMENTARY PROGRAMMES)

SYLLABUS & MODEL QUESTION PAPERS

w.e.f 2019 admission onwards

CBCSSUG Regulations 2019

B.Sc. DEGREE PROGRAMME (PHYSICS CORE)

COURSE STRUCTURE

Semester	Course Code	Course Title	Total hours	Hours/Week	Credits
1	A 01	Common Course I – English	72	4	4
	A 02	Common Course II – English	90	5	3
	A 07	Common Course III – Language other than English	72	4	4
	PHY1 B01	Core course I - Methodology of Science and Basic Mechanics	36	2	2
		Core Course V - Practical I	36	2	*
		1 st Complementary Course I - Mathematics	72	4	3
		2 nd Complementary Course I	36	2	2
		2 nd Complementary Course Practical I	36	2	*
	EO1	Environment Studies	-	-	4**
	Total	450	25	18	
2	A 03	Common Course IV – English	72	4	4
	A 04	Common Course V – English	90	5	3
	A 08	Common Course VI – Language other than English	72	4	4
	PHY2 B02	Core Course II - Mechanics	36	2	2
		Core Course V - Practical I	36	2	*
		1 st Complementary Course II - Mathematics	72	4	3
		2 nd Complementary Course II	36	2	2
		2 nd Complementary Course Practical II	36	2	*
	E02	Disaster Management			4**
	Total	450	25	18	
3	A 05	Common Course VI – English	90	5	4
	A 09	Common Course VIII - Language other than English	90	5	4

	PHY3 B03	Core Course III – Electrodynamics-I	54	3	3
		Core Course VI– Practical I	36	2	*
		1 st Complementary Course III – Mathematics	90	5	3
		2 nd Complementary Course III	54	3	2
		2 nd Complementary Course Practical III	36	2	*
	E03	Human Rights or Intellectual Property Rights or Consumer protection			4**
		Total	450	25	16
4	A 06	Common Course IX – English	90	5	4
	A 10	Common Course X - Language other than English	90	5	4
	PHY4 B04	Core Course IV - Electrodynamics II	54	3	3
	PHY4 B05	Core Course Practical V – Practical I	36	2	5
		1 st Complementary Course IV– Mathematics	90	5	3
		2 nd Complementary Course IV	54	3	2
		2 nd Complementary Course Practical IV	36	2	4
	E04	Gender studies or Gerontology			4**
	Total	450	25	25	
5	PHY5 B06	Core Course VI - Computational Physics	54	3	3
	PHY5 B07	Core Course VII - Quantum Mechanics	54	3	3
	PHY5 B08	Core Course VIII - Optics	54	3	3
	PHY5 B09	Core Course IX- Electronics (Analog and Digital)	54	3	3
		Open Course – (course from other streams)	54	3	3
		Core Course Practical XIV - Practical II	72	4	*
		Core Course Practical XV- Practical III	72	4	*
		Core Course XVII Project/Research methodology	36	2	*
		Total	450	25	15
6	PHY6 B10	Core Course X - Thermodynamics	54	3	3
	PHY6 B11	Core Course XI -Statistical Physics, Solid State Physics, Spectroscopy and Photonics	54	3	3
	PHY6 B12	Core Course XII - Nuclear Physics and Particle Physics	54	3	3

	PHY6 B13	Core Course XIII - Relativistic Mechanics and Astrophysics	54	3	3
	PHY6 B14	Core Course XIV (Elective:EL1 / EL2 / EL3)	54	3	3
	PHY6 B15	Core Course Practical XV – Practical II	72	4	5
	PHY6 B16	Core Course Practical XVI – Practical III	72	4	5
	PHY6 B17 (P/R)	Core Course XVII Project/Research methodology Tour report	36	2	2 1
		Total	450	25	28
Total Credits					120

Tour report shall be evaluated with Practical III

*Credit for practical / project to be awarded only at the end of Semester 4 and Semester 6.

**Mandatory audit courses for the program, but not counted for the calculation of SGPA or CGPA.

Student can attain only pass (Grade P) for these courses.

Semester 1 | Core Course I

PHY1B01: METHODOLOGY OF SCIENCE AND BASIC MECHANICS

36 hours (Credit - 2)

	Course Outcome	PSO	CL	KC	Class Sessions allotted
CO1	Understand the features, methods and limitations of science	PSO1	U	C	6
CO2	Understand and apply the basic concepts of Newtonian Mechanics to physical systems	PSO1	Ap	C, P	10
CO3	Understand and apply the basic idea of work-energy theorem to physical systems	PSO1	Ap	C,P	8
CO4	Understand and apply the rotational dynamics of rigid bodies	PSO1	Ap	C,P	8
CO5	Understand the basic ideas of elasticity	PSO1	U	C	4

Unit 1 – Methodology of Science

6 Hours

Science as facts, science as generalization, Some distinctions when describing science, Science as a social activity, scientific revolutions and paradigms, Science and pseudo-science, Science and democratic development, The limitations of science-presuppositions, fundamental questions on reality: Rationality, Description, Causality - Prediction and Explanation in science - Mathematics and science, Hypothesis, Theories and laws, Verification, Falsification, Acceptance - Peer Review in Science - Scientific method.

[Sections 2.2.1 to 2.2.5, 2.3.1, 2.4.1, 2.5.1 to 2.5.4, 2.6.1 to 2.6.4, 2.8.1 to 2.8.4, 3.1 to 3.3, 4.1 to 4.4 & 7.1 of Research Methodology : The Aims, Practices and Ethics of Science by Peter Pruzan]

Unit 2 – Newton's Laws

10 Hours

Newton's First Law, Second Law and Third Law – Astronauts in space : Inertial systems and fictitious forces – Standards and units – Some applications of Newton's laws – The astronauts' tug of war, Freight train, Constraints, Block on string, The whirling block, The conical pendulum – The everyday forces of physics – Gravity and Weight; Gravitational force of a sphere; Turtle in an elevator; Gravitational field – Electrostatic force – Contact forces; Block and string; Dangling rope; Whirling rope; Pulleys; Tension and Atomic forces; Normal force; Friction; Block and wedge with friction; Viscosity – Linear restoring force; Spring and block : The equation for simple harmonic motion; Spring and gun : Illustration of initial conditions – Dynamics of a system of particles – The

Bola – Centre of mass – Drum major’s baton – Centre of mass motion – Conservation of momentum – Spring Gun recoil

[Sections 2.1 to 2.5, 3.1 to 3.3 of An Introduction to Mechanics (1stEdn.) by Daniel Kleppner and Robert J. Kolenkow]

Unit 3 – Work and Energy

8 Hours

Integrating the equation of motion in one dimension – Mass thrown upward in a uniform gravitational field; Solving the equation of simple harmonic motion – Work-energy theorem in one dimension – Vertical motion in an inverse square field – Integrating the equation of motion in several dimensions – Work-energy theorem – Conical pendulum; Escape velocity – Applying the work-energy theorem – Work done by a uniform force; Work done by a central force; Potential energy – Potential energy of a uniform force field; Potential energy of an inverse square force – What potential energy tells us about force – Stability – Energy diagrams – Small oscillations in a bound system – Molecular vibrations – Nonconservative forces – General law of conservation of energy – Power

[Sections 4.1 to 4.13 of An Introduction to Mechanics (1stEdn.) by Daniel Kleppner and Robert J. Kolenkow. The problems in chapter 5 should be discussed with this.]

Unit 4 – Angular Momentum

8 Hours

Angular momentum of a particle – Angular momentum of a sliding block; Angular momentum of the conical pendulum – Torque – Central force motion and the law of equal areas – Torque on a sliding block; Torque on the conical pendulum; Torque due to gravity – Angular momentum and fixed axis rotation – Moments of inertia of some simple objects – The parallel axis theorem – Dynamics of pure rotation about an axis – Atwood’s machine with a massive pulley – The simple pendulum – The physical pendulum – Motion involving both translation and rotation – Angular momentum of a rolling wheel – Drum rolling down a plane – Work-energy theorem for a rigid body – Drum rolling down a plane : energy method – The vector nature of angular velocity and angular momentum – Rotation through finite angles – Rotation in the xy-plane – Vector nature of angular velocity – Conservation of angular momentum

[Sections 6.1 to 6.7, 7.1, 7.2 and 7.5 of An Introduction to Mechanics (1stEdn.) by Daniel Kleppner and Robert J. Kolenkow]

Unit 5 – Properties of matter

4 Hours

Elasticity, Different types of elasticity, Poisson’s ratio, Twisting couple on a cylinder, 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.

[Relevant portions from Chapter 8: Elements of properties of matter by D.S Mathur]

Books of Study:

1. Research Methodology: The Aims, Practices and Ethics of Science – Peter Pruzan – Springer International Publishing Ltd., 2016.
2. An Introduction to Mechanics, 1stEdn. – Daniel Kleppner and Robert J. Kolenkow – McGraw-Hill
3. Elements of properties of matter by D.S Mathur

Reference Books:

1. An Introduction to the History and Philosophy of Science – R. V. G. Menon – Dorling Kindersley (India) Pvt. Ltd.
2. Science Rules: A Historical Introduction to Scientific Methods – Peter Achinstein – Johns Hopkins University Press.
3. Berkeley Physics Course: Vol.1: Mechanics, 2ndEdn. – Kittel *et al.* – McGraw-Hill
4. Mechanics : D S Mathur
5. NPTEL video lectures available online

Mark distribution for setting Question paper.

Unit/ chapter	Title	Marks
1	Methodology of Science	12
2	Newton's Laws	22
3	Work and Energy	18
4	Angular Momentum	18
5	Properties of matter	9
<i>Total Marks *</i>		79

*Total marks include that for choice of questions in sections A, B and C in the question paper.

Semester 5 | Open Course I

PHY5D01(1): NON CONVENTIONAL ENERGY SOURCES

54 hours (Credit – 3)

	Course Outcome	CL	KC	Class Sessions allotted
CO1	Understand the importance of non conventional energy sources	U	C	4
CO2	Understand basic aspects of solar energy	U	C	12
CO3	Understand basic principles of wind energy conversion	U	C	10
CO4	Understand the basic ideas of geothermal and biomass energy and recognize their merits and demerits	U	C	16
CO4	Understand the basic ideas of oceans and chemical energy resources and recognize their merits and demerits	U	C	12

Unit 1

4 Hours

Energy Resources-Non Conventional Energy Sources-Renewable and Non-Renewable energy sources.

(Section 1.3, 1.4 and 1.5 from Non- Conventional Energy Sources and Utilisation by R.K.Rajput, S.Chand Publishers, 1st Edition.)

Unit 2

Solar energy

12 Hours

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)

(Section 2.2.1 and 2.2.2, 2.3, 3.1.2, 3.1.3-3.1.5, 3.2, 3.3.1-3.3.3, 3.4.1-3.4.10, 4.16, 4.17, 4.18, 4.19, 4.20, 4.21.4, 4.21.8, 4.21.9, 4.21.10, 4.21.4 from Non- Conventional Energy Sources and Utilisation by R.K.Rajput, S.Chand Publishers, 1st Edition.)

Unit 3 Wind energy

10 Hours

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.

(Section 5.1-5.6, 5.8, 5.10, 5.11, 5.20, 5.25, 5.26 from Non- Conventional Energy Sources and Utilisation by R.K.Rajput, S.Chand Publishers, 1st Edition.)

Unit 4

16 Hours

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.

(Section 7.1, 7.2, 7.3, 7.5, 7.8.1, 7.8.2, 7.8.3, 7.8.4, 7.9, 7.10 from Non- Conventional Energy Sources and Utilisation by R.K.Rajput, S.Chand Publishers, 1st Edition.)

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)

(Section 6.1, 6.2, 6.5.1, 6.5.2, 6.5.3, 6.5.4, 6.6.1, 6.6.2, 6.7.1, 6.7.2, 6.7.3 from Non- Conventional Energy Sources and Utilisation by R.K.Rajput, S.Chand Publishers, 1st Edition.)

Unit 5. Energy from Oceans and Thermal and Chemical effects

12 Hours

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)

(Section 8.1, 8.2, 8.3.1, 8.3.8, 8.3.14, 8.4.1, 8.4.2, 8.4.3, 8.5.1, 8.5.3, 8.5.4, 8.5.5.1, 8.5.5.5, 8.5.6, 9.2, 9.7.1, 9.7.2, 9.7.3, 10.1, 10.2, 10.3, 11.2.1, 11.5 from Non- Conventional Energy Sources and Utilisation by R.K.Rajput, S.Chand Publishers, 1st Edition.)

Books of study:

1. Non- Conventional Energy Sources and Utilisation by R.K.Rajput, S.Chand Publishers

References

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 Utilization by G.D. Rai, Khanna Publishers, 1995.

Mark distribution for setting Question paper.

Unit/ chapter	Title	Marks
1	Non Conventional energy	06
2	Solar energy	18
3	Wind energy	15
4	Geothermal energy and energy from biomass	22
5	Energy from Oceans and Chemical energy resources	18
<i>Total Marks *</i>		79

*Total marks include that for choice of questions in sections A, B and C in the question paper.

SACRED HEART COLLEGE FOR WOMEN

CHALAKUDY, THRISSUR, KERALA



AQAR 2020-21 ENGLISH

CRITERION I - CURRICULAR ASPECTS

SUB CRITERION - 1.3.1 - Institution integrates crosscutting issues relevant to Professional Ethics, Gender, Human Values, Environment and Sustainability into the Curriculum.

Department of English

B. A. English Language and Literature

Sl. No.	Course Codes	Courses Offered	Issues Addressed
1.	ENG6B11	Voices of Women	Gender
2.	ENG6B21/ ENG6B22	Project/ Research Methodology	Professional Ethics
3.	ENG6B15	Literature of the Marginalized	Human Values
4.	ENG6B17	Writing for the Media	Professional Ethics
5.	ENG1 A02	Ways with Words: Literatures in English	Human Values, Gender
6.	ENG1 A03	Writing for Academic and Professional Success	Professional Ethics
7.	ENG2 A04	Zeitgeist: Readings on Contemporary Culture	Environmental Sustainability, Gender
8.	ENG3A05	Signatures: Expressing the Self	Human Values, Gender, Environmental Sustainability
9.	ENG4A06	Spectrum: Literature and Contemporary Issues	Human Values, Gender, Environmental Sustainability

M. A. English Language and Literature

Sl. No.	Course Codes	Courses Offered	Issues Addressed
1.	ENG2C08	Postcolonial Writings	Human Values
2.	ENG3C09	20 th Century British Literature post 1940	Gender
3.	ENG3C10	Literary Criticism and Theory	Environmental Sustainability
4.	ENG4C11	English Literature in the 21 st Century	Gender
5.	ENG4C12	Dissertation/ Project	Professional Ethics

CORE COURSES

Serial No.	COURSE CODE	SEMESTER	TITLE OF THE COURSE	HRS/WK	CREDITS	PAGE NO.
1	ENG1B01	1	INTRODUCING LITERATURE	6	5	10
2	ENG2B02	2	APPRECIATING POETRY	6	5	13
3	ENG3B03	3	APPRECIATING PROSE	4	4	15
4	ENG3B04	3	ENGLISH GRAMMAR AND USAGE	5	4	17
5	ENG4B05	4	APPRECIATING FICTION	5	4	19
6	ENG4B06	4	LITERARY CRITICISM	4	4	21
7	ENG5B07	5	APPRECIATING DRAMA AND THEATRE	5	4	23
8	ENG5B08	5	LITERARY THEORY	5	4	25
9	ENG5B09	5	LANGUAGE AND LINGUISTICS	5	4	27
10	ENG5B10	5	INDIAN WRITING IN ENGLISH	5	4	30
11	ENG6B11	6	VOICES OF WOMEN	5	4	32
12	ENG6B12	6	CLASSICS OF WORLD LITERATURE	5	4	34
13	ENG6B13	6	FILM STUDIES	5	4	36
14	ENG6B14	6	NEW LITERATURES IN ENGLISH	5	4	38
15	ENG6B15/16/17/18/19/20	6	ELECTIVES	3	3	40/42/44/46/48/50
16	ENG6B21/ ENG6B22	5 and 6	PROJECT/ RESEARCH METHODOLOGY	2 per semester	2	52/55
17	SCHEME OF EXAMINATION					72

	TOTAL	63 CREDITS
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Study Tour

Students may be taken on a study tour to any of the premier institutions of language, culture, art, film or media within the country during the Vth or VIth semesters

ELECTIVES

Serial No.	COURSE CODE	SEMESTER	TITLE OF THE COURSE	HRS/WK	PAGE NO.
1	ENG6B15	6	LITERATURE OF THE MARGINALIZED	3	40
2	ENG6B16	6	DIGITAL LITERATURE AND ENGLISH	3	42
3	ENG6B17	6	WRITING FOR THE MEDIA	3	44
4	ENG6B18	6	TRANSLATION STUDIES	3	46
5	ENG6B19	6	ENGLISH LANGUAGE EDUCATION	3	48
6	ENG6B20	6	SHAKESPEARE	3	50

OPEN COURSES

(FOR STUDENTS OF OTHER DISCIPLINES)

Open Course offers chances for any undergraduate students in an institution to take a course of their own choice, from other disciplines in the same institution.

Serial No.	COURSE CODE	SEMESTER	TITLE OF THE COURSE	HRS/WK	CREDITS	PAGE NO.
1	ENG5D01	5	ENGLISH FOR COMPETITIVE EXAMINATIONS	3	3	57
2	ENG5D02	5	CREATIVE WRITING IN ENGLISH	3	3	59

LIST OF COMMON COURSES (ENGLISH) FOR ALL UG PROGRAMMES

Serial No.	COURSE CODE	SEMESTER	TITLE OF THE COURSE	HRS/WK	CREDITS	PAGE NO.
1	ENG1A01	1	TRANSACTIONS – ESSENTIAL ENGLISH LANGUAGE SKILLS	4	3	5
2	ENG1A02	1	WAYS WITH WORDS – LITERATURES IN ENGLISH	5	3	7
3	ENG2A03	2	WRITING FOR ACADEMIC AND PROFESSIONAL SUCCESS	4	4	9
4	ENG2A04	2	ZEITGEIST – READINGS ON CONTEMPORARY CULTURE	5	4	11
5	ENG3A05	3	SIGNATURES – EXPRESSING THE SELF	5	4	13
6	ENG4A06	4	SPECTRUM – LITERATURE AND CONTEMPORARY ISSUES	5	4	15
	TOTAL		22 CREDITS			

COMMON COURSES (ENGLISH) TO BE OPTED FOR SPECIFIC PROGRAMMES

SI No.	PROGRAMME	SEMESTER 1	SEMESTER 2	SEMESTER 3	SEMESTER 4
1	B.A./ B.Sc	A01 A02	A03 A04	A05	A06
2	BCom and other LRP	A01 A02	A03 A04		
3	B.A. Afzal ul Ulema	A01	A04	A05	A06
4	BCom Professional	A01			

M.A in English Language and Literature in the Affiliated Colleges

(CBCSS Scheme) 2019 of the University of Calicut.

