ALAGAPPA CHETTIAR GOVERNEMNT COLLEGE OF ENGINEERING & TECHNOLOGY

KARAIKUDI –630 003

An Autonomous Institution, Affiliated to Anna University, Chennai

B.E. COMPUTER SCIENCE ENGINEERING

REGULATIONS – 2019, CURRICULUM & SYLLABUS FOR FULL TIME

Applicable to the students admitted from the academic year 2019—2020 onwards.

CONTENT

1. College Vision and Mission 1
2. Department Vision and Mission 2
3. Programed Outcomes (PO) 3
4. Programed Educational Objective (PEO) 4
5. Programed Specific Outcomes (PSO) 5
6. Regulation 2019 UG (Full time) 7
7. I Year (Full Time) Curriculum and Syllabus 25
8. III Sem - VIII Sem (Full Time & Part Time) Curriculum and Syllabus 51

Alagappa Chettiar Government College of Engineering and Technology

Karaikudi – 630 003.

Sivagangai District, Tamilnadu
(An Autonomous Institution, Permanently affiliated to Anna University, Chennai)
(Accredited with B++ Grade by NAAC)

COLLEGE VISION AND MISSION

Vision

Our commitment as a Centre of Engineering Education is to impart technical knowledge par excellence, motivate the learners in research, evolve result-oriented, innovative techniques in Engineering, provide necessary career guidance, and train our students in leadership qualities so as to achieve better productivity and prosperity for our country.

Mission

Constantly updating the departmental resources, facility and other infrastructure by acquiring state of art equipment. Imparting constant in–service training to the faculty and supporting staff. Providing state of art education and training to the students. Motivating the students to excel and augmenting their knowledge through continuing education programs. Providing soft skill development learning to students.

DEPARTMENT OF

COMPUTER SCIENCE AND ENGINEERING

VISION

Commitment to continuously improve educational environment to provide and develop graduates having strong academic and technical knowledge required to achieve excellence in their profession and career.

MISSION

1. Constantly updating the departmental resources, faculty and other infrastructure by acquiring state of the art equipment's and by imparting constant in service training to the faculty and supporting staff.
2. To provide excellent education and to prepare students for carrier as computer scientists, industrialist, academician, researcher and developer to evolve with their innovative ideas and applications.
3. To inculcate professional behaviours, strong ethical values and leadership abilities in the young minds so as to work with a commitment to the progress of our nation.

PROGRAM OUTCOMES

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM EDUCATIONAL OBJECTIVES

Program Educational Objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve after graduation.

The **Program Education Objectives** (PEOs) of B.E. Computer Science and Engineering Program are:

PEO1: Excel in professional career and /or higher education by acquiring knowledge and also in inter disciplinary domains.

PEO2: Explore the real life problems and take the initiative to solve the social issues which are technically and economically feasible.

PEO3: Inculcate to follow the professionalism with ethical conscious , inter personal skills with excellent presentation skills

PROGRAM SPECIFIC OUTCOMES

1. Apply standard Software Engineering practices and strategies in real-time software project development using open-source programming environment or commercial environment to deliver quality product for the organization success

2. Design and develop computer programs/computer-based systems in the areas related to algorithms, networking, web design, cloud computing, IoT and data analytics of varying complexity.

3. Acquaint with the contemporary trends in industrial/research settings and thereby innovate novel solutions to existing problems

ALAGAPPA CHETTIAR GOVERNMENT COLLEGE OF ENGINEERING & TECHNOLOGY

KARAIKUDI – 630 003

(An Autonomous Institution, Affiliated to Anna University, Chennai)

Regulations – 2019

(CHOICE BASED CREDIT SYSTEM)

Degree of Bachelor of Engineering

(B.E.)

(Applicable to the students who are admitted from the academic year 2019-2020 onwards)

ALAGAPPA CHETTIAR GOVERNMENT COLLEGE OF ENGINEERING & TECHNOLOGY

KARAIKUDI – 630 003

(An Autonomous Institution, Affiliated to Anna University, Chennai)

Regulations – 2019

(CHOICE BASED CREDIT SYSTEM)

FOR

Degree of Bachelor of Engineering (B.E)

(Applicable to the students admitted from the academic year 2019-2020 onwards)

1. Preliminary definitions and nomenclature

In these Regulations, unless the context otherwise requires:

(i) "Programme" means Degree Programme, that is B.E. Degree Programme.

(ii) "Discipline" means specialization or branch of B.E. Degree Programme, like Civil Engineering, Mechanical Engineering, etc.

(iii) "Course" means a theory or practical subject that is normally studied in a semester, like Mathematics, Physics, etc.

(iv) "Head of the Institution" means the Principal of the Institution.

(v) "Controller of Examinations" means the authority of the Institution who is responsible for all Examinations related activities of the Institution.

(vi) "University" means ANNA UNIVERSITY

2. Admission

2.1 Regular Admission

Candidates seeking admission to the First semester B.E degree Programme should have passed the Higher secondary examination of (10+2) curriculum (Academic stream) prescribed by the Government of Tamilnadu with Mathematics, Physics and Chemistry as three of the four subjects of study under Part III or any examination of any other University or authority accepted by the syndicate of Anna University, Chennai as equivalent thereto or should have passed the Higher secondary examinations of vocational stream (Vocational groups in Engg. / Tech.) as prescribed by the Government of Tamilnadu.

2.2 Lateral Entry Admission

2.2.1 The candidates who possess the Diploma in Engg. / Technology awarded by the State Board of Technical Education, Tamilnadu or its equivalent are

eligible to apply for direct admission to the third semester of B.E degree Programme under Lateral Entry Scheme in the branch corresponding to the branch of study.

or

2.2.3 The candidates who possess the Degree of science (B.Sc) (10+2+3 stream) with mathematics as a subject at the +2 level are eligible to apply for admission to the third semester of B.E Degree Programme. Such candidate shall undergo two additional engineering subjects in the third and fifth semester or fourth and six semesters respectively as prescribed by the respective discipline. (Annexure – I).

3. Programmes Offered

A candidate may be offered admission to any one of the disciplines approved by AICTE and it is offered by this Institution. The Programme offered by the institution is given in Annexure II.

4. Structure of the Programme

The duration of UG Degree Programme is to be normally of 4 academic years (=8 Semesters), with the year being divided into two Semesters of 20 weeks (>=90 working days) consisting of Continuous Internal Evaluation **(CIE)** in the Semester & Semester End Examination **(SEE)** in every semester.

4.1 Choice Based Credit System (CBCS)

The CBCS provides choice to the students to select a number of courses from the prescribed courses (core, elective or minor or soft skill courses, etc.) in order to earn required credit for the award of degree.

4.2 Course

Usually referred to, as 'papers' is a component of a Programme. All courses need not carry the same weight. The courses should define learning objectives and learning outcomes. A course may be designed to comprise lectures/ tutorials/laboratory work / field work / outreach activities/ project work / vocational training /viva / seminars / term papers / assignments / presentations / self-study etc. or a combination of some of these. The typical course structure suggested by AICTE is shown in Annexure – III. The courses of a Programme are categorized as follows:

(i) Humanities and Social Sciences (HS) courses, Engineering Ethics and Human Values, Communication skills, Environmental Science and

Engineering.

(ii) Basic Sciences (BS) courses include Mathematics, Physics, Chemistry, Biology, etc.

(iii) Engineering Sciences (ES) courses include Engineering practices, Engineering Graphics, Basics of Electrical / Electronics / Mechanical / Computer Engineering, Instrumentation etc.

(iv) Professional Core Courses (PC): A course which is compulsorily studied by a student for the requirement of a programme in his / her discipline of study.

(v) Professional Elective Courses (PE): Generally, a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline /domain or nurtures the candidate's proficiency/ skill is called Professional Elective Course.

(vi) Open Elective Courses (OE): An elective course chosen generally from other discipline / subject, with an intention to seek interdisciplinary exposure is called an open elective. Every student shall earn 9 credits by choosing three of the open elective courses from the open elective list offered by different departments. While choosing the electives, students shall ensure that they do not opt for the courses with syllabus contents of which are similar to that of their departmental core/elective courses.

(vii) Employability Enhancement Courses (EEC) include Project Work and/or Internship, Seminar, Professional Practices, Case Study and Industrial/Practical Training.

(viii) Mandatory Courses prescribed by AICTE/UGC (not for credit calculation)

(ix) Self Study Courses: An elective course designed to acquire a special/advanced knowledge, such as supplement study/support study to a project work, and a candidate studies such a course on his own with an advisory support by a teacher is called a Self Study. A student shall undergo two self- study courses for the entire duration of study.

(x) One Credit Courses: One credit course shall be offered by the Department with the prior approval from the BOS and Academic Council. Normally one credit courses to be designed by Industrial / Academic expert for 15 contact hours. The credits earned through the one credit courses shall be

over and above the minimum credit requirement prescribed in the curriculum. The students shall undergo one credit courses offered in other Departments with the permission of Head of Department.

(xi) Online Courses: Students shall earn credit through online courses offered by international / National recognized Institutions with prior permission from the respective Head of the Department.

(xii) Audit Courses: Students shall be able to register for Courses outside the prescribed range of Credits for audit only, when interested to supplement their knowledge/skills; Optional for students to register these course and/or seek their inclusion in the Grade cards or Transcripts issued (but, not for earning Credit).

4.3 Credit Representation

Credit values assigned for different academic activities are shown in the following table

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5 credit

4.4 Course Load

Every student should register for a set of Courses in each Semester, with the total number of their Credits being limited by considering the permissible weekly Contact Hours.

4.5 Course Registration

Every student should formally register for Courses (Credits) as advice per the guidance of the faculty adviser in each Semester. It is helpful for monitoring the CIE, SEE performance in each case and to assist the students in self-paced learning by dropping/withdrawing from Course(s), and to avail of Course Flexibility;

4.6 Course Evaluation

CIE and SEE to constitute the major evaluations prescribed for each Course. Each Course has to be evaluated for 100 marks, irrespective of its Credits.

4.7 Credits Required for Degree Award

It is suggested that the minimum number of Credits to be earned by a student for the award of Degree should be between 160 and 165 specified in the curriculum of the

relevant branch.

4.8 Grade Point Average (GPA)

It is a measure of performance of work done in a semester. It is ratio of total credit points secured by a student in various courses registered in a semester and the total course credits taken during that semester.

4.9 Cumulative Grade Point Average (CGPA)

It is a measure of overall cumulative performance of a student over all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters.

4.10 Medium of Instruction

The medium of instruction is English for all courses, examinations, seminar presentations and project / thesis / dissertation reports.

5. Duration of the Programme

5.1 A student is normally expected to complete the B.E. Programme in minimum period of four academic years but in any case, not more than 14 Semesters for HSC candidates and not more than 12 semesters for Lateral entry students.

5.2 Each semester shall normally consist of roughly 90 working days. The Principal shall ensure that every teacher imparts instruction as per the number of periods/ weeks specified in the syllabus and that the teacher teaches the full content of the specified syllabus for the course being taught.

5.3 The Principal may permit to conduct additional classes for improvement, special coaching, conduct of model test etc., over and above the specified periods. The end semester examination will follow immediately after the last working day of every semester as prescribed in the academic schedule.

5.4 The total period for completion of the Programme reckoned from the commencement of the first semester to which the candidate was admitted shall not exceed the maximum period specified in clause (5.1) irrespective of the period of break of study in order that he / she may be eligible for the award of the degree (vide clause 13).

6. Faculty Adviser

To help the students in planning their courses of study and for general advice on the academic Programme, the Head of the Department will attach a certain class of students to a teacher of the Department who shall function as Faculty Adviser for those

students throughout their period of study. Such Faculty Advisers shall advise the students and monitor the courses undergone by the students, check the attendance and progress of the students attached to him/her and counsel them periodically. If necessary, the faculty adviser may also discuss with or inform the parents about the progress of the students.

7. Class committee

7.1 Every class shall have a class committee consisting of teachers handling the class concerned, student representatives and a chairperson. The objective of the class committee is to monitor overall the goal of improving the teaching-learning process. The functions of the class committee include:

- Solving problems experienced by students in the class room and in the laboratories.
- Clarifying the regulations of the degree Programme and other details relevant to academic activities. Informing the student representatives on the details of Regulations regarding weightage used for each course. In the case of practical courses (laboratory/drawing/project work/Seminar etc.) the breakup of marks for each experiment / exercise / module of work, should be clearly discussed in the class committee meeting and informed to the students.
- Analyzing the performance of the students of the class after each series test and finding the ways and means of solving problems, if any.
- Identifying the weak students, if any, and requesting the teachers concerned to provide some additional help or guidance or coaching to such weak students.
- Informing the students about the attendance details of the class at every class committee meeting and advising the students to attend the classes regularly to avoid shortage of attendance.

7.2 The class committee for a class under a particular branch is normally constituted by the Head of the Department. However, if the students of different branches are mixed in a class (like the first semester which is generally common to all branches), the class committee is to be constituted by the Principal / Chief faculty advisor.

7.3 The class committee shall be constituted within the first week of each semester.

7.4 At least 4 student representatives (usually 2 boys and 2 girls) shall be included in the class committee.

7.5 The chairperson of the class committee may invite the Faculty adviser(s) and the Head of the Department to the meeting of the class committee.

7.6 The Principal may participate in any class committee of the institution.

7.7 The chairperson is required to prepare the minutes of every meeting, submit the same to Principal within two days of the meeting and arrange to circulate it among the students and teachers concerned. If there are any recommendations in the minutes that require necessary action by the Principal, the same shall be brought to the notice of the Principal.

7.8 The first meeting of the class committee shall be held within one week from the date of commencement of the semester, in order to inform the students about the nature and weightage of assessments within the framework of the Regulations. Two or three subsequent meetings may be held in a semester at suitable intervals. The Class Committee Chairman shall put on the Notice Board the cumulative attendance particulars of each student at the end of every such meeting to enable the students to know their attendance details. During these meetings the student members representing the entire class, shall meaningfully interact and express the opinions and suggestions of the other students of the class in order to improve the effectiveness of the teaching-learning process.

8. Examinations

Performance in each course of study shall be evaluated based on (i) Continuous Internal Assessment throughout the semester and (ii) End semester examination.

8.1 Each course, both theory and practical (including project work & viva voce Examinations) shall be evaluated for a maximum of 100 marks.

(a) Theory courses

For all theory courses, the Continuous Internal Assessment will carry 30 marks and the End semester examination will carry 70 marks.

The break-up of marks for continuous internal assessment is as follows:

Average of three assessment test = 20 marks

Average of three Assignment = 10 marks

Total = 30 marks.

(b) Practical Courses

Every practical exercise / experiment shall be evaluated based on the exercise / experiment prescribed as per the syllabi and the records of work done maintained by the students. The criteria for arriving at the internal assessment marks (30 marks) shall be decided based on the performance of the students in all experiments put together and reduced to 20 marks and one model test will carry 10 marks.

(c) Theory Courses with Laboratory Component

If there is a theory course with Laboratory component, there shall be three tests: the first two tests (each 100 marks) will be from theory portions and the third test (maximum mark 100) will be for laboratory component.

8.2 (a) The credits earned through the one credit courses other than curriculum shall be over and above the minimum credit requirement prescribed in the curriculum.

The one credit course shall carry 100 marks based on assessments and Semester End Examination.

(b) The Industrial / Practical Training, Summer Project, Internship shall carry 100 marks and shall be evaluated through internal assessment only. At the end of Industrial / Practical training / internship / Summer Project, the candidate shall submit a certificate from the organization where he / she has undergone training and a brief report. The evaluation will be made based on this report and a Viva-Voce Examination, conducted internally by a three member Departmental Committee constituted by the Head of the Department. The certificates (issued by the organization) submitted by the students shall be attached to the mark list sent by the Head of the Department to the Controller of Examinations.

(c) The Seminar shall be evaluated for 30 marks internal and 70 marks external examinations.

8.3 Project Work

Project work may be allotted to a single student or to a group of students not exceeding 4 per group. The Head of the department shall constitute a review committee for project work for each branch of study. There shall be three reviews during the semester by the review committee. The student shall make presentation

on the progress made by him / her before the committee. The total marks obtained in the three reviews shall be reduced for 30 marks and rounded to the nearest integer.

8.3.1 The project report shall carry a maximum of 20 marks. The project report shall be submitted as per the approved guidelines, given by the COE. Marks shall be awarded to every student within the project group for the project report. The viva-voce examination shall carry 50 marks. Marks are awarded to each student of the project group based on the individual performance in the viva-voce examination.

Review I	Review II	Review III	Guide (report)	End Semester Examinations (Viva-Voce)	
				Internal Examiner	External Examiner
10	10	10	20	25	25

8.3.2 If a candidate fails to submit the project report on or before the specified deadline, then the student(s) is not eligible to appear for Project Viva Voce examination. Further, if a student fails to secure a pass in project work or not eligible to appear for Viva Voce Examination, the student shall register and repeat the project work again in the subsequent semesters.

8.4 Internal marks approved by the Head of the Institution shall be displayed by the respective HODs within 5 days from the last working day.

9. Requirements for appearing End Semester Examinations

A candidate shall normally be permitted to appear for the End Semester Examination of any course in a particular semester for which he/she has registered the course if he/she could satisfy 75 % attendance in a course. (For all theory and practical courses except self study courses).

However, a candidate who secures attendance between 65 % and 75 %, in a particular semester due to medical reasons (hospitalization / accident / specific illness) or due to participation in the College / University / State / National / International level Sports events with prior permission from the Head of the Department concerned shall be given exemption from the prescribed attendance requirement and he / she shall be

permitted to appear all courses registered in that particular semester examinations.

Candidates who secure less than 65 % attendance in a particular course will not be permitted to write the Semester End Examination. They are required to redo the particular course.

