



UNIVERSITY OF CALICUT

**Abstract**

General and Academic– M.Sc Computer Science - Correction in the existing workload distribution in the approved Syllabus - Implemented subject to the ratification of Academic Council - Orders issued.

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**G & A - IV - J**

U.O.No. 5644/2019/Admn

Dated, Calicut University.P.O, 30.04.2019

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*Read:-*1. U.O.No. 5502/2016/AdmnU.O.No. 5502/2016/Admn dated 28.04.2016

2. Item No.3 in the Minutes of the meeting of the Board of Studies in Computer Science P.G held on 08.02.2019

3. Remarks from the Dean Faculty of Science dated 09.04.2019.

**ORDER**

Vide paper read first above, the syllabus of M.Sc Computer Science w.e.f 2014 admission onwards was implemented in this University. The Board of Studies in Computer Science PG at its meeting held on 08.02.2019, vide paper read second above, resolved to approve correction in the workload of the existing syllabus of M.Sc Computer Science with Theory workload of 17 and Practical workload of 8 per week, uniformly in all the 4 semesters.

The Dean, Faculty of Science, vide paper read third above has approved the recommendation in the Minutes of the Board of Studies in Computer Science P.G held on 02.04.2019.

The Vice Cahcellor, after having considered the exigency, accorded sanction to implement the resolution vide Item No.3 minutes of the meeting of the Board of Studies in Computer Science P.G held on 02.04.2019 to approve the correction in the workload of the existing syllabus of M.Sc Computer Science with Theory workload of 17 and Practical workload of 8 per week, uniformly in all the 4 semesters, subject to the ratification of the Academic Council.

Sanction has therefore been accorded to implement the correction in the workload of the existing syllabus of M.Sc Computer Science as detailed above, subject to the ratification of the Academic Council.

Orders are issued accordingly.

(Syllabus appended)

Biju George K

Assistant Registrar

To

All Affiliated Colleges offering M.Sc Computer Science

Copy to : PS TO VC,PA TO PVC,PA TO REGISTRAR,GA-II,SF/DF/FC

Forwarded / By Order

Section Officer

**UNIVERSITY OF CALICUT**  
**THENHIPALAM, CALICUT UNIVERSITY P.O**



**DEGREE OF**  
**MASTER OF SCIENCE (MSc)**  
**IN**  
**COMPUTER SCIENCE**  
**(CHOICE BASED CREDIT AND SEMESTER SYSTEM)**

**UNDER THE**  
**FACULTY OF SCIENCE**

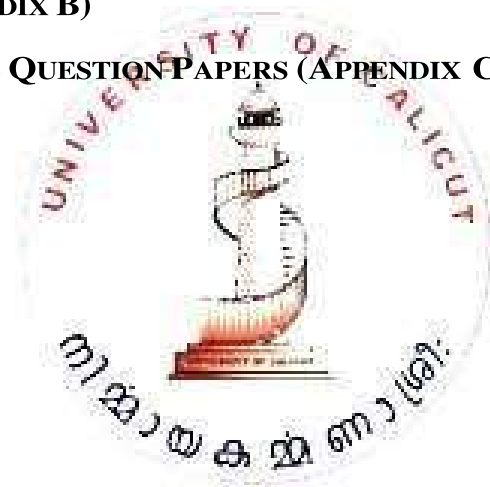
**SYLLABUS**  
**(FOR THE STUDENTS ADMITTED FROM THE ACADEMIC YEAR 2014 – 15 ONWARDS)**

**BOARD OF STUDIES IN COMPUTER SCIENCE &**  
**APPLICATIONS (PG)**

**THENHIPALAM, CALICUT UNIVERSITY**  
**P.O KERALA, 673 635, INDIA**  
**DECEMBER, 2015**

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# REGULATIONS FOR THE DEGREE OF MASTER OF SCIENCE (COMPUTER SCIENCE)

EFFECTIVE FROM THE ACADEMIC YEAR 2014 - 15

## 1 PROGRAMME OBJECTIVES

The course of the MSc (Computer Science) programme is designed with the following objectives:

- a) To equip students to take up challenging research oriented responsibilities and courses for their higher studies/profession.
- b) To train and equip the students to meet the requirements of the Software industry in the country and outside.
- c) To motivate and support the students to prepare and qualify challenging competitive examinations such as JRE/NET/JAM/GATE etc.