Semester 1

Core courses

1. ENG1CO1 British Literature from Chaucer to 18th century (5 credits)
2. ENG1CO2 British Literature 19th century (5 credits)
3. ENG1CO3 History of English Language (5 credits)
4. ENG1CO4 Indian Literature in English (5 credits)

Total Credits 20

Semester 2

Core courses

5. ENG2 CO5 Twentieth century British Literature up to 1940 (5 credits)
6. ENG2 CO6 Literary Criticism and Theory - Part 1(up to New Criticism) (5 credits)
7. ENG2 CO7 American Literature (5 credits)
8. ENG2 CO8 Postcolonial writings (5 credits)

Total Credits 20

Semester 3

Core course

9. ENG3 CO9 Twentieth century British Literature post 1940 (5 credits)
10. ENG3C10 Literary criticism and theory - Part 2 (5 credits)
11. Elective 1 (5 credits)
12. Elective 2 (5 Credits)

Total Credits 20

List of Electives

1. ENG3E01 Shakespeare Studies
2. ENG3 E02European Fiction in Translation
3. ENG3 E03 Women's Writing
4. ENG3 E04 Introduction to Linguistics
5. ENG3 E05 Introduction to Cultural Studies
6. ENG3 E06 Teaching of English
7. ENG3 E07 World Drama
8. ENG3 E08 Latino Literature
9. ENG3 E09 American Ethnic Writing

Semester 4

Core course

13. ENG4 C11 English Literature in the 21st Century (4 credits)
14. ENG4 C12 Dissertation / Project (4 credits)
15. ENG4 C13 Comprehensive viva-voce (4 credits)
16. Elective 1 (4 credits)
17. Elective 2 (4 Credits)

Total Credits 20

List of Electives

1. ENG4 E10 Film Studies

SACRED HEART COLLEGE FOR WOMEN

CHALAKUDY, THRISSUR, KERALA



AQAR 2020-21 CHEMISTRY

CRITERION I - CURRICULAR ASPECTS

SUB CRITERION - 1.3.1 - Institution integrates crosscutting issues relevant to Professional Ethics, Gender, Human Values, Environment and Sustainability into the Curriculum.

1.3.1. Description of courses which address the Professional Ethics, Gender, Human Values, Environment and Sustainability into the Curriculum

Sl. No.	Name of the Course	Course Code	Name of the Programme	Specify the issue(s) dealing with
1.	Physical and applied chemistry	CHE4C04	BSc. Chemistry / Complementary course	Deals with pollution prevention measures and environmental sustainability.
2.	Inorganic chemistry – III	CHE5B06	BSc. Chemistry / Core course	Environment and Sustainability.
3.	Environmental chemistry	CHE5D01	BSc. Chemistry / Open course	Environment and Sustainability.
4.	Advanced and Applied Chemistry	CHE6B12	BSc. Chemistry / Core course	Environment and Sustainability.
5.	Green and nano chemistry	CHE3E03	MSc. Chemistry / Elective course	Deals with environmental sustainability through the production of nanomaterials
6.	Industrial catalysis	CHE4E05	MSc. Chemistry / Elective course	Discusses key issues in catalysis for clean energy production and environmental sustainability.
7.	Advanced topics in chemistry	CH4C13	MSc. Chemistry / Core course	Renewable Energy, Environment and Sustainability.

1.3.1 Syllabi of Courses which Address Crosscutting Issues (Chemistry)

SEMESTER IV

UNIVERSITY OF CALICUT

Course Code: CHE4C04

Complementary Course IV: PHYSICAL AND APPLIED CHEMISTRY

Total Hours: 48; Credits: 2; Hours/Week: 3

Module I: Colloidal Chemistry (6 hrs)

True solution, colloidal solution and suspension. Classification of colloids: Lyophilic, lyophobic, macromolecular, multimolecular and associated colloids with examples. Purification of colloids by electrodialysis and ultrafiltration. Properties of colloids: Brownian movement – Tyndall effect – Electrophoresis. Origin of charge and stability of colloids – Coagulation - Hardy Schulze rule – Protective colloids - Gold number. Emulsions. Applications of colloids: Delta formation, medicines, emulsification, cleaning action of detergents and soaps.

Module II: New Vistas in Chemistry (6 hrs)

Nanochemistry: Introduction – classification of nanomaterials (0D, 1D, 2D) - size dependence of material properties (optical, electrical and catalytic) - surface to volume ratio and its significance - application of nanomaterials in electronics, optics, catalysis and medicine. **Green Chemistry: Definition and need of green chemistry - principles - atom economy - green solvents - green synthesis of Ibuprofen.**

Module III: Chromatography (6 hrs)

Chromatography- Introduction - Adsorption and partition chromatography - Principle and applications of column, thin layer, paper and gas chromatography - Rf value – Relative merits of different techniques.

Module IV: Spectroscopy (10 hrs)

Origin of spectra - Interaction of electromagnetic radiation with matter. Different types of energy levels in molecules: Rotational, vibrational and electronic levels. Statement of Born Oppenheimer approximation - Fundamental laws of spectroscopy and selection rules (derivations not required).

IR Spectroscopy: Introduction - Group frequency concept - Characteristic stretching frequencies of O-H, N-H, C-H, C=C, C=N and C=O functional groups - Fingerprint region in IR spectra.

UV-Visible Spectroscopy: Introduction - Beer-Lambert's law - Electronic transitions in molecules ($\sigma \rightarrow \sigma^*$, $n \rightarrow \sigma^*$, $\pi \rightarrow \pi^*$ and $n \rightarrow \pi^*$) - Chromophore and auxochrome - Red shift and blue shift.

NMR Spectroscopy: Introduction - Chemical shift and spin-spin coupling - Application in elucidating the structure of ethanol, dimethyl ether, propanal and acetone.

Module V: Polymers (4 hrs)

Classification of polymers - Addition and condensation polymers - Thermoplastics and thermosetting plastics - Structure and applications of synthetic rubbers (Buna-S, Buna-N and neoprene), synthetic fibres (Nylon 66, Nylon 6 and dacron), thermoplastics (polyethene, polystyrene, PVC and teflon) and thermosetting plastics (bakelite and melmac). Uses of kevlar, nomex and lexan - Biodegradable polymers (PGA, PLA and PHBV) and their applications.

Module VI: Environmental Pollution (6 hrs)

Definition - Types of pollution.

Air pollution: Pollution by oxides of nitrogen, carbon and sulphur. Effects of air pollution: Depletion of ozone, green house effect and acid rain.

Water pollution: Pollution due to sewage, industrial effluents, soaps, detergents, pesticides, fertilizers and heavy metals - Eutrophication - Biological magnification and bioaccumulation - Effects of water pollution. Water quality parameters - DO, BOD and COD (elementary idea only).

Soil pollution - Pollution due to plastics. Thermal pollution and radioactive pollution: Sources, effects and control measures.

Module VII: Chemistry in Daily Life (10 hrs)

Petrochemicals: Name, carbon range and uses of fractions of petroleum distillation – Octane number - Cetane number – Flash point. LPG and CNG: Composition and uses. Pharmaceuticals: Drug - Chemical name, generic name and trade names with examples. Antipyretics, analgesics, antibiotics, antacids, antiseptics.

Dyes: Definition – Requirements of a dye - Theories of colour and chemical constitution – Structure and applications of martius yellow, indigo and alizarin.

Food: Food additives: Food preservatives, artificial sweeteners and antioxidants. Commonly used permitted and non-permitted food colours.

Cement: Manufacture, composition and setting. Glass: Types of glasses and uses.

References:

1. B. R. Puri, L. R. Sharma, M. S. Pathania, Principles of Physical Chemistry, 46th Edn., Vishal Publishing Company, New Delhi, 2013.
2. F. Daniels, R. A. Alberty, Physical Chemistry, 5th Edn., John Wiley and Sons, Canada, 1980.
3. T. Pradeep, A Textbook of Nanoscience and Nanotechnology, McGrawhill, New Delhi, 2012.
4. V. K. Ahluwalia, Green Chemistry, Narosa Publishing House, New Delhi, 2011.
5. R. A. Day Junior, A. L. Underwood, Quantitative Analysis, 5th Edn., Prentice Hall of India Pvt. Ltd., New Delhi, 1988.
6. R. P. Budhiraja, Separation chemistry, New Age International (P) Ltd., 2007.
7. C. N. Banwell, E. M. Mc Cash, Fundamentals of Molecular Spectroscopy, 4th Edn., McGraw–Hill publishing Company Limited, New Delhi, 2002.
8. V. R. Gowarikar, Polymer Chemistry, New Age International Pvt. Ltd., New Delhi, 2010.
9. Fred. W. Billmeyer, Textbook of Polymer Science, 3rd Edn., Wiley India, Delhi, 2008.
10. A. K. De, Environmental Chemistry, 6th Edn., New Age International Pvt. Ltd., New Delhi, 2006.
11. A. K. Ahluwalia, Environmental Chemistry, Ane Books India, New Delhi, 2008.
12. Jayashree Ghosh, A Textbook of Pharmaceutical Chemistry, 3rd Edn., S. Chand and Company Ltd., New Delhi, 1999.
13. B. Sivasankar, Food processing and preservation, Prentice – Hall of India Pvt. Ltd., New Delhi, 2002.

SEMESTER V

UNIVERSITY OF CALICUT

Course Code: CHE5B06

Core Course VI: INORGANIC CHEMISTRY – III

Total Hours: 48; Credits: 3; Hours/Week: 3

Module I: Analytical Principles II (6 hrs) Qualitative Analysis:

Applications of solubility product and common ion effect in the precipitation of cations – Interfering acid radicals and their elimination (oxalate, fluoride, borate, phosphate, chromate, arsenite and arsenate) – Introduction of micro scale experiments in inorganic and organic qualitative analysis & their advantages. Preparation of Na_2CO_3 extract for inorganic qualitative analysis and its advantages. Gravimetric analysis – Mechanism of precipitate formation. Factors affecting stability of precipitates. Co-precipitation and post precipitation. Effects of digestion, washing, drying and ignition of precipitates.

Module II: Metallurgy (10 hrs)

[Prerequisites: Occurrence of metals based on standard electrode potential – Concentration of ores – Calcination and roasting – Reduction to free metal.] Electrometallurgy – Hydrometallurgy. Refining of metals: Electrolytic refining, ion exchange method, zone refining, vapour phase refining and oxidative refining – Ellingham diagrams for metal oxides – Extractive metallurgy of Al, Fe, Ni, Cu, Ti and U. Alloys: Definition – Composition and uses of German silver, brass, bronze, gunmetal and alnico. Steel: Open hearth process – classification of steel – Composition and uses of alloy steels – Composition, properties and applications of industrially important stainless steel types: Austenitic, Martensitic and Ferritic stainless steels, Aerospace and automotive applications of stainless steel. Intramedullary rods (a brief study).

Module III: Interhalogen compounds (5 hrs)

[Prerequisites: Halogens, properties, electronic configuration, electronegativity, electron affinity.] Electropositive character of iodine – General preparation and properties of interhalogen compounds (study of individual members not required) – Structure, hybridization and reactivity of ClF_3 , ICl_3 , IF_5 and IF_7 - Comparison of properties of halogens and pseudohalogens (cyanogens as example) – Structure of polyhalide ions.

Module IV: Noble Gases (3 hrs)

[Prerequisites: Why the name noble gas? electronic configuration.] Discovery – Occurrence – Separation by charcoal adsorption method – Structure of oxides, fluorides and oxy fluorides of xenon – Reaction of xenon fluorides with water – Uses of noble gases.

Module V: Inorganic Polymers & Non-aqueous Solvents (8 hrs)

[Prerequisites: Catenation, Self ionization of water.] Inorganic Polymers: Heterocatenation. Structure and applications of silicones and silicates. Phosphazenes: Preparation, properties and structure of di and tri phosphonitrilic chlorides. SN compounds: Preparation, properties and structure of S_2N_2 , S_4N_4 and $(\text{SN})_x$. Non-aqueous Solvents: Classification – General properties – Self ionization and leveling effect – Reactions in liquid ammonia, liquid N_2O_4 , liquid SO_2 and liquid HF .

Module VI: Environmental Pollution (12 hrs)

[Prerequisites: What is Pollution? quality of drinking water.]

Air pollution: Major air pollutants – Oxides of carbon, nitrogen and sulphur – Particulates – London smog and photochemical smog. Effects of air pollution: Acid rain, greenhouse effect and depletion of ozone. Control of air pollution – Alternate refrigerants. Bhopal Tragedy (a brief study).

Water pollution: Water pollution due to sewage and domestic wastes – Industrial effluents – Agricultural discharge – Eutrophication. Quality of drinking water – Indian standard and WHO standard. Water quality parameters: DO, BOD and COD – Determination of BOD and COD. Toxic metals in water (Pb, Cd and Hg) – Minamata disaster (a brief study). Control of water pollution – Need for the protection of water bodies.

Thermal pollution: noise pollution and radioactive pollution (Sources, effects and consequences). Pollution due to light.

Hiroshima, Nagasaki and Chernobyl accidents (a brief study). Local environmental movements: Silent Valley, Plachimada, Narmada.

Air pollution in Indian cities: Delhi, Agra and Kanpur.

Module VII: Solid Waste Management (4 hrs)

[Prerequisites: Aerobic and anaerobic degradation.]

House hold, municipal and industrial solid waste – Non-degradable, degradable and biodegradable waste – Hazardous waste – Pollution due to plastics. Solid waste management: Recycling, digestion, dumping, incineration, land treatment and composting. Impacts of medical waste and e-waste and their disposal. Energy production from waste.

References:

1. Jeffrey A. Lee, The Scientific Endeavor: A Primer on Scientific Principles and Practice, Pearson Education, 1999.
2. D. A. Skoog, D. M. West, F. J. Holler, S. R. Crouch, Fundamentals of Analytical Chemistry, 8th Edn., Brooks/Cole, Thomson Learning, USA, 2004. \
3. A. I. Vogel, A Textbook of Quantitative Inorganic Analysis, 3rd Edn., Longmans, Green, London, 1962.
4. A. Cottrel, An introduction to metallurgy, 2nd Edn., University press, 1990.
5. D. F. Shriver, P. W. Atkins, Inorganic Chemistry, 3rd Edn., Oxford University Press, 2006..
6. F. A. Cotton, G. Wilkinson, C. Murillo, M. Bochman, Advanced Inorganic Chemistry, 6th Edn., John Wiley, New York, 1999.
7. Christian Reichardt, Thomas Welton, Solvents and solvent effect in organic chemistry, Wiley VCH Verlag GmbH & Co., 2002.
8. S. S. Dara, A Textbook of Environmental Chemistry and Pollution Control, 8th Edn., S. Chand and Sons, New Delhi, 2008.
9. A. K. De, Environmental Chemistry, 6th Edn., New Age International (P) Ltd., New Delhi, 2006.
10. G. M. Masters, Introduction to Environmental Engineering and Science, 3rd Edn., Prentice-Hall Inc., New Delhi, 2007.
11. M. N. Rao, A. K. Datta, Waste Water treatment, Oxford & IBH Publ, Co. Pvt. Ltd., 1987.
12. R. C. Brunner, Hazardous Waste Incineration, McGraw Hill Inc., 1989.

SEMESTER V

UNIVERSITY OF CALICUT

Course Code: CHE5D01

Open Course 1: ENVIRONMENTAL CHEMISTRY

Total Hours: 48; Credits: 3; Hours/Week: 3

Module I: Introduction to Environment and Environmental pollution (4 hrs)

Environmental chemistry - introduction, Environmental segments – Lithosphere: components of soils, Hydrosphere: water resources, Biosphere, Atmosphere - regions of atmosphere – Troposphere, stratosphere, mesosphere, thermosphere. Environmental pollution – Concepts and definition – Pollutant, contaminant, receptor and sink – Classification of pollutants – Global, regional, local, persistent and non-persistent pollutants.

Module II: Air Pollution (8 hrs)

Tropospheric pollution – Gaseous air pollutants – Hydrocarbons, oxides of sulphur, nitrogen and carbon – Global warming, green house effect, acid rain – Particulates – Smog: London smog and photochemical smog – effects and control of photochemical smog – stratospheric pollution - depletion of ozone layer, chlorofluorocarbons - Automobile pollution. Control of air pollution – Alternate refrigerants – Bhopal Tragedy (a brief study). Air pollution in Indian cities (Delhi, Agra and Kanpur).

Module III: Water Pollution (10 hrs)

Impurities in water – cause of pollution – natural and anthropogenic – Marine water pollution – Underground water pollution. Source of water pollution – Industrial waste, Municipal waste, Agricultural waste, Radioactive waste, Petroleum, Pharmaceutical, heavy metal, pesticides, soaps and detergents. Types of water pollutants: Biological agents, physical agents and chemical agents – Eutrophication - biomagnification and bioaccumulation. Water quality parameters: DO, BOD, COD, alkalinity, hardness, chloride, fluoride and nitrate. Toxic metals in water and their effects: Cadmium, lead and mercury – Minamata disaster (a brief study), itai-itai disease, oil pollution in water. International standards for drinking water.

Module IV: Soil, Noise, Thermal, light and Radioactive Pollutions (8 hrs)

Soil pollution: Sources by industrial and urban wastes. Pollution due to plastics, pesticides, biomedical waste and e-waste (source, effects and control measures) – Control of soil pollution - Solid waste Management – Open dumping, landfilling, incineration, re-use, reclamation, recycle, composting. Non-degradable, degradable and biodegradable wastes. Hazardous waste. Noise Pollution – physiological response to noise, Noise categories - effect of noise – biological effects. Thermal pollution – definition, sources, harmful effects and prevention. Light pollution. Radioactive pollution (source, effects and control measures) – Hiroshima, Nagasaki and Chernobyl accidents (brief study). Endosulfan disaster in Kerala.