If a candidate fails to secure at least 65 % attendance in the 50 % of the registered courses, he/she shall be prevented to write the end semester examinations and he/she must repeat all the regular courses registered in the next academic year after getting Re- admission order from the Commissioner of Technical Education.

Registration is mandatory for semester examinations as well as arrears examinations. A candidate already appeared for a course/ courses in a semester and passed the examination is not entitled to appear in the same subject or subjects of the semester for improvement of grades / marks.

10. Passing requirements

10.1 (i)

A candidate who secures not less than 50 % of total marks prescribed for the courses with minimum of 45 % of the marks prescribed for the End Semester Examination in both theory and practical courses shown in table (including Project work, except one credit and self study courses), shall be declared to have passed the examination. The evaluation for the end semester shall be 100 marks.

(ii) Self study courses have only Semester End Examinations only which requires 50% of marks to be declared as pass. (No Internal Assessment).

(iii) One Credit courses shall be assessed with one internal assessment and end semester examination for 50 marks.

(iv) If anyone fails in an elective course, he may reappear or drop that course and choose another elective course.

10.2 If a candidate fails to secure a pass in a particular course, it is mandatory that he/she shall register and reappear for the examination in that course during the subsequent semester when examination is conducted in that course; he/she should

continue to register and reappear for the examinations in the failed courses till he / she secures a pass.

10.3 The internal assessment marks obtained by the candidate in the first appearance shall be retained and considered valid for all subsequent examination till the candidate pass the courses.

11 Award of Letter Grades

All assessments of a course will be done on the basis of absolute marks. However, for the purpose of reporting the performance of a candidate, letter grades, each carrying certain number of points, will be awarded as per the range of total marks (out of 100) obtained by the candidate in each course as detailed below:

Letter Grade	Grade Points	Marks range
O (Outstanding)	10	91-100
A+(Excellent)	9	81-90
A(Very Good)	8	71-80
B+(Good)	7	61-70
B(Average)	6	50-60
RA	0	Less than 50
AB (Absent)	0	
I (Prevented)	0	
W(Withdrawal)	0	

12 GPA and CGPA Calculation

After results are declared, Grade Sheets will be issued to each student which will contain the following details:

Name of the Institution

List of courses enrolled during the semester and the grade scored.

Grade Point Average (GPA) for the semester and

Cumulative Grade Point Average (CGPA) of all the courses enrolled from the first semester onwards.

GPA is the ratio of the sum of the products of the number of credits of courses enrolled and the points corresponding to the grades scored in those courses, taken for all the courses, to the sum of the credits of all courses registered.

. $$GPA = \frac{\text{Sum of } C * GP}{\text{Sum of } C}$$

"C" - Credits allotted for the subjects.

"GP" – is the grade point corresponding to the letter grade obtained for each course.

"CGPA" will be calculated considering all the courses enrolled from first semester.

. "F", "I" and "W" grades will be excluded for calculating GPA and CGPA.

13. Eligibility for the Award of Degree

A student shall be declared to be eligible for the award of the B.E. Degree provided the student has

(i) Successfully gained the required number of total credits as specified in the curriculum corresponding to his / her Programme within the stipulated time.

(ii) Successfully completed any additional courses prescribed by the BOS and Academic Council whenever, any candidate is readmitted under regulations other than R-2019 .

(iii) No disciplinary action pending against the student.

(iv) The award of Degree must have been approved by the Syndicate of the University.

14. Classification of the Degree awarded

14.1 First Class with Distinction

A candidate who satisfies the following conditions shall be declared to have passed the examination in First class with Distinction:

Should have passed the End Semester Examination in all the courses for the minimum credits prescribed in the curriculum of the respective Programme in his/her **First Appearance** within five years (four years for lateral entry students) including authorized break of study.

Withdrawal from examination (vide Clause 17) will not be construed as an appearance.

Should have secured a **CGPA of not less than 8.5**

Should NOT have been prevented from writing end semester examination due to disciplinary action.

14.2 First Class

A candidate who satisfies the following conditions shall be declared to have passed the examination in First class:

Should have passed the End Semester Examination in all the courses registered for the minimum credits prescribed in the curriculum of the respective Programmes semesters within five years (Four years for lateral entry students).

Withdrawal from examination (vide Clause 16) will not be construed as an

appearance.

Should have secured a **CGPA of not less than 7.0.**

One year authorized break of study (if availed of) is permitted in addition to four years for award of First class.

14.3 Second Class

All other candidates (not covered in clauses 14.1 and 14.2) who qualify for the award of the degree shall be declared to have passed the examination in Second Class.

14.4 A candidate who is absent in semester examination in a course / project work after having registered for the same shall be considered to have appeared in that examination for the purpose of classification.

15. Revaluation

15.1 A candidate can apply for revaluation of his/her semester examination answer paper in a theory course, within 2 weeks from the declaration of results, on payment of a prescribed fee along with prescribed application to the Controller of Examinations through the Head of Department. The Controller of Examination will arrange for the revaluation and the results will be intimated to the candidate concerned through the Head of the Department. Revaluation is not permitted for practical courses, seminar and for project work. A candidate can apply for revaluation of answer scripts for not exceeding 5 subjects at a time.

15.2 If the candidate is not satisfied with the revaluation marks/results, he/she can challenge, by paying required fee. If there is a change in the result after re-revaluation, the challenged fee will be refunded to the candidate.

16. Provision for withdrawal from examinations

16.1 A candidate may, for valid reasons, (medically unfit / unexpected family situations) be granted permission to withdraw from appearing for the examination in any course or courses in any one of the semester examinations during the entire duration of the degree Programme. Also, only one application for withdrawal is permitted for that semester examination in which withdrawal is sought.

16.2 Withdrawal application shall be valid only if the candidate is otherwise eligible to write the examination (Clause 9) and if it is made within TEN days before the commencement of the examination in that course or courses and also recommended by the Head of the Department.

16.3 Notwithstanding the requirement of mandatory TEN days notice, applications for withdrawal for special cases under extraordinary conditions will be considered on the merit of the case.

16.4 Withdrawal shall not be construed as an appearance for deciding the eligibility of a candidate for First Class with Distinction and First Class.

16.5 Withdrawal is NOT permitted for arrears examinations of the previous semesters.

17. Authorized Break of study from a Programme

17.1 A candidate is normally not permitted to temporarily break the period of study. However, if a candidate may avail an authorized break of study for valid reasons such as accident or hospitalization due to prolonged ill health otherwise for the purpose of study outside the campus, during the Programme duration. In a duration of study two semesters break period may be permitted.

17.2 Authorized break of study will be taken into account for classification. (vide Clause 14.1&14.2).

17.3 The total period for completion of the Programme reckoned from, the commencement of the first semester to which the candidate was admitted shall not exceed the maximum period specified in clause 5.1 irrespective of the period of break of study in order that he / she may be eligible for the award of the degree (vide clause 13).

17.4 If any student is detained under disciplinary actions, the period spent in that semester shall not be considered as permitted 'Break of Study' and Clause 17.1. is not applicable for this case.

17.5 If the student does not report back to the department, even after the extended Break of Study, the name of the candidate shall be deleted permanently from the college enrollment.

18. Industrial visits / Training

Every student is required to go for at least one Industrial Visit every year starting from the second year of the Programme. The Heads of Departments shall ensure that necessary arrangements are made in this regard.

The students may undergo Industrial training for a period as specified in the Curriculum during summer / winter vacation. In this case the training has to be undergone continuously for the entire period.

The students may undergo Internship at Research organization / University (after due

approval from the Head of the Department) for the period prescribed in the curriculum during summer / winter vacation, in lieu of Industrial training.

19. Personality and Character development

All students shall enroll, on admission, in any one of the personality and character development Programmes (the NCC/NSS/NSO/YRC) and undergo training for about 80 hours and attend a camp of about seven days. The training shall include classes on hygiene and health awareness and also training in first-aid.

National Cadet Corps (NCC) will have about 20 parades.

National Service Scheme (NSS) will have social service activities in and around the College / Institution.

National Sports Organization (NSO) will have sports, Games, Drills and Physical exercises.

Youth Red Cross (YRC) will have activities related to social services in and around college/institutions.

YOGA: Students shall practice yoga to improve their physical and mental strength.

While the training activities will normally be during weekends, the camp will normally be during vacation period. Every student shall put in a minimum of 75% attendance in the training and attend the camp compulsorily. The training and camp shall be completed during the first year of the Programme. However, for valid reasons, the Head of the Institution may permit a student to complete this requirement in the second year.

20. Discipline

Every student is required to observe disciplined and decorous behavior both inside and outside the College and not to indulge in any activity which will tend to bring down the prestige of the Institution. If a student indulges in malpractice in any of the Internal examination/End semester examination he / she shall be liable for punitive action as prescribed by the university from time to time.

21. Revision of Regulation and Curriculum

The Institution may from time to time revise, amend or change the Regulations, examination scheme and syllabi if found necessary.

ANNEXURE- I

Additional courses to be studied by the B.Sc. Graduates admitted to III semester B.E. (R-2019) under lateral entry scheme.

The following two additional courses are prescribed for the B.Sc. Graduates:

a. The first course to be studied either in their III semester or V semester of study.

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	M	C
1.		Engineering Graphics	1	0	4	100	3

b. The Second course to be studied during the IV or VI semester of their study.

The student can register for any ONE of the following courses as applicable to their Branch of study.

(i). For Non-Circuit Branches:

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	M	C
2.		Basic Electrical & Electronics	4	0	0	100	4

(ii). For Circuit Branches:

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	M	C
2.		Basic Civil & Mechanical Engineering	4	0	0	100	4

ANNEXURE – II

B.E. Degree Programmes:

1. B.E. Civil Engineering
2. B.E. Mechanical Engineering
3. B.E. Electrical and Electronics Engineering
4. B.E. Electronics and Communication Engineering
5. B.E. Computer Science and Engineering

ANNEXURE – III

Typical breakdown of Course Representation for UG Degree Programmes:

Sl.No	Course Work - Subject Area	Suggested Break-up of Credits
1	Humanities and Social Sciences *(HS)*, including Management	12
2	Basic Sciences *(BS)* including Mathematics, Physics, Chemistry, Biology	25
3	Engineering Sciences *(ES)*, including Materials, Workshop, Drawing, Basics of Electrical/Electronics/Mechanical/Computer Engineering, Instrumentation	24
4	Professional Subjects-Core (PC), relevant to the chosen specialization/branch	48-54
5	Professional Subjects – Electives *(PE)*, relevant to the chosen specialization/ branch	18
6	Open Subjects- Electives *(OE)*, from other technical and/or emerging subject areas	6-12
7	Project Work, Seminar and/or Internship in Industry or elsewhere	15
8	Mandatory Courses [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Knowledge Tradition]	(non-credit)
9	Total credits	160 – 165

Alagappa Chettiar Government College of Engineering & Technology, Karaikudi-3

(An Autonomous Institution Affiliated to Anna University Chennai)

CHOICE BASED CREDIT SYSTEM

ANNEXURE - I

Regulations 2019

CURRICULUM AND SYLLABI

SEMESTER I

S.No	Course Code	Course Title	Category	L	T	P	C
THEORY							
1	19ENH11	Communicative English	HS	2	0	2	3
2	19MAB12	Mathematics I	BS	3	1	0	4
3	19PHB14	Physics: Optics and Semiconductors	BS	3	1	0	4
4	19CMG15	Basic Civil and Mechanical Engineering	ES	4	0	0	4
PRACTICAL							
5	19PHL17	Physics Laboratory	BS	0	0	3	1.5
6	19MEL18	Workshop Practice Laboratory	ES	0	0	4	2
MANDATORY COURSE							
7		Induction Programme	MC				0
Total Number of Credits							**18.5**

SEMESTER II

S. No	Course Code	Course Title	Category	L	T	P	C
THEORY							
1	19CHB21	Chemistry	BS	3	1	0	4
2	19MAB22	Mathematics II	BS	3	1	0	4
3	19CSG23	Python Programming	ES	3	0	0	3
4	19EEG16	Basic Electrical and Electronics Engineering	ES	4	0	0	4
PRACTICAL							
5	19CHL26	Chemistry Laboratory	BS	0	0	3	1.5
6	19CSL27	Python Programming Lab	ES	0	0	3	1.5
AUDIT COURSE							
7	19SHA01	Professional Communication	AC	1	0	2	0
8	19SHA02	Error Analysis and Fundamental Physical Quantities	AC	1	0	2	0
Total Number of Credits							**18**

SEMESTER I

19ENH11 : COMMUNICATIVE ENGLISH

Category : HS **L T P C**
2 0 2 3

Course Objectives:

The course is intended to

- Make learners listen to audio files and replicate in speaking context.
- Make learners read widely and practice it in writing.
- Make learners develop vocabulary and strengthen grammatical understanding

Unit- I: **6**

Vocabulary Building

The concept of Word Formation - Root words from foreign languages and their use in English - Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives - Synonyms, antonyms, and standard abbreviations.

Unit – II **6**

Basic Writing Skills

Sentence Structures-Use of phrases and clauses in sentences-Importance of proper punctuation - Creating coherence - Organizing principles of paragraphs in documents-Techniques for writing precisely

Unit –III **6**

Identifying Common Errors in Writing

Subject-verb agreement - Noun-pronoun agreement - Misplaced modifiers –Articles – Prepositions – Redundancies - Clichés

Unit –IV **6+6=12**

Nature and Style of sensible Writing (6 periods)

Describing – Defining – Classifying - Providing examples or evidence -Writing introduction and conclusion

Writing practice(6 periods)

Comprehension - Précis Writing - Essay Writing – Job Application Letter and Resume

Unit- V **15 sessions**

Listening and Speaking

(This unit involves interactive practice sessions in Language Lab)

- Listening Comprehension
- Pronunciation, Intonation, Stress and Rhythm
- Common Everyday Situations: Conversations and Dialogues
- Interviews and Presentations

Suggested Readings:

1. *Practical English Usage.* Michael Swan. OUP. 1995.
2. *Remedial English Grammar*. F.T. Wood. Macmillan.2007
3. (iii)*On Writing Well.* William Zinsser. Harper Resource Book. 2001
4. *Study Writing.* Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
5. *Communication Skills*. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
6. *Exercises in Spoken English.* Parts. I-III. CIEFL, Hyderabad. Oxford University Press

Course Outcome

The student will acquire basic proficiency in English including reading and listeningcomprehension, writing and speaking skills.

19MAB12 : MATHEMATICS –I

(Common to all Branches of B.E)

Category : BS

L	T	P	C
3	1	0	4

Course Objectives:

The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariable analysis and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

UNIT I MATRICES 12

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNITII DIFFERENTIAL CALCULUS 12

Representation of functions – Limit of a function – Continuity – Derivatives –Differentiation rules – Maxima and Minima of functions of one variable.

UNIT III FUNCTIONS OF SEVERAL VARIABLES 12

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT IV INTEGRAL CALCULUS 12

Definite and Indefinite integrals – Substitution rule – Techniques of Integration – Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions – Improper integrals.

UNIT V MULTIPLE INTEGRALS 12

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

3. James Stewart, "Calculus: Early Transcendental", Cengage Learning, 7th Edition, New Delhi, 2015.

REFERENCES:

1. Anton, H, Bivens, I and Davis, S, "Calculus", Wiley, 10th Edition, 2016.
2. Jain R.K. and Iyengar S.R.K., “Advanced Engineering Mathematics”, Narosa Publications, New Delhi, 3rd Edition, 2007.
3. N.P. Bali and Dr.Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Ninth Edition,2016
4. Erwin kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2011.
5. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

Course Outcomes:

The students will learn:

CO1: The essential tool of matrices and linear algebra in a comprehensive manner.

CO2: To use both limit definition and rules of differentiation to differentiate functions and apply differentiation to solve maxima and minima problems.

CO3: To deal with functions of several variables that are essential in most branches of engineering.

CO4: To evaluate integrals using techniques of integration, such as substitution, partial fractions and integration by parts.

CO5: The mathematical tools needed in evaluating multiple integrals and their usage.

19PHB14 : PHYSICS: OPTICS AND SEMICONDUCTORS

Category : BS **L T P C**

3 1 0 4

OBJECTIVES: To enhance the fundamental knowledge in Semiconductor Physics and its applications relevant to various streams of Engineering and Technology. Upon completion of this course the students will be familiar with:

- Wave optics phenomenon, Huygens's principle, interference of light.
- Basic principles in lasers & fiber optics - characteristic, types and its applications.
- Origin of quantum physics.
- Measurement of various parameters related to semiconductors.
- The application of semiconductors to photo detector.

UNIT I WAVE OPTICS 9 Hours

Huygens' Principle-superposition of waves and interference of light - Air wedge- Theory - Applications- Testing of flat surfaces –Thickness of a thin sheet of paper- Michelson interferometer-Theory-Applications-Determination of wavelength of monochromatic light.

UNIT II LASER AND FIBER OPTICS 9 Hours

Einstein's theory of matter radiation interaction and A and B coefficients-amplification of light by population inversion-different types of lasers-gas laser-CO_2- solid state laser-Neodymium Nd-YAG laser-properties of laser beams-monochromaticity-coherence-directionality and brightness.

Introduction – Basic Principles involved in fiber optics- Total internal reflection – Structure of optical fiber –Propagation of light through optical fiber –Derivation for Numerical Aperture and acceptance angle - fractional index change - Classification of optical fiber based on materials, refractive index profile and Modes - Fiber optical communication system.

UNIT III QUANTUM MECHANICS 9 Hours

Limitations of classical Physics - Introduction to Quantum theory - Dual nature of matter and radiation- Properties of matter waves-de-Broglie wavelength in terms of voltage, energy, and temperature –Heisenberg's Uncertainty principle – verification – physical significance of a wave function- Schrödinger's Time independent and Time dependent wave equations –- Particle in a one-dimensional potential well.