## 2 GENERAL PROGRAMME STRUCTURE

**Duration:** The duration of the MSc (Computer Science) programme shall be 4 semesters distributed over a period of 2 academic years. The odd semesters (1, 3, 5) shall be from June to October and the even Semesters (2, 4, 6) shall be from November to March. Each semester shall have 90 working days inclusive of all examinations.

**Courses:** The programme includes four types of courses, viz., Core courses (Code C) and Elective Courses (Code E). Core courses are of theory and practical oriented. There is a Project Work which is to be undertaken by all students. No course shall have more than 4 credits. For project work and General Viva-Voce, the maximum credits shall be 8. General Viva-Voce covers questions from all courses in the programme.

**Attendance:** A student shall be permitted to appear for the semester examination, only if (s)he secures not less than 75% attendance in each semester. Attendance shall be maintained by the concerned department. Condonation of shortage of attendance to a maximum of 9 days in a semester subject to a maximum of two times during the whole period of the MSc Computer Science programme may be granted by the University. Benefits of attendance may be granted to students who attend the approved activities of college/university with prior concurrence of the head of the institution. Participation in such activities may be treated as presence in lieu of their absence on production of participation / attendance certificate in curricular / extracurricular activities. It should be limited to 9 days in a semester.



The condonation of shortage of attendance shall be granted according to the existing prescribed norms.

If a student registered in first semester of the MSc Computer Science programme is continuously absent from the classes for more than 14 working days at the beginning of the semester without informing the authorities the matter shall immediately be brought to the notice of the Registrar of the University. The names of such students shall be removed from the rolls.

Admission to repeat courses should be within the sanctioned strength. However if more candidates are there, the candidates who have suffered serious health problems, on production of a medical certificate issued by a physician not below the rank of a Civil Surgeon in Government service, may be permitted to repeat the course, with a written order issued by the Registrar, Calicut University (by considering his / her SGPA / CGPA and percentage of attendance). The number of such candidates should not exceed two.

**Project:** Every student of the MSc Computer Science programme shall have to work on a project of not less than 8 credits under the supervision of a faculty member as per the curriculum.

### 3 ADMISSION

The admission to all programmes will be as per the rules and regulations of the University. The eligibility criteria for admission shall be as announced by the University from time to time.

Separate rank lists shall be drawn up for reserved seats as per the existing rules. The college shall make available to all students admitted a prospectus listing all the courses offered including electives in various departments during a particular semester. The information provided shall contain title of the course and credits of the course.

There shall be a uniform calendar prepared by the University for the registration, conduct /schedule of the courses, examinations and publication of results. The University shall ensure that the calendar is strictly followed.

There shall be provision for inter collegiate and inter university transfer in third semester within a period of two weeks from the date of commencement of the semester. There shall be provision for credit transfer subject to the conditions specified by the Board of Studies concerned.

### 4 REGISTRATION

A student shall be permitted to register for the programme at the time of admission. A student shall be permitted to register for the examination also. If registration for

examination is not possible owing to shortage of attendance beyond condonation limit, the student shall be permitted to move to the next semester. In such cases, a request from the student may be forwarded through the principal of the college to the University within two weeks of the commencement of that semester. An undertaking from the Principal may also be obtained stating that the students will be permitted to make up the shortage of attendance in that semester after completing 6 semesters (Students shall make up the shortage of attendance in 'Repeat Semester' after completion of the programme).