Module V: Pollution Control Measures (12 hrs)

Air pollution control measures – Gravitational settling chamber, fabric filter, wet scrubber, catalytic converters, stacks and chimneys, cyclone collectors, Cottrell electrostatic precipitator, extraction ventilator, zoning and green belt.

Module VI: Green Chemistry (6 hrs)

Introduction- Definition of green Chemistry, need of green chemistry, basic principles of green chemistry. Applications of green chemistry in daily life.

References:

1. A. K. De, Environmental Chemistry, 7 th Edn., New Age International, 2012.
2. A. K. Ahluwalia, Environmental Chemistry, The Energy and Resources Institute, 2017.
3. Balram Pani, Textbook of Environmental Chemistry, I. K. International Pvt Ltd, 2010.
4. S. K. Banergy, Environmental Chemistry, 2 nd Edn., Prentice-Hall of India Pvt. Ltd., New Delhi, 2005.
5. J. M. H. Selendy, Water and Sanitation-Related Diseases and the Changing Environment, John Wiley & Sons, 2011.
6. P. K. Goel, Water Pollution: Causes, Effects and Control, New Age International, 2006.
7. K. C. Schiffner, Air Pollution Control Equipment Selection Guide, CRC Press, 2013.
8. M. Lancaster, Green Chemistry: An Introductory Text, Royal Society of Chemistry, 2010.
9. V. K. Ahluwalia, M. Kidwai, New Trends in Green Chemistry, Springer Science & Business Media, 2012.

SEMESTER VI

UNIVERSITY OF CALICUT

Course Code: CHE6B12

Core Course XII: Advanced and Applied Chemistry

Total Hours: 48; Credits: 3; Hours/Week: 3

Module I: Colloids and Nanomaterials (6 hrs)

[Prerequisites: Colloids: Definition – classification - Synthesis – nanometer, micrometer.]
Colloids: Stability – electrical double layer – zeta potential - Aggregation – flocculation – purification of colloids - Properties and applications of colloids. Nanomaterials: Classification of nanomaterials (0D, 1D, 2D and 3D) – Top down and bottom up approaches in the synthesis – Size dependence of material properties (optical, electrical and catalytic). Variation in electronic and optical properties – Surface area to volume ratio (aspect ratio) and its significance – Metal and semiconductor nanoparticles and carbon nanotubes. Characterization of nanomaterials. Applications of nanomaterials (general idea only).

Module II: New vistas in chemistry (8 hrs)

Green Chemistry: Introduction – need of green chemistry approach – Twelve principles of green chemistry with explanations - Atom economy and microwave assisted reactions – Green solvents – Green synthesis of ibuprofen. Microwave and ultrasound assisted green synthesis: Diels-Alder reaction and Cannizzaro reaction.

Supramolecular chemistry: Introduction - types of non-covalent interactions – Molecular recognition – Host-guest interactions.

Combinatorial Chemistry: Introduction – combinatorial synthesis (elementary idea only). Applications of combinatorial synthesis (brief study).

Module III: Introduction to Computational Chemistry (6 hours)

Computational chemistry as a tool and its scope. Classification of computational chemistry methods – Molecular Mechanics methods (basic idea of force field and examples) and Electronic Structure methods (basic idea of ab initio and semi empirical methods), potential energy surface – local minima, global minima, saddle point and transition states. Geometry optimization. Softwares used in computational chemistry calculations.

Module IV: Synthetic polymers (4 hrs)

Classification – Tacticity – Synthesis and applications of addition polymers (polyethene, polystyrene, PAN and PMMA) and condensation polymers (nylon 6, nylon 66, Bakelite, kevlar and terylene) – thermosets. Zeigler Natta polymerization - advantages. Plastic identification codes. Biodegradable polymers: PLA, PGA and PHBV.

Module V: Applied inorganic chemistry (8 hrs)

Cement: Manufacture, composition and setting. Glass: Manufacture, annealing, types of glasses and uses. Refractory materials: borides and carbides. Inorganic fertilizers: Essential nutrients for plants – nitrogeous, phosphatic and potash fertilizers – examples with formula. Rocket propellants: Classification with examples. Tooth paste and Talcum powder: Composition and health effects. Chemical industries in kerala: Location, raw materials, chemistry involved in the preparation and uses of the following, caustic soda and chlorine – Travancore Cochin Chemicals Ltd., TiO_2 pigment from ilmenite – Travancore Titanium Products Ltd.

Module VI: Applied organic chemistry – I (8 hrs)

Petroleum: Carbon range and uses of various fractions of petroleum distillation – Petrol – Knocking – Octane number – Anti-knocking compounds – Diesel oil – Cetane number – Flash point – Composition and uses of LPG and CNG.

Pharmaceuticals: Medicinal chemistry – Drugs (chemical, generic and trade names with examples). Terminology: Prodrug, pharmacy, pharmacology, pharmacodynamics and pharmacokinetics (elementary idea only). Antipyretics, analgesics, antacids, antihistamines, antibiotics, antiseptics, disinfectants (definition and examples, structures not expected) – Preparation of paracetamol and aspirin.

Cleansing agents: Soaps and detergents: Preparation of soap by saponification of oils and fats, classification, advantages and disadvantages of soaps and detergents – TFM of soap – Cleaning action. Shampoos: Ingredients and functions.

Pesticides: Insecticides, rodenticides and fungicides (definition and examples) – Organo chlorine pesticides – Structure of Endosulfan, DDT and BHC. Organo phosphorus pesticides – malathion, parathion. Harmful effects of pesticides. Herbicides – glyphosate – side effects.

Module VII: Applied organic chemistry – II (8 hrs)

Dyes: Definition – Requirements of a dye – Theories of colour and chemical constitution – Classification based on structure and mode of application to the fabric – Preparation and uses of Rosaniline and Indigo. Composition of hair dyes. Food adulterants: Common food adulterants in various food materials and their identification: Milk, vegetable oils, tea, coffee powder and chilli powder. Food additives: Food preservatives, artificial sweeteners and antioxidants (definition and examples, structures not required) – Structure of BHT, BHA and Ajinomoto – Common permitted and non-permitted food colours (structures not required) – Natural pigments in fruits and vegetables (carotenoids, chlorophylls and flavonoids). Artificial ripening of fruits. Composition of chocolate, milk powder and soft drinks.

References:

1. M. A. Shah, Tokeer Ahmad, Principles of Nanoscience and Nanotechnology, Narosa Publishing House, New Delhi, 2010.
2. T. Pradeep, A Textbook of Nanoscience and Nanotechnology, McGrawhill, New Delhi, 2012.
3. P. N. Prasad, Nanophotonics, John Wiley & Sons, 2004.
4. P. W. Atkins, J. de Paula, Atkin's Physical Chemistry, 8 th Edn., Oxford University Press, 2006.
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10. V. R. Gowariker, Polymer Chemistry, New Age International (P) Ltd., New Delhi, 2010.
11. Fred. W. Billmeyer, Textbook of Polymer Science, 3rd Edn., Wiley India, Delhi, 2008.
12. M. S. Bhatnagar, Polymer Chemistry, S Chand and Company Pvt. Ltd., New Delhi, 2014.

SEMESTER III

UNIVERSITY OF CALICUT

M.Sc. CHEMISTRY (CSS PATTERN)

CHE3E03- GREEN AND NANOCHEMISTRY (ELECTIVE) (4credits, 54 h)

Unit I: Introduction to green chemistry (9h)

Green chemistry-relevance and goals, Anastas' twelve principles of green chemistry - Tools of green chemistry: alternative starting materials, reagents, catalysts, solvents and processes with suitable examples.

UNIT-2: Microwave mediated organic synthesis (MAOS) (9h)

Microwave activation, advantage of microwave exposure, specific effects of microwave – Neat reactions, solid supports reactions, Functional group transformations, condensations reactions, oxidations – reductions reactions, multi-component reactions.

Unit 3: Alternative synthesis, reagents and reaction conditions (9h)

Introduction, synthesis of ionic liquids, physical properties, applications in alkylation – hydroformylations , expoxidations , synthesis of ethers, Friedel-craft reactions, Diels-Alder reactions , Knoevengal condensations, Wittig reactions, Phase transfer catalyst - Synthesis – applications. A photochemical alternative to Friedel-crafts reactions - Dimethyl carbonate as a methylating agent – the design and applications of green oxidants – super critical carbon dioxide for synthetic chemistry.

Unit 4: Nanomaterials – An Introduction & Synthetic Methods (9h)

Definition of nano dimensional materials - Historical milestones - unique properties due to nanosize, Quantum dots, Classification of Nanomaterials .General methods of synthesis of nanomaterials – Hydrothermal synthesis, Solvothermal synthesis, Microwave irradiation, sol – gel and Precipitation technologies, Combustion Flame-Chemical Vapor Condensation Process, gas Phase Condensation Synthesis, Reverse Micelle Synthesis, Polymer – Mediated Synthesis, Protein Microtube – Mediated Synthesis. Synthesis of Nanomaterials using microorganisms and other biological agents, Sonochemical Synthesis, Hydrodynamic

Cavitation. Inorganic nanomaterials – Typical examples – nano TiO₂ / ZnO/CdO/CdS, Organic nanomaterials – examples – Rotaxanes and Catenanes

Unit 5: Techniques for Characterisation of nanoscale materials (9h)

Principles of Atomic force microscopy (AFM), Transmission electron microscopy (TEM)-Resolution and scanning transition electron microscopy (STEM), Scanning Tunneling Microscopy (STM), Scanning near field optical microscopy (SNOM), Scanning ion conductance microscope, scanning thermal microscope, scanning probe microscopes and surface plasmon spectroscopy.

Unit 6: Carbon Clusters and Nanostructures (9h)

Nature of carbon bond, new carbon structures. Carbon clusters: Discovery of C₆₀, Alkali doped C₆₀, Superconductivity in C₆₀, Larger and smaller fullerenes. Carbon nanotubes: Synthesis, Single walled carbon nanotubes, Structure and characterization, Mechanism of formation. Chemically modified carbon nanotubes, Doping - Functionalizing nanotubes. Application of carbon nanotubes. Nanowires: Synthetic strategies, Gas phase and solution phase growth, Growth control - Properties.

References:

1. V. K. Ahluwalia, Green Chemistry – Environmentally benign reactions, AneBooks India (Publisher), (2006).
2. V. K. Ahluwalia, Green Chemistry: A Textbook, Narosa Publishing House, 2013.
3. Green Chemistry – Designing Chemistry for the Environment – edited by Paul T. Anastas & Tracy C. Williamson. Second Edition, (1998).
4. Green Chemistry–Frontier sinbenign chemical synthesis and processes-edited by Paul T. Anastas & Tracy C. Williamson. Oxford University Press, (1998).
5. Green Chemistry – Environment friendly alternatives- edited by Rashmi Sanghi& M. M. Srivastava, Narora Publishing House, (2003).
6. C.N.R. Rao, A. Muller, A.K. Cheetam (Eds), The Chemistry of Nanomaterials, Vol.1, 2, Wiley –VCH, Weinheim, 2004.
7. H. Fujita (Ed.), Micromachines as tools in nanotechnology, Springer- Verlag, Berlin, 2003.

SEMESTER IV

UNIVERSITY OF CALICUT

M.Sc. CHEMISTRY (CSS PATTERN)

CHE4E05 - INDUSTRIAL CATALYSIS (ELECTIVE) (4 Credits, 72h)

Unit 1: Introduction to Adsorption process (9h)

Intermolecular interactions, physisorption. The forces of adsorption. Dispersion and repulsive forces. Classical electrostatic interactions. Adsorbate-adsorbate interactions, chemisorption, potential energy curves, thermodynamics of adsorption. Isothermal and adiabatic heats of adsorption. Variation of heats of adsorption with coverage. Adsorption isotherms, Langmuir, BET and Freundlich. Kinetics of chemisorptions. Activated and nonactivated chemisorptions. Absolute rate theory. Electronic theories. Hysteresis and shapes of capillaries.

Unit 2: Kinetics and Catalysis (9h)

Adsorption and catalysis. Adsorption and reaction rate. Strength of adsorption bond and catalysis. Adsorption equilibrium and catalysis. Kinetics of heterogeneous catalysis: diffusion steps neglected. Unimolecular reactions. Bimolecular reactions. Langmuir-Hinshelwood and Eley-Rideal mechanism. Kinetics of heterogeneous catalysis: diffusion controlling. Mechanism of diffusion. Diffusion and reaction in pores. Selectivity and diffusion. Electronic factors in catalysis by metals, electronic factors in catalysis by semiconductors, geometric factors and catalysis.

Unit 3: Catalyst - Preparative Methods (9h)

Surface area and porosity measurement. Measurement of acidity of surfaces. Support materials. Preparation and structure of supports. Surface properties. Preparation of catalysts. Introduction of precursor compound. Pre-activation treatment. Activation process. General methods of synthesis of zeolites. Mechanism of nuclear formation and crystal growth. Structures of some selected zeolites. Zeolites A, X and Y. Pentasil. ZSM-5. ZSM-11. Shape selective catalysis by zeolites.

Unit 4: Deactivation of Catalysts (9h)

Deactivation of catalysts. Classification of catalyst deactivation processes. Poisoning of catalysts. Coke formation on catalysts. Metal deposition on catalysts. Sintering of catalysts. Regeneration of deactivated catalysts. Feasibility of regeneration. Description of coke deposit and kinetics of regeneration.

UNIT 5: Phase Transfer Catalysis (9h)

Basic concepts in phase transfer catalysis. Phase transfer catalyzed reactions. Basic steps of phase transfer catalysis. Effect of reaction variables on transfer and intrinsic rates. Outline of compounds used as phase transfer catalysts. Use of quaternary salts. Macrocyclic and macrobicyclic ligands. PEG's and related compounds. Use of dual phase transfer catalyst or co-catalyst in phase transfer systems. Separation and recovery of phase transfer catalysts. Insoluble phase transfer catalysts.

UNIT 6: Biocatalysis (9h)

Enzymes. An introduction to enzymes. Enzymes as proteins. Classification and nomenclature of enzymes. Structure of enzymes. How enzymes work. Effect on reaction rate. Thermodynamic definitions. Catalytic power and specificity of enzymes. Optimization of weak interactions between enzyme and substrate in the transition state. Binding energy, reaction specificity and catalysis. Specific catalytic groups contributing to catalysis. Immobilized biocatalysts. Definition and classification of immobilized biocatalysts. Immobilization of coenzymes.

UNIT 7: Industrial Catalysis-1 (9h)

Oil based chemistry. Catalytic reforming. Catalytic cracking. Paraffin cracking. Naphthenic cracking. Aromatic hydrocarbon cracking. Isomerization. Hydrotreatment. Hydrodesulphurization. Hydrocracking. Steam cracking. Hydrocarbons from synthesis gas. Fisher-Tropsch process. Mobil process for conversion of methanol to gasoline hydrocarbons. Catalysis for environmental protection, removal of pollutants from exhausts, mobile and static sources.

UNIT 8: Industrial Catalysis-II (9h)

Hydroformylation of olefins. Carbonylation of organic substrates. Conversion of methanol to acetic acid. Synthesis of vinyl acetate and acetic anhydride. Palladium catalyzed oxidation of ethylene. Acrylonitrile synthesis. Zeigler-Natta catalysts for olefin polymerization. Propene polymerization with silica supported metallocene/MAO catalysts.

References:

1. A. Clark, "Theory of adsorption and catalysis", Academic Press, 1970.
2. J.M. Thomas & W.J. Thomas, "Introduction to principles of heterogeneous catalysis", Academic Press, New York, 1967.
3. R.H.P. Gasser, "An introduction to chemisorption and catalysis by metals", Oxford, 1985.
4. D.K Chakraborty, "Adsorption and catalysis by solids", Wiley Eastern Ltd. 1990.
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6. R.B. Anderson, "Experimental methods in catalysis research", Vol I, II, Academic press, NY, 1981.
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10. A.L. Lehninger, "Principles of Biochemistry", Worth Publishers, USA, 1987.
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12. R.J. Farrauto and C.H. Bartholomew, "Fundamentals of Industrial Catalytic Processes", Blackie Academic and Professional – Chapman and Hall, 1997.
13. R. Pearce and W.R. Patterson, "Catalysis and chemical processes", Academic press, Leonard Hill, London, 1981.

SEMESTER IV

UNIVERSITY OF CALICUT

M.Sc. CHEMISTRY (CSS PATTERN)

CH4C13- ADVANCED TOPICS IN CHEMISTRY (4Credits, 72hrs)

Unit 1: Chemistry of Nanomaterials (9hrs)

History of nanomaterials- Classification. Size- dependence of properties. Electronic structure theory of metals and semiconductors. Quantum size effects. Synthesis of nanostructures: bottom-up-approach, top- down approach, self-assembly, lithography, molecular synthesis, template assisted synthesis. Methods of characterization: Electron microscopies-SEM,TEM. Scanning prob microscopiesSTM, AFM. X-ray photoelectron spectroscopy(XPS), Dynamic light scattering(DLS), X-ray diffraction(XRD). Applications: Nanoelectronics, nanosensors, nanocatalysts, nanofiltration, diagnostic and therapeutic applications and targeted drug delivery. Introduction to graphenes and fullerenes.

Unit 2: Green Chemistry (9hrs)

Introduction, the need of green chemistry, principles of green chemistry, planning of green synthesis, tools of green chemistry. Green reactions- Aldol condensation, Cannizaro reaction and Grignard reaction. Comparison of the above green reactions with classical reactions. Green preparations. Applications of phase transfer catalysis. Introduction to microwave organic synthesis, Applications: environmental, solvents, time and energy benefits.

Unit 3: Introduction to Computational Quantum Chemistry (9hrs)

Electronic structure of molecules-Review of Hartee-Fock SCF method. Basis sets STOs and GTOs . Nomenclature of Basis sets. Semi empirical and ab initio methods. Calculations using Gaussian programme . Spesification of molecular geometry using a) Cartisian coordinates and b) Internal coordinates. The Z-matrix . Z- matrices of some simple molecules like H₂,H₂o, formaldehyde ammonia and methanol.

Unit 4: Supramolecular Chemistry (9hrs)

Concepts and language. Molecular recognition: Molecular receptors for different types of molecules, design and synthesis of coreceptors and multiple recognition. Strong, weak and very weak Hydrogen bonds. Utilisation of H-bonds to create supramolecular structures. Use of H bonds in crystal engineering and molecular recognition. Supramolecular reactivity and catalysis. Transport processes and carrier design. Supramolecular devices. Supramolecular photochemistry, supramolecular electronic, ionic and switching devices Some examples of self- assembly in supramolecular chemistry.