UNIT IV SEMICONDUCTORS 9 Hours

Free electron theory - Fermi distribution function - effect of temperature – density of energy states in metals-Semiconductors – Properties – elemental and compound semiconductors - Intrinsic and extrinsic semiconductors – properties - Carrier concentration in intrinsic Semiconductor - variation of Fermi level with temperature - extrinsic semiconductors - Carrier concentration in P- type and N-type semiconductors – variation of Fermi level with temperature and impurity concentration.

UNIT V PHOTODETECTORS 9 Hours

Types of semiconductor photodetectors -pn junction, PIN, and Avalanche - and their structure, materials, working principle, and characteristics, Noise limits on performance; Solar cells - construction and working of Silicon solar cells

Total 45 Hours

TEXT BOOKS

1. Dr. V.Rajendran, Material Science, Tata McGraw-Hill Publications, NewDelhi, (2011)
2. Dr.Jayakumar .S, Materials science , R.K.publishers, (2008)2

REFERENCES

1. D.J.Griffiths, Quantum mechanics, Pearson Education, 2014
2. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley (2008).
3. P. Bhattacharya, Semiconductor Optoelectronic Devices, Prentice Hall of India (1997).
4. J.Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc. (1995)

OUTCOMES

Upon completion of this course the students will be able to

CO1: Study the wave and optical phenomena - application.[Understanding & application]

CO2: Analyze the construction and working of gas laser and solid state laser, explain fiber optics and classify fibers based. [Familiarity & application]

CO3: To study the dual nature of matter using De – Broglie matter waves, Heisenberg's uncertainty principle, Schrodinger's equation.[Familiarity & Understanding]

CO4: List the properties and applications of engineered semiconducting materials. [Familiarity& Application]

CO5: Analyze the properties and applications of Semiconductor detectors. [Familiarity]

19CMG15 : BASIC CIVIL AND MECHANICAL ENGINEERING

Category : ES **L T P C**
4 0 0 4

COURSE OBJECTIVES

- To impart the students with the basics in Mechanical Engineering
- To introduce the students the types and working principle of power plant units, Internal Combustion engines and Refrigeration and Air-conditioning system

A–CIVILENGINEERING

UNIT – I Civil Engineering Aspects 12

Introduction to different domains of civil engineering - requirements and selection of site for residential and industrial buildings – Principles and objectives of codes of practices, surveying, geotechnical investigation, building planning, structural design and construction management – Objectives and requirements of interior design and landscaping – Definitions and implications of plinth area, carpet area, built-up area, plot area, floor area ratio, common area, plinth area rate, plan approval, building bye-laws and master plan of a town.

UNIT – II Building Materials 12

Types, properties, uses, manufacture and quality requirements of the following : Bricks, building stones, fine aggregates, coarse aggregates, cement, construction water, concrete, steel, timber and flooring tiles.

UNIT – III Building Components 6

Substructure : Types, functions and requirements of a good foundation

Super structure : Types, construction, requirements and functions of the following : Brick masonry, stone masonry, RC elements like beam, column, lintel and roof slab, roof coverings, floorings, plastering and paintings.

TOTAL:30PERIODS

PART B - MECHANICAL ENGINEERING

UNIT III ENERGY ENGINEERING 6

Sources of Energy - Renewable and Non-renewable, Classification of power plants, Working principle of Steam, Hydro, Diesel, Gas turbine and Nuclear power plants (layouts, element/component description, advantages, disadvantages and applications).

UNIT IV ENERGY CONVERSION DEVICES 12

Boilers - Water tube boilers and fire tube boilers, Internal combustion engines - Working principles of two stoke and four stroke I.C Engines(S.I and C.I engines), Pumps and Turbines –reciprocating pump and centrifugal pump, Pelton Turbine and Kaplan Turbine.

UNIT V REFRIGERATION AND AIR CONDITIONING 12

Vapor compression and Vapor absorption systems, Psychrometric processes - window air conditioner and split air conditioner, Refrigerants and their impact on environment.

Total : 27 Hrs

Text Book :

1. 'Basic Civil and Mechanical Engineering' - Shanmugam G and Palanichamy M S, TataMcgraw Hill Publishing & Co., NewDelhi
2. 'Basic Mechanical Engineering' – Venugopal K and Prabu Raja V, Anuradha Publisher, Kumbakonam

COURSE OUTCOMES

After the completion of the course the student is able to

CO1: List out the different types of sources of energy and explain the principle and working of different types of power plants

CO2: Demonstrate the working principles different types of energy conversion devices

CO3: Explain the principle and types of Refrigeration and Air conditioning systems

19PHL17 : PHYSICS LABORATORY
(Common to all branches)

Category : BS

L	T	P	C
0	0	3	1.5

Objectives: To have a practical knowledge about the concepts of physics and its applications in the emerging fields of engineering and technology

List of Experiments:

1. Spectrometer - Diffraction Grating Normal Incidence Method.
2. Air Wedge –Determination thickness of a wire.
3. Young's Modulus – Non Uniform Bending Method.
4. Young's Modulus – Uniform Bending Method.
5. Ammeter and Voltmeter Calibration – Low Range.
6. Determination of Bandgap Energy of Semiconductor.
7. Ultrasonic Interferometer - Velocity of sound & Compressibility of liquids.
8. Torsional pendulum –Determination of Rigidity Modulus & Moment of Inertia.
9. Compound Pendulum – Determination of acceleration due to gravity.
10. Melde's string- Determination of frequency of a.c source.
11. B.H. curve of a ferromagnetic material.
12. Carey Foster's Bridge- Determination of specific resistance of the material of the wire.
13. Spectrometer- Determination of dispersive power of a Prism.
14. 14 Lee's disc - Determination of thermal conductivity of a bad conductor.
15. Newton's Rings – Radius of curvature of a lens.
16. Determination of Plank's constant (Photo electric effect).
17. Determination of viscosity of liquid – poiseuille's method.

REFERENCE:

1. Marsh W. White, Kenneth V. Manning, Robert L. Weber, R. Orin Cornett, Practical Physics, McGraw-Hill Book Company, Inc. New York and London, 1943.
2. William Watson,A text-book of practical physics, Longmans, Green, and Co. Mumbai 1913.
3. Dieter Meschede, Optics,Light & Lasers: The Practical Approach to Modern Aspects of Photonics and Laser Physics Wiley-VCH Verlag GmbH & Co KGaA, 2004.

OUTCOMES:

Upon completion of this practical classes, students will be able to

CO1. Determine all physical properties of matter.

CO2. Calibrate electrical measuring instruments and thereby effectively using it for particular application.

CO3. Understand principle of Laser diffraction and its application in particle size determination

CO4. Understand the concept of light propagation through optical fibers and determination of its parameters

CO5. Determine the Intrinsic characteristic features of electronic devices for electrical and electronic applications.

CO6. Understand the ultrasonic wave propagation in liquids and the determination of compressibility of liquids for engineering applications

19MEL18 : WORKSHOP PRACTICE LABORATORY

(Common to all branches of Engineering)

Category : ES **L T P C**
0 0 4 2

OBJECTIVES

Toprovideexposuretothestudentswithhands onexperienceonvariousbasic engineeringpracticesinCivil,Mechanical,Electricaland ElectronicsEngineering.

GROUPA(CIVIL&MECHANICAL)

I CIVIL ENGINEERING PRACTICE 9

Plumbing: Practice of Internal threading, external threading, pipe bending, and pipe fitting, Pipes with coupling for same diameter and with reducer for different diameters and Practice of T-fitting, Y-fitting, Gate valves fitting

Carpentry: Study of Carpentry Tools, Equipment and different joints, Practice of Tee Joint, Cross Half lap joint, Dovetail joint and Mortise Tenon Joint.

II MECHANICAL ENGINEERING PRACTICE 13

Welding: Introduction, Study of Tools and welding Equipment (Gas and Arc welding), Selection of welding electrode and current, Practice of Butt Joint, Lap Joint and Tee Joint.

Sheet Metal: Introduction, Study of sheet metal tools, Practice of Forming & Bending and Model making of Trays, Cone and Funnels.

Demonstration on:

Foundry Trade: Introduction to foundry, Patterns, pattern allowances, ingredients of moulding sand and melting furnaces. Foundry tools and their purposes, Demo of mould preparation and Practice – Preparation of mould by using split pattern.

GROUPB (ELECTRICAL&ELECTRONICS)

III ELECTRICAL ENGINEERING PRACTICE 10

a) Residentialhousewiringusingswitches,fuse, indicator, lampandenergy meter.
b) Fluorescentlampwiring.
c) Staircasewiring
d) Measurementof electrical quantities –voltage,current,power&power factor inRLCcircuit.
e) Measurementofenergyusingsingle phaseenergymeter.

IV ELECTRONICS ENGINEERING PRACTICE 13

a) Study ofElectroniccomponentsandequipments.
b) Studyof logic gatesAND,OR,XORand NOT.
c) Study of CRO.
d) Solderingpractice–ComponentsDevicesandCircuits–Usinggeneral purposePCB.
e) MeasurementofripplefactorofHWRandFWR.

TOTAL: 45 PERIODS

REFERENCES:

1. Jeyachandran K., Natarajan S. & Balasubramanian S., "A Primer on Engineering Practices Laboratory," Anuradha Publications, 2007.
2. Jeyapoovan T., Saravanapandian M. & Pranitha S., "Engineering Practices Lab Manual," Vikas Puplishing House Pvt.Ltd, 2006.
3. Bawa H.S., "Workshop Practice," Tata McGraw Hill Publishing Company Limited, 2007.
4. Rajendra Prasad A. & Sarma P.M.M.S, "Workshop Practice," Sree Sai Publication, 2002.
5. Kannaiah P. & Narayana K.L., "Manual on Workshop Practice," SciTech Publications, 1999.

COURSE OUTCOMES:

CO1. Students will be able understand different types of joints and fittings used in carpentry and plumbing works.

CO2. Students will be able to prepare metal joints, make simple parts using sheet metals and prepare moulds for casting.

CO3. Students will get knowledge about different types of wiring and electrical quantity measuring instruments.

CO4. Students will get knowledge about different types of Electroniccomponentsandequipments and its applications.

SEMESTER - II

19CHB21 : CHEMISTRY

(Common to ALL Branches)

Category : BS **L T P C**

3 1 0 4

OBJECTIVE:

- To introduce the basic chemistry concepts relevant to different branches of Engineering and Technology

UNIT-I Water Treatment 9

Water- Hardness of water- Types- $CaCO_3$ equivalent- Alkalinity – Types – Estimation of alkalinity Estimation of total hardness by EDTA method- Problems- Boiler feed water- - Sludge and Scale - Caustic embrittlement - Priming and foaming- Treatment of water - Internal Conditioning – External Conditioning - Demineralisation process - Zeolite process - Ion-exchange resin process - Desalination- Electrodialysis and Reverse osmosis- Domestic water treatment.

UNIT-II Basics of Electrochemistry 9

Electrochemistry – Definitions -Type of cells - Reversible and Irreversible cell- Electrolytic and Electrochemical cell - Standard Electrode potential - Electrochemical series - Nernst equation – Problems - Reference electrodes - Standard Hydrogen electrode, Calomel electrode, glass electrode and measurement of pH – Potentiometric and Conductometric titrations.

UNIT-III Corrosion & Energy Storage Devices 9

Corrosion- Chemical corrosion and electrochemical corrosion- Mechanism- Pilling-Bedworth rule- Galvanic corrosion- Differential aeration corrosion- Corrosion control methods- Cathodic protection method-Sacrificial anode method – Impressed cathodic current method- Corrosion inhibitors.

Batteries- Introduction - Primary and secondary batteries - Dry cells - Alkaline batteries, Lead acid storage cell - Nickel- Cadmium cell - Lithium battery - Fuel cell - Advantages and limitations of Fuel cells.

UNIT-IV Fuels and Combustion 9

Combustion- Gross and Net calorific value - Coal- Proximate and Ultimate analysis- Coke manufacture- Otto- Hoffman method- Characteristics of metallurgical coke- Synthetic Petrol- Bergius and Fischer- Tropsch method- Knocking- Octane number- Cetane number- Production, Composition and Uses of Producer and Water gas- Theoretical calculation of calorific values- problems- Calculation of minimum requirement of air- problems- Flue gas analysis- Orsat’s apparatus.

UNIT-V **Analytical Techniques** **9**

Beer-Lambert's law- Estimation of iron by colorimetry- UV-Visible spectroscopy- Block Diagram-. Principles and instrumentation - IR spectroscopy- Principles and instrumentation and Applications of Atomic Absorption Spectroscopy (AAS)- Quantitative estimation of Nickel by AAS - Flame photometry - Theory and instrumentation –Estimation of sodium by flame photometry.

Text Book:

1. Jain P.C and Monika Jain, Physical Chemistry for Engineers, Dhanpat Rai & Sons, New Delhi 2010
2. Jain P.C and Renuka Jain, Physical Chemistry for Engineers, Dhanpat Rai & Sons,New Delhi 2010.
3. Puri B.R., Sharma L.R. and Madhan S.Pathania, Principles of Physical Chemistry, Shoban Lal Nagin Chand & Co., Jalandhar, 2010.

References:

1. Puri B.R., Sharma L.R. and Madhan S.Pathania, Principles of Physical Chemsitry, Shoban Lal Nagin Chand & Co., Jalandhar, 2010
2. B.K. Sharma, Engineering Chemistry, Krishna Prakasan Media Pvt Ltd, Meerut (2010)

Course Outcomes

On the successful completion of the course, students will be able to

CO1. Identify the properties of water and its treatment methods (Understand)

CO2. Summarize the principles and instrumentations of spectroscopic techniques (Understand)

CO3. Analyze the potentiometric and conductometric methods (Apply)

CO4. Adapt the suitable corrosion control methods (Apply)

CO5. Get Knowledge in fuels(Understand)

19MAB22 : MATHEMATICS –II

(Common to all branches of B.E)

Category : BS **L T P C**

3 1 0 4

Course Objectives:

The objective of this course is to familiarize the prospective engineers with techniques in vector differentiation and integration, ordinary differential equations and complex variables. Laplace transform can be used for efficiently solving the problems that occur various branches of engineering disciplines. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.

UNIT I DIFFERENTIAL EQUATIONS 12

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients – Method of undetermined coefficients.

UNIT II VECTOR CALCULUS 12

Gradient and directional derivative – Divergence and curl – Vector identities – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral – Area of a curved surface – Volume integral – Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III ANALYTIC FUNCTIONS 12

Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates – Properties – Harmonic conjugates – Construction of analytic function – Conformal mapping – Mapping by functions, – Bilinear transformation.

UNIT IV COMPLEX INTEGRATION 12

Line integral – Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour.

UNIT V LAPLACE TRANSFORMS 12

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constant coefficients.

TEXT BOOKS :

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.

2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
3. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016. 27

REFERENCES :

1. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi , 3rd Edition, 2007.
4. O'Neil, P.V. "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, New Delhi, 2007.
5. Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

Course Outcomes:

The students will learn:

CO1. The effective mathematical tools for the solutions of differential equations that model physical processes.

CO2. About vector differentiation and vector integration which are essential for application of to Engineering problems.

CO3. The ideas of analytic functions with their properties and conformal mappings with examples that have direct application.

CO4. The basics of complex integration and contour integration which are useful for evaluation of certain real integrals

CO5. To understand the method of solving differential equations of certain types that might be encountered in their engineering studies.

19CSG23 : PYTHON PROGRAMMING

Category : ES

L	T	P	C
3	0	0	3

OBJECTIVES:

- To know the basics of algorithmic problem solving
- To read and write simple Python programs.
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures –- lists, tuples, dictionaries.
- To do input/output with files in Python.

UNIT I ALGORITHMIC PROBLEM SOLVING 9 Hours

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi. (Algorithms only).

UNIT II BASICS OF PYTHON PROGRAMMING 9 Hours

Introduction-Python Interpreter-Interactive and script mode -Values and types, operators, expressions, statements, precedence of operators, Multiple assignments, comments. Conditional (if), alternative (if-else), chained conditional (if-else)-Iteration-while, for, break, continue, pass - Simple related programs.

UNIT III FUNCTIONS AND STRINGS 9 Hours

Functions - Introduction, inbuilt functions, user defined functions, passing parameters, return values, recursion, Lambda functions. Strings-String slices, immutability, string methods and operations- related programs.

UNIT IV LISTS, TUPLES, AND DICTIONARIES 9 Hours

Lists-creating lists, list operations, list methods, mutability, aliasing, cloning lists, list and strings, list and functions-list processing-list comprehension. Tuples-Tuple assignment, Operations on Tuples, lists and tuples, Tuple as return value- Dictionaries-operations and methods, Nested Dictionaries – related programs.

UNIT V FILES, MODULES, PACKAGES 9 Hours

Files and Exception-Text files, reading and writing files, format Operator-Modules Python Modules-Creating own Python Modules-packages, Introduction to exception handling-related Programs.

TEXT BOOKS :

1. Ashok Namdev Kamthane, Amit Ashok Kamthane, “Programming and Problem Solving with Python” , Mc-Graw Hill Education,2018.
2. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist‘‘, 2nd edition, Updated for Python 3, Shroff/O‘Reilly Publishers, 2016.

REFERENCES

1. Robert Sedgewick, Kevin Wayne, Robert Dondero, “Introduction to Programming in Python: An Inter-disciplinary Approach”, Pearson India Education Services Pvt. Ltd., 2016.
2. Guido van Rossum and Fred L. Drake Jr, ―An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

Course Outcomes:

CO1. To know the basics of algorithmic problem solving – problem types – Development of Algorithms and Flowcharts.
CO2. To read and write simple Python programs with conditionals and loops.
CO3. To develop Python programs with functions and call them- syntax and strings.
CO4. To use Python data structures –- lists, tuples, dictionaries – fundamentals and programs.
CO5. To do input/output with files in Python.