The 'Repeat Semester' shall be possible only once for the entire programme and shall be done in the same college. A student who registered for the course shall successfully complete the programme within 4 years from the year of first registration. If not, such candidate has to cancel the existing registration and join afresh as a new candidate. The students who have attendance within the limit prescribed, but could not register for the examination have to apply for the token registration, within two weeks of the commencement of the next semester.

## 5 COURSE EVALUATION

The evaluation scheme for each course shall contain two parts: (a) internal evaluation and (b) external evaluation. 25% weight shall be given to internal evaluation and the remaining 75% to external evaluation. Therefore the ratio of weight between internal and external is 1:3. Both internal and external evaluation shall be carried out using Direct grading system.

### INTERNAL EVALUATION

The internal evaluation shall be based on predetermined transparent system involving periodic written tests, assignments, seminars and attendance in respect of theory courses and based on lab tests, lab skill records/viva and attendance in respect of practical courses.

### THEORY PAPERS

The weightage assigned to various components for internal evaluation for theory papers is as shown below.

Components	Weightage
Test papers with at least 25% questions based on problems or programs (minimum two)	2
Assignments (minimum two) such as homework, problem solving, group discussions, quiz, literature survey, term-project, software exercises, etc.	1
Regularity in the class	1
Seminar	1
<b>Total</b>	<b>5</b>

To ensure transparency of the evaluation process, the internal assessment grade awarded to the students in each course in a semester shall be published on the notice board at least one week before the commencement of external examination. There shall not be any chance for improvement for internal grade.

The course teacher shall maintain the academic record of each student registered for the course, which shall be forwarded to the University, through the college Principal.

### **PRACTICAL PAPERS**

The mark distribution to award internal continuous assessment marks for practical course should be as follows:

<b>Components</b>	<b>Weightage</b>
Rough record for each experiment	1
Performance in the laboratory – coding, results	1
Fair Record	1
Regularity	1
End-semester test	1
<b>Total</b>	<b>5</b>

#### **Note:**

1. All students should have a rough record (observation note book) in which they write all the works to be carried out in the lab prior to his/her entering the lab. (S)he may also note down the i/p and o/p that (s)he gives for program verification in the observation note book (rough record).
2. All lab works should be neatly recorded in a Laboratory Record Book (Fair Record) in written form. However program results can be pasted in the left hand side of the fare record.
3. Chairperson, Board of Examination (PG) has to prepare the modalities of the practical papers (list of experiments to be done, number of minimum experiments required in the practical record etc) and distributed to all departments concerned, at the beginning of each semester itself. Model lists of experiments are provided with the syllabus for each practical session.
4. No candidate will be permitted to attend the end-semester test unless he/she produces certified record of the laboratory.
5. Full credit for regularity in the class can be given only if the candidate has secured minimum 90% attendance in the course. Attendance evaluation for each course is as follows:

Percentage of Attendance	Weightage
90% and above	4
85 to 89.9%	3
80 to 84.9%	2
75 to 79.9%	1
Below 75 %	0

### EVALUATION COMMITTEE (EC)

For the evaluation of the Project Work (CSS4C02) and Term Paper (CSS2P07), an evaluation committee is to be constituted. One faculty is to be designated as the Course Coordinator for these courses. Committee is to be constituted by the head of the department (HOD) and (s)he shall be the Chairperson of the committee. In addition to the HOD, the Course Coordinator and at least three faculty members can be designated as the members of the committee. In case HOD is unable to represent himself/herself in the committee, (s)he can nominate a faculty in lieu for him/her as a member and the chairperson of the committee. In addition to this, faculty guiding a particular student will also be a member of the committee. At least one member of the committee should be a lady, if lady faculties are available in the department concerned. The Coordinator has to set the schedule for presentation and submission of the reports. While calculating the final score, 25% weight is to be given for the scores awarded by the guide to the student and the rest 75% weight is to be given for the average of the scores awarded to the student by remaining committee members.