Unit 5: Medicinal Chemistry (9hrs)

Drug Design and Relationship of Functional Groups to Pharmacologic Activity: Introduction, different classes of drugs, drug action, pro drugs, physico chemical properties of drugs and their pharmacologic activity , SAR and QSAR , factors governing ability of drugs. Drug design, factors governing drug design, rational approach to drug design, general methods of drug synthesis. Immunoassays: General principles, antigen -antibody interactions, Hapten inhibition test, immunodiffusion, immunoelectrophoresis, ELISA, ELOSA, Fluorescence immunoassay and Radio immunoassay. Biosensors and chemosensors (basic idea only).

Unit 6: Combinatorial Chemistry (9hrs)

Introduction. Combinatorial approach. Combinatorial libraries, technologies. Solid phase synthesis, requirements-resins, Linkers. Reactants for solid phase synthesis. Methods of Parallel synthesis: Haughton`s tea bag procedure. Automated parallel synthesis. Methods in mixed combinatorial synthesis: general principles. Furkas mix and split combinatorial synthesis. Structure determination of active compounds- Deconvolution. Methods in deconvolutionrecursive deconvolution, tagging use of decoded sheets. Planning and designing of combinatorial synthesis. Spider like scaffolds, drug molecules. Limitations of combinatorial chemistry.

Unit 7: Introduction to Industrial Catalysis (9hrs)

Structure and chemical nature of surfaces. Physisorption and chemisorptions. Energy exchange at surface. Determination of surface area and pore structure of catalysts - physical adsorption methods, X-ray methods, mercury intrusion method, chemisorptions methods. Determination of surface acidity-TPD method. Catalyst selectivity, effect of pore size on selectivity. Homogeneous and heterogeneous catalysts. Preparative methods for heterogeneous catalysts- precipitation and coprecipitation methods, sol gel method, flame hydrolysis. Preparation of Zeolites and silica supports. Mesoporous materials. Introduction to Phase transfer catalysis, biocatalysis, nanocatalysis and polymer supported catalysis. Application of heterogeneous catalysts in water gas shift reaction, ammonia synthesis, catalytic cracking, Fisher-Tropsch process, threeway catalysis.

Unit 8: Renewable Energy Sources (9hrs)

World's reserve of commercial energy sources and their availability, various forms of energy, Renewable and conventional energy systems, comparison - coal, oil and natural gas, availability, applications, merits and demerits. Renewable energy sources - solar energy, nature of solar radiation, components- solar heaters, solar cookers, water desalination. Photovoltaic generation – basics, merits and demerits of solar energy. i) Solid state junction solar cells:- principle of solar cells, Fabrication of CdS/Cu₂S and CdS/CuInSe₂ solar cells, performance testing, stability and efficiency consideration. Dye sensitized solar cells (DSSC)-Working principle, Fabrication of DSSCs based on TiO₂ and ZnO, stability and performance of dyes.

References:

1. C.P.Poole(Jr.) and F.J. Owens, Introduction to Nanotechnology, Wiley India, 2007.
2. G.A.Ozin and A.C.Arsenault, Nanochemistry, RSC Publishing, 2008.
3. T.Pradeep, The essentials of Nanotechnology, Tata McGraw Hill, New Delhi, 2007.
4. K.J.Klabunde(Ed.), Nanoscale Materials in Chemistry, John Wiley & Sons, 2001.
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14. Lemke, Williams, Roche and Zito, Principles of Medicinal Chemistry, 7/e, Wolters Kluwer, 2012.
15. G.Thomas, Fundamentals of Medicinal Chemistry, Wiley. Page62
16. G.Gringauz, Introduction to Medical Chemistry, Wiley-VCH, 1997.
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SACRED HEART COLLEGE FOR WOMEN

CHALAKUDY, THRISSUR, KERALA



AQAR 2020-21 ZOOLOGY

CRITERION I - CURRICULAR ASPECTS

SUB CRITERION - 1.3.1 - Institution integrates crosscutting issues relevant to Professional Ethics, Gender, Human Values, Environment and Sustainability into the Curriculum.

1.3.1 Courses which address cross cutting issues relevant to Gender, Environment and Sustainability, Human Values and Professional Ethics into the Curriculum

Sl.No	Name of the Course	Course Code	Name of the Programme	Specify the issue(s) dealing with
1.	Conservation Biology	ZOL1C03	MSc.Zoology	Environment and sustainability
2.	Behavioral Studies	ZOL1C03	MSc.Zoology	Deals with the biological aspects of Gender
3.	Ethics In Taxonomy	ZOL2C06	MSc.Zoology	Deals with the professional Ethics in Taxonomy
4.	Gender Development- Genetic and Environmental Basis	ZOL3C08	MSc.Zoology	Factors affecting Gender Development
5.	Environmental Biotechnology	ZOL4C10	Msc.Zoology	Environment and Sustainability
6.	Ethics in Biotechnology	ZOL4C10	Msc.Zoology	Deals with the professional Ethics in Biotechnology
7.	Genetic basis of Gender	ZOL5B06T	BSc.Zoology	Discuss the genetic aspects of Gender
8.	Ethics in Science and Animal Ethics	ZOL5B09T	BSc.Zoology	Professional Ethics in Zoology
9.	Sex Education	ZOL5D01T	BSc.Zoology	Helps understanding Gender roles ,Human Values
10.	Environmental and Conservation biology	ZOL6B12T	Bsc.Zoology	Environment and Sustainability

1.3.1 Courses which address cross cutting issues relevant to Gender, Environment and Sustainability, Human Values and Professional Ethics into the Curriculum

Syllabus –MSc.Zoology

ZOL1C03 - ECOLOGY AND ETHOLOGY (90 Hours)

Part-A-Ecology (54 hrs)

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, In direct 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, interdemec 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- refference 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 adaptiveness 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 behaviour- mechanism of hormonal action.

ZOL2C06 - SYSTEMATICS AND EVOLUTION (90 Hours)

Part –A: Systematics (54 Hrs)

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

5. Classification (7 hrs)

5.1 Uses of Classification

5.2 Purpose of Classification

5.3 Theories of Classification

(a) Essentialism (b) Nominalism (c) Empiricism (d) Cladism (e) Evolutionary Classification

5.4 Hierarchy of Categories

5.5 The objectives of classification

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

6.1 Taxonomic collections: Types of collections, Value of Collection

6.2 Purpose of scientific collection

6.3 Preservation of Specimens

6.4 Labeling

6.5 Curating of collections

6.6 Curating of types

6.7 Identification- Methods of identification

6.8 Use of keys, types of keys.

6.9 Merits and demerits of different keys

6.9.1 Description and publication

7. Taxonomic Characters (6 hrs)

7.1 Nature of taxonomic characters

7.2 Taxonomic characters and adaptation

7.3 Kinds of taxonomic characters

(a) Morphological (b) Physiological (c) Ecological (d) Ethological and (e) Geographical characters

7.4 Taxonomic characters and classification

7.5 Taxonomic characters and evolution

7.6 Functions of taxonomic characters

8. Zoological Nomenclature (6 hrs)

8.1 Brief History of nomenclature

8.2 International Code of Zoological Nomenclature

8.3 The nature of scientific names

8.4 Species and infraspecies names

8.5 Gender of generic names

- 8.6 Synonyms and Homonyms
- 8.7 The Law of Priority
- 8.8 Rejection of names
- 8.9 Type method and different kinds of types

9. Newer trends in systematics (4 hrs)

- 9.1 DNA Bar coding
- 9.2 Molecular systematics
- 9.3 Chemo taxonomy and serotaxonomy
- 9.4 Cytotaxonomy
- 9.5 Numerical taxonomy
- 9.6 Cladistics

10. Ethics related to taxonomic publications (4 hrs)

- 10.1 Authorship of taxonomic papers
- 10.2 Correspondence
- 10.3 Suppression of data
- 10.4 Undesirable features of taxonomic papers
- 10.5 Taxonomist and user communities

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

ZOL3C08–DEVELOPMENTAL BIOLOGY & ENDOCRINOLOGY (90 Hours)

Part- A - DEVELOPMENTAL BIOLOGY (54hrs)

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, realtor 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.

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

- 4.1. Induction and competence- cascade of induction- reciprocal and sequential inductive events, instructive and permissive interactions.
- 4.2. Epithelial- Mesenchymal interactions- paracrine factors - The Hedhog family, The Wnt family, Juxtacrine signaling and cell patterning, notch pathway.
- 4.3. Cellular interactions concerned in fertilization, blastulation, gastrulation and organogenesis.
- 4.5. Molecular basis of cellular differentiation – Cadherins.

5. Genetic basis of development (8 hrs)

- 5.1. Differential gene transcription –Promoters and Enhancers, DNA methylation, Transcription factors, Silencers and Insulators.
- 5.2. Differential RNA processing- X chromosome inactivation- dosage compensation.
- 5.3. 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.
- 5.4. Post translational regulation of gene expression.
- 5.5. Models of cell differentiation- hematopoiesis, myogenesis, differentiation of neural crest cells.
- 5.6. Reversibility of patterns of gene activity-cell fusion, transdifferentiation.

6. Metamorphosis, Regeneration and Ageing (7 hrs)

- 6.1. Metamorphosis in Amphibians and Insects and their hormonal control
- 6.2. Types of regeneration - Super, Hetero, Epimorphic, Morphallactic and Compensatory regeneration, Histological process during regeneration
- 6.3. 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)

7.1 Environmental regulation of normal development - types of polyphenism

- 7.2 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

7.3. Environmental oestrogens.

- 7.4. Impact of pesticide on development.

8. Developmental Mechanisms of Evolutionary change- (2hrs)

Heterotopy, Heterochrony, Heterometry, Heterotypy. (Brief

Part B- ENDOCRINOLOGY (36 hrs)

1. Endocrine glands and their Hormones (Brief account) (5 hrs)

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

2. General mechanisms of Hormonal action (5 hrs)

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

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

- 3.1. Hypothalamus
- 3.2. Hypophysis
- 3.3. Thyroid
- 3.4. Parathyroid
- 3.5. Adrenal
- 3.6. Pancreas

4. Hormones and male reproductive physiology (7 hrs)

- 4.1. Synthesis, chemistry, and metabolism of androgens
- 4.2. Endocrine control of testicular function
- 4.3. Physiological roles of androgens and estrogens
- 4.4. Pathophysiology

5. Hormones and female reproductive physiology (3 hrs)

- 5.1. Synthesis, chemistry, and metabolism of Ovarian steroid hormones
- 5.2. Physiological roles of Ovarian steroid hormones
- 5.3. Hormonal regulation of female monthly rhythm
- 5.4. Hormonal factors in pregnancy, parturition and lactation

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

ZOL4C10- BIOTECHNOLOGY& MICROBIOLOGY (90 hours)

Part - A. BIOTECHNOLOGY (54 Hrs)

1. Introduction (1 hr)

Definition, branches, scope and importance

2. Vectors (5 hrs)

- 2.1. Cloning vectors –
 - 2.1.1. Plasmids: pBR322 and pUC
 - 2.1.2. Phages: λ gt10 and M13 vector
 - 2.1.3. Cosmids: general features
 - 2.1.4. Phagemids: general features
 - 2.1.5. Viruses: SV40 and CaMV
 - 2.1.6. Transposones; Ac transposon and Ds transposon of Maize, P-element of

Drosophila

2.1.7. Artificial chromosomes: BAC, YAC and MAC.

2.2. Shuttle vectors: applications and example

2.3. Expression vectors: mention commonly used promoters in expression vectors (Nopaline synthase (*nos*) promoter from T-DNA, 35 S RNA promoter of CaMV, Polyhedrin promoter from Baculovirus)

3. Different steps involved in *in vivo* cloning (3hrs)

3.1. Construction of chimeric DNA (Blunt end ligation, cohesive end ligation, homopolymer tailing, use of linkers)

3.2. Selection of transformed cells –blue white selection method, colony hybridization, Plaque hybridization

3.3. Amplification – Multiplication, Expression, and integration of the DNA insert in host genome

4. Molecular probes (3 hrs)

4.1. Production

4.2. Labelling

4.3. Applications

4.4. FISH, McFISH and GISH

5. Genomic and cDNA library (4 hrs)

5.1. Construction

5.2. Screening –By DNA hybridization, Screening by immunological assay, and screening by protein activity.(Refer unit 4-Molecular Biotechnology by Glick and Pasternak-ASM press)

5.3. Blotting techniques- Southern blot, Northern blot, Western blot, Dot blot and Slot blot.

5.4. Chromosome walking

6. Polymerase Chain Reaction (3 hrs)

6.1. Basic PCR – raw materials and steps involved

6.2. Inverse PCR, Anchored PCR, Asymmetric PCR, PCR for mutagenesis and Real Time PCR

6.3. Applications of PCR in Biotechnology and genetic engineering

7. Molecular markers: detection and applications (3 hrs)

7.1. RFLP

7.2. AFLP

7.3. RAPD

7.4. Minisatellites (VNTR)

7.5. Microsatellites (SSR)

7.6. SNPs

8. Isolation, sequencing and synthesis of genes (3 hrs)

8.1. Isolation (for specific proteins and tissue specific proteins)

8.2. DNA sequencing – Maxam and Gilbert's chemical degradation method, Sanger's dideoxynucleotide synthetic method.

8.3. Synthesis of gene-Chemical synthesis of tRNA gene, Synthesis of gene from mRNA, Gene synthesis machines

9. Transfection methods and transgenic animals (3 hrs)

9.1. Definition, Methods - Electroporation, DNA micro injection, Calcium phosphate precipitation, Dextran mediated transfer, shot gun method, virus mediated, lipofection method, engineered embryonic stem cell method

9.2. Transgenic animals for human welfare

10. Biotechnology - Animal and human health care (4 hrs)

10.1. Vaccines

10.2. Disease diagnosis

10.3. Gene therapy

10.4. Transplantation of bone marrow, artificial skin,

10.5. Antenatal diagnosis

10.6. DNA finger printing

10.7. Forensic medicine

11. *In vitro* fertilization (3 hrs)

11.1. *In vitro* fertilization and embryo transfer in human

11.2. *In vitro* fertilization and embryo transfer in live stock

12. Animal cell and tissue culture (3 hrs)

12.1. Culture media – natural and artificial

12.2. Culture methods – primary explantation techniques, various methods of cell and tissue culture

12.3. Tissue and organ culture

13. Gene Silencing techniques (2 hrs)

13.1. Antisense RNA

13.2. RNAi

13.3. Gene knockouts and Knock out mouse

14. Cloning- (2 hrs)

14.1. Cloning procedures

15. Environmental biotechnology (3 hrs)

15.1. Pollution control – cleaner technologies, toxic site reclamation, removal of oil spill, reducing of pesticides and fertilizers, biosensors, biomonitoring.

15.2. Restoration of degraded lands - reforestation using micro propagation, development of stress tolerant plants

16. Agricultural Biotechnology (3 hrs)

16.1. Biofertilizers

16.2. Insect pest control (Pheromones, hormone mimics & analogues)

16.3. Biopesticides (Baculovirus, *Bacillus thuringiensis*, NPV)

16. Intellectual property rights (3 hr)

16.1. Intellectual property protection,

16.2. Patents, copy right, trade secrets, trademark

16.3. GATT and TRIPS, patenting of biological materials,

16.4. International co-operation, obligation with patent applications, implications of patenting current issues

17. The ethical and social implications - (3 hrs)

17.1. Ethics of Genetic engineering - Social impacts - Human safety-Virus resistant plants- Animals and ethics-

17.2. Release of GEOs-Use of herbicide resistant plants-Human genome alterations by biotechnology

17.3. Social acceptance of biotechnology-Transgenic crops - Social acceptance of medical biotechnology- Acceptance of GM crops for food and pharmaceutical production, Social acceptance of Industrial biotechnology

Syllabus- BSc.Zoology

CELL BIOLOGY AND GENETICS

Code: ZOL5B06T

Section B: GENETICS (27 hrs)

MODULE 6. Interaction of genes (5 hrs)

Allelic interactions: incomplete dominance and co-dominance with examples. Nonallelic 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. 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 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. (8hrs)

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)

METHODOLOGY IN SCIENCE, BIOSTATISTICS AND BIOINFORMATICS

Code: ZOL5B09T

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)

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 2. Sex determination and Chromosomal anomalies (3 hrs) Chromosomal mechanism of sex determination; Barr body; twin studies; sex reversal; Sex chromosomal anomalies: Turner's syndrome and Klinefelter's syndrome.

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

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-fetoprotein 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, gonorrhoea, 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.

MODULE 9. Ethical aspects of sex (2 hrs) Healthy relationship with opposite sex, role of counseling, gender discrimination in family and society

ENVIRONMENTAL AND CONSERVATION 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.

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

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)

1.3.1 Courses which address cross cutting issues relevant to Gender, Environment and Sustainability, Human Values and Professional Ethics into the Curriculum

Syllabus –MSc.Zoology

ZOL1C03 - ECOLOGY AND ETHOLOGY (90 Hours)

Part-A-Ecology (54 hrs)

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, In direct 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, interdemec 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)
- Inter linking of major rivers of India,
 - Sethusamudram ship canal project.
 - 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- refference 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 adaptiveness 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 behaviour- mechanism of hormonal action.

ZOL2C06 - SYSTEMATICS AND EVOLUTION (90 Hours)

Part –A: Systematics (54 Hrs)

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

5. Classification (7 hrs)

5.1 Uses of Classification

5.2 Purpose of Classification

5.3 Theories of Classification

(a) Essentialism (b) Nominalism (c) Empiricism (d) Cladism (e) Evolutionary Classification

5.4 Hierarchy of Categories

5.5 The objectives of classification

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

6.1 Taxonomic collections: Types of collections, Value of Collection

6.2 Purpose of scientific collection

6.3 Preservation of Specimens

6.4 Labeling

6.5 Curating of collections

6.6 Curating of types

6.7 Identification- Methods of identification

6.8 Use of keys, types of keys.

6.9 Merits and demerits of different keys

6.9.1 Description and publication

7. Taxonomic Characters (6 hrs)

7.1 Nature of taxonomic characters

7.2 Taxonomic characters and adaptation

7.3 Kinds of taxonomic characters

(a) Morphological (b) Physiological (c) Ecological (d) Ethological and (e) Geographical characters

7.4 Taxonomic characters and classification

7.5 Taxonomic characters and evolution

7.6 Functions of taxonomic characters

8. Zoological Nomenclature (6 hrs)

8.1 Brief History of nomenclature

8.2 International Code of Zoological Nomenclature

8.3 The nature of scientific names

8.4 Species and infraspecies names

8.5 Gender of generic names

- 8.6 Synonyms and Homonyms
- 8.7 The Law of Priority
- 8.8 Rejection of names
- 8.9 Type method and different kinds of types

9. Newer trends in systematics (4 hrs)

- 9.1 DNA Bar coding
- 9.2 Molecular systematics
- 9.3 Chemo taxonomy and serotaxonomy
- 9.4 Cytotaxonomy
- 9.5 Numerical taxonomy
- 9.6 Cladistics

10. Ethics related to taxonomic publications (4 hrs)

- 10.1 Authorship of taxonomic papers
- 10.2 Correspondence
- 10.3 Suppression of data
- 10.4 Undesirable features of taxonomic papers
- 10.5 Taxonomist and user communities

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

ZOL3C08–DEVELOPMENTAL BIOLOGY & ENDOCRINOLOGY (90 Hours)

Part- A - DEVELOPMENTAL BIOLOGY (54hrs)

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, realtor 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.