19EEG16 : BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Category : ES **L T P C**
4 0 0 4

OBJECTIVES:

At the end of the course students will be able:

- To understand the basic law concepts in AC & DC circuits.
- To explain the working principle, construction, applications of DC machines, AC machines & measuring instruments.
- To Gain knowledge about the fundamentals of digital electronic system.
- To impart basic knowledge of communication engineering.

UNIT I ELECTRICAL CIRCUITS AND MEASURMENTS 12

Ohm's Law – Kirchhoff's Laws – Steady State Solution of DC Circuits – Introduction to AC Circuits – Waveforms and RMS Value – Power and Power factor – Single Phase and Three Phase Balanced Circuits. Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters.

UNIT II ELECTRICAL MACHINES 12

Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single Phase Transformer, single phase induction Motor. (Quantitative Approach only)

UNIT III SEMICONDUCTOR DEVICES AND APPLICATIONS 12

Characteristics of PN Junction Diode – Zener Diode and its Characteristics, Applications – Photodiode-Half wave and Full wave Rectifiers. Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics- FET Characteristics.

UNIT IV DIGITAL ELECTRONICS 12

Binary Number System – Logic Gates – Boolean algebra: Laws and Theorems- Combinational Circuits: Adder, Subtractor. Sequential Circuits: Flip-Flops (SR,JK,D,T) – A/D and D/A Conversion (simple concepts).

UNIT V FUNDAMENTALS OF COMMUNICATION ENGINEERING 12

Types of Signals: Analog and Digital Signals – Modulation and Demodulation: Principles of Amplitude and Frequency Modulations. Communication Systems : Satellite and Optical Fiber (Block Diagram Approach only)- Super Heterodyne- receiver.

Total: 60 Periods

TEXT BOOKS

1. Mittle V.N., "Basic Electrical Engineering", TMH Edition, New Delhi, 1990.
2. Sedha, R.S., "Applied Electronics" S. Chand and Co., 2006.

REFERENCES

1. Muthusubramanian R, Salivahanan S and Muraleedharan K A, “Basic Electrical,Electronics and Computer Engineering”, TMH, Second Edition, (2006).
2. Nagsarkar T K and Sukhija M S, “Basics of Electrical Engineering”, Oxford press (2005).
3. Mehta V K, “Principles of Electronics”, S.Chand and Company Ltd, (1994).
4. Mahmood Nahvi and Joseph A. Edminister, “Electric Circuits”, Schaum’ Outline Series, McGraw Hill,(2002).
5. Premkumar N, “Basic Electrical Engineering”, Anuradha Publishers, (2003).
6. Morris Mano, ”Digital Design”, Pearson Education, 2006.

COURSE OUTCOMES:

CO1: Gain knowledge in solving Basic Electric Circuit using Ohm’s Law and Kirchhoff’s Laws. and Gain knowledge about the various instruments required in electrical quantitymeasurements.

CO2: Illustrate the working principle of Electrical D.C and A.C Generator, Motors and Transformers.

CO3: Characterize semiconductors, Diodes, Rectifiers and Transistors.

CO4: Understand binary Number System, logic Gates and Boolean algebra to explain digitalelectronics systems.

CO5: Elucidate the fundamental principles and concepts involved in electronicCommunication.

19CHL26 : CHEMISTRY LAB

(For all branches)

Category : BS

L	T	P	C
0	0	3	1.5

OBJECTIVES

The course is aimed at imparting knowledge of experimental techniques which would be useful for students to apply the practical principles of Chemistry relevant to conventional engineering field.

List of Experiments :

1. Estimation of Hardness by EDTA method.
2. Estimation of Chloride by Argentometric method.
3. Conductometric titration of mixture of Strong Acid and Weak Acid using Strong Base.
4. Estimation of HCl by pH titration.
5. Estimation of Dissolved Oxygen.
6. Estimation of Iron by Spectrophotometer.
7. Potentiometric titration of Ferrous iron by dichromate.
8. Determination of the Rate Constant of reaction by Spectrophotometry.

(Any Five Experiments)

REFERENCES:

1 A.O.Thomas, Practical Chemistry, Scientific Book Centre, Cannanore, 2003.

2 Vogel's Text book of quantitative analysis, Jeffery G H, Basset J. Menthom J, Denney R.C., 6th edn, EBS, 2009.

3 ChemistryLaboratory Manual, Department of the Chemistry, Alagappa Chettiar Govt.College of Engineering and Technology, Karaikudi - 630003

OUTCOMES

Students will be able to

CO1. Understand the nature of hardness, chloride level, pollution level using dissolved oxygen content, iron present in water and analyse them in water.

CO2. Apply the EMF and conductometric measurements in quantitative analysis of substances.

19CSL27 :PYTHON PROGRAMMING LAB

Category : ES

L	T	P	C
0	0	3	1.5

OBJECTIVES:

- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python.

LIST OF PROGRAMS (Sample list given below)

1. Implement simple python programs using interactive and script mode.
2. Develop python programs using id() and type() functions .
3. Implement range() function in python.
4. Implement various control statements in python.
5. Develop python programs to perform various string operations like concatenation, slicing, Indexing.
6. Demonstrate string functions using python.
7. Implement user defined functions using python.
8. Compute the GCD of two numbers.
9. Find the square root of a number (Newton‘s method).
10. Exponentiation (power of a number).
11. Find the maximum of a list of numbers.
12. Linear search and Binary search.
13. First n prime numbers.
14. Develop python programs to perform operations on list.
15. Programs that take command line arguments (word count)
16. Implement dictionary in python.
17. Develop programs to work with Tuples.
18. Create programs to solve problems using various data structures in python.
19. Implement python program to perform file operations.
20. Implement python programs using modules and packages.

19SHA01 : PROFESSIONAL COMMUNICATION

Category : Audit

L	T	P	C
1	0	2	0

Objectives:

- Develop communication skills particularly Speaking and Listening
- Employ soft skills and develop their personality

UNIT I Listening and speaking practice in Communicative Functions 6

Introductions and meetings – Talking about studies and/ or job – Expressing likes and dislikes – Describing daily routines and current activities – Talking about past states and events – Talking about future plans and intentions – Expressing preferences – Giving reasons – Expressing opinions, agreement and disagreement – Seeking and giving advice – Making suggestions

UNIT II Speaking 6

Making an oral presentation – Preparing the presentation – Performing the presentation – Beginning– Language – Visual aids and body language – Voice – Ending – Questions

UNIT III Speaking and Writing 6

E mail – Memo- Report writing - Group Discussion and Interview - English proficiency exams - BEC – TOEFL- IELTS.

UNIT IV Soft skills (1) 6

Preparing for and dealing with change – Motivation, goal-setting and self-esteem – Managing time and stress – Career and life planning – Team work – Leadership traits

UNIT V Soft skills (2) 6

Multiple Intelligences – Learning Styles and Personality typing – Critical and creative thinking – People, cultures and self – Intercultural Communication

List of activities that are to be carried out:

- Listening and speaking practice exercises with communicative functions.
- Practice with more advanced communicative functions.
- Making an oral presentation in English.
- Giving an exposure to and practice with model group discussion and interviews.
- Completing the steps involved in Career, Life Planning and Change Management.
- Setting goals and objectives exercises.
- Prioritizing and time planning exercises.
- Taking a Personality Typing/ Psychometric Test
- Improving body language with pictures.

References and Text books

1. Kamalesh Sadanand and Susheela Punitha, “Spoken English: A Foundation Course” for Speakers of Indian Languages, Part 2 Audio CD, Hyderabad: Orient Longman, 2008
2. Malcome Goodale, “Professional Presentations”, (VCD) New Delhi: Cambridge University Press, 2005
3. Barbara Garside and Tony Garside, Essential Telephoning in English (Audio CD), Cambridge: Cambridge University Press, 2002

4. Hari Mohan Prasad and Rajnish Mohan, How to Prepare for Group Discussion and Interview (Audio Cassette) Tata McGraw-Hill Publishing
5. International English Language Testing System Practice Tests, CUP
6. Business English Certificate Materials, Cambridge University Press
7. Personality Development (CD-ROM), Times Multimedia, Mumbai
8. Interactive Multimedia Programs on Managing Time and Stress
9. Robert M. Sherfield and et al "Developing Soft Skills" 4th edition, New Delhi: Pearson Education, 2009

Outcomes:

- At the end of the course the students will be able to take part in group discussions actively.
- At the end of the course the students will be able to attend interview with a good perception of what is expected of them.
- The students will be equipped with the interpersonal skills and would know how to conduct themselves in various situations.

19SHA02 : ERROR ANALYSIS AND FUNDAMENTAL PHYSICAL QUANTITIES

Category :Audit **L T P C**

1 0 2 0

OBJECTIVES: To enhance the fundamental knowledge in error analysis and the measurement of fundamental physical quantities relevant to their field of engineering.

UNIT I STATISTICAL TREATMENT OF DATA 9 Hours

Introduction to errors, Significant Figures, Accuracy and Precision - Error Definitions - Round-off errors - Taylor Series - Error propagation: Functions of a Single Variable, Functions of more than one Variable - Total numerical errors, blunders, formulation errors,and data uncertainty.

UNIT II Measurement of length, weight and density 8 Hours

Standards of length - Vernier, screw gauge, travelling microscope. The balance - weighing by the method of oscillation and to compare the length of the arms of the balance. Density - Measurement of the density of a solid heavier than water by the method of Archimedes. Measurement of the density of a solid lighter than water. Measurement of the density of a liquid with specific gravity bottle. Hare's apparatus for the comparison of the densities of liquids - Hydrometer.

UNIT III Measurement of current, voltage and resistance 8 Hours

Voltmeter, ammeter, galvanometer - lamp and scale method, scale and telescope method – types of galvanometers. Resistance measurements - Wheatstone bridge-measurement of resistance of a galvanometer – Carey Foster bridge – measurement of low and high resistances – variation of resistance with temperature.

Total 25 Hours

REFERENCES

1. Steven C. Chapra and Raymond P. Canale Numerical Methods for Engineers, 7th edition, McGraw Hill Publications, 2015.
2. William Watson, a text-book of practical physics Longmans, Green, and Co. 1913
3. B. L. Worsnop and H. T. Flint Advanced Practical Physics for Students Methuen &Co. Ltd. 1931

OUTCOMES

Upon completion of this course the students will

CO1: Acquire basic knowledge in errors and error propagation.

CO2: Acquire knowledge on the measurement of length, weight and density

CO3: Acquire knowledge on the measurement of current, voltage and resistance

ALAGAPPA CHETTIAR GOVERNMENT COLLEGE OF ENGINEERING &TECHNOLOGY

KARAIKUDI–630003

(AnAutonomousInstitutionPermanently Affiliated to Anna University, Chennai)

COMPUTER SCIENCE AND ENGINEERING

B.E –FULL-TIME

ChoiceBasedCreditSystem

CURRICULUM AND SYLLABUS

(For III To VIII SEMESTER)

REGULATION-2019

(For students admitted during 2019-2020 and onwards)

Alagappa Chettiar Government College of Engineering & Technology, Karaikudi-3

(An Autonomous Institution Affiliated to Anna University Chennai)

CHOICE BASED CREDIT SYSTEM

ANNEXURE - I

Regulations 2019

CURRICULUM AND SYLLABI

SEMESTER I

S.No	Course Code	Course Title	Category	L	T	P	C
THEORY							
1	19ENH11	Communicative English	HS	2	0	2	3
2	19MAB12	Mathematics I	BS	3	1	0	4
3	19PHB13	Physics: Optics and Semiconductors	BS	3	1	0	4
4	19CMG15	Basic Civil and Mechanical Engineering	ES	4	0	0	4
PRACTICAL							
5	19PHL17	Physics Laboratory	BS	0	0	3	1.5
6	19MEL18	Workshop Practice Laboratory	ES	0	0	4	2
							18.5

SEMESTER II

S.No	Course Code	Course Title	Type of Course	L	T	P	C
THEORY							
1	19CHB21	Chemistry	BS	3	1	0	4
2	19MAB22	Mathematics II	BS	3	1	0	4
3	19CSG23	Python Programming	ES	3	0	0	3
4	19EEG16	Basic Electrical and Electronics Engineering	ES	4	0	0	4
PRACTICAL							
5	19CHL26	Chemistry Laboratory	BS	0	0	3	1.5
6	19CSL27	Python Programming Laboratory	ES	0	0	3	1.5
			Total Number of Credits				**18**

SEMESTER - III

Sl. No.	Subject Code	Subject	Category	Contact Periods	L	T	P	C
Theory								
1	19MAB31	Mathematics – III	BS	4	3	1	0	4
2	19CSH31	Professional Ethics and Human Values	HS	3	3	0	0	3
3	19ECC43	Microprocessor and Microcontroller	ES	3 3	3	0	0	3
4	19CSC31	Programming & Data Structures	PC	3	3	0	0	3
5	19CSC32	Database Management Systems	PC	3	3	0	0	3
6	19CHM31	Environmental Science and Engineering	MC	3	3	0	0	0
Practical								
7	19CSL31	Programming & Data Structures Laboratory	PC	2	0	0	2	1
8	19CSL32	Database Management Systems Laboratory	PC	2	0	0	2	1
			Total	**23**	**18**	**1**	**4**	**18**

SEMESTER – IV

Sl. No.	Subject Code	Subject	Category	Contact Periods	L	T	P	C
Theory								
1	19MAB43	Discrete Mathematics	BS	4	3	1	0	4
2	19CSG41	Analog and Digital Communication	ES	3	3	0	0	3
3	19CSC41	Advanced Data Structures	PC	3	3	0	0	3
4	19CSC42	Operating Systems	PC	3	3	0	0	3
5	19CSC43	Computer Organization & Architecture	PC	3	3	0	0	3
6	19CSC44	Design and Analysis of Algorithms	PC	3	3	0	0	3
Practical								
7	19CSL41	Advanced Data Structures Laboratory	PC	2	0	0	2	1
8	19CSL42	Operating Systems Laboratory	PC	2	0	0	2	1
			Total	**23**	**18**	**1**	**4**	**21**

SEMESTER - V

Sl. No.	Subject Code	Subject	Category	Contact Periods	L	T	P	C
Theory								
1	19MAB51	Probability and Queuing Theory	BS	4	3	1	0	4
2	19CSC51	Software Engineering	PC	3	3	0	0	3
3	19CSC52	Computer Networks	PC	3	3	0	0	3
4	19CSC53	Theory of Computation	PC	3	3	0	0	3
5	19CSC54	OOPS and Java Programming	PC	3	3	0	0	3
6	19CSEXX	Professional Elective – I	PE	3	3	0	0	3
Practical								
7	19CSL51	Networks Laboratory	PC	2	0	0	2	1
8	19CSL52	OOPS &JavaProgramming Laboratory	PC	2	0	0	2	1
9	19CSZ51	Technical Seminar – I	EEC	2	0	0	2	1
			Total	**25**	**18**	**1**	**6**	**22**

SEMESTER - VI

Sl. No.	Subject Code	Subject	Category	Contact Periods	L	T	P	C
Theory								
1	19CSC61	Artificial Intelligence	PC	3	3	0	0	3
2	19CSC62	Compiler Design	PC	3	3	0	0	3
3	19CSC63	Web Application Programming	PC	3	3	0	0	3
4	19CSC64	Object Oriented Analysis and Design	PC	3	3	0	0	3
5	19CSC65	Mobile and Pervasive Computing	PC	3	3	0	0	3
6	19CSEXX	Professional Elective –II	PE	3	3	0	0	3
Practical								
8	19CSL61	Compiler Design Laboratory	PC	2	0	0	2	1
9	19CSL62	CASE Tools Laboratory	PC	2	0	0	2	1
10	19CEZ51	Soft Skill Enhancement Training	EEC	3	0	0	0	0
11	19CSZ61	Technical Seminar – II	EEC	2	0	0	2	1
			Total	**27**	**18**	**0**	**6**	**21**

SEMESTER - VII

Sl. No.	Subject Code	Subject	Category	Contact Periods	L	T	P	C
Theory								
1	19CSC71	Graphics and Multimedia	PC	3	3	0	0	3
2	19CSC72	C # and .NET Technologies	PC	3	3	0	0	3
3	19CSC73	Cryptography and Network Security Software Testing	PC	3	3	0	0	3
4	19CSEXX	Professional Elective –III	PE	3	3	0	0	3
5	19CSEXX	Professional Elective –IV	PE	3	3	0	0	3
6	19CSPXX	Open Elective –I	OE	3	3	0	0	3
Practical								
7	19CSL71	Graphics and Multimedia Laboratory	PC	2	0	0	4	1
8	19CSL72	C # and .NET Laboratory	PC	2	0	0	2	1
9	19CSZ71	Mini Project	EEC	8	0	0	8	3.5
			Total T otal	**30**	**18**	**0**	**14**	**23.5**

SEMESTER - VIII

Sl. No.	Subject Code	Subject	Category	Contact Periods	L	T	P	C
Theory								
1	19CSEXX	Professional Elective- V	PE	3	3	0	0	3
2	19CSEXX	Professional Elective- VI	PE	3	3	0	0	3
3	19CSPXX	Open Elective- II	OE	3	3	0	0	3
Practical								
4	19CSZ81	Project Work	EEC	18	0	0	18	9
			Total	**27**	**9**	**0**	**18**	**18**

Total number of credits earned for the degree: **160**

*** The authorized department may prepare the syllabus and circulate to other department.**

[#] Based on the nomenclature the commonality course are assigned. If the syllabus is different the nomenclature may be modified and same may be informed accordingly.