### TERM PAPER

A tentative list of the components for evaluation of Term Paper is as shown below. Evaluation committee can decide about the actual composition of the components and scores to be awarded for each component.

Component
Relevance of the Topic, Statement of Objectives, Correctness
Quality of Literature Survey / Product Review
Methodology / tools Adopted
Quality of Contributions
Quality of Implementation / Simulation
Quality of Testing
Identification of Future Work
Quality of the Term Paper Report
Publications/Presentations/Communications out of the Term Paper
Quality of Presentation

## PROJECT WORK

Total weightage for Project Work (and General Viva Voce) shall be 72 (36 x 2). Hence the total grade points shall be 288 (72 x 4). Scheme to award internal continuous assessment grades for project work should be as follows:

Components	Weightage
Monthly progress	4
Regularity	1
<b>Total</b>	<b>5</b>

Regularity is to be reported by the guide to the EC, considering factors such as students' commitment to work, timely submission of assignments, punctuality and availability.

Monthly progress can be conveniently evaluated in various phases such as Formulation of Project Problem, Analysis, Design, Implementation and Testing. In each of these phases, students can be asked to make presentations of their work and submit interim reports for each phase. Components for evaluation of monthly progress is as shown below.

Component	Grade Points
Relevance of the Topic, Statement of Objectives, Methodology	20
Quality of Literature Survey/Product Review	20
Quality of Analysis Phase	20
Quality of Design Phase	20
Quality of Implementation/Simulation	50
Quality of Testing/Result Analysis	20
Quality of Contributions	20
Identification of Future Work	8
Quality of Project Report	50
Publications/Presentations out of the Project Work*	10
Quality of Presentation	15
Demonstration of the Project Work	10
General Viva Voce	25
<b>Total</b>	<b>288</b>
Grade is calculated by dividing total number of points obtained by a student by 72	

\*In case at least one student of the batch has a publication/presentation out of his/her project work in a workshop/conference/journal/IT fest etc, this score is to be awarded for the student; no other students will deserve score for this component! If none of the students in the batch could make such an edge, then the score for this component is to be added with the component "Identification of Future Work".

The Evaluation Committee can decide about the components for monthly evaluation from the above list. See [Appendix B](#) for a sample evaluation.



## EXTERNAL EVALUATION

- End semester examinations for theory and practical courses will be conducted by the University. For practical courses, end semester examinations will be conducted in even semesters.
- Evaluation for the following courses will be done internally by the concerned departments:
  - CSS2P07 Term Paper
  - CSS4E01 Elective IV
  - CSS4C01 Principles of Software Engineering
- The external examinations in theory and practical courses (excluding three courses mentioned above) are to be conducted by the University with question papers set by external experts.
- External project evaluation shall be conducted at the end of the fourth semester.
- The evaluation of the answer scripts shall be done by examiners based on a well-defined scheme of valuation. The external evaluation shall be done immediately after the examination preferably in a Centralized Valuation Camp.
- Practical examinations, project evaluation and General Viva-Voce shall be conducted by two external examiners. General Viva-Voce covers questions from all courses in the programme.
- For Project Work, if the performance of the student is below the expected benchmark (E grade), student will be given a chance to reappear **within six weeks (from the date of evaluation)** to present the work again, after incorporating the changes suggested by the examiners. Examiners have to submit their suggestions in writing to Chairperson, Board of Examinations PG and the concerned HOD **on the day of examination itself**. HOD has to convey the matter ASAP to the students concerned. The Chairperson, Board of Examinations has to inform the concerned HOD about the schedule for resubmission and revised evaluation **within seven days of the date of evaluation**. While submitting the revised report, the student has to produce a certificate (signed by the student, the guide and the HOD) stating that the changes suggested by the examiners are incorporated in the revised report. Also a summary of the changes made in the revised report as per the suggestions of the examiners is to be submitted (as a separate manuscript) with the revised report. If the result of the second evaluation is worth E grade, (s)he will have to appear for the end semester examinations along with regular students. This provision is only applicable for Project Work evaluation.
- Failed or improvement candidates will have to appear for the end semester examinations along with regular students.