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

- 4.1. Induction and competence- cascade of induction- reciprocal and sequential inductive events, instructive and permissive interactions.
- 4.2. Epithelial- Mesenchymal interactions- paracrine factors - The Hedhog family, The Wnt family, Juxtacrine signaling and cell patterning, notch pathway.
- 4.3. Cellular interactions concerned in fertilization, blastulation, gastrulation and organogenesis.
- 4.5. Molecular basis of cellular differentiation – Cadherins.

5. Genetic basis of development (8 hrs)

- 5.1. Differential gene transcription –Promoters and Enhancers, DNA methylation, Transcription factors, Silencers and Insulators.
- 5.2. Differential RNA processing- X chromosome inactivation- dosage compensation.
- 5.3. 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.
- 5.4. Post translational regulation of gene expression.
- 5.5. Models of cell differentiation- hematopoiesis, myogenesis, differentiation of neural crest cells.
- 5.6. Reversibility of patterns of gene activity-cell fusion, transdifferentiation.

6. Metamorphosis, Regeneration and Ageing (7 hrs)

- 6.1. Metamorphosis in Amphibians and Insects and their hormonal control
- 6.2. Types of regeneration - Super, Hetero, Epimorphic, Morphallactic and Compensatory regeneration, Histological process during regeneration
- 6.3. 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)

7.1 Environmental regulation of normal development - types of polyphenism

- 7.2 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

7.3. Environmental oestrogens.

- 7.4. Impact of pesticide on development.

8. Developmental Mechanisms of Evolutionary change- (2hrs)

- Heterotopy, Heterochrony, Heterometry, Heterotypy. (Brief

Part B- ENDOCRINOLOGY (36 hrs)

1. Endocrine glands and their Hormones (Brief account) (5 hrs)

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

2. General mechanisms of Hormonal action (5 hrs)

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

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

- 3.1. Hypothalamus
- 3.2. Hypophysis
- 3.3. Thyroid
- 3.4. Parathyroid
- 3.5. Adrenal
- 3.6. Pancreas

4. Hormones and male reproductive physiology (7 hrs)

- 4.1. Synthesis, chemistry, and metabolism of androgens
- 4.2. Endocrine control of testicular function
- 4.3. Physiological roles of androgens and estrogens
- 4.4. Pathophysiology

5. Hormones and female reproductive physiology (3 hrs)

- 5.1. Synthesis, chemistry, and metabolism of Ovarian steroid hormones
- 5.2. Physiological roles of Ovarian steroid hormones
- 5.3. Hormonal regulation of female monthly rhythm
- 5.4. Hormonal factors in pregnancy, parturition and lactation

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

ZOL4C10- BIOTECHNOLOGY& MICROBIOLOGY (90 hours)

Part - A. BIOTECHNOLOGY (54 Hrs)

1. Introduction (1 hr)

Definition, branches, scope and importance

2. Vectors (5 hrs)

- 2.1. Cloning vectors –
 - 2.1.1. Plasmids: pBR322 and pUC
 - 2.1.2. Phages: λ gt10 and M13 vector
 - 2.1.3. Cosmids: general features
 - 2.1.4. Phagemids: general features
 - 2.1.5. Viruses: SV40 and CaMV
 - 2.1.6. Transposones; Ac transposon and Ds transposon of Maize, P-element of

Drosophila

2.1.7. Artificial chromosomes: BAC, YAC and MAC.

2.2. Shuttle vectors: applications and example

2.3. Expression vectors: mention commonly used promoters in expression vectors (Nopaline synthase (*nos*) promoter from T-DNA, 35 S RNA promoter of CaMV, Polyhedrin promoter from Baculovirus)

3. Different steps involved in *in vivo* cloning (3hrs)

3.1. Construction of chimeric DNA (Blunt end ligation, cohesive end ligation, homopolymer tailing, use of linkers)

3.2. Selection of transformed cells –blue white selection method, colony hybridization, Plaque hybridization

3.3. Amplification – Multiplication, Expression, and integration of the DNA insert in host genome

4. Molecular probes (3 hrs)

4.1. Production

4.2. Labelling

4.3. Applications

4.4. FISH, McFISH and GISH

5. Genomic and cDNA library (4 hrs)

5.1. Construction

5.2. Screening –By DNA hybridization, Screening by immunological assay, and screening by protein activity.(Refer unit 4-Molecular Biotechnology by Glick and Pasternak-ASM press)

5.3. Blotting techniques- Southern blot, Northern blot, Western blot, Dot blot and Slot blot.

5.4. Chromosome walking

6. Polymerase Chain Reaction (3 hrs)

6.1. Basic PCR – raw materials and steps involved

6.2. Inverse PCR, Anchored PCR, Asymmetric PCR, PCR for mutagenesis and Real Time PCR

6.3. Applications of PCR in Biotechnology and genetic engineering

7. Molecular markers: detection and applications (3 hrs)

7.1. RFLP

7.2. AFLP

7.3. RAPD

7.4. Minisatellites (VNTR)

7.5. Microsatellites (SSR)

7.6. SNPs

8. Isolation, sequencing and synthesis of genes (3 hrs)

8.1. Isolation (for specific proteins and tissue specific proteins)

8.2. DNA sequencing – Maxam and Gilbert's chemical degradation method, Sanger's dideoxynucleotide synthetic method.

8.3. Synthesis of gene-Chemical synthesis of tRNA gene, Synthesis of gene from mRNA, Gene synthesis machines

9. Transfection methods and transgenic animals (3 hrs)

9.1. Definition, Methods - Electroporation, DNA micro injection, Calcium phosphate precipitation, Dextran mediated transfer, shot gun method, virus mediated, lipofection method, engineered embryonic stem cell method

9.2. Transgenic animals for human welfare

10. Biotechnology - Animal and human health care (4 hrs)

10.1. Vaccines

10.2. Disease diagnosis

10.3. Gene therapy

10.4. Transplantation of bone marrow, artificial skin,

10.5. Antenatal diagnosis

10.6. DNA finger printing

10.7. Forensic medicine

11. *In vitro* fertilization (3 hrs)

11.1. *In vitro* fertilization and embryo transfer in human

11.2. *In vitro* fertilization and embryo transfer in live stock

12. Animal cell and tissue culture (3 hrs)

12.1. Culture media – natural and artificial

12.2. Culture methods – primary explantation techniques, various methods of cell and tissue culture

12.3. Tissue and organ culture

13. Gene Silencing techniques (2 hrs)

13.1. Antisense RNA

13.2. RNAi

13.3. Gene knockouts and Knock out mouse

14. Cloning- (2 hrs)

14.1. Cloning procedures

15. Environmental biotechnology (3 hrs)

15.1. Pollution control – cleaner technologies, toxic site reclamation, removal of oil spill, reducing of pesticides and fertilizers, biosensors, biomonitoring.

15.2. Restoration of degraded lands - reforestation using micro propagation, development of stress tolerant plants

16. Agricultural Biotechnology (3 hrs)

16.1. Biofertilizers

16.2. Insect pest control (Pheromones, hormone mimics & analogues)

16.3. Biopesticides (Baculovirus, *Bacillus thuringiensis*, NPV)

16. Intellectual property rights (3 hr)

16.1. Intellectual property protection,

16.2. Patents, copy right, trade secrets, trademark

16.3. GATT and TRIPS, patenting of biological materials,

16.4. International co-operation, obligation with patent applications, implications of patenting current issues

17. The ethical and social implications - (3 hrs)

17.1. Ethics of Genetic engineering - Social impacts - Human safety-Virus resistant plants- Animals and ethics-

17.2. Release of GEOs-Use of herbicide resistant plants-Human genome alterations by biotechnology

17.3. Social acceptance of biotechnology-Transgenic crops - Social acceptance of medical biotechnology- Acceptance of GM crops for food and pharmaceutical production, Social acceptance of Industrial biotechnology

Syllabus- BSc.Zoology

CELL BIOLOGY AND GENETICS

Code: ZOL5B06T

Section B: GENETICS (27 hrs)

MODULE 6. Interaction of genes (5 hrs)

Allelic interactions: incomplete dominance and co-dominance with examples. Nonallelic 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. 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 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. (8hrs)

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)

METHODOLOGY IN SCIENCE, BIOSTATISTICS AND BIOINFORMATICS

Code: ZOL5B09T

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)

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 2. Sex determination and Chromosomal anomalies (3 hrs) Chromosomal mechanism of sex determination; Barr body; twin studies; sex reversal; Sex chromosomal anomalies: Turner's syndrome and Klinefelter's syndrome.

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

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-fetoprotein 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, gonorrhoea, 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.

MODULE 9. Ethical aspects of sex (2 hrs) Healthy relationship with opposite sex, role of counseling, gender discrimination in family and society

ENVIRONMENTAL AND CONSERVATION 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.

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

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)

1.3.1 Courses which address cross cutting issues relevant to Gender, Environment and Sustainability, Human Values and Professional Ethics into the Curriculum

Sl.No	Name of the Course	Course Code	Name of the Programme	Specify the issue(s) dealing with
1.	Conservation Biology	ZOL1C03	MSc.Zoology	Environment and sustainability
2.	Behavioral Studies	ZOL1C03	MSc.Zoology	Deals with the biological aspects of Gender
3.	Ethics In Taxonomy	ZOL2C06	MSc.Zoology	Deals with the professional Ethics in Taxonomy
4.	Gender Development-Genetic and Environmental Basis	ZOL3C08	MSc.Zoology	Factors affecting Gender Development
5.	Environmental Biotechnology	ZOL4C10	Msc.Zoology	Environment and Sustainability
6.	Ethics in Biotechnology	ZOL4C10	Msc.Zoology	Deals with the professional Ethics in Biotechnology
7.	Genetic basis of Gender	ZOL5B06T	BSc.Zoology	Discuss the genetic aspects of Gender
8.	Ethics in Science and Animal Ethics	ZOL5B09T	BSc.Zoology	Professional Ethics in Zoology
9.	Sex Education	ZOL5D01T	BSc.Zoology	Helps understanding Gender roles ,Human Values
10.	Environmental and Conservation biology	ZOL6B12T	Bsc.Zoology	Environment and Sustainability

1.3.1 Courses which address cross cutting issues relevant to Gender, Environment and Sustainability, Human Values and Professional Ethics into the Curriculum

Syllabus –MSc.Zoology

ZOL1C03 - ECOLOGY AND ETHOLOGY (90 Hours)

Part-A-Ecology (54 hrs)

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, In direct 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, interdemec 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- refference 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 adaptiveness 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 behaviour- mechanism of hormonal action.

ZOL2C06 - SYSTEMATICS AND EVOLUTION (90 Hours)

Part –A: Systematics (54 Hrs)

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

5. Classification (7 hrs)

5.1 Uses of Classification

5.2 Purpose of Classification

5.3 Theories of Classification

(a) Essentialism (b) Nominalism (c) Empiricism (d) Cladism (e) Evolutionary Classification

5.4 Hierarchy of Categories

5.5 The objectives of classification

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

6.1 Taxonomic collections: Types of collections, Value of Collection

6.2 Purpose of scientific collection

6.3 Preservation of Specimens

6.4 Labeling

6.5 Curating of collections

6.6 Curating of types

6.7 Identification- Methods of identification

6.8 Use of keys, types of keys.

6.9 Merits and demerits of different keys

6.9.1 Description and publication

7. Taxonomic Characters (6 hrs)

7.1 Nature of taxonomic characters

7.2 Taxonomic characters and adaptation

7.3 Kinds of taxonomic characters

(a) Morphological (b) Physiological (c) Ecological (d) Ethological and (e) Geographical characters

7.4 Taxonomic characters and classification

7.5 Taxonomic characters and evolution

7.6 Functions of taxonomic characters

8. Zoological Nomenclature (6 hrs)

8.1 Brief History of nomenclature

8.2 International Code of Zoological Nomenclature

8.3 The nature of scientific names

8.4 Species and infraspecies names

8.5 Gender of generic names

- 8.6 Synonyms and Homonyms
- 8.7 The Law of Priority
- 8.8 Rejection of names
- 8.9 Type method and different kinds of types

9. Newer trends in systematics (4 hrs)

- 9.1 DNA Bar coding
- 9.2 Molecular systematics
- 9.3 Chemo taxonomy and serotaxonomy
- 9.4 Cytotaxonomy
- 9.5 Numerical taxonomy
- 9.6 Cladistics

10. Ethics related to taxonomic publications (4 hrs)

- 10.1 Authorship of taxonomic papers
- 10.2 Correspondence
- 10.3 Suppression of data
- 10.4 Undesirable features of taxonomic papers
- 10.5 Taxonomist and user communities

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

ZOL3C08–DEVELOPMENTAL BIOLOGY & ENDOCRINOLOGY (90 Hours)

Part- A - DEVELOPMENTAL BIOLOGY (54hrs)

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, realtor 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.

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

- 4.1. Induction and competence- cascade of induction- reciprocal and sequential inductive events, instructive and permissive interactions.
- 4.2. Epithelial- Mesenchymal interactions- paracrine factors - The Hedhog family, The Wnt family, Juxtacrine signaling and cell patterning, notch pathway.
- 4.3. Cellular interactions concerned in fertilization, blastulation, gastrulation and organogenesis.
- 4.5. Molecular basis of cellular differentiation – Cadherins.

5. Genetic basis of development (8 hrs)

- 5.1. Differential gene transcription –Promoters and Enhancers, DNA methylation, Transcription factors, Silencers and Insulators.
- 5.2. Differential RNA processing- X chromosome inactivation- dosage compensation.
- 5.3. 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.
- 5.4. Post translational regulation of gene expression.
- 5.5. Models of cell differentiation- hematopoiesis, myogenesis, differentiation of neural crest cells.
- 5.6. Reversibility of patterns of gene activity-cell fusion, transdifferentiation.

6. Metamorphosis, Regeneration and Ageing (7 hrs)

- 6.1. Metamorphosis in Amphibians and Insects and their hormonal control
- 6.2. Types of regeneration - Super, Hetero, Epimorphic, Morphallactic and Compensatory regeneration, Histological process during regeneration
- 6.3. 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)

7.1 Environmental regulation of normal development - types of polyphenism

- 7.2 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

7.3. Environmental oestrogens.

- 7.4. Impact of pesticide on development.

8. Developmental Mechanisms of Evolutionary change- (2hrs)

Heterotopy, Heterochrony, Heterometry, Heterotypy. (Brief

Part B- ENDOCRINOLOGY (36 hrs)

1. Endocrine glands and their Hormones (Brief account) (5 hrs)

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

2. General mechanisms of Hormonal action (5 hrs)

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

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

- 3.1. Hypothalamus
- 3.2. Hypophysis
- 3.3. Thyroid
- 3.4. Parathyroid
- 3.5. Adrenal
- 3.6. Pancreas

4. Hormones and male reproductive physiology (7 hrs)

- 4.1. Synthesis, chemistry, and metabolism of androgens
- 4.2. Endocrine control of testicular function
- 4.3. Physiological roles of androgens and estrogens
- 4.4. Pathophysiology

5. Hormones and female reproductive physiology (3 hrs)

- 5.1. Synthesis, chemistry, and metabolism of Ovarian steroid hormones
- 5.2. Physiological roles of Ovarian steroid hormones
- 5.3. Hormonal regulation of female monthly rhythm
- 5.4. Hormonal factors in pregnancy, parturition and lactation

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

ZOL4C10- BIOTECHNOLOGY& MICROBIOLOGY (90 hours)

Part - A. BIOTECHNOLOGY (54 Hrs)

1. Introduction (1 hr)

Definition, branches, scope and importance

2. Vectors (5 hrs)

- 2.1. Cloning vectors –
 - 2.1.1. Plasmids: pBR322 and pUC
 - 2.1.2. Phages: λ gt10 and M13 vector
 - 2.1.3. Cosmids: general features
 - 2.1.4. Phagemids: general features
 - 2.1.5. Viruses: SV40 and CaMV
 - 2.1.6. Transposones; Ac transposon and Ds transposon of Maize, P-element of

Drosophila

2.1.7. Artificial chromosomes: BAC, YAC and MAC.

2.2. Shuttle vectors: applications and example

2.3. Expression vectors: mention commonly used promoters in expression vectors (Nopaline synthase (*nos*) promoter from T-DNA, 35 S RNA promoter of CaMV, Polyhedrin promoter from Baculovirus)

3. Different steps involved in *in vivo* cloning (3hrs)

3.1. Construction of chimeric DNA (Blunt end ligation, cohesive end ligation, homopolymer tailing, use of linkers)

3.2. Selection of transformed cells –blue white selection method, colony hybridization, Plaque hybridization

3.3. Amplification – Multiplication, Expression, and integration of the DNA insert in host genome

4. Molecular probes (3 hrs)

4.1. Production

4.2. Labelling

4.3. Applications

4.4. FISH, McFISH and GISH

5. Genomic and cDNA library (4 hrs)

5.1. Construction

5.2. Screening –By DNA hybridization, Screening by immunological assay, and screening by protein activity.(Refer unit 4-Molecular Biotechnology by Glick and Pasternak-ASM press)

5.3. Blotting techniques- Southern blot, Northern blot, Western blot, Dot blot and Slot blot.

5.4. Chromosome walking

6. Polymerase Chain Reaction (3 hrs)

6.1. Basic PCR – raw materials and steps involved

6.2. Inverse PCR, Anchored PCR, Asymmetric PCR, PCR for mutagenesis and Real Time PCR

6.3. Applications of PCR in Biotechnology and genetic engineering

7. Molecular markers: detection and applications (3 hrs)

7.1. RFLP

7.2. AFLP

7.3. RAPD

7.4. Minisatellites (VNTR)

7.5. Microsatellites (SSR)

7.6. SNPs

8. Isolation, sequencing and synthesis of genes (3 hrs)

8.1. Isolation (for specific proteins and tissue specific proteins)

8.2. DNA sequencing – Maxam and Gilbert's chemical degradation method, Sanger's dideoxynucleotide synthetic method.

8.3. Synthesis of gene-Chemical synthesis of tRNA gene, Synthesis of gene from mRNA, Gene synthesis machines

9. Transfection methods and transgenic animals (3 hrs)

9.1. Definition, Methods - Electroporation, DNA micro injection, Calcium phosphate precipitation, Dextran mediated transfer, shot gun method, virus mediated, lipofection method, engineered embryonic stem cell method

9.2. Transgenic animals for human welfare

10. Biotechnology - Animal and human health care (4 hrs)

10.1. Vaccines

10.2. Disease diagnosis

10.3. Gene therapy

10.4. Transplantation of bone marrow, artificial skin,

10.5. Antenatal diagnosis

10.6. DNA finger printing

10.7. Forensic medicine

11. *In vitro* fertilization (3 hrs)

11.1. *In vitro* fertilization and embryo transfer in human

11.2. *In vitro* fertilization and embryo transfer in live stock

12. Animal cell and tissue culture (3 hrs)

12.1. Culture media – natural and artificial

12.2. Culture methods – primary explantation techniques, various methods of cell and tissue culture

12.3. Tissue and organ culture

13. Gene Silencing techniques (2 hrs)

13.1. Antisense RNA

13.2. RNAi

13.3. Gene knockouts and Knock out mouse

14. Cloning- (2 hrs)

14.1. Cloning procedures

15. Environmental biotechnology (3 hrs)

15.1. Pollution control – cleaner technologies, toxic site reclamation, removal of oil spill, reducing of pesticides and fertilizers, biosensors, biomonitoring.