PROFESSIONAL ELECTIVES

S.No	Subject Code	Subject	Credits
1.	19CSE01	Parallel Computing	3
2.	19CSE02	Digital Image Processing	3
3.	19CSE03	Component Based Technology	3
4.	19CSE04	Natural Language Processing	3
5.	19CSE05	UNIX Internals	3
6.	19CSE06	Open Source Software	3
7.	19CSE07	TCP / IP Design and Implementation	3
8.	19CSE08	Social networking Concepts	3
9.	19CSE09	Computer H/w & trouble shooting	3
10.	19CSE10	Visual Programming	3
11.	19CSE11	Advanced Databases	3
12.	19CSE12	Advanced Operating Systems	3
13.	19CSE13	Embedded Systems	3
14.	19CSE14	Knowledge based Decision Support Systems	3
15.	19CSE15	Green Computing	3
16.	19CSE16	XML and Web Technology	3
17.	19CSE17	User Interface Design	3
18.	19CSE18	Information Security	3
19.	19CSE19	Information storage and retrieval	3
20.	19CSE20	Wireless Network Systems	3
21.	19CSE21	Service oriented Architecture	3
22.	19CSE22	Real Time Systems	3
23.	19CSE23	Soft Computing	3
24.	19CSE24	Software Project Management	3

25.	19CSE25	Resource Management Techniques	3
26.	19CSE26	Software Quality Management	3
27.	19CSE27	Big Data Analytics	3
28.	19CSE28	Bio Informatics	3
29.	19CSE29	Cyber Forensics	3
30.	19CSE30	Computer Vision	3
31.	19CSE31	Pattern Recognition	3
32.	19CSE32	Grid & Cloud Computing	3
33.	19CSE33	Semantic Web	3
34.	19CSE34	Requirements Engineering	3
35.	19CSE35	Quantum Computing	3
36.	19CSE36	Numerical Methods for CSE	3
37.	19CSE37	Data Warehousing and Mining	3
38.	19CSE38	Adhoc & Sensor Networks	3
39.	19CSE39	Advanced Mobile computing	3
40.	19CSE40	Agile methodologies	3
41.	19CSE41	Database Tuning	3
42.	19CSE42	Game Programming	3
43.	19CSE43	GPU Architecture and Programming	3
44.	19CSE44	Graph Theory	3
45.	19CSE45	Nano Computing	3
46.	19CSE46	Robotics	3
47.	19CSE47	Advanced Computer Architecture	3
48.	19CSE48	Software Testing	3
49.	19CSE49	Machine Learning	3
50.	19CSE50	Multicore Architecture and programming	3
51.	19CSE51	Advanced Microprocessors and Microcontrollers	3
52.	19CSE52	Deep Learning	3
53.	19CSE53	Internet of Things	3

OPEN ELECTIVES

Sl. No.	Subject Code	Subject	Credits
1	19CSP01	Fundamentals of Computing	3
2	19CSP02	Data Structures & Algorithms	3
3	19CSP03	Fundamentals of Database	3
4	19CSP04	Operating system concepts	3

SEMESTER III

19MAB31	MATHEMATICS – III			
	L	T	P	C
	3	1	0	4

COURSE OBJECTIVES:

The Course objective is

- to develop the skills of the students in solving different kinds of problems that occur in their engineering field.
- to expose the students in gaining adequate knowledge in the theory and applications of Fourier series, Fourier Transforms, Partial Differential Equations & their applications and Z-transforms

COURSE OUTCOMES:

At the end of the course, the students will

CO1: Solve partial differential equations involved in Wave phenomena, Heat conduction in homogenous solids and potential theory.

CO2: Apply Fourier series to solve various problems that arise in Electrical Engineering and heat conduction.

CO3: Solve boundary value problems that arise from transverse vibrations of a string, heat flow in one dimension and steady state temperature distribution in two dimensions.

CO4: Apply Fourier transforms to deal with non-periodic functions in Signals and Systems, Communication Engineering and other branches of applied mathematics.

CO5: Acquire adequate knowledge in Z-transforms in order to deal with discrete time signals in Communication Engineering.

COURSE CONTENT:

UNIT 1: **PARTIAL DIFFERENTIAL EQUATIONS** — 12 hrs

Formation of partial differential equations- Lagrange's linear equation- Solutions of standard types of first order partial differential equations- Solutions of homogenous linear partial differential equations of second and higher order with constant coefficients

UNIT 2: **FOURIER SERIES** — 12 hrs

General Fourier series- Dirichlet's conditions- Odd and Even functions- Half Range sine series- Half Range cosine series- Complex form of Fourier series- Parseval's identity- Harmonic analysis

UNIT 3: **APPLICATIONS OFPARTIAL DIFFERENTIAL EQUATIONS** — 12 hrs

Solutions of one-dimensional wave equation- one-dimensional equation of heat conduction- Steady state solution of two-dimensional equation of heat conduction (insulated edges excluded)- Fourier series solutions in Cartesian co-ordinates.

UNIT 4: **FOURIER TRANSFORMS** — 12 hrs

Fourier integral theorem (without proof)- Fourier transform pair- Properties of Fourier Transforms- Fourier Sine and Cosine transforms- Properties- Convolution theorem- Parseval's identity.

UNIT 5: Z-TRANSFORMS AND DIFFERENCE EQUATIONS	12 hrs
Z-Transforms- Properties- Z-transforms of some basic functions - Inverse Z-Transforms- Convolution theorem- Formation of difference equations- Solution of difference equations using Z-Transforms	
Total Hours	**60**

TEXT BOOKS:

1. Grewal.B.S. "Higher Engineering Mathematics ", 43rd Edition, Khanna Publishers, Delhi, 2015.
2. Veerarajan.T, "Transforms and Partial Differential Equations", Third Edition, Tata McGraw-Hill Pub.Co.Ltd, New Delhi, 2016.

REFERENCES:

1. Glyn James, "Advanced Modern Engineering Mathematics", 4th Edition, Pearson Education, 2011.
2. Ramana.B.V. "Higher Engineering Mathematics ",Tata McGraw-Hill Pub.Co.Ltd, New Delhi, 2010.
3. .Venkataraman.M.K.," Engineering Mathematics III", Thirteenth Edition (Revised & enlarged), The National Pub.Co., 1998.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K3	3	2	1	1	-	-	-	-	-	-	-	-	1	1	1
	CO2	K3	3	2	1	1	-	-	-	-	-	-	-	-	1	1	1
	CO3	K3	3	2	1	1	-	-	-	-	-	-	-	-	1	1	1
	CO4	K3	3	2	1	1	-	-	-	-	-	-	-	-	1	1	1
	CO5	K3	3	2	1	1	-	-	-	-	-	-	-	-	1	1	1
Average Correlation Level			3	2	1	1	-	-	-	-	-	-	-	-	1	1	1

19CSH31	PROFESSIONAL ETHICS AND HUMAN VALUES				
		L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To emphasize into awareness on Engineering Ethics and Human Values.
- To understand social responsibility of an engineer.
- To appreciate ethical dilemma while discharging duties in professional life.

COURSE OUTCOMES:

Upon Completion of the course, the students should have:

CO1: Ability to perform with professionalism ,
CO2: Understand their rights, legal, ethical issues and their responsibilities as it pertains to engineering profession
CO3: Engaging in life-long learning with knowledge of contemporary issues.
CO4: Examining the Responsibilities and rights in their professional occupation.
CO5: Emphasize the social and moral responsibilities while discharging duties in professional life

UNIT 1: **HUMAN VALUES**	9 hrs

Morals-Valuesandethics−Integrity−Workethic−Servicelearning−CivicVirtue −Respect for Others −Living Peacefully −Caring −Sharing −Honesty −Courage− ValuingTime−Co-operation− Commitment−Empathy−Self-Confidence− Character −Spirituality.

UNIT 2: **ENGINEERING ETHICS**	9 hrs

Senses ofEngineeringEthics−Varietyofmoral issues − Types of inquiry −Moral dilemmas – Moralautonomy− Kohlberg's theory − Gilligan's theory − Consensus and controversy−Modelsofprofessionalroles –TheoriesaboutRightAction −Self- Interest− Customs and religion − Uses of ethical theories.

UNIT 3: **ENGINEERING AS SOCIAL EXPERIMENTATION**	9 hrs

Engineeringasexperimentation−EngineersasResponsibleExperimenters−Codes of Ethics − Balanced Outlook on Law− Challenger Case Study.

UNIT 4: **SAFETY- RESPONSIBILITIES AND RIGHTS**	9 hrs

Safety and Risk − Assessment of Safety and Risk − Risk Benefit Analysis and Reducing Risk − Three Mile Island and Chernobyl Case Studies− Collegiality and Loyalty − Respect for Authority − Collective Bargaining − Confidentiality − Conflicts ofInterest−OccupationalCrime – ProfessionalRights−EmployeeRights− Intellectual Property Rights (IPR)− Discrimination.

UNIT 5: **GLOBAL ISSUES**	9 hrs

Multinational corporations–Environmentalethics−Computer Ethics Weapons Development −Engineers as managers − Consulting Engineers − Engineers as Expert WitnessesandAdvisors−Moralleadership –SampleCodeofEthicsLikeASME- ASCE−IEEE-

InstitutionofEngineers(India)−IndianInstitute of Materials Management−InstitutionofElectronicsandTelecommunication Engineers(IETE)- India- Etc.

Total Hours	**45**

TEXT BOOKS:

1. Mike W. Martin and Roland Schinzinger, "**Ethics in Engineering**", Tata McGraw Hill, New Delhi, 2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "**Engineering Ethics**", Prentice Hall of India, New Delhi, 2004.

REFERENCES:

1. Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics – Concepts and Cases", Cengage Learning, 2009
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003
4. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001
5. Laura P. Hartman and Joe Desjardins, "Business Ethics: Decision Making for Personal Integrity and Social Responsibility" Mc Graw Hill education, India Pvt.Ltd.,New Delhi 2013.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K4	-	-	-	-	-	2	3	2	-	-	-	-	-	-	-
	CO2	K2	-	-	-	-	-	2	3	2	3	-	-	-	-	-	-
	CO3	K5	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-
	CO4	K3	-	-	-	-	-	2	2	-	2	-	-	-	-	-	-
	CO5	K2	-	-	-	-	-	3	2	-	-	-	-	2	-	-	-
Average Correlation Level			-	-	-	-	-	2.25	2.5	2	2.5	-	-	2.5	-	-	-

19ECC43	MICROPROCESSOR AND MICROCONTROLLER				
		L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To describe the architecture and programming of 8085 and 8086 Microprocessor.
- To understand the diverse peripheral interfacing techniques.
- To portray the diverse units in internal architecture of 8051 Microcontroller.
- To acquire interfacing skills on different devices with 8051Microcontroller.

COURSE OUTCOMES:

Upon completion of this course, students are able to

CO1: Implement arithmetic, logic, counter and delay application programs using 8085.
CO2: Interface memory and I/O devices with 8085 using diverse interfaces.
CO3: Develop arithmetic, logic and interrupt programs in 8086.
CO4: Portray the diverse units of 8051 Microcontroller architecture.
CO5: Interface memory and I/O devices with 8051 using diverse interfaces

UNIT 1: **8085MICROPROCESSOR** — **9 hrs**

8085InternalArchitecture–InstructionSet–AddressingModes–Assembly language programming Counters–Time delays–Interrupts–Memory and I/O Devices Interfacing.

UNIT 2: **PERIPHERALS INTERFACING OF 8085** — **9 hrs**

8255ProgrammablePeripheralInterface – 8279Keyboard and display controller– ADC/DAC interfacing 8253ProgrammableIntervalTimer-8251 Programmable Serial Communication Interface– 8257DirectMemoryAccess Controller.

UNIT 3: **8086 MICROPROCESSOR** — **9 hrs**

8086 Internal Architecture –Addressing Modes–Instruction Set–Assembly language programming– Hardware and Software Interrupts.

UNIT 4: **8051 MICROCONTROLLER** — **9 hrs**

8051Microcontrollerhardware–8051 Pin Description – I/O Ports and circuits – External memory– Counters and timers–Serial data I/O– Interrupts – Interfacing to externalmemoryand8255.

UNIT 5: **8051 PROGRAMMING AND APPLICATIONS** — **9 hrs**

8051instructionset–Addressing modes–Assembly language programming– I/Oportprogramming-Timerandcounterprogramming–Serialcommunication– Interrupt programming–Interfacing with 8051: ADC, DAC and Steppermotor.

Total Hours — **45**

TEXT BOOKS:

1. RameshS.Gaonkar,"**Microprocessor Architecture Programming and application with 8085**", 4th Edition,PHI,2000.
2. JohnUffenbeck,"**The 80x86 Families, Design, Programming and Interfacing**",3rdEdition, PearsonEducation, 2002.
3. Mohammed Ali Mazidiand Janice GillispieMazidi,"**The 8051 Microcontroller and Embedded Systems**",PearsonEducation Asia,2003.

REFERENCES:

1. Ray A. K. and Burchandi K. M.,"Intel Microprocessors Architecture ProgrammingandInterfacing",TMH,2000.
2. Rafiquzhman. M, "Microprocessors Theory and Applications: Intel and Motorola",PHIPvt.Ltd.,2003.
3. Kenneth. J. Ayala, "The 8051 Microcontroller Architecture Programming andApplication",2ndEdition,PenramInternationalPublishers(India),1996.

NPTEL Course:

1. Microprocessors and Microcontrollers, https://nptel.ac.in/courses/106/108/106108100/

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K4	-	-	-	-	-	2	3	2	-	-	-	-	-	-	-
	CO2	K2	-	-	-	-	-	2	3	2	3	-	-	-	-	-	-
	CO3	K5	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-
	CO4	K3	-	-	-	-	-	2	2	-	2	-	-	-	-	-	-
	CO5	K2	-	-	-	-	-	3	2	-	-	-	-	2	-	-	-
Average Correlation Level			-	-	-	-	-	2.25	2.5	2	2.5	-	-	2.5	-	-	-

19CSC31	PROGRAMMING AND DATA STRUCTURES			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To gain the knowledge of various operations on C Programming language.
- To understand and apply the various operations on pointers, structures & unions.
- To gain the knowledge of basics of data structures.
- To understand the various operations on linear data structures.
- To
-
- gain the knowledge of stack & queue.

COURSE OUTCOMES:

CO1: Understand the various operations on C Programming language.
CO2: Apply the various operations on pointers, structures &unions.
CO3: Constructthe various basic concepts of data structures.
CO4: Analyze the various operations on linear data structures.
CO5: Analyze various operations on stacks & queues.

COURSE CONTENT:

UNIT 1: **C PROGRAMMING – INTRODUCTION** 9 hrs

Structure of a C program – Constants, Variables – Data Types – Expressions using operators in C – Managing Input and Output operations – Decision Making and Branching – Looping statements. Arrays – Initialization – Declaration – One dimensional and Two-dimensional arrays. Strings- String operations – String Arrays. Simple programs- sorting- searching – matrix operations.

UNIT 2: **FUNCTIONS, POINTERS, STRUCTURES AND UNIONS** 9 hrs

Functions – Pass by value – Pass by reference – Recursion. Pointers – Definition – Initialization – Pointers arithmetic. Structures and unions – definition – Structure within a structure. Union – Programs using structures and Unions .Storage classes, Pre-processor directives.

UNIT 3: **DATA STRUCTURES – INTRODUCTION** 8 hrs

Data Structures - Basic Terminologies, Types of Data Structures - Data structure operations. Abstract Data Types –Operations. Algorithm – Characteristics. Analysis of algorithms- types of analysis. Complexity of algorithms: Time and Space complexity.

UNIT 4: **LINEAR DATA STRUCTURES : LINKED LIST**	9 hrs

List ADT – array-based implementation – linked list implementation. Types of List - Singly linked list- representation – Operations - Insertion, Deletion, Merge &Traversal. Doubly-linked list – representation – Operations - Insertion, Deletion, Merge&Traversal. Circularly linked list- representation – Operations - Insertion, Deletion, Merge, TraversalApplications of lists – Polynomial Representation , Sparse matrix Manipulation.

UNIT 5: **LINEAR DATA STRUCTURES :STACKS AND QUEUES**	10 hrs

Stacks: Introduction – Representation- Array representation of stack, Linked representation of stack. Primitive operations on stack. Application of Stacks - Recursion - Conversion of Infix to Postfix and Prefix Expressions - Evaluation of Postfix Expressions.

Queues: Introduction - Representation– Representation of queue using array , representation of queue using linked list. Operations on queue. Types of Queues-Circular Queue – Dequeue- Priority Queue. Applications of queues – simulation, cpu scheduling & round robin algorithms.

Total Hours	**45**

TEXT BOOKS:

1. Reema Thareja, " **Programming in C**", OUP publications, 2nd Edition, 2016.
2. Narasimha Karumanchi ,"**Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzles**", Career Monk Publications; 5th *Edition* , 2016.

REFERENCES:

Brian W. Kernighan ,Dennis Ritchie, "The C Programming Language ", Pearson publications,2nd Edition, ,2015.

1. Thomas H. Cormen Charles E. Leiserson Ronald L. Rivest Clifford Stein,"Introduction to Algorithms", 3rd Edition, PHI Learning Private Limited, 2012.

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K3	K4	K5
Course Outcomes	CO 1	K 2	2	-	-	2	-	-	-	-	-	-	-	-	2	-	-
	CO 2	K 3	3	-	-	-	3	-	-	-	-	-	-	-	3	-	-
	CO 3	K 3	-	2	3	-	-	-	-	-	-	-	-	-	3	-	-
	CO 4	K 4	-	3	-	3	-	-	-	-	-	-	-	-	-	2	-
	CO 5	K 4	-	3	-	-	-	-	-	-	-	-	-	-	-	2	-
Average Correlation Level			2.5	2.6	3	2.5	3	-	-	-	-	-	-	-	2.6	2	-

19CSC32	DATABASE MANAGEMENT SYSTEMS			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To expose the fundamentals of Database Management Systems.
- To understand the relational model & SQL
- To design the normalized database
- To understand the fundamentals of Transaction Processing and Concurrency Control techniques.
- To have knowledge about various storage media and query processing.