## REVALUATION

- Photocopies of the answer scripts of the end semester examinations shall be made available to the students for scrutiny on request and revaluation/scrutiny of answer scripts shall be done as per the existing rules prevailing in the University.
- Awarding of a higher grade after revaluation may be given only after a second revaluation.

## IMPROVEMENT/SUPPLEMENTARY

A maximum of two courses (Core or Elective) can be improved in each semester. Improvement of a particular semester can be done only once. The student shall avail the improvement chance in the succeeding year after the successful completion of the semester concerned. The internal marks already obtained will be carried forward to determine the grades/marks in the improvement examination. If the candidate fails to appear for the improvement examination after registration, or if there is no change in the results of the improvement examination appeared, the marks/grades obtained in the first appearance will be retained.

Improvement and supplementary examinations cannot be done simultaneously.

## 7 PATTERN OF QUESTION PAPERS

Duration of End Semester examinations for both theory and practical courses shall be 3 hours.

### QUESTION PAPERS - THEORY

Section	No of Questions		Weightage for each question	Total
	To be Asked	To be Answered		
A: Short answer questions <sup>+</sup>	12	12	1	12
B: Short Essay	9	6	2	12
C: Essays*	6	3	4	12
			<b>Total</b>	<b>36</b>

<sup>+</sup>MCQ / fill in the blank / matching /one word / etc. Each question is to be answered in 7 minutes duration and should extract the critical knowledge acquired by the candidate in the subject.

\* Programs / Pseudocode / Problems / Derivations / Narrations. A question can have subdivisions. Each question is to be answered in 30 minutes. May be asked as a single question or in parts.

## QUESTION PAPERS - PRACTICAL

Mark distribution for practical courses shall be as follows.

Component	Weightage
Algorithm/Flow diagram/UI diagram/Class Diagram	1
Implementation	1
Result/Output	1
Record	1
Viva	1
<b>Total</b>	<b>5</b>

## PROJECT WORK

Total weightage for Project Work (and General Viva Voce) shall be 72 (36 x 2). Hence the total grade points shall be 288 (72 x 4).

The scheme of evaluation for project work shall be:

Component	Grade Points
Relevance of the Topic, Statement of Objectives, Methodology	20
Quality of Literature Survey/Product Review	20
Quality of Analysis Phase	20
Quality of Design Phase	20
Quality of Implementation/Simulation	50
Quality of Testing/Result Analysis	20
Quality of Contributions	20
Identification of Future Work	8
Quality of Project Report	50
Publications/Presentations out of the Project Work*	10
Quality of Presentation	15
Demonstration of the Project Work	10
General Viva Voce	25
<b>Total</b>	<b>288</b>

Grade is calculated by dividing total number of points obtained by a student by 72

\*In case at least one student of the batch has a publication/presentation out of his/her project work in a workshop/conference/journal/IT fest etc, this score is to be awarded for the student; no other students will deserve score for this component! If none of the students in the batch could make such an edge, then the score for this component is to be added with the component "Identification of Future Work".

## 8 CREDIT SYSTEM

Each course shall have a specific credit (whole number) depending on the academic load and the nature and importance of the course. The credit associated with each course is as listed in the prescribed scheme and syllabi.



Direct Grading System based on a 5 point scale is used to evaluate the performance (External and Internal Examination of students).