15.2. Restoration of degraded lands - reforestation using micro propagation, development of stress tolerant plants

16. Agricultural Biotechnology (3 hrs)

16.1. Biofertilizers

16.2. Insect pest control (Pheromones, hormone mimics & analogues)

16.3. Biopesticides (Baculovirus, *Bacillus thuringiensis*, NPV)

16. Intellectual property rights (3 hr)

16.1. Intellectual property protection,

16.2. Patents, copy right, trade secrets, trademark

16.3. GATT and TRIPS, patenting of biological materials,

16.4. International co-operation, obligation with patent applications, implications of patenting current issues

17. The ethical and social implications - (3 hrs)

17.1. Ethics of Genetic engineering - Social impacts - Human safety-Virus resistant plants- Animals and ethics-

17.2. Release of GEOs-Use of herbicide resistant plants-Human genome alterations by biotechnology

17.3. Social acceptance of biotechnology-Transgenic crops - Social acceptance of medical biotechnology- Acceptance of GM crops for food and pharmaceutical production, Social acceptance of Industrial biotechnology

Syllabus- BSc.Zoology

CELL BIOLOGY AND GENETICS

Code: ZOL5B06T

Section B: GENETICS (27 hrs)

MODULE 6. Interaction of genes (5 hrs)

_Allelic interactions: incomplete dominance and co-dominance with examples. Nonallelic 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. 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 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. (8hrs)

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)**

METHODOLOGY IN SCIENCE, BIOSTATISTICS AND BIOINFORMATICS

Code: ZOL5B09T

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)

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 2. Sex determination and Chromosomal anomalies (3 hrs) Chromosomal mechanism of sex determination; Barr body; twin studies; sex reversal; Sex chromosomal anomalies: Turner's syndrome and Klinefelter's syndrome.

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

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-fetoprotein 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, gonorrhoea, 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.

MODULE 9. Ethical aspects of sex (2 hrs) Healthy relationship with opposite sex, role of counseling, gender discrimination in family and society

ENVIRONMENTAL AND CONSERVATION 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.

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

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)

1.3.1 Courses which address cross cutting issues relevant to Gender, Environment and Sustainability, Human Values and Professional Ethics into the Curriculum

Sl.No	Name of the Course	Course Code	Name of the Programme	Specify the issue(s) dealing with
1.	Conservation Biology	ZOL1C03	MSc.Zoology	Environment and sustainability
2.	Behavioral Studies	ZOL1C03	MSc.Zoology	Deals with the biological aspects of Gender
3.	Ethics In Taxonomy	ZOL2C06	MSc.Zoology	Deals with the professional Ethics in Taxonomy
4.	Gender Development- Genetic and Environmental Basis	ZOL3C08	MSc.Zoology	Factors affecting Gender Development
5.	Environmental Biotechnology	ZOL4C10	Msc.Zoology	Environment and Sustainability
6.	Ethics in Biotechnology	ZOL4C10	Msc.Zoology	Deals with the professional Ethics in Biotechnology
7.	Genetic basis of Gender	ZOL5B06T	BSc.Zoology	Discuss the genetic aspects of Gender
8.	Ethics in Science and Animal Ethics	ZOL5B09T	BSc.Zoology	Professional Ethics in Zoology
9.	Sex Education	ZOL5D01T	BSc.Zoology	Helps understanding Gender roles ,Human Values
10.	Environmental and Conservation biology	ZOL6B12T	Bsc.Zoology	Environment and Sustainability

SACRED HEART COLLEGE FOR WOMEN

CHALAKUDY, THRISSUR, KERALA



AQAR 2020-21 HISTORY

CRITERION I - CURRICULAR ASPECTS

SUB CRITERION - 1.3.1 - Institution integrates crosscutting issues relevant to Professional Ethics, Gender, Human Values, Environment and Sustainability into the Curriculum.

Sl No.	Name of the Course	Course Code	Name of the Programme and Code	Crosscutting issues
1	Trends in Historiography	HIS1B01	BA History	Professional Ethics
2	Trends in Indian Historiography	HIS2B02	BA History	Professional Ethics
3	Methodology of Historical Writings	HIS5B10	BA History	Professional Ethics
4	Gender Studies	HIS6B13	BA History	Gender
5	Indian Heritage and Plurality of Cultures	HIS6B14	BA History	Human Values
6	Historical Tourism	HIS5DO1	BA History	Human Values
7	History of Archaeology in India	HIS6B16	BA History	Professional Ethics
8	Indian Constitution and Politics: Basic Features and Governmental Structures	ICP1(2)C01	BA History-Complementary	Human Values, Gender
9	Indian Constitution and Politics: Federalism, Decentralisation & Political Dynamics	ICP4(3)C02	BA History-Complementary	Human Values, Gender
10	Certificate Course on Human Rights and Duties Education	SHCCHRDE2019-21	Certificate Course	Human Values, Gender.



UNIVERSITY OF CALICUT

Abstract

General and Academic- Faculty of Humanities- BA History programme- Syllabus of fifth and sixth semester BA History (including Dual Core) along with the Syllabus of Gender Studies (HIS4B20) for IV semester BA History (dual core) - under CBCSS UG Regulation 2019 - with effect from 2019 Admission onwards - Implemented- Orders Issued

G & A - IV - B

U.O.No. 12854/2020/Admn

Dated, Calicut University.P.O, 22.12.2020

- Read:-*
1. UO. No. 4368/2019/Admn Dated: 23.03.2019
 2. UO. No. 8479/2019/Admn Dated: 30.06.2019
 3. UO. No. 3514/2020/Admn Dated: 17.03.2020
 4. UO. No. 5130/2020/Admn Dated: 04.06.2020
 5. Item No.3 of the Minutes of the meeting of the Board of Studies in History-UG held on 16.07.2020
 6. Item No. 19 of the Minutes of the meeting of the Faculty of Humanities held on 26.08.2020.
 7. Extract of the item No.II.D of the minutes of the LXXXI meeting of the Academic Council held on 01.10.2020.

ORDER

1. The Regulations for Choice Based Credit and Semester System for Under Graduate (UG) Curriculum- 2019 (CBCSS UG Regulations 2019) for all UG Programmes under CBCSS-Regular and SDE/Private Registration, with effect from 2019 Admission, has been implemented vide paper read (1) above.
2. The Scheme and Syllabus of I and II Semesters of BA History Programme (including Dual core) in tune with new CBCSS UG Regulation-2019, has been implemented in the University with effect from 2019 Admission onwards, vide paper read (2) above.
3. The Syllabus of the Complementary Course, Historical Tourism offered by BA History programme in accordance with CBCSS UG Regulations-2019 has been implemented in the University with effect from 2019 Admission onwards, vide paper read (3) above.
4. The Scheme and Syllabus of III and IV Semesters of BA History Programme (including Dual core) in tune with new CBCSS UG Regulation-2019, has been implemented in the University with effect from 2019 Admission onwards, vide paper read (4) above.
5. The meeting of the Board of Studies in History (UG), held on 16.07.2020 resolved to approve the Syllabus of BA History Programme w.e.f 2019 admissions (V and VI Sem), along with the Syllabus of Gender Studies (HIS4B20) for IV semester BA History (double main), vide paper read (5) above.
6. The online meeting of the Faculty of Humanities held on 26.08.2020, vide paper read (6)above, has approved the above resolution of the Board of Studies.
7. The meeting of the Academic Council held on 01.10.2020 has approved the minutes of the meeting of the Board of Studies in History UG held on 16.07.2020 as approved by Faculty of Humanities vide paper read as (7) above. Sanction has been accorded by the Vice Chancellor in the file No. 7251/GA-IV-B1/2013/CU dated 09.10.2020 to implement the above decision of the Academic Council.
8. Sanction is therefore accorded to implement the Scheme and Syllabus of BA History Programme - Vth and VIth semester (including Dual Core) along with the Syllabus of Gender Studies (HIS4B20) for IVth semester BA History (dual core) in accordance with the CBCSS UG Regulations-2019, in the University with effect from 2019 Admission onwards.
9. Orders are issued accordingly. (Syllabus of I to VI sem with Model question papers appended).

Arsad M

Assistant Registrar

To

1.The Principals of all Affiliated Colleges 2. Director, SDE
Copy to: PS to VC/PA to PVC/ PA to Registrar/PA to CE/JCE I/JCE II/JCE VIII/EX IV and EG
Sections/GA I F/CHMK Library/Information Centres/SF/DF/FC

Forwarded / By Order

Section Officer

**CHOICE BASED CREDIT AND SEMESTER SYSTEM FOR
UNDER GRADUATE (UG) PROGRAMME**

UNIVERSITY OF CALICUT



**For
BA HISTORY
*Under***

**Restructured Curriculum and Syllabi
As per CBCSS
UG Regulations (2019)**

(2019 Admissions Onwards)

University of Calicut
Board of Studies in History (UG)
Revised Curriculum of Undergraduate
Programme in History
Effective from 2019- 20 Admissions

The revised syllabus is the product of a workshop held in May 2019, attended by around 35 teachers from various colleges under the University of Calicut, for revising and restructuring the curriculum, in the wake of the UG regulations 2019. The suggestions and opinions of the participants of the workshop have surely prevailed upon us in shaping the content of the new syllabus.

The following are the pedagogic objectives of teaching history at UG level

- a. inculcating curiosity about past
- b. imparting intellectual skills to make sense of the past
- c. developing the critical faculty of the students
- d. developing an understanding of the presentness of the past

Criticality is the soul of the discipline of history. In the present context, a more important objective shall be enabling the students to understand the fertile plurality of Indian culture and tradition and the cultural symbiosis in India that developed through the ages. It is with these objectives in mind that the courses of the programme of History have been designed and the contents have been fixed.

The Board also feels that since history is one of the most dynamic disciplines, periodic revision of the syllabus in subjects like history is essential to incorporate most recent developments within the discipline. The board has taken much care to see that these new shifts in the domain of historical research are amply reflected in the revised syllabus.

Dr. P P Abdul Razak
Chairman, Board of Studies in History (UG)
University of Calicut

Ability Enhancement courses/Audit courses

These are courses which are mandatory for a programme but not counted for the calculation of SGPA or CGPA. There shall be one Audit course each in the first four semesters. These courses are not meant for class room study. The students can attain only pass (Grade P) for these courses. At the end of each semester there shall be examination conducted by the college from a pool of questions (Question Bank) set by the University. The students can also attain these credits through online courses like SWAYAM, MOOC etc (optional). The list of passed students must be sent to the University from the colleges at least before the fifth semester examination. The list of courses in each semester with credits is given below.

Course with credit Semester

Course	Credit	Semester
Environment Studies	4	1
Disaster Management	4	2
*Human Rights/Intellectual Property Rights/ Consumer Protection	4	3
*Gender Studies/Gerontology	4	4

* Colleges can opt any one of the courses.

Extra credit Activities

Extra credits are mandatory for the programme. Extra credits will be awarded to students who participate in activities like NCC, NSS and Swatch Bharath. Those students who could not join in any of the above activities have to undergo Calicut University Social Service Programme (CUSSP). Extra credits are not counted for SGPA or CGPA.

Credits

A student is required to acquire a minimum of 140 credits for the completion of the UG programme, of which 120 credits are to be acquired from class room study and shall only be counted for SGPA and CGPA. Out of the 120 credits, 38 (22 for common (English) courses + 16 for common languages other than English) credits shall be from common courses, 2 credits for project/corresponding paper and 3 credits for the open course. (In the case of LRP Programmes 14credits for common courses (English), 8 credits for additional language courses and 16 credits for General courses). The maximum credits for a course shall not exceed 5. Dual core programmes are having separate credit distribution. Audit courses shall have 4 credits per course

CORE COURSES

(15 courses including project work)

Sl. No	Code	Title	Contact Hours	Semester	Credit
1	HIS1 B01	TRENDS IN HISTORIOGRAPHY	6	I	5
2	HIS2 B02	TRENDS IN INDIAN HISTORIOGRAPHY	6	II	5
3	HIS3 B03	WORLD HISTORY- 1	4	III	4
4	HIS3 B04	INDIAN HISTORY- 1	5	III	4
5	HIS4 B05	WORLD HISTORY- 2	4	IV	4
6	HIS4 B06	INDIAN HISTORY- 2	5	IV	4
7	HIS5 B07	WORLD HISTORY- 3	5	V	4
8	HIS5 B08	INDIAN HISTORY- 3	5	V	4
9	HIS5 B09	KERALA HISTORY-1	5	V	4
10	HIS5 B10	METHODOLOGY OF THE WRITING OF HISTORY	5	V	4
11	HIS6 B11	INDIAN HISTORY- 4	5	VI	4
12	HIS6 B12	KERALA HISTORY- 2	5	VI	4
13	HIS6 B13	GENDER STUDIES	5	VI	4
14	HIS6 B14	INDIAN HERITAGE AND PLURALITY OF CULTURES	5	VI	4
15	HIS6 B15	DISSERTATION/ METHODOLOGY OF LOCAL HISTOICAL WRITING	2 Hours each in 5 th and 6 th Semesters	V&VI	2
TOTAL CREDIT					60

COMPLEMENTARY COURSES

(12 courses)

Sl. No.	Code	Name of the Courses	Credit	Contact Hours/week	Sem
1	HIS1(2) C01	Modern Indian History (1857 to the Present): I	4	6	I/II
2	HIS4(3) C01	Modern Indian History (1857 to the Present): II	4	6	IV/III
3	HIS1(2) C02	Modern World History from AD 1500: I	4	6	I/II
4	HIS4(3) C02	Modern World History from AD 1500: II	4	6	IV/III
5	HIS1(2) C03	Social and Cultural History of Britain: I	4	6	I/II
6	HIS4(3) C03	Social and Cultural History of Britain: II	4	6	IV/III
7	HIS1(2) C04	West Asian Studies: I	4	6	I/II
8	HIS4(3) C04	West Asian Studies: II	4	6	IV/III
9	HIS1(2) C05	Archaeology In India: I	4	6	I/II
10	HIS4(3) C05	Archaeology In India: II	4	6	IV/III
11	HIS1(2) C06	History Of Journalism: I	4	6	I/II
12	HIS4(3) C06	History Of Journalism: II	4	6	IV/III
13	HIS1(2) C07	Tourism in Historical Perspective	4	6	I/II
14	HIS4(3) C07	History of Tourism Development in India	4	6	IV/III

OPEN COURSES

(3 courses)

Sl. No	Code	Title	Contact Hours	Semester	Credit
1	HIS5D01	HISTORICAL TOURISM	3	V	3
2	HIS5D02	HISTORY OF KERALA RENAISSANCE	3	V	3
3	HIS5D03	HISTORY OF SCIENCE AND TECHNOLOGY IN INDIA	3	V	3

ELECTIVE COURSES
(4 courses)

Sl. No	Code	Title	Contact Hours	Semester	Credit
1	HIS6 B16	HISTORY OF ARCHAEOLOGY IN INDIA	3	VI	3
2	HIS6 B17	HISTORY OF EPIGRAPHY IN INDIA	3	VI	3
3	HIS6 B18	ORAL HISTORY	3	VI	3
4	HIS6 B19	HISTORY OF HUMAN RIGHTS	3	VI	3

DUAL CORE (Double Main)

For Double Main Programmes, there should be the following Core Courses, 10 Common Courses and 1 Open Course (from any other departments) . The code for History Double Main will be same as that of the core courses, i.e., HIS- B-- . There are no Complementary Courses for Double Main.

Sl. No	Code	Title	CONTACT HOURS	SEMESTER	CREDIT
1	HIS1B01	TRENDS IN HISTORIOGRAPHY	6	I	5
2	HIS2B02	TRENDS IN INDIAN HISTORIOGRAPHY	6	II	5
3	HIS3B04	INDIAN HISTORY- 1	4	III	4
4	HIS4B06	INDIAN HISTORY- 2	5	IV	4
5	HIS4 B20	GENDER STUDIES	5	IV	4
6	HIS5B08	INDIAN HISTORY- 3	5	V	4
7	HIS5B09	KERALA HISTORY-1	5	V	4
8	HIS6B11	INDIAN HISTORY- 4	5	VI	4
9	HIS6B12	KERALA HISTORY- 2	5	VI	4
		TOTAL			38
	HIS6B15	*DISSERTATION	4	VI	3

*Dissertation / Project can be chosen from either of the two core courses.