COURSE OUTCOMES:

CO1: Design ERdiagrams forDatabase applications.
CO2: Construct a Relational Database with constraints using SQL
CO3: Apply the Normalization for Efficient Database management.
CO4:Make use of concurrency control and recovery mechanisms for solving practical problem
CO5: Design the Query Processor and Transaction Processor.

COURSE CONTENT:

UNIT 1: **FUNDAMENTALSAND DATA MODELS** — 9 hrs

Purposeofdatabasesystem –Viewsofdata–Datamodels– Database Languages-Database system architecture–. Entity Relationshipmodel(E-R Model) – E-R diagrams – Enhanced-ER Model – ER-to-Relational Mapping

UNIT 2: **RELATIONAL MODEL&SQL** — 10 hrs

Introduction to Relational Databases-Relational model-Keys-Relational Algebra-Relational calculus - SQL fundamentals– Integrity– Triggers – Security – Advanced SQL features–EmbeddedSQL– DynamicSQL–Views.

UNIT 3: **DATABASE DESIGN** — 8 hrs

Functionaldependencies–Non-lossdecomposition–Normalization–First–Second–Thirdnormalforms-Dependencypreservation–Boyce/coddnormal form –Multi-valueddependenciesandfourthnormalform –Joindependenciesand fifth normal form.

UNIT 4: **TRANSACTIONS** — 9 hrs

Transaction concepts –ACIDproperties -Schedules– Serializability -Concurrency– Needforconcurrency–Lockingprotocols– Twophaselocking– Intent locking – Deadlock — Transaction Recovery – Save Points- Recovery Isolation Levels – SQL Facilities for Concurrency.

UNIT 5: IMPLEMENTATION TECHNIQUES	9 hrs
RAID – FileOrganization–Organizationof RecordsinFiles–IndexingandHashing– OrderedIndices–B+ TreeIndexFiles–BTreeindexfiles–Statichashing– Dynamic hashing – Query processing overview – Algorithms for SELECT and JOIN operations – Query optimization using Heuristics and Cost Estimation.Advanced databases:Overview of Parallel Database - Multimedia Database.	
Total Hours	**45**

TEXT BOOKS:

1. Silberschatz, A., Korth, H.F. and Sudharshan, S., "**Database System Concepts**",7th Edition, Tata Mc-Graw Hill, 2020.
2. Elmasri, R.and Navathe, S.B., "**Fundamentals of Database Systems**", 7th Edition, Pearson / Addison Wesley, 2015

REFERENCES:

1.Ramakrishnan,R.,"DatabaseManagementSystems", 4th Edition,Mc-Graw Hill, 2010.

2. Singh,S.K., "DatabaseSystemsConcepts,DesignandApplications",1st Edition, Pearson Education, 2006.

3. Date,C.J.,Kannan,A.andSwamynathan,S.,"AnIntroductiontoDatabase Systems", 8th Edition, Pearson Education, 2006.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K5	-	-	2	-	-	-	-	-	-	-	2	-	-	3	-
	CO2	K3	-	-	3	-	3	-	-	-	-	-	-	-	-	2	-
	CO3	K3	3	-	-	-	3	-	-	-	-	-	-	-	3	-	-
	CO4	K2	2	-	-	3	-	-	-	-	-	-	-	-	2	-	-
	CO5	K4	2	-	3	-	2	-	-	-	-	-	-	-	-	3	-
Average Correlation Level			**2.3**	**-**	**2.6**	**3**	**2.6**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**2.5**	**2.6**	**-**

19CHM31	ENVIRONMENTAL SCIENCE AND ENGINEERING			
L	T	P	C	
3	0	0	0	

COURSE OBJECTIVES

- To study the nature and facts about environment.
- To study the importance of ecosystem and biodiversity with the environment.
- To find and implement scientific solutions to environmental pollution, nuclear hazards, disaster an waste management.
- To analyze social issues and its impact on environment.
- To relate the impact of human population, role of ITin environment and human health.

COURSE OUTCOMES

CO1: Develop knowledge on various natural resources, over exploitation, their causes, effects and Control measures

CO2: Explain the nature of various eco systems, their structure, composition, function, inter-Dependency, values and enunciate the values of bio-diversity, threats and suggest appropriate Strategies for its conservation

CO3: Identify and implement technological and economical solution to environmental pollution, Nuclear hazards, disaster and waste management

CO4: Implement strategies in achieving sustainable development by analyzing social issues and its Impact on environment

CO5: Demonstrate the impact of human population and role of IT in environment and human health

COURSE CONTENT

UNIT 1INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES	9 hrs

Definition, Scope and Importance – Need For Public Awareness. Forest Resources :- Use and Over Exploitation, Deforestation, Timber Extraction, Mining, Dams and their effects on forest and tribal people, Case Studies. Water Resources:- Over Utilization of Water, Ground Water,Floods,Droughts,Conflicts Over Water, Dams – Benefits and problems – Case studies

Mineral Resources:- Use and Over Utilization of Surface and Exploitation of minerals, Environmental Effects of Extracting and using Mineral Resources, Case Studies. Food Resources:- World Food Problems, Changes caused by Agriculture and Overgrazing ,Effects of Modern Agriculture, Fertilizer – Pesticide Problems, Water Logging,Salinity,Case Studies. Energy Resources:-Growing Energy Needs, Renewable and Non Renewable Energy Sources, Use of Alternative Energy Sources, Case Studies. Land Resources: - Land as a resource, Land Degradation, Man Induced Land Slides, Soil Erosion and Deforestation –Role of an individual in Conservation of Natural Resources – Equitable use of Resources for Sustainable Life styles.Field Study of Local Area to document Environmental assets – Rivers / Forest / Grassland / Hill / Mountain

UNIT 2ECOSYSTEMS AND BIODIVERSITY	9 hrs

Ecosystem - concept of an ecosystem – 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 (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity 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 – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservationofbiodiversity.Fieldstudy of common plants, insects, birds; Field study of simple ecosystems – pond, river, hill slopes, etc

UNIT 3ENVIRONMENTAL POLLUTION	9 hrs

Definition – causes, 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 municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban, Rural, Industrial, Agricultural.

UNIT 4SOCIAL ISSUES AND THE ENVIRONMENT	9 hrs

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – Role of non-governmental organization- Environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

UNIT 5HUMAN POPULATION AND THE ENVIRONMENT	9 hrs

Population growth, variation among nations – population explosion – family welfare Programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

Total Hours	**45**

TEXT BOOKS

1. Benny Joseph, '**Environmental Science and Engineering'**, Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M.Masters, '**Introduction to Environmental Engineering and Science**', 2nd edition,Pearson Education, 2004.

3. Kausik and Kausik, '**Environmental Science and Engineering**', 3rd Edition, New Age International Publishers, New Delhi, 2008

REFERENCES

1. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India Pvt Ltd, New Delhi, 2007.
2. ErachBharucha, "Textbook of Environmental Studies", Universities Press (I) Pvt Ltd, Hydrabad, 2015.
3. G. Tyler Miller and Scott E. Spool man, "Environmental Science", Cengage Learning India PVT LTD, Delhi, 2014.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, 2005.

5. Wright and Nebel, 'Environmental Science towards a sustainable', future, Prentice Hall of India Ltd, 2000.

6. S.K. Garg and Garg, 'Ecological and Environmental studies', Khanna Publishers, Delhi,2006

7. Gillbert M. Masters, 'Introduction to Environmental Engineering and Science', Second Edition, Pearson education publication, Delhi,2004.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping		Programme Outcomes / Programme Specific Outcomes														
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
Course Outcomes	CO1	2	-	-	-	-	2	3	-	-	2	-	-	1	-	-
	CO2	2	-	-	-	-	2	3	-	-	2	-	-	1	-	-
	CO3	2	1	-	-	-	2	3	-	-	2	-	-	1	-	-
	CO4	2	1	-	-	-	2	3	-	-	2	-	-	1	-	-
	CO5	2	1	-	-	-	2	3	-	-	2	-	-	1	-	-
Average Correlation Level		2	1	-	-	-	2	3	-	-	2	-	-	1	-	-

19CSL31	PROGRAMMING AND DATA STRUCTURES LABORATORY			
L	T	P	C	
0	0	2	1	

COURSE OBJECTIVES:

- To understand the various concepts in C.
- To develop applications in C using functions, pointers,structures, unions.
- To implement the various operations on linked list algorithms.
- To implement the stack algorithms.
- To implement the queue algorithms.

COURSE OUTCOMES:

CO1: Design the various concepts in C.
CO2: Write a program in C using functions, pointers,structures, unions.
CO3: Apply the various operations on Linked List algorithms.
CO4: Design the various operations on stack.
CO5: Apply the various queue algorithms in real world applications.

List of Experiments :

1. C Programs using Input /Output statements.
2. C Programs using control statements - branching& looping
3. C Programs using arrays – one dimensional & two dimensional.
4. C Programs using strings.
5. C Programs using functions- pass by value & pass by reference.
6. C Programs using pointers.
7. C Programs using structures.
8. C Programs using structures unions.
9. Implementation of singly linked list operations.
10. Implementation of doubly linked listoperations.
11. Implementation of circularly linked listoperations.
12. Implementation of applications of linked list
13. Implementation of applications of stacks.
14. Implementation of queues.
15. Implementation of applications of queues.

Hardware & Software requirements :

Stand alone desktops with C.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K3	K4	K5
Course Outcomes	CO1	K2	-	-	2	2	-	-	-	-	-	-	-	-	-	2	-
	CO2	K1	-	2	-	-	-	-	-	-	-	-	-	-	-	2	-
	CO3	K3	3	-	-	3	3	-	-	-	-	-	-	-	3	-	-
	CO4	K2	-	-	2	-	-	-	-	-	-	-	-	-	2	-	-
	CO5	K3	3	-	-	-	-	-	-	-	-	-	-	-	3	-	-
Average Correlation Level			3	2	2	2.5	3	-	-	-	-	-	-	-	2.6	2	-

19CSL32	DATABASE MANAGEMENT SYSTEMS LABORATORY			
	L	T	P	C
	0	0	2	1

COURSE OBJECTIVES:

- Have hands on experience on DDL, DML, DCL Commands
- Learn to create and use a database
- Be familiarized with a query language
- Familiarize advanced SQL queries
- Be Exposed to different applications

COURSE OUTCOMES:

CO1: Design and implement a database schema for a given problem-domain
CO2: Populate and query a database
CO3: Create and maintain relations using PL/SQL
CO4: Create database triggers and functions
CO5: Prepare reports

COURSE CONTENT:

1. TableCreation, Constraints
2. Insert, Select Commands, Update and Delete Commands.
3. Database Querying – Simple queries, Nested queries, Sub queries and Joins
4. Views
5. Controlstructures
6. Procedures and Functions
7. Triggers
8. Database design using ER modeling, Normalization.
9 Data base connectivity using front end tools and GUI Tools
10. Menu Design
11. Reports.
12. Database Design and implementation (Mini Project)

SOFTWARES REQUIRED:
Front end: VB/VC ++/JAVA or Equivalent
Back end: Oracle / SQL / MySQL/ PostGress / DB2 or Equivalent

Total Hours	**30**

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K6	-	-	3	2	3	-	-	-	-	-	-	-	-	2	-
	CO2	K4	-	3	-	4	-	-	-	-	-	-	-	-	-	2	-
	CO3	K6	2	-	-	-	3	-	-	-	-	-	-	-	-	3	-
	CO4	K6	-	-	-	-	-	2	-	-	-	-	-	-	-	3	-
	CO5	K4	-	-	-	-	-	-	-	-	2	3	-	-	-	-	-
Average Correlation Level			2	3	3	3	3	2	-	-	2	3	-	-	-	2.5	-

SEMESTER IV

19MAB43	DISCRETE MATHEMATICS			
L	T	P	C	
3	1	0	4	

COURSE OBJECTIVES:

The objective of the Course is

- To improve the logical thinking of the students which is very much essential to develop their skills in writing Programs.
- To provide the basic concepts of sets and various algebraic structures so that the students would improve their knowledge in Coding theory.

COURSE OUTCOMES:

At the end of the Course, the students will be able to

***CO1* :** understand the laws and rules involved in Propositions and Arguments.
***CO2* :** apply the rules of inference and the rules ofuniversal specification andgeneralization to the propositional functions.
***CO3* :** understand the concepts and significance of set theory, Hasse diagram, lattices and Boolean algebra which are widely used in computer science and engineering.
***CO4* :** learnthebasic concepts of combinatoricswhichareessentialforcomputer science engineering courses .
***CO5* :** Exposetheconcepts and properties of algebraic structures such as groups and rings.

COURSE CONTENT:

UNIT 1: **PROPOSITIONAL CALCULUS** — 12 hrs

Propositions – Logical connectives – Compound proposition – Conditional and bi-conditional propositions – Truth tables – Tautologies and contradictions – Contra positive – Logical equivalences and implications – Demorgon's Laws – Normal forms – Principal conjunctive and disjunctive normal forms

UNIT 2: **PREDICATE CALCULUS** — 12 hrs

Rules of Inference – Arguments – Validity of Arguments. Predicates – Statement function – Variables – Free and bound variables – Quantifiers – Universe of discourse – Logical equivalences and implications for quantified statements – Theory of inference – The rule of universal specification and generalization - Validity of arguments.

UNIT 3: **SET THEORY** — 12 hrs

Basic concept – Notations – Subset – Algebra of sets – The power set – Ordered pairs and Cartesian product – Relations on sets – Types of relations and their properties – Relational matrix and graph of a relation – Partitions – Equivalence relations – Partial ordering – Poset – Hasse diagram - Lattices and their properties – sub lattices – Boolean algebra

UNIT 4: **COMBINATORICS**	12 hrs
Mathematical induction – Strong induction and well ordering – The basics of counting – The pigeonhole principle – Permutations and combinations – Recurrence relations – Solving linear recurrence relations – Generating functions – Inclusion and exclusion principle and its applications	
UNIT 5: **GROUPS**	12hrs
Algebraic systems – Semi groups and monoids - Groups – Subgroups – Homomorphism – Normal subgroup and cosets – Lagrange‘s theorem – Definitions and examples of Rings and Fields.	
Total Hours	**60**

TEXT BOOKS:

1. Veerarajan.T “Discrete **Mathematics with Graph Theory and Combinatorics**”, Tata McGraw-Hill Publishing Company Limited, 2007
2. Trembley and R.Manohar , “**Discrete Mathematical Structures with Applications to computer Science**”, Tata McGraw Hill, 2008.

REFERENCES:

1. Ralph P. Grimaldi, “Discrete and Combinatorial Mathematics: An Applied Introduction”, 4th Edition, Pearson Education Asia,2002.
2. Kenneth H.Rusen, “Discrete Mathematics and its Application”, Sixth Edition, Tata McGraw Hill, 2007
3. Richard Johnsonbaugh, “Discrete Mathematics”, 5th edition, Pearson Education Asia,2002.
4. Chandrasekaran and Umaparvathi, “Discrete Mathematics”, PHI, 2010.
5. Koshy, T. "Discrete Mathematics with Applications", Elsevier Publications, 2006

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			Programme Outcomes / Programme Specific Outcomes														
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K2	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	CO2	K3	3	2	1	1	-	-	-	-	-	-	-	-	1	1	1
	CO3	K3	3	2	1	1	-	-	-	-	-	-	-	-	1	1	1
	CO4	K2	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	CO5	K3	3	2	1	1	-	-	-	-	-	-	-	-	1	1	1
Average Correlation Level			2.6	1.6	1	1	-	-	-	-	-	-	-	-	1	1	1

19CSG41	ANALOG AND DIGITAL COMMUNICATION				
		L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce the concept of various analog modulations and their spectral characteristics.
- To learn data and pulse communication techniques.
- To explain the shift keying properties.
- To study the limit set by information theory.
- To utilize multi-user radio communication.

COURSE OUTCOMES:

CO1: Explain basic concepts of AM, FM and PM communication systems.
CO2: Illustrate data and pulse communication techniques.
CO3: Explore the shift keying mechanisms in digital communication.
CO4: Analyze the information theory coding concepts.
CO5: Gain knowledge on multi user radio communication

UNIT 1: **FUNDAMENTALS OF ANALOG COMMUNICATION** — 9 hrs

Introduction to communication systems – Modulation- Need for modulation-Types of modulation - Theory of amplitude modulation - Frequency spectrum of AM wave – Power relations in AM wave - Evolution and description of SSB techniques - Theory of frequency and phase modulation - Comparison of analog communication systems (AM-FM-PM)

UNIT 2: **PULSE AND DATA COMMUNICATION** — 9 hrs

Pulse modulation-Sampling Theorem-Types of pulse modulation-Pulse Amplitude Modulation (PAM) - Pulse Time Modulation (PTM) - Pulse Code Modulation (PCM)-Quantization and Companding -Delta modulation and adaptive delta modulation- Data Communication: History of Data communications-Standard organizations for data communication-Data communication circuits-Data communication codes- Data communication hardware-Serial and Parallel interfaces.

UNIT 3: **DIGITAL COMMUNICATION** — 9 hrs

Amplitude Shift Keying – FrequencyShiftKeying–FSKBitRateandBaud–FSKTransmitter–BW ConsiderationofFSK–FSKReceiver– PhaseShiftKeying–Binary PhaseShiftKeying – QPSK – Quadrature Amplitude Modulation – Bandwidth Efficiency – Carrier Recovery – Squaring Loop – Costas Loop – DPSK.