- a) One Credit is equivalent to 4 periods of 60 minutes each, for theory and practical.
- b) Total credits of the MSc Computer Science Programme shall be 87. The following is the semester wise credits a student must earn for the award of the degree:

Semester	Duration	Credits
I	Six Months	24
II	Six Months	25
III	Six Months	24
IV	Six Months	14
<b>Total</b>	<b>24 Months</b>	<b>87</b>

## 9 DIRECT GRADING SYSTEM

- Direct Grading System based on a 4 point scale is used to evaluate the performance (external and internal examination of students).
- Each course is evaluated by assigning marks with a letter grade (A, B, C, D, E).

Grade	Performance	Grade Point	Grade Range
A	Excellent	4	3.50 - 4.00
B	Very Good	3	2.50 - 3.49
C	Good	2	1.50 - 2.49
D	Average	1	0.50 - 1.49
E	Poor	0	0.00 - 0.49

- Each course is evaluated by assigning a letter grade (A,B,C,D or E) to that course by the method of direct grading. The internal (weightage =1) and external weightage = 3) components of a course are separately graded and then combined to get the grade of the course after taking into account of their weightage.
- An aggregate of C grade (external and internal put together) is required in each course for a pass and also for awarding the degree.
- A student who fails to secure a minimum grade for a pass in a course will be permitted to write the examination along with the next batch.
- After the successful completion of a semester, Semester Grade Point Average (SGPA) of a student in that semester is calculated using the formula given below. For the successful completion of a semester, a student should pass all courses. However, a student is permitted to move to the next semester irrespective of SGPA obtained.

- SGPA of the student in that semester is calculated using the formula

$$\text{SGPA} = \frac{\text{Sum of the credit points of all courses in a semester}}{\text{Total credits in that semester}}$$

- The Cumulative Grade Point Average (CGPA) of the student is calculated at the end of a programme. The CGPA of a student determines the overall academic level of the student in a programme and is the criterion for ranking the students. CGPA can be calculated by the following

$$\text{CGPA} = \frac{\text{Total credit points obtained in four semesters}}{\text{Total credits acquired}}$$

- SGPA and CGPA shall be rounded off to two decimal places. CGPA determines the broad academic level of the student in a programme and is the index for ranking students (in terms of grade points).
- An overall letter grade (Cumulative Grade) for the entire programme shall be awarded to a student depending on her/his CGPA .

## 10 GRADE CARDS

The University shall issue to the students grade/marks card (by online) on completion of each semester, which shall contain the following information:

- i. Name of the University.
- ii. Name of the college.
- iii. Title of the Programme MSc Computer Science.
- iv. Semester concerned.
- v. Name and Register Number of the student.
- vi. Code number, Title and Credits of each course opted in the semester.
- vii. Internal marks, External marks, total marks, Grade point (G) and Letter grade in each course in the semester.
- viii. The total credits, total credit points and SGPA in the semester.

The Final Grade Card issued at the end of the final semester shall contain the details of all courses taken during the entire programme including those taken over and above the prescribed minimum credits for obtaining the degree. The Final Grade Card shall show the CGPA and the overall letter grade of a student for the entire programme.

## **11 AWARD OF DEGREE**

The successful completion of all the courses prescribed for the MSc Computer Science programme with C grade shall be the minimum requirement for the award of MSc Computer Science programme degree.

## **12 GRIEVANCE REDRESSAL COMMITTEE**

### **COLLEGE LEVEL**

The College shall form a Grievance Redressal Committee in each department comprising of course teacher and one senior teacher as members and the HOD as Chairman. The Committee shall address all grievances relating to the internal assessment grades of the students. There shall be a college level Grievance Redressal Committee comprising of student advisor, two senior teachers and two staff council members (one shall be an elected member) as member and the Principal as the Chairperson.

### **UNIVERSITY LEVEL**

The University shall form a Grievance Redressal Committee as per the existing norms.

## **13 TRANSISTORY PROVISION**

Notwithstanding anything contained in these regulations, the Vice-Chancellor shall, for a period of one year from the date of coming into force of these regulations, have the power to provide by order that these regulations shall be applied to any programme with such modifications as may be necessary.