HIS1B01 TRENDS IN HISTORIOGRAPHY

Course Category: Core Course 1

No. of Credits: 5

No. of Contact Hours: 6 Hours per week

This course is designed to expose first semester students, to 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. The course will illustrate how the methodological and philosophical shifts have contributed for the development of History as a discipline.

Module I

- ▲ Meaning of Historiography – Quasi History
- ▲ Past and History- Differentiation and Conceptualization
- ▲ Nature and Character of Greek Historical Writings- Herodotus
- ▲ Nature of Medieval Historical Writings- St: Augustine – Ibn Khaldun

Books for Study

1. R G Collingwood, *The Idea of History*, OUP, 1994.
2. Shashi BhushanUpadhyay, *Historiography in the Modern World: Western and Indian Perspectives*, OUP, 2016.

Module II

- ▲ Vico and New science – Positivism- Auguste Comte and Ranke
- ▲ Marx and Historical Materialism
- ▲ Cultural History- Jacob Burckhardt
- ▲ A J Toynbee and the Study of Civilizations

Books for Study

1. R G Collingwood, *The Idea of History*, OUP, 1994.
2. Shashi BhushanUpadhyay, *Historiography in the Modern World: Western and Indian Perspectives*, OUP, 2016.

Module III

- ▲ The Annales – Marc Bloch, Fernand Braudel
- ▲ History of Mentalities- Philippe Aries
- ▲ History from Below- E P Thompson
- ▲ Post Modernism – Keith Jenkins

Books for Study

1. Peter Burke, *The French Historical Revolution: The Annales School, 1929-89*, Polity Press, Cambridge, 1990.
2. Patrick H Hutton, 'The History of Mentalities: The New Map of Cultural History' In *History and Theory*, Vol. 20, No. 3 (Oct. 1981), pp. 237-259.
3. R G Collingwood, *The Idea of History*, OUP, 1994.
4. Shashi BhushanUpadhyay, *Historiography in the Modern World: Western and Indian Perspectives*, OUP, 2016.

Module IV

- ▲ Gender History– Gerda Lerner
- ▲ Food History – Felipe Fernandez- Armesto
- ▲ Environmental History – Alfred W Crosby
- ▲ Oral Tradition and Oral History – Jan Vansina and Allan Nevins

Books for Study

1. Shashi BhushanUpadhyay, *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.

HIS2 B02 Trends in Indian Historiography

Course Category: Core Course 2

No. of Credits: 5

No. of Contact Hours: 6 Hours per week

This course is designed to expose Second semester students, to the basic understanding regarding the development of Historical consciousness in India. It will also provide a basic understanding regarding the major trends in the arena of Historical Writing and Thought in India. It will also 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.

Module I Historical Consciousness in Pre- British India

- ▲ Concept of time in early India
- ▲ Jain and Buddhist Tradition
- ▲ Ithihasa – Purana Tradition
- ▲ Charithas and Kavyas- Harshacharitha – Mooshakavamsa- Rajatharangani
- ▲ Kitab-al- Hind- Al- Biruni
- ▲ Historical Writings of Sultanate Period- Barani- Amir Khusrau
- ▲ Historiography of Mughal period -AbulFazal
- ▲ Historical consciousness in other parts of India - Ferishta- Sheikh Zainuddeen- Mangalkabya

Module II Colonial and Nationalist Historiography

- ▲ Indology- William Jones- Max Muller
- ▲ James Mill and the Division of Indian History- The History of British India
- ▲ Vincent A Smith- Great Men History
- ▲ Nationalist Historiography- K.P Jayswal- R.C Majumdar- R.C Dutt- K.A.N Sastri- Elamkulam ▲ P N Kunjan Pillai

Module III Critique of Paradigms

- ▲ Oriental Despotism
- ▲ Asiatic Mode of Production
- ▲ Hydraulic Society
- ▲ Aryan Racial Supremacy Theory
- ▲ Romila Thapar's Critique on Colonial and Nationalist Historiography

Module IV Historiographical Trends in Independent India

- ▲ Marxist Approach to Indian History- D.D Kosambi- R.S Sharma- Irfan Habib- Bipan Chandra
- ▲ Subaltern Studies- Ranajith Guha- Dipesh Chakraborty
- ▲ Cambridge and new Cambridge school- Anil Seal- C A Bayly
- ▲ Gender History- Uma Chakravarti
- ▲ Environmental History- Ramachandra Guha

Books for Study

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 Bhushan Upadhyay, 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

HIS5 B10 - METHODOLOGY OF THE WRITING OF HISTORY

Course Category: Core Course-10

No. of Credits-4

No. of Contact Hours per week -5

Course Outcomes

- CO 1.** Enable the student to understand the techniques of writing History and the evolution of such a techniques.
- CO 2.** Students will learn the theory and practice of historical research as practiced by professionals in the field including traditional and current research methodologies.
- CO 3.** It enables the student to develop a thesis/argument, evaluate its historical probability, and place that argument in a historiographical context.
- CO 4.** It helps to develop a historian's skills, including reading, writing, speaking, and critical inquiry and would be able to execute and guided independent research projects in accord with the research manuals.
- CO 5.** Distinguish between various forms of presentation of history and the basic elements of research in history.
- CO 6.** Prepare students for writing the local history projects.

Module I: Selecting Historical Problem

- ▲ Literary review and identification of a Historical Problem – making hypotheses and drafting Synopsis – Preliminary Bibliography.

Essential Readings

Arthur Marwick, *The new nature of History*

E. H. Carr, *What is History*

Elton G.R., *The Practice of History*

Sharron Sorenson, *How to write Research Paper*

HIS6 B13-GENDER STUDIES

Course Category: Core Course -13

No. of Credits: 4

No. of Contact Hours: 5 Hours per week

The syllabus primarily aims to introduce the area of gender studies to graduate students. The present course explains the socio-historical constructions of sexual differences in Indian society by emphasizing the plural backgrounds. The Course is designed in such a way that the students will be able to understand the concept of gender, how genderization takes place in society, how it creates inequalities, and how these inequalities become the basis for gender-based violence, and provides an outline of how gender norms can be altered for better human relationships in society. The course is designed to prepare students to challenge the conventional social norms about gender.

Course Outcomes

- CO 1. Explain conventional social norms about male-female dichotomy and can device policies and strategies to foster gender equality and gender justice
- CO 2. Contribute to creative interventions that may result in a world with less inequality
- CO 3. Critically interrogate and actively engage in social processes related to the construction of gender
- CO 4. Analyse social and cultural phenomena through the lens of gender in a way that appreciates a range of disciplinary perspectives

Module I: Key Terminologies and Concepts

- ▲ Conceptualising Gender; define gender and sex- sexuality and sexism- gender as social construction- concept of masculinity and femininity-gender discrimination
- ▲ Patriarchy and Matriarchy; concept and practice, Gerda Lerner., The Creation of patriarchy
- ▲ Origin and concept of feminism; black feminism-dalit feminism-eco feminism
- ▲ Judith Butler., Gender Performativity Theory

Essential readings

Jane Pilcher and Imelda Whelehan. *Fifty,Key Concepts in Gender Studies*
Judith Butler.*Gender Trouble: Feminism and Subversion of Identity*
Kamla Bhasin.*What is Patriarchy?*

Gerda Lerner. *Creation of Patriarchy*

References

Ruth Vanita and Saleem Kidwai (eds.). *Same Sex Love in India: Readings in History and Literature*

Sushila Agarwal. *Status of Women*

Uma Chakravarti. *Gendering Caste through a Feminist Lens*

Vandana Shiva. *The Violence of Green Revolution*

Leela Dube. *Anthropological Explorations in Gender*

Kamla Bhasin. *Understanding Gender*

Simon de Bouver. *The Second Sex*

Luce Irigaray. *This Sex Which is Not One*

Module II: Indian Society through Gender Perspective

- ▲ Division of labour in pre- proto historic period- women in agriculture- involvement in technology and tool making-women images and ideas in Indus seals and crafts
- ▲ Gender order in Brahmanical patriarchy- Uma Chakravarty- women in Buddhism and Jainism
- ▲ Medieval Islamic law and women- rights of women in marriage and inheritance- women in royal courts- life in Mughal harem-cunubinage- marginalised women- slave girls
- ▲ British rule of law and women- Colonialism and discussion of women question
- ▲ Gayatri Chakravorty Spivak on women

Essential Readings

Kunkum Roy(eds.). *Women in Early Indian Societies: Readings in Early Indian History*

Thomas. P. *Indian Women through the Ages*

Uma Chakravarti. *Gendering Caste through a Feminist Lens*

Gayatri Chakravorty Spivak. Can subaltern speak?

References

A.S. Altekar, *The Position of Women in Hindu Civilization.*

Thomas. P, *Indian Women through the Ages.*

Kiran Pawar, *Women in India History: Vision and Venture*

MadhuVij, et al. *Women Studies in India, A journey of 25 Years*

Sushila Agarwal. *Status of Women*

Vandana Siva. *Staying Alive*

Uma Chakravarti. *Everyday Lives, Everyday Histories: Beyond the Kings and Brahmanasof 'Ancient India'*

Module III: Social, labour, educational and health issues of women at present

- ▲ Changing concept of family and marriage- labour and health issues- participation of women in politics-women literacy

Law Relating to Crimes against Women and transgender (study main features only)

- ▲ Indian Penal Code -1860, 1983
- ▲ Dowry Prohibition Act,1961
- ▲ Protection of Women from Domestic Violence Act, 2005
- ▲ Indecent Representation of Women [Prohibition]Act,1986

Essential readings

Nivedita Menon. *Gender and Politics in India*

Sushila Kaushik. *Panchayati Raj in Action: Challenges to Women's Role*

Usha Sharma. *Women Education in Modern India*

Reshmi.G. and Anil Kumar K.S, *Transgender, Charithram, Samskaram, Pradinidanam*

A comprehensive Guide to Women's Legal Rights for Indian Institute of Technology,

IIT Kanpur

References

Indian Law related to Women and Children, Wikigender, www.wikigender.org

www.legalservicesindia.com

www.ncw.nic.in

<https://wcd.nic.in>

Law Relating to Women, <https://shodganga.inflibnet.ac.in>

Module IV: Contemporary Issues (short answer only)

- ▲ Gender Identity- Heterosexuality-Queer Theory-Third Gender – Cross Dressers- - problems of Sexual Minorities- Coming Out- MIX- Organizations of Sexual Minorities; Queerala- Queerhythm-SGMFK.

Essential Readings:

Ruth Vanita and Saleem Kidwai (eds.). Same Sex Love in India: Readings in History and Literature

Richard Ekins and Dave King. *Blending Genders: Social Aspects of Cross Dressing and Sex Changing*

Reshmi.G and Anil Kumar K.S. *Transgender, Charithram, Samskaram,Pradinidanam*

A comprehensive Guide to Women's Legal Rights for Indian Institute of Technology, IIT Kanpur

References

Judith Butler, *Gender Trouble: Feminism and Subversion of Identity*

KumKumSangari and Uma Chakravarthi,(eds.)*From Myths to Markets;Essays on Gender*

Reshmi.G, and Anil Kumar,K.S *Transgender, Charithram, Samskaram,Pradinidanam*(Mal.)

Vina Mazumdar, "Emergence of Women's Question in India and the Role of Women's Studies", Occasional Paper, No. 7, Centre for Women's Development Studies, New Delhi, 1985.

HIS6 B14-INDIAN HERITAGE AND PLURALITY OF CULTURES

Course Category: Core Course -14

No. of Credits: 4

No. of Contact Hours: 5 Hours per week

(Topics should be studied in relation to the core theme; Indian Heritage and Plurality of Cultures)

Course Outcomes

CO1. Realise the diverse nature of Indian culture

CO2. Involve in nation building process with an understanding on multicultural system of the country

CO3. Realise the values and ideologies of secular movements and ideologies of the Country

Module I: Plurality and the elements of dissent in Ancient India

- ▲ Pluralism; definition and scope-Monism- Coercive singular
- ▲ Multiculturalism in the formation of Early India- the concept of *VasudaivaKudumbakam*- the idea of *Tatwamasi*
- ▲ Cultural confluence in Buddhism and Jainism
- ▲ Ashoka Dhamma and setting of social norms; principle of tolerance and environmental concerns
- ▲ Dissent and protest to existing knowledge and philosophy; Ajitha Kesakambali and Indian materialism- Lokayatas

Essential readings

Romila Thapar. *Early India from the Origins to AD 1300*

Tony Joseph. *Early Indians: The Story of Our Ancestors and Where We Came From*

Asok Vajpeyi (ed.). *India Dissents: 3000 years of Difference, Doubt and Agreement*

Yuval Noah Harari. *Sapience: A Brief History of Humankind*

Vijaya Ramaswamy. *Devotion and Dissent in Indian History*

References

Mark Bevir. *Modern Pluralism: Anglo American Debate Since 1880*

William E Connolly. Pluralism

DN Jha. *Ancient India in Historical Outline*

AL Basham. *The Wonder that was India*

-----*Cultural History of Early India*

Pooja Lamba Cheema. *The Crucible Dhamma*

Irfan Habib and Vivekananda Jha. *Mauryan India*

Irfan Habib and Vijay Thakur. *The Vedic Age*

Debi Prasad Chattopadhyaya. *Lokayata :A Study in Ancient Indian Materialism*

L. Egair Humphrey. *Ajita Kesakambali*

Romila Thappar. *Asoka and the Decline of the Mauryas*

BS Prasad. *Jainism and Buddhism :Comparative Study*

Module II: Medieval Synthesis

- ▲ Bhakti and Sufi tradition; making of a composite culture- cross fertilization of religious ideas – Kabirdas, Gurunanak; Adigranth and concept of equal justice - Lal Ded- Basava cult
- ▲ Akbar- Sulh-i-kul (Universal peace)-Ibadathkhana and idea of secular nationalism- Darashikho-*Majmaulbahrain* (sagarasangamam)- Razam nama
- ▲ Cultural confluence in Indo Islamic art- architecture and paintings

Essential Readings

Athar Ali. *Medieval India: Ideas, Tradition and Cultural Values*

Paul Smith. *The Book of Dara Shikoh: Life, Poems and Prose*

Upinder Singh. *A History of Ancient and Early Medieval India: From the Stone age to the 12th century*

References.

Shahabuddin Iraqi. *Bhakti Movement in Medieval India: Social and Political Perspectives*

Satish Chandra. *Medieval India : From Sultanate to the Mughals*

-----*Medieval India: The Story of a Civilization*

-----*State, Pluralism and Indian Historical Tradition*

Meenakshi Khana. *Cultural History of Medieval India*

Anne Marie Schimmel. *The Empire of the Great Mughals: History, Art and Culture*

KN Chitnis. *Socio Economic History of Medieval India*

Module III: National movement and After: The idea of 'India'

- ▲ 1857 revolt and Hindu Muslim Unity- National Movement and practice of multiculturalism
- ▲ Tagore and the idea of Universal brotherhood-*Geethanjali*
- ▲ Gandhi's programme on Hindu Muslim Unity
- ▲ Multicultural discourses and claiming spaces; Jothiba Phule, Tarabai Shinde- Ambedkar-*GulamGiri (reading)*
- ▲ Constitution as a multicultural document- preamble of the Constitution
- ▲ Indian advocates of Pluralism-Nehru and the Democratic India- Amartya Sen and the 'Argumentative Indian'
- ▲ Threat to the principle of secularism-shift from pluralism to communal and caste politics-citizen unbecoming; politics of exclusion-pluralism to fragmentation- Globalisation and homogenisation of cultures

Essential Readings

Jawaharlal Nehru. *The Discovery of India*

Amartya Sen. *The Argumentative Indian: Writings on Indian History, Culture and*

Identity

Irfan Habib. *The National Movement. Studies in Ideology and History*

References.

Bipan Chandra, *Essays on Contemporary India*

Bipan Chandra, Mridula Mukerjee and Aditya Mukerjee, *India Since Independence*

Bipan Chandra. et. al (ed.), *India After Independence*

Ramachandra Guha, *India After Gandhi: The History of the World's Largest*

Democracy S.Gopal, Jawaharlal Nehru. *A Biography*, vol. 2, 1947-1956

S.Gopal, Jawaharlal Nehru. *A Biography*, vol. 3, 1956- 1964

KN Panikkar. *Communal Threat, Secular Challenge* Mushirul Hasan. *In Search of Identity: Indian Muslims Since Independence*

Shashi Tharoor. *India from Midnight to the Millennium*

Module IV: Plurality: The Kerala Experience

- ▲ The idea of cultural symbiosis; Tarisappally-Jewish and Muccunti inscriptions
- ▲ Socio-religious movements and Kerala modernity; Vaikuntaswamy-Narayanaguru and idea of brotherhood - Ayyankali-Poyikayil Appacchan-Vakkom Abdul Khadar Moulavi
- ▲ Modern education and accommodation of societal diversity

HIS5D01 HISTORICAL TOURISM

Course Category: Open Course 1

No. of Credits: 3

No. of Contact Hours: 3 Hours per week

Course Outcomes

CO 1. Realise the Tourism potential of India and Kerala

CO 2. Serve as mentors and tourism operators

CO 3. Realise the importance of eco tourism and sustainable tourism

Module I: Historicising Travel in India

- ▲ Tourism; basic concepts-definitions-elements of tourism-types of tourism
- ▲ Travelers and Travel accounts; Megasthenese- Pliny - Fa -Hien- Marcopolo -Ibn Batuta- Ralf Fitch –Buchanan
- ▲ Tourism and Economy
- ▲ Tourism and Acculturation
- ▲ Tourism and leisure
- ▲ Transport and communication technology and Tourism
- ▲ Eco Tourism
- ▲ Sustainable Tourism
- ▲ Medical Tourism

Essential Readings

Viswanath Ghosh. *Tourism and Travel Management*

Pran Nath Seth and Sushma Seth Bhat. *An Introduction to Travel and Tourism*

AK Bhatia. *Tourism Development: Principles and Practices*

S.P Gupta. *Cultural Tourism Module II*

Salini Modi. *Tourism and Society Module III*

Ratan Deep Singh. *Dynamics of Modern Tourism*

Kunol Chattopadhyaya. *Tourism Today- Structure, Marketing and Profile Module IV*

Ratan Deep Singh. *Economic Impact of Tourism development: An Indian Experience*

Sampadkumar Jain. *Tourism Principles and Practices* (Oxford)

Cooper, Fletcher and Wanhill. *Gilbert, Tourism Principles and Practices*

Harish Bhatt and B S Badan. *Sustainable Tourism*

HIS6 B16 HISTORY OF ARCHAEOLOGY IN INDIA

Course Category: Elective Course-1

No. of Credits: 3

No. of Contact Hours: 3 Hours per week

This paper provides an overview about the archaeology discipline and the history of archaeology in India.