UNIT 4: **INFORMATIONTHEORY** — 9 hrs

Discrete messagesand information content -Concept of amount of information – Averageinformation- Entropy-Informationrate- Sourcecodingincrease average information per bit - Shannon-fanocoding -Huffman coding - Lempel-Ziv(LZ)coding-Shannon'stheorem-Channelcapacity– Bandwidth-S/N trade-off-Mutualinformationandchannelcapacity-Ratedistortiontheory-Lossy source coding.

UNIT 5: MULTI –USER RADIO COMMUNICATION	9 hrs
Global system for mobile communication (GSM)-Code division multiple access (CDMA)-Cellular concept and frequency response -Channel assignment and handover techniques -Overview of multiple access schemes - Satellite communication - Bluetooth.	
Total Hours	**45**

TEXT BOOKS:

1. WayneTomasi,"**AdvancedElectronicCommunicationSystems**",6th Edition, Pearson Education, 2009.

2. Simon Haykin and Michael Moher, "**Communication Systems**", 5th edition, John wiley& Sons.

REFERENCES:

1. H P Hsu, Schaum Outline Series-Analog and Digital communications TMH 2006.
2. B. P. Lathi, "Modern Analog and Digital Communication Systems", 3rd Edition, Oxford University Press, 2007
3. BruceCarlson.,"CommunicationSystems",3rdEdition,TMH,1996.
4. H. Taub, D L Schilling, G Saha,"Principles of Communication", 3rd Edition, 2007.

Mapping			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5
Course Outcomes	CO1	-	**1**	**1**	-	-	-	-	-	**1**	**1**	**1**	-	**1**	**1**	**1**
	CO2	-	**3**	**3**	-	-	-	-	-	**3**	**3**	**3**	-	**3**	**3**	**3**
	CO3	-	**3**	**2**	-	-	-	-	-	**3**	**3**	**3**	-	**3**	**3**	**3**
	CO4	-	**3**	**3**	-	-	-	-	-	**3**	**3**	**3**	-	**3**	**3**	**3**
	CO5	-	**3**	**3**	-	-	-	-	-	**3**	**3**	**3**	-	**3**	**3**	**3**
Average Correlation Level			2.6	2.4	-	-	-	-	-	2.6	2.6	2.6	-	2.6	2.6	2.6

19CSC41	ADVANCED DATA STRUCTURES			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To gain the knowledge of various operations on binary tree.
- To understand and apply the various graph algorithms in real world.
- To gain the knowledge of types of searching& sorting.
- To understand the various types of search trees.
- To Be familiarized with hashing &dynamic Storage Management.

COURSE OUTCOMES:

CO1: Understand the various operations on binary tree.

CO2;Apply the various graph algorithms in real world programming.

CO3: Compare the various operations on searching & sorting.

CO4: Analyze the various search trees suitable for real time applications.

CO5: Apply suitable hashing mechanism and data storage.

COURSE CONTENT:

UNIT 1: **Non Linear Data Structures - Trees** — 9 hrs

Trees : Basic Terminology – General tree . Types of trees . Binary Tree – Binary tree traversals – Binary tree operations . Binary search tree –Operations – Insertion, Searching, deletion .Threaded Binary tree.- right threaded binary tree – traversals. Applications of binary trees – Huffman Algorithm - Expression trees – Decision tree- Game trees.

UNIT 2:**Non Linear Data Structures - Graphs** — 9 hrs

Graphs : Representation of graphs - Graph Traversals - Depth-first and breadth-first traversal . Topological sort . Spanning trees -Shortest-path algorithms – Connected components – Prim's algorithm- Kruskal's algorithm- Biconnected components – Disjoint set operations. Applications of graphs.

UNIT 3:**Searching and Sorting** — 9 hrs

Searching : Searching techniques - Sequential Search - Binary Search –Fibonacci search- Indexed search – Hashed search.

Sorting : Types of sorting- bubble sort, Insertion sort. Selection sort. Quick sort- Heap sort - Shell sort -Bucket sort – Radix sort –File sort –Shell sort. Comparison of all sorting Methods.

UNIT 4:**Search Trees** — 9 hrs

Symbol table – representation of symbol table. Optimal Binary search tree. Types of search trees – Multi way search tree- B- tree – B+ tree- Trie tree- Splay tree- Red black tree-K- dimensional tree- AVL tree.

UNIT 5:Hashing Techniques and Dynamic Storage Management	9 hrs

Hashing : Introduction- Hash functions – Collision resolution strategies – Hash table overview- Extendible hashing – Dictionary.

Dynamic Storage Management- First Fit - Best Fit - Storage Release - Boundary Tag Method - Buddy System - Garbage Collection –Compaction.

Total Hours	**45**

TEXT BOOKS:

1. Mark Allen Weiss, "**Data Structures and Algorithm Analysis in C**", Second Edition, Pearson Education, 2010.
2. Jean Paul Tremblay, Paul G. Sorenson, "**An Introduction to Data Structures with Applications**", Second Edition , McGraw Hill, 2012.

REFERENCES:

1. Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Second Edition ,Pearson Education, 2011.
2. G.A.V.Pai , "Data Structures and Algorithms: Concepts - Techniques and Applications", First Edition, McGraw Hill Education, 2017.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K3	K4	K5
Course Outcomes	CO1	K2	2	-	-	-	3	-	-	-	-	-	-	-	2	-	-
	CO2	K3	3	-	3	3	-	-	-	-	-	-	-	-	3	-	-
	CO3	K4	-	3	-	-	-	-	-	-	-	-	-	-	-	3	-
	CO4	K4	-	3	-	2	-	-	-	-	-	-	-	-	2	-	-
	CO5	K3	-	-	2	-	-	-	-	-	-	-	-	-	3	-	-
Average Correlation Level			2.5	3	2.5	2.5	3	-	-	-	-	-	-	-	2.5	3	-

19CSC42	OPERATING SYSTEMS			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- Understand the structure and functions of OS.
- Learn about Processes, Threads and Scheduling algorithms.
- Understand the principles of concurrency and Deadlocks.
- Learn various memory management schemes.
- Study I/O management and File systems.

COURSE OUTCOMES:

CO1;Describe the structure and functions of Operating systems
CO2: Design various Scheduling algorithms.
CO3: Design deadlock, prevention and avoidance algorithms.
CO4: Compare and contrast various memory management schemes.
CO5: Design and Implement a prototype file systems and I/O systems.

COURSE CONTENT:

UNIT 1: **PROCESSES AND THREADS**	9 hrs

Introduction to operating systems- Operating systems structure, functions, characteristics – System calls – system programs – services –system structure -Design, implementation and issues of Operating systems – Virtual machines – Process – concept, hierarchy and operations – Process management – Cooperating process – IPC- Threads - multi-threaded programming – Threading issues -Case study – IPC in linux

UNIT 2:**PROCESS SCHEDULING AND SYNCHRONIZATION**	9 hrs

CPU scheduling – scheduling criteria – scheduling algorithms and comparative study of algorithms – multiple processor scheduling- context switching – process synchronization- synchronization hardware - critical section- semaphores – Peterson's solution- Classical synchronization problems – monitors – Deadlocks and characteristics – Condition, prevention, detection, avoidance and recovery-Case study – Process scheduling in Linux

UNIT 3: **STORAGE MANAGEMENT**	9 hrs

Memory management – partitioning – swapping – contagious memory allocations – paging – segmentation -segmentation with paging – Virtual memory – demand paging – page replacement – page replacement algorithms – Allocation of frames – Thrashing – Locality of reference-Case study – Memory management in Linux and Windows.

UNIT 4: FILE SYSTEMS	9 hrs
File system interface – file concept – file access and allocation methods – file system implementation and issues – file protection and security mechanisms – Directory structure – directory implementation-free space management – efficiency and performance – Recovery – Log structured file systems – Case studies – File system in Linux	
UNIT 5: I/O SYSTEMS	9 hrs
I/O systems – I/O hardware – I/O interface – Kernel I/O subsystems- streams – Mass storage structure – Disk structure and disk access – Disk scheduling – Disk management – Swap-space management – RAID structures – Disk attachment - Overview of Security and protection - Concepts of distributed and real time systems-Case study – I/O in Linux	
Total Hours	**45**

TEXT BOOKS:

1.Silberschatz, Galvin and Gagne, "**Operating System Concept**s", 10th Edition,Wiley India Pvt. Ltd., 2018.

REFERENCES:

1.Tanenbaum, A.S., "Modern Operating Systems", 2nd Edition, PearsonEducation, 2010.
2.Gary Nutt, "Operating Systems", 3rd Edition, Pearson Education, 2004.
3.William Stallings, "Operating Systems", 7th Edition, Prentice Hall of India,2011.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	-	-	-	2	-	3	-	-	-	-	-	-	-	2	-	-
	CO2	-	-	-	3	3	-	-	-	-	-	-	-	-	-	2	-
	CO3	-	-	2	3	-	-	-	-	-	-	-	-	-	-	2	-
	CO4	-	-	-	3	3	-	-	-	-	-	-	-	-	-	-	2
	CO5	-	-	-	2	-	3	-	-	-	-	-	-	-	-	2	-
Average Correlation Level			-	2	2.6	3	3	-	-	-	-	-	-	-	2	2	2

19CSC43	COMPUTER ORGANIZATION AND ARCHITECTURE			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To make students understand the basic structure and operation of digital computer.
- To familiarize the students with arithmetic and logic unit and implementation of fixed point and floating-point arithmetic operations.
- To expose the students to the concept of pipelining.
- To familiarize the students with hierarchical memory system including cache memories and virtual memory.
- To expose the students with different ways of communicating with I/O devices and standard I/O interfaces.

COURSE OUTCOMES:

CO1: Describe the organization and operations of Computer

CO2: Analyze arithmetic and logic unit operations.

C**O3:**Analyze pipelined control units

CO4: Investigate performance of memory management systems.

CO5: Analyze the Interrupts and I/O organization.

COURSE CONTENT:

UNIT 1: **BASIC STRUCTURE OF COMPUTERS**	9 hrs

Functional units – Basic operational concepts –Performance–Instructionsetarchitecture-Instructionsandinstructionsequencing – Addressingmodes- RISC–CISC- Hardware–Softwareinterface.

UNIT 2ALU ANDPROCESSING UNIT	9 hrs

Number Representation –fixed point and floating point operations–ALU Design – Fundamentalconcepts –Instruction Execution–Hardware Components- Hardwired control– Micro programmed control – Nano Programming.

UNIT 3: **PIPELINING**	8 hrs

Basicconcepts–Datahazards– Instructionhazards–Influenceoninstructionsets–Datapathandcontrolconsiderations–Performanceconsiderations –Exception handling.

UNIT 4: **MEMORY SYSTEM**	10 hrs
Basic concepts – Semiconductor RAM – ROM –Directmemoryaccess- Cache memories – Improving cache performance – Virtual memory – Memory management requirements – Associative memories – Secondary storage devices.	
UNIT 5: **I/O ORGANIZATION**	9 hrs
Bus structures and operations – ProgrammedI/O–Interrupts— Interface Circuits – Standard I/O interfaces (PCI, SCSI, SATA, PCI Express and USB) – I/O Devices andprocessors. Introduction to Multicore and shared memory Multiorocessors	
Total Hours	**45**

TEXT BOOKS:

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "**Computer Organizationand Embedded System**", 6th Edition, Tata Mc-Graw Hill, 2012.
2. WilliamStallings,"**ComputerOrganizationandArchitecture–DesigningforPerformance**", 11th Edition, Pearson Education, 2019.

REFERENCES:

1. Patterson,D.A.,andHennessy,J.L.,"ComputerOrganizationandDesign: The Hardware/Software InterfaceRISC-V Edition", 1st Edition, Morgan Kaufman, 2017.
2. Heuring,V.P. and Jordan, H.F., "Computer Systems Design and Architecture", 2nd Edition, Pearson Education, 2005.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES <Times New roman>Font Size, 8.

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K3	K4	K5
Course Outcomes	CO1	K2	1	-	3	-	3	-	-	-	-	-	-	-	2	-	-
	CO2	K4	-	3	-	2	2	-	-	-	-	-	-	-	-	3	-
	CO3	K4	2	3	-	1	-	-	-	-	-	-	-	-	-	3	-
	CO4	K3	3	-	2	2	-	-	-	-	-	-	-	-	3	-	-
	CO5	K4	-	3	-	2	-	-	-	-	-	-	-	-	-	3	-
Average Correlation Level			2	3	2.5	1.5	2.5	-	-	-	-	-	-	-	2.5	3	-

19CSC44	DESIGN AND ANALYSIS OF ALGORITHMS			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To introduce the basic concepts & mathematical aspects of analysis of algorithms.
- To introduce the searching and sorting algorithms using various algorithmic techniques.
- Introduces the concept of dynamic programming and greedy algorithm.
- To analyze the concepts of back tracking algorithm.
- To understand the limitations of branch and bound and NP problems.

COURSE OUTCOMES:

CO1;Understand the basic concepts of algorithms for various computing problems.

CO2: Apply the time and space complexity of searching & sorting algorithms.

CO3: Summarize the different algorithm design techniques of dynamic &greedy problem.

CO4: Analyzethe desired design techniques to solve back tracking problems.

CO5: Construct the branch & bound and NP problems.

COURSE CONTENT:

UNIT 1: **ALGORITHM ANALYSIS** — 8 hrs

Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithmic Efficiency –Algorithm Notations and their properties. Analysis Framework – Mathematical analysis for Recursive and Non-recursive algorithms.

UNIT 2: **DIVIDE & CONQUER AND BRUTE FORCE** — 10 hrs

Divide and Conquer Methodology – Binary Search – Merge sort – Quick sort – Heap Sort - Multiplication of Large Integers – Closest-Pair and Convex - Hull Problems.

Brute Force – Computing a_n – String Matching - Closest-Pair and Convex-Hull Problems - Travelling Salesman Problem - Knapsack Problem - Assignment problem.

UNIT 3: **DYNAMIC PROGRAMMING AND GREEDY TECHNIQUES** — 10 hrs

Dynamic programming **–** Principle of optimality - Coin changing problem**,** Computing a Binomial Coefficient – Floyd‘s algorithm – Multi stage graph - Optimal Binary Search Trees – Knapsack Problem and Memory functions.

Greedy Technique – Container loading problem - Prim‘s algorithm and Kruskal's Algorithm – 0/1 Knapsack problem, Optimal Merge pattern - Huffman Trees.

UNIT 4: BACKTRACKING — 8 hrs

Backtracking–Generalmethod–8Queensproblem –Sum ofsubsets–Graph coloring – Hamiltonian problem– Knapsack problem- Complexity analysis.

UNIT 5: BRANCH AND BOUND & NP PROBLEMS	9 hrs
Branch and Bound –LIFO Search and FIFO search - Assignment problem – Knapsack Problem – Travelling Salesman Problem - Approximation Algorithms for NP-Hard Problems – Travelling Salesman problem – Knapsack problem. Lower - Bound Arguments - P, NP ,NP- Complete and NP Hard Problems.	
Total Hours	**45**

TEXT BOOKS:

1. Ellis Horowitz, SartajSahni and SanguthevarRajasekaran, "**Computer Algorithms**",Second Edition, Universities Press, 2019.
2. AnanyLevitin, " **Introduction to the Design and Analysis of Algorithms**", Third Edition, Pearson Education, 2012.

REFERENCES:

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, " Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.

2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, 2011.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K3	K4	K5
Course Outcomes	CO1	K2	2	2	-	3	-	-	-	-	-	-	-	-	2	-	-
	CO2	K3	3	-	3	-	-	-	-	-	-	-	-	-	3	-	-
	CO3	K2	-	-	-	3	2	-	-	-	-	-	-	-	-	2	-
	CO4	K4	-	3	-	-	-	-	-	-	-	-	-	-	2	-	-
	CO5	K3	2	-	3	-	-	-	-	-	-	-	-	-	-	3	-
Average Correlation Level			2.3	2.5	3	3	2	-	-	-	-	-	-	-	2.3	2.5	-

19CSL41	ADVANCED DATA STRUCTURES LABORATORY			
	L	T	P	C
	0	0	2	1

COURSE OBJECTIVES:

- To understand the different operations of binary trees.
- To implement graph traversal algorithms.
- To understand the different operations of search trees.
- To get familiarized to sorting and searching algorithms.
- To implement hash functions with collision techniques.

COURSE OUTCOMES:

CO1: Design the various operations of binary trees.
CO2: Apply the various graph algorithms.
CO3: Compare the performance operations of search trees.
CO4: Design the various sorting and searching algorithms.
CO5: Apply appropriate hash functions that result in a collision free scenario for data storage and retrieval.

List of Experiments :

1. Implementation of Binary Trees and operations of Binary Trees.
2. Implementation of Binary Search Trees and operations of Binary Search Trees.
3. Implementation of Applications of Binary trees.
4. Implementation of Graph representation and Traversal algorithms.
5. Implementation of Topological sort – Prim's algorithm
6. Implementation of Kruskal's algorithm
7. Implementation of Applications of Graphs.
8. Implementation of Indexed search.
9. Implementation of Hashed search.
10. Implementation of Quick sort.
11. Implementation of Heap sort
12. Implementation of AVL Trees.
13. Implementation of Splay Trees.
14. Implementation of Red black trees.
15. Develop applications for Hashing – any two collision techniques.

Hardware & Software requirements :

Stand alone desktops with C.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K3	K4	K5
Course Outcomes	CO1	K2	-	-	2	-	-	-	-	-	-	-	-	-	-	2	-
	CO2	K3	3	-	-	-	3	-	-	-	-	-	-	-	3	-	-
	CO3	K4	-	3	-	2	-	-	-	-	-	-	-	-	-	-	-
	CO4	K2	-	-	2	-	3	-	-	-	-	-	-	-	-	2	-
	CO5	K3	3	-	-	-	-	-	-	-	-	-	-	-	3	2	-
Average Correlation Level			3	3	2	2	3	-	-	-	-	-	-	-	3	2	-

19CSL42	OPERATING SYSTEMS LABORATORY			
	L	T	P	C
	0	0	2	1

COURSE OBJECTIVES:

- Learn shell programming and the use of filters in the UNIX environment.
- Be exposed to programming in C using system calls.
- Learn to use the file system related system calls.
- Be exposed to process creation and inter process communication.
- Be familiar with implementation of CPU Scheduling Algorithms, page replacement algorithms and Deadlock avoidance

COURSE OUTCOMES:

CO1: Implement deadlock avoidance, and Detection Algorithms

CO2: Compare the performance of various CPU Scheduling Algorithm

CO3: Critically analyze the performance of the various page replacement algorithms

CO4: Create processes and implement IPC

CO5: ImplementThreading & Synchronization Algorithms.

COURSE CONTENT:

1. Basics of UNIX commands.
2. Shell Programming.
3. Implement the following CPU scheduling algorithms
    a) Round Robin b) SJF c) FCFS d) Priority
4. Implement all file allocation strategies
    a) Sequential b) Indexed c) Linked
5. Implement Semaphores
6. Implement all File Organization Techniques
    a) Single level directory b) Two level c) Hierarchical d) DAG
7. Implement Bankers Algorithm for Dead Lock Avoidance
8. Implement an Algorithm for Dead Lock Detection
9. Implement all page replacement algorithms
    a) FIFO b) LRU c) LFU
10. Implement Shared memory and IPC
11. Implement Paging Technique of memory management.
12. Implement Threading & Synchronization Applications

Total Hours	**30**

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			Programme Outcomes / Programme Specific Outcomes														
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	-	2	-	3	-	-	-	-	-	2	2	-	-	-	2	-
	CO2	-	-	3	-	-	3	-	-	-	-	3	-	-	-	3	-
	CO3	-	-	2	3	-	-	-	-	-	2	3	-	-	-	2	-
	CO4	-	-	-	3	3	-	-	-	-	2	2	-	-	-	-	2
	CO5	-	-	3	-	2	-	-	-	-	-	2	-	-	-	3	-
Average Correlation Level			2	2.6	3	2.5	3	-	-	-	2	2.4	-	-	-	2.5	2

SEMESTER V

19MAB51	PROBABILITY AND QUEUEING THEORY			
L	T	P	C	
3	2	0	4	

COURSE OBJECTIVES:

The Course objective is

- To enrich the knowledge of the students in order to solve the engineering problems related to Probability and Queuing systems.
- To expose the students to the theory and applications of Special Random variables and their distributions, Two-dimensional random variables, Markov Processes, Queuing theory and Queue networks

COURSE OUTCOMES:

After the completion of the Course, the students will be able to

CO1 **:** Understand the probability concepts, special random variables and their distributions and hence to solve the problems involved in their engineering subjects.

CO2 **:** Solve problems that deal with two random variables defined on the same sample space as there are many situations of interest in engineering that can be handled by the theory of two random variables.

CO3 **:** Analyse andClassify the random processes that are functions of time and Markov processes that are essential for Queuing theory.

CO4 **:** Associate queue discipline, Single and Multi server Queuing Models in many practical problems.

CO5 **:** Solve problems involving series queue networks and open and closed queue networks that are applicable in networking.

COURSE CONTENT:

UNIT 1: **RANDOM VARIABLES & PROBABILITY DISTRIBUTIONS**	12 hrs

Discrete and continuous random variables - Moments of random variables – Moment generating function and their properties – Discrete distributions: Binomial – Poisson and Geometric distributions – Continuous distributions: Uniform – Exponential – Gamma and Weibull distributions

UNIT 2: **TWO DIMENSIONAL RANDOM VARIABLES**	12 hrs

Joint distributions of bivariate random variables – Marginal and conditional distributions of bivariate random variables – Covariance and correlation coefficient – Transformation of random variables – Central limit theorem.

UNIT 3: **RANDOM PROCESSES**	12 hrs

Classification of random processes – Stationary random processes – Markov process –Discrete time Markov chains – Transition probabilities – Limiting distributions – Poisson process.

UNIT 4: **QUEUEING THEORY**	12 hrs

Markovian models – Birth and death queuing models – Steady state results –Single and multiple server queuing models – Queues with finite waiting rooms – Finite source models – Little's formulae.

UNIT 5: NON-MARKOVIAN QUEUES AND QUEUE NETWORKS	12 hrs
M/G/1 queue – Pollaczek – Khintchine formula – Series queues – series queues with blocking– Open and closed Jackson networks- Applications to computer science engineering.	
Total Hours	**60**

TEXT BOOKS:

3. Veerarajan.T "Probability, Statistics and Random Processes with Queuing Theory and Queue networking", Third Edition , Tata McGraw-Hill Pub.Co.Ltd, 2007.
4. Gross, D., Shortle, J.F, Thompson, J.M and Harris. C.M., ―Fundamentals of Queueing Theory", Wiley Student 4th Edition, 2014

REFERENCES:

1. Ibe, O.C., "Fundamentals of Applied Probability and Random Processes" , Elsevier, Indian Reprint,2013.
2. Allen, A.O., "Probability, Statistics and Queueing Theory with Computer Applications", 2nd Edition, Elsevier, 2005.
3. Trivedi, K.S., "Probability and Statistics with Reliability, Queueing and computer Science Applications" ,2nd Edition, PHI, 2009.
4. Yates, R.D. and Goodman. D. J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOME

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K2	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	CO2	K3	3	2	1	1	-	-	-	-	-	-	-	-	1	1	1
	CO3	K4	3	3	2	1	-	-	-	-	-	-	-	-	2	2	2
	CO4	K4	3	3	2	1	-	-	-	-	-	-	-	-	2	2	2
	CO5	K3	3	2	1	1	-	-	-	-	-	-	-	-	1	1	1
Average Correlation Level			2.8	2.2	1.5	1	-	-	-	-	-	-	-	-	1.5	1.5	1.5

19CSC51	SOFTWARE ENGINEERING			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To be aware of generic models to structure the software development process**.**
- To understand fundamental concepts of requirements engineering and requirements specification**.**
- To understand different notion of complexity at both the module and systemlevel.
- To be aware of some widely known designmethods.
- To understand the role and contents of testing activities in different life cyclephases

COURSE OUTCOMES:

CO1: To differentiate the perspective of various software process models
CO2: To elicit the requirements for real-time problems
CO3: To compile a SRS pertaining to industry standards
CO4: To create a behavioral model from the set of requirements
CO5: To outline various software metrics and their context in measuring software programs.

COURSE CONTENT:

UNIT 1: **SOFTWARE PROCESS MODELS**	9 hrs

The Evolving Role of Software – Software – The changing Nature of Software Legacy software — A generic view of process– A layered Technology – A Process Framework – The Capability Maturity Model Integration (CMMI) – Process Assessment –Personal and Team Process Models – Product and Process – Process Models – The Waterfall Model – Incremental Process Models – Incremental Model – The RAD Model – Evolutionary Process Models – Prototyping – The Spiral Model – The Concurrent Development Model – Specialized Process Models – The Unified Process

UNIT 2: **REQUIREMENTS ENGINEERING**	9 hrs

Software Engineering Practice – Communication Practice – Planning Practice - Modeling Practice– Construction Practice –Deployment. Requirements Engineering - Requirements Engineering Tasks – Initiating the Requirements Engineering Process - Eliciting Requirements – Developing Use Cases – Building the Analysis Models –Elements of the Analysis Model – Analysis Pattern – Negotiating Requirements – Validating Requirements

UNIT 3: **ANALYSIS MODELLING**	9 hrs

Requirements Analysis – Analysis Modeling Approaches – Data Modeling Concepts – Object Oriented Analysis – Scenario Based Modeling – Flow Oriented Modeling – Class Based Modeling – CreatingBehavior Model.

UNIT 4: **DESIGN AND TESTING**	9 hrs

Design Engineering – Design Process -Design Quality - Design Model - User Interface Design – Testing Strategies - Testing Tactics - Strategies Issues for Conventional and Object Oriented Software - Validation Testing – System Testing – Art of Debugging – Project Management

UNIT 5: **QUALITY AND MAINTENANCE**	9 hrs

Software Evolution - Verification and Validation -Critical Systems Validation – Metrics for Process, Project and Product-Quality Management - Process Improvement – Risk Management - Configuration Management – Introduction to SCM process-Software Configuration items- Software Cost Estimation--Reverse Engineering

Total Hours	**45**

TEXT BOOKS:

1. Roger S.Pressman**,Software Engineering: A Practitioner's Approach 1**,9 th Edition,McGraw Hill International Edition,Seventh Edition,2015.
2. Ian Somerville,-**Software Engineering**,Ninth Edition,Pearson Education,2011.

REFERENCES:

1. Stephan Schach , Software Engineering1, Tata McGraw Hill,2007
2. Pfleeger and Lawrence ,Software Engineering: Theory and Practice1,Pearson Education,Second Edition,2001

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	-	-	-	3	-	-	-	3	-	-	2	-	-	-	-	2
	CO2	-	-	2	-	-	-	-	3	-	3	2	-	-	-	2	-
	CO3	-	-	-	-	3	3	-	-	-	2	2	-	-	-	2	-
	CO4	-	-	2	3	-	-	-	-	3	2	-	-	-	-	-	2
	CO5	-	2	-	-	-	2	2	3	-	-	-	-	-	3	-	-
	CO6	-	-	-	-	-	-	-	-	3	2	2	-	2		3	-
Average Correlation Level			2	2	3	3	2.5	2	3	3	2.25	2	-	2	3	2.3	2

19CSC52	COMPUTER NETWORKS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

The student should be made to:

- Understand the division of network functionalities into layers.
- Be familiar with the components required to build different types of networks
- Be exposed to the required functionality at each layer
- To understand the flow of information from one node to another node in the network
- Learn the flow control and congestion control algorithms

COURSE OUTCOMES

CO1: Identify the components required to build different types of networks
CO2: Choose the required functionality at each layer for given application
CO3: Identify solution for each functionality at each layer
CO4: Trace the flow of information from one node to another node in the network
CO5: Analyze and apply the various routing and congestion control algorithms.

COURSE CONTENT:

UNIT 1:DATA COMMUNICATIONS 8 hrs

Introduction - Direction of data flow − Networks − Components and categories − Types of connections − Topologies − Protocols and standards – ISO OSI model –TCP/IP model − Transmission media− Coaxial cable − Fiber optics − Line coding − Modems − RS232 Interfacing sequences.

UNIT 2:DATA LINK LAYER 10 hrs

Error detection and correction − Parity − LRC − CRC − Hamming code − Flow control and error control − Stop and wait − Go back − N ARQ − Selective repeat ARQ – Sliding window − HDLC − LAN − Ethernet IEEE 802.3 − IEEE 802.4 – IEEE 802.5 − IEEE 802.11 − FDDI − SONET − Bridges.

UNIT 3:NETWORK LAYER 10 hrs

Internetworks − Packet switching and datagram approach − IP addressing methods − Subnetting − Routing − Distance vector routing − Link state routing – Routers – Multicast Routing- IPv4 – Ipv6-address mapping-ARP and RARP

UNIT 4:TRANSPORT LAYER 9 hrs

Duties of Transport layer − Multiplexing − Demultiplexing − Sockets − User Datagram Protocol (UDP) − Transmission Control Protocol (TCP) − Congestion Control − Quality of Services (QOS) − Integrated services-Session layer.

UNIT 5:APPLICATION LAYER	8 hrs
Domain Name Space (DNS) − SMTP − FTP − HTTP − WWW - SNMP − Security −Cryptography.	
Total Hours	**45**

TEXT BOOKS:

1. William Stallings, "**Data and Computer Communicatio**n", 10th Edition, Pearson Education, 2014.

2. Behrouz A. Forouzan, "**Data communication and Networking**", 5thEdition, Tata McGraw Hill, 2012.

REFERENCES:

1. Larry L. Peterson and Peter S. Davie, "Computer Networks", 2nd Edition,Harcourt Asia Pvt. Ltd.,1996.

2. James F. Kurose and Keith W. Ross, "Computer Networking A Top – DownApproach Featuring the Internet", Pearson Education, 2004.

3. Andrew S. Tanenbaum, "Computer Networks", 4th Edition, Prentice Hall ofIndia, 2007.

4. Peterson, "Computer Networks A System Approach",4th Edition, ElsevierIndia Private Limited, 2010.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES <Times New roman>Font Size, 8.

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	-	-	-	3	2	2	-	-	-	-	-	-	-	2	-	-
	CO2	-	-	2	-	-	3	-	-	-	-	-	-	-	-	2	-
	CO3	-	3	-	2	-	-	-	-	-	-	-	-	-	-	2	-
	CO4	-	-	2	3	-	-	-	-	-	-	-	-	-	-	-	2
	CO5	-	-	-	-	2	3	-	-	-	-	-	-	-	-	2	-
Average Correlation Level			3	2	2.6	2	2.6	-	-	-	-	-	-	-	2	2	2

19CSC53	THEORY OF COMPUTATION			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

Upon completion of this course, the students will be familiar with:

- Regular languages and Finite Automata
- Context Free Languages and Grammars
- Push Down Automata
- Turing Machines and their capabilities.
- Recursively, Recursively Enumerable Languages and Undecidable problems

COURSE OUTCOMES:

Upon completion of this course, the students will be able to,

CO1: Construct finite automata for the given regular grammar and vice versa.

CO2: Write an unambiguous and simplified Context free grammars for given language.

CO3: Construct Pushdown Automata for Context free languages.

CO4:lDesign Turing machines for the given problem.

CO5: Find whether the given problem is decidable or not.

COURSE CONTENT:

UNIT 1 : REGULAR LANGUAGES 9hrs

Introduction- Basic Mathematical Notation and techniques- Regular Languages- Regular Expression - Finite State systems – Basic Definitions – Finite Automaton – DFA & NDFA – Finite Automaton with €- moves — Equivalence of NFA and DFA – Equivalence of NDFA‟s with and without €-moves – Equivalence of finite Automaton and regular expressions –Minimization of DFA- Pumping Lemma for Regular sets – Closure Properties. - Problems based on Pumping Lemma.

UNIT 2 : CONTEXT FREE LANGUAGES 9 hrs

Grammar Introduction– Types of Grammar - Context Free Grammars(CFG) and Languages– Derivations and Languages – Derivation Trees - Ambiguity- Relationship between derivation and derivation trees – Simplification of CFG – Elimination of Useless symbols - Unit productions - Null productions — Chomsky normal form – Greibach Normal form - Problems related to CNF and GNF.

UNIT 3: PUSHDOWN AUTOMATA 9 hrs

Pushdown Automata- Definitions – Moves – Instantaneous descriptions – Acceptance by final state and empty stack - Deterministic pushdown automata – Equivalence of Pushdown automata and CFL - pumping lemma for CFL – Closure Properties - problems based on pumping Lemma.

UNIT 4: TURING MACHINES 9 hrs

Turing Machines – Language of a Turing Machine – Turing Machine as a Computing Device - Techniques for TM – Modifications of Turing Machines – Two-way Infinite Tape, Equivalence of One

Way Infinite Tape and Two-way Infinite Tape Turing Machines – Multi Tape Turing Machines, Non-deterministic Turing machine.

UNIT 5: UNDECIDABILITY	9 hrs

Recursively Enumerable and Recursive-Enumerating a Language - A Language that is not Recursively Enumerable (RE) – An Undecidable Problem that is RE – Undecidable Problems about Turing Machine – Rice Theorem for Recursive and Recursively Enumerable Languages – Post's Correspondence Problem (PCP) – Modified Post Correspondence Problem.

Total hours	**45**

TEXT BOOKS:

1. John E Hopcroft, Rajeev Motwani, Jeffrey D Ullman, **"Introduction to Automata Theory, Languages and Computation"**, Third Edition, Pearson, 2013.

REFERENCES:

1. John C. Martin "Introduction to languages and the theory of computation", Third edition, Mc Graw Hil, 2015.
2. Michael Sipser, "Introduction to Theory of Computation", Third Edition, Cengage learning, 2013.
3. Adam Brooks Webber, "Formal languages: a practical introduction", Jim Leisy, 2008.
4. Kamala Krithivasan and Rama. R, "Introduction to Formal Languages, Automata Theory and Computation", Pearson Education 2009

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES <Times New roman>Font Size, 8.

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K6	2	3	2	-	2	-	-	-	-	-	-	-	2	-	-
	CO2	K2	3	2		-	-	-	-	-	-	-	-	-	2	-	-
	CO3	K5	-	2	3	2	-	-	-	-	-	-	-	-	-	3	-
	CO4	K4	-	3	2	2	-	-	-	-	-	-	-	-	-	2	-
	CO5	K2	2	-	2	3	2	-	-	-	-	-	-	-	1	-	-
Average Correlation Level			2.5	2.5	2.25	2.5	2	-	-	-	-	-	-	-	1.75	2.5	-

19CSC54	OOPS AND JAVA PROGRAMMING			
L	T	P	C	
3	0	0	3	

COURSE OBJECTIVES:

- To learn the basic concepts of object oriented programming
- To learn advanced Java programming concepts like interface, threads, Swings etc.
- To develop network programs in Java.
- To understand Concepts needed for distributed and multi-tier applications.
- To understand issues in enterprise applications development.

COURSE OUTCOMES:

CO1: Construct the applications using object orientedconcepts of java
CO2: Construct the programs using advance java concepts like swing, applet
CO3: Discuss the networking concepts in java.
CO4: Discuss the concepts of multi-tier architecture and servlets.
CO5: Explore the applications on Java Beans

COURSE CONTENT:

UNIT 1: **JAVA FUNDAMENTALS** — 9 hrs

OOPs Concepts — Objects and classes – Encapsulation - Inheritance – Polymorphism – Java Features - JVM - Data Types – Variables – Strings - Defining