## **14 REPEAL**

The Regulations now in force in so far as they are applicable to programmes offered by the University and to the extent they are inconsistent with these regulations are hereby repealed. In the case of any inconsistency between the existing regulations and these regulations relating to the Choice Based Credit Semester System in their application to any course offered in a College, the latter shall prevail.

## MASTER OF SCIENCE COMPUTER SCIENCE PROGRAMME STRUCTURE

LEGEND	
Item	Description
C	Credits
E	External Component (%)
I	Internal Component (%)
L	Lecture Hours
P	Practical Hours
T	Total

### Semester I

No	Course Code	Course Name	C	Weightage			Hrs/wk		
				I	E	T	L	P	T
1.1	CSS1C01	Discrete Mathematical Structures	4	25	75	100	4		4
1.2	CSS1C02	Advanced Data Structures	4	25	75	100	3	2	5
1.3	CSS1C03	Theory of Computation	4	25	75	100	4		4
1.4	CSS1C04	The Art of Programming Methodology	4	25	75	100	2	2	4
1.5	CSS1C05	Computer Organization and Architecture	4	25	75	100	4		4
1.6	CSS1P06	Practical I	4	25	75	100		4	4
<b>Total</b>			<b>24</b>				<b>17</b>	<b>8</b>	<b>25</b>

### Semester II

No	Course Code	Course Name	C	Weightage			Hrs/wk		
				I	E	T	L	P	T
2.1	CSS2C01	Design and Analysis of Algorithms	4	25	75	100	3	1	4
2.2	CSS2C02	Operating System Concepts	4	25	75	100	3	1	4
2.3	CSS2C03	Computer Networks	4	25	75	100	3	1	4
2.4	CSS2C04	Computational Intelligence	4	25	75	100	4		4
2.5	CSS2E05	Elective I	4	25	75	100	4		4
2.6	CSS2P06	Practical II	4	25	75	100		4	4
2.7	CSS2P07*	Term Paper	1	100		100		1	1
<b>Total</b>			<b>25</b>				<b>17</b>	<b>8</b>	<b>25</b>

\* Evaluation is to be done fully internally for this paper

### List of Elective Courses (Semester II)

No	Course Code	Course Name
2.5a	CSS2E05a	Computer Graphics
2.5b	CSS2E05b	Introduction to Soft Computing
2.5c	CSS2E05c	Web Technology
2.5d	CSS2E05d	Bioinformatics
2.5e	CSS2E05e	Computer Optimization Techniques
2.5f	CSS2E05f	Numerical and Statistical Methods

### Semester III

No	Course Code	Course Name	C	Weightage			Hrs/wk		
				I	E	T	L	P	T
3.1	CSS3C01	Advanced Database Management System	4	25	75	100	3	1	4
3.2	CSS3C02	Principles of Compilers	4	25	75	100	3	1	4
3.3	CSS3C03	Object Oriented Programming Concepts	4	25	75	100	3	1	4
3.4	CSS3E04	Elective II	4	25	75	100	4		4
3.5	CSS3E05	Elective III	4	25	75	100	4		4
3.6	CSS3P06	Practical III	4	25	75	100		5	4
<b>Total</b>			<b>24</b>				<b>17</b>	<b>8</b>	<b>25</b>

### List of Electives for CSS3E04

No	Course Code	Course Name
3.4a	CSS3E04a	Pattern Recognition
3.4b	CSS3E04b	Wireless and Mobile Networks
3.4c	CSS3E04c	Cryptography and Network Security
3.4d	CSS3E04d	Advanced Web Technology
3.4e	CSS3E04e	Virtualisation and Cloud Computing
3.4f	CSS3E04f	Data Warehousing and Data Mining

### List of Electives for CSS3E05

No	Course Code	Course Name
3.5a	CSS3E05a	Data Compression
3.5b	CSS3E05b	Pervasive Computing
3.5c	CSS3E05c	System Security
3.5d	CSS3E05d	Molecular Simulation and Modeling
3.5e	CSS3E05e	Fundamentals of Big Data
3.5f	CSS3E05f	Web Engineering

## Semester IV

No	Course Code	Course Name	Credit	Weightage			Hrs/wk		
				I	E	T	L	P	T
4.1	CSS4E01*	Elective IV	4	100		100	4	1	5
4.2	CSS4C01*	Principles of Software Engineering	2	100		100	2	1	3
4.3	CSS4C02	Project Requirements Analysis & Design Related Discussion	8	100	0	100	5	0	5
		Project Coding, Testing & Implementation Related Discussion		100	0	100	5	0	5
		Project Lab Work		100	0	100	0	6	6
		Project Evaluation & Assessment		25	75	100	1	0	1
<b>Total</b>			<b>14</b>				<b>17</b>	<b>8</b>	<b>25</b>
<b>Total Credits (Sem I – IV)</b>						<b>87 Credits</b>			

\*Evaluation is to be done Internally for these papers (by providing 25% weightage for continues assessment and 75% weightage for the internal examination)

Note:-

- Evaluation for CSS4C01 and CSS4E01 is to be carried out as follows:
  - 25% weightage for the following components:

Components for Continuous Evaluation	Weightage
Test papers with at least 25% questions based on problems or programs (minimum two)	2
Assignments (minimum two) such as homework, problem solving, group discussions, quiz, literature survey, term project, software exercises etc.	1
Regularity in the class	1
Seminar	1
<b>Total</b>	<b>5</b>

- 75% weightage for the End Semester Examination which is to be conducted by the concerned department. Question papers for the examinations are to be prepared in the format specified for university examinations with 36 weightage.
- Suppose that a student got 3.5 points for the components of continuous evaluation and 3.0 points for the End Semester Examination. The total grade point is to be calculated as follows:  $(1 \times 3.5 + 3 \times 3.0)/4 = 3.13$ .



### List of Electives for CSS4E01

No	Course Code	Course Name
4.1a	CSS4E01a	Digital Image Processing
4.1b	CSS4E01b	Advanced Topics in Database Design
4.1c	CSS4E01c	Software Development for Portable Devices
4.1d	CSS4E01d	Storage Area Networks
4.1e	CSS4E01e	Semantic Web
4.1f	CSS4E01f	Advanced Java Programming

## Semester I

### CSS1C01 | Discrete Mathematical Structures

<b>Course Number:</b> 1.1	<b>L</b>	<b>P</b>	<b>C</b>
<b>Contact Hours/Week:</b> 4	<b>4</b>	<b>0</b>	<b>4</b>
<b>Number of Credits:</b> 4			
<b>Number of Contact Hours:</b> 60 Hrs			
<b>Prerequisite/Exposure:</b> None			
<b>Course Evaluation:</b> 25% (Internal) + 75% (External)			

### Objectives

- To introduce discrete mathematics concepts necessary to understand basic foundation of Computer Science.

### Course Outline

#### Unit I

Sets and Mathematical Logic: Set Theory - Types of sets, Set operations, Principles of Inclusion and Exclusion. Mathematical Logic - Propositional Calculus - Statement, Connectives, Conditional and Biconditional, Equivalence of Formula, Well Formed Formula, Tautologies, Duality Law, Functionally Complete Sets of Connectives, Normal Forms, Theory of Inference for the Statement Calculus, Predicate Calculus - Statement Functions, Variables and Quantifiers, Free and Bound Variables, Theory of Inference for the Predicate Calculus.

#### Unit II

Functions and Relations: Functions – Types of Functions, Composition of Functions and Inverse Functions. Relations - Relations and Their Properties, Functions as relations, Closure of Relations, Composition of relations, Equivalence Relations and Partitions. Partial Ordering, Hasse Diagram. The Pigeon Hole Principle.