Course Outcomes

CO1. Engaged in excavation process to recover historical traits and cultural sites

CO1. Experimenting with various scientific dating methods

CO3. Expertise in setting of Museum and conservation and preservation of artifacts

Module I: Archaeology as a Discipline

- ▲ Definition- scope -basic concepts; Artifacts, Features, Eco-facts
- ▲ Mount or site or tell, Assemblage, Industry, Culture
- ▲ Antiquarianism- beginning of scientific archaeology- scientific exploration and excavation methods
- ▲ Absolute and relative dating techniques; C-14, Dendrochronology, Thermo luminescence- Stratigraphy

Essential readings

Colin Renfrew and Paul Bahn. *Archaeology: Theories, Methods, and Practice*

Brian. M. Fagan, Nadia Durani. *Archaeology A Brief Introduction*

Peter.L. Drewett. *Filed Archaeology: An Introduction*

K.Rajan. *Archaeology Principles and Methods*

Module II: Archaeology in India

- ▲ Asiatic society of Bengal and the beginning of Archaeological studies in the Colonial period- Alexander Cunningham and Archaeological Survey of India-Robert Bruce Foote and pre-historic studies
- ▲ Discovery of Harappan civilization- John Marshal, DayaramSahni and Mortimer Wheeler
- ▲ Post-independence Harappan archaeology- Amalananda Ghosh – RS Bisht- J.P. Joshi- S.R. Rao
- ▲ Excavations in the Indo- Gangetic and Yamuna doab -B.B. Lal- Dilip K Chakrabarti

Essential readings

Sourindranath Roy. *The Story of Indian Archaeology 1784-1947*

K.Rajan. *Archaeology Principles and Methods*

Upinder Singh, *A History of Ancient and Early Medieval India*

Dilip K. Chakrabarti. *Archaeological Geography of the Ganga Plain: The Lower and the Middle Ganga*

Dilip K. Chakrabarti, *The Oxford Companion to Indian Archaeology: The Archaeological Foundations of Ancient India, Stone Age to AD 13th century*

ShereenRatnagar, *Understanding Harappa*

Module III- Archeology in South India

- ▲ Alexander Rea and Adichanellur excavation
- ▲ Mortimer Wheeler and Areekamedu and Brahmagiri Excavations
- ▲ B.K.Gururaja Rao, A Sundara and Megalithic Studies
- ▲ K. Rajan and Porunthal - Kodumanal excavations
- ▲ Recent excavations at Keezhadi

Essential Readings

Alexander Rea. *Catalogue of Pre-Historic Antiquities*

B.K. Gururaja Rao, *Megalithic Culture in South India*

A. Sundara. *Early Chamber Tombs*

R.K. Mohanty, V.Selvakumar. "The Archaeology of Megaliths in India: 1947-1997" in S Settar, Ravi Korisettar. *PREHISTORY- Archaeology of South Asia Vol I*. pp 313-351

Udaya Ravi S Moorti. *Megalithic Culture of South India*

Dept. of Archaeology, Govt. of Tamilnadu. *Keeladi - An Urban Settlement of Sangam Age on the banks of River Vaigai*

V.P. Yatheesh Kumar and K Rajan. *Archaeology of Amaravathi River Valley: Porunthal Excavations*

Module IV: Archaeology in Kerala

- ▲ Pre-historic Archaeology- F. Fawcett and the discovery of Edakkal caves-Marayur cave Paintings- P. Rajendran and Prehistoric studies
- ▲ Megalithic Explorations and Excavations - J Babington's Chattaparamba- William Logan and Robert Sewell- A Ayyappan's Feroke excavation- B.K.Thappar's Porkkalam Excavation-T Sathyamurti's Mangadu excavation- Ummichipoyil excavation- Kadanad Excavation
- ▲ Early Historic Sites –Pattanam excavations- Vizhinjam Excavations

- ▲ Early medieval and Medieval sites; AnujanAchan's ChermanParampu- K.V Raman's Matilakam excavation- State Archaeology department's Kottappuram excavation

Essential Readings

William Logan. *Malabar Manuel*

Robert Sewell. *Lists of the Antiquarian Remains in the Presidency of Madras*

RajanGurukkal and RaghavaVarier. *Cultural History of Kerala*

T. Satyamurti. *Iron Age in Kerala*

P. Rajendran. *Prehistoric Cultures and Environment: A Case Study of Kerala*

YashodharMathpal. *Rock Art in Kerala*

V.Selvakumar. P.K.Gopi and K.P. Shajan, "Trial Excavation at Pattanam- A Preliminary Report", *Journal of the Centre for Heritage Studies* Volume 2, 2005, pp. 57-67.

M.R. Manmathan (ed.). *Archaeology in Kerala-Past and Present*

Ajit Kumar. *Archaeology in Kerala: Emerging Trends*

P.J. Cherian (ed). *Pattanam Excavation Reports*, KCHR

K.R. Sona (ed.). *A Brief report on Archaeological Excavation at Kottappuram, Kerala State Archaeology Department*

NB : Study tour/Field trip is compulsory for this course



UNIVERSITY OF CALICUT

Abstract

General and Academic- Faculty of Humanities- Syllabus of BA Political Science Programme under CBCSS UG Regulations 2019 with effect from 2019 Admission onwards - Implemented- Orders Issued.

G & A - IV - B

U.O.No. 8480/2019/Admn

Dated, Calicut University.P.O, 30.06.2019

- Read:-*1. UO. No. 4368/2019/Admn Dated 23.03.2019
2. Minutes of the meeting of the Board of Studies in Political Science - UG held on 05.04.2019 (Item No.1)
3. Minutes of the meeting of Faculty of Humanities held on 19.06.2019 (Item No.15)

ORDER

The Regulations for Choice Based Credit and Semester System for Under Graduate (UG) Curriculum-2019 (CBCSS UG Regulations 2019) for all UG Programmes under CBCSS- Regular and SDE/Private Registration with effect from 2019 Admission has been implemented vide paper read first above.

The Board of Studies in Political Science-UG in its meeting held on 05.04.2019 vide Item no.1 has approved the Syllabus of BA Political Science Programme in tune with the new CBCSS UG Regulation implemented with effect from 2019 Admission onwards, vide paper read second above.

The Faculty of Humanities at its meeting held on 19.06.2019 vide Item no.15 has approved Item no. 1 of the minutes of the meeting of the Board of Studies in Political Science-UG held on 05.04.2019, vide paper read third above.

Under these circumstances, considering the urgency, the Vice Chancellor has accorded sanction to implement the Scheme and Syllabus of BA Political Science Programme in accordance with the new CBCSS UG Regulation 2019, in the University with effect from 2019 Admission onwards, subject to ratification by the Academic Council.

Sanction is therefore accorded for implementing the Scheme and Syllabus of BA Political Science Programme in accordance with CBCSS UG Regulations 2019, in the University with effect from 2019 Admission onwards .

Orders are issued accordingly.(Syllabus appended)

Biju George K

Assistant Registrar

To

1.The Principals of all Affiliated Colleges 2. Director, SDE
Copy to: PS to VC/PA to PVC/ PA to Registrar/PA to CE/JCE I/JCE II/JCE VIII/GA I F/CHMK
Library/Information Centres/SF/DF/FC

Forwarded / By Order

Section Officer

**CHOICE BASED CREDIT AND SEMESTER SYSTEM (CBCSS)
FOR UNDER GRADUATE (UG) PROGRAMME**

UNIVERSITY OF CALICUT



**For
BA POLITICAL SCIENCE
*Under***

**Restructured Curriculum and Syllabi
As per CBCSS
UG Regulations (2019)**

(2019 Admissions Onwards)

III Complementary Courses for other UG Programmes

Complementary Course Model I

POL 1 (2)CO1 Political Science: Introduction to Political Science and Governmental Structures and Processes

POL 4(3) CO2 Political Science: Political Ideas, Concepts and Ideologies

Complementary Course Model II

ICP1(2) CO1 Indian Constitution and Politics: Basic Features and Governmental Structures

ICP4(3) CO2 Indian Constitution and Politics: Federalism, Decentralisation and Political Dynamics

Complementary Course Model III

IPO1(2) CO1: International Politics and Organisation: Introduction and Concepts..

IPO4(3) CO2: International Politics And Organisation: Organisations and Contemporary Issues

.

Complementary Course Model IV

PUA1(2)CO1: Public Administration: Introduction and Basic Concepts

PUA 4(3)CO2: Public Administration: Personnel, Financial and Indian Administration

Note: Colleges can opt any one of the model (Complementary) for their entire course. However, the Colleges shall continue to opt their course, equivalent to their subsidiary papers now offering

BA POLITICAL SCIENCE (Core Courses)

Core Course I - POL1BO1 Foundations of Political Science

This course introduces fundamentals of Political Science, its history and approaches, and an assessment of its critical and contemporary trends. This course aims to introduce certain key aspects of conceptual analysis in Political Science and the skills required to engage in debates surrounding the application of the concepts

Module I

Nature of Political Science:

Complementary Course – Model II

Semester 1/2

(ICP1 (2) CO1) Indian Constitution and Politics: Basic Features and Governmental Structures

At the end of the course, the students will be able to understand the process through which the constitution of India came into existence, its salient features, its philosophical base, fundamental rights, fundamental duties and directive principles of state policy. This course also help students to understand the structure and functions of different organs of governments in India; legislature, executive and judiciary

Module 1-

- a) Importance of Constitution
- b) Constitutional developments with special reference to Govt. of India Acts: 1909; 1919; 1935 and Indian Independence Act 1947

Module 11-

- a) Basic features of the constitution
- b) The Preamble – with special reference to 42nd amendment act
- c) Fundamental Rights and Fundamental Duties,
- d) Directive Principles of State Policies, Tussle between Fundamental Rights and Directive Principles

Module 1II

- a. **Union Executive**- President and Vice President; Prime Minister; Council of Ministers – powers and functions
- b. **Bureaucracy** - Civil Services in India, UPSC
- c. **Union Legislature** – a) Lok Sabha & Rajya Sabha – Composition, powers and functions; Role of the Speaker

Module 1V

- a. **State Executive** – Governor; Chief Minister; Council of Ministers – powers and functions
- b. **State Legislature** – Assembly and Council- Composition, powers and functions

Module V-

- a. Supreme Court and High Court- Composition, jurisdiction and functions
- b. Judicial review, Judicial Activism and Independence of Judiciary

Semester. 3/4

(ICP4 (3) CO2) Indian Constitution and Politics: Federalism, Decentralization and Political Dynamics

This course would help students to critically evaluate the main features of Indian federal system, centre state relations and three tier system of decentralization. The process of constitutional amendments and major amendments is another important discussion in this paper. Students also develop fairly good idea about party system, regionalism, minority rights, etc., by the end of the course.

Module 1-

- a) **Indian Federalism** - Constitutional provisions
- b) Union- State Relations- Legislative, Administrative and Financial provisions
- c) Challenges to Indian federalism
- d) Finance Commission, Niti Ayog, GST Council, Inter State Council- Composition, Powers and Functions

Module 11-

- a) **Panchayath Raj System** in Kerala- 73RD and 74th Constitutional Amendments, People's Planning Programme
- b) Impact of reservation in Panchayath Raj system

Module 111-

- a) Procedure to amend the constitution
- b) Major constitutional amendments with special reference to 1, 42, 44, 52, 86, 101

Module 1V-

- a) Indian Party System- Major features and Emerging trends
- b) Major National and Regional political parties
- c) Regionalism – threat or strengthening of democracy?

Module V-

- a) Constitutional provisions to protect human rights – Civil and Political rights, Socio-Economic and Cultural rights
- b) Protection of minorities – religious, linguistic and sexual minorities, Right to Information Act

- 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. Dr.B.L.Fadia, Indian Government and Politics, Sahitya Bhavan Publications, 2010.
4. Dr.A.P, Avasthi, Indian Government and Politics, Lakshmi Narayan Agarwal, 2012.
5. J.C.Johari, Indian Political System, Anmol Publications, 2008.
6. Grenville Austin, Indian Constitution: A cornerstone of a Nation, OUP, New Delhi, 2008.
7. Brij Kishore Shama, Introduction to the Constitution of India. Prentice Hall, New Delhi, 2007.
8. Bidyut Chakrabarthy, Indian Government and Politics. Sage, New Delhi 2008.
- 9., Lakshmi Kanth, Indian Polity, TATA Magrow, New Delhi2010.
10. A. G. Noorani, Constitutional and Citizen's Rights, OUP, New Delhi, 2006.
11. N P Singh and Rekha Saxsena, Indian Politics, Constitutional Foundations and Institutional Functions, PHI, 2014.

COMPLEMENTARY COURSE MODEL III.

SEMESTER. I/2

IPO1 (2) CO1: International Politics And Organisation: Introduction And Concepts

In this semester, the meaning, nature, scope and importance of international politics will be covered. The students will also be introduced to the major theories, approaches and to main concepts in the area of international politics.

MODULE. I.

(a) Approaches to the study of International Politics, - Political Realism – Kaplan's System theory – Liberalism – Neo-Realism and Neo-Liberalism -

MODULE.II

State System: Evolution – Development – Corollaries of State System – Nature of Contemporary State System.

MODULE.III

a) Concept of Power – National Power – Elements of National Power, significance of National Power.

b) Limitation of National Power.

Balance of Power: meaning and forms – methods of maintaining balance of power – Balance of terror.

Collective Security: Meaning and safeguards – enforcement under

c) U.N.O.

Pacific Settlement of Disputes – its major devices.

Disarmament and Arms Control – Disarmament efforts under U.N.O.

MODULE.IV

Diplomacy – Its meaning, functions and importance – Kinds of modern

Diplomacy – Open diplomacy and summit diplomacy

MODULE.V

Foreign Policy: Meaning – Determinants of Foreign Policy – Basic Principles of India's Foreign Policy.

SEMESTER. 3/4

CERTIFICATE COURSE

HUMAN RIGHTS AND DUTIES

SYLLABUS

MODULE 1.	5 Hrs.
A, Concept and classification of human rights and duties Promotion of Human Rights and Humanitarian Law	
B, Tension between rights and duties	
MODULE 2.	5 Hrs.
A, Evolution of human rights on the international plane U.N and Refugees	
B, Universal Declaration of Human Rights	
MODULE 3.	5. Hrs.
A, International Refugee Law	
B, Human Rights of disadvantaged sections of society in India	
MODULE 4	5Hrs.
A, societal problems of human rights in India	
- Poverty, illiteracy, unemployment etc	
- Domestic violence, child labour etc	
MODULE 5	10 Hrs.
A, Human rights and Indian Constitution	
- Fundamental Rights, Directive Principles, Fundamental Duties etc.	
- Role of Judiciary in protecting Human Rights.	

SACRED HEART COLLEGE FOR WOMEN

CHALAKUDY, THRISSUR, KERALA



AQAR 2020-21 COMMERCE

CRITERION I - CURRICULAR ASPECTS

SUB CRITERION - 1.3.1 - Institution integrates crosscutting issues relevant to Professional Ethics, Gender, Human Values, Environment and Sustainability into the Curriculum.

1.3.1 Courses which address cross cutting issues relevant to Gender, Environment and Sustainability, Human Values and Professional Ethics into the Curriculum

Sl. No	Name of the Course	Course Code	Name of the Programme	Specify the issue(s) dealing with
1	Business Management	BCM1B01	Bcom	Professional Ethics and Human Values
2	Marketing Management	BCM2C02	Bcom	Human Values and Professional Ethics
3	Human Resource Management	BCM3C03	Bcom	Human Values
4	Professional Business Skills	BCM3A12	Bcom	Professional Ethics
5	Entrepreneurship Development	BCM4A13	Bcom	Gender
6	Quantitative Techniques for Business	BCM4C04	Bcom	Professional Ethics
7	Basic Numerical Methods	BCM3A11	Bcom	Professional Ethics
8	Banking and Insurance	BCM4A14	Bcom	Human Values
9	Business Research Methods	BCM5B08	Bcom	Human Values
10	Income Tax Law and Accounts	BCM5B09	Bcom	Professional Ethics
11	Income Tax and GST	BCM6B12	Bcom	Professional Ethics
12	Auditing and Corporate Governance	BCM6B13	Bcom	Human Values and Professional Ethics

13	Computer Applications in Business	BCM5B10	Bcom	Professional Ethics
14	Computerized Accounting with Tally	BCM6B15	Bcom	Professional Ethics
15	Business Environment and Policy	MCM1C01	Mcom	Environment and Sustainability
16	Corporate Governance and Business ethics	MCM1C02	Mcom	Professional Ethics
17	Management Theory and Organisational Behaviour	MCM1C04	Mcom	Human Value and Factors affecting Gender Development
18	Income Tax Law, Practice and Tax Planning	MCM3C12	Mcom	Professional Ethics
19	International Business	MCM2C09	Mcom	Professional Ethics
20	Financial Derivatives and Risk Management	MCM4C14	Mcom	Professional Ethics

SACRED HEART COLLEGE FOR WOMEN

CHALAKUDY, THRISSUR, KERALA



AQAR 2020-21 COMPUTER SCIENCE

CRITERION I - CURRICULAR ASPECTS

SUB CRITERION - 1.3.1 - Institution integrates crosscutting issues relevant to Professional Ethics, Gender, Human Values, Environment and Sustainability into the Curriculum.

Course : MSc Computer Science

Programme: CSS2C08 – COMPUTER NETWORKS

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.

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.

Programme: CSS2C10 – PRINCIPLES OF SOFTWARE ENGINEERING

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 –

Programme: CSS3C11 – ADVANCED DATABASE MANAGEMENT SYSTEM

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 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, modifying 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, ALTER 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.

1.3.1 Courses which address cross cutting issues relevant to Gender, Environment and Sustainability, Human Values and Professional Ethics into the Curriculum

Sl.No	Name of the Course	Course Code	Name of the Programme	Specify the issue(s) dealing with
1.	Computer Organisation and Architecture	CSS1C05	MSc.Computer Science	Environment and sustainability
2.	Computer Networks	CSS2C08	MSc.Computer Science	Professional Ethics
3.	Advanced Database Management system	CSS2C11	MSc.Computer Science	Environment and sustainability
4.	Principles of Software Engineering	CSS2C10	MSc.Computer Science	Human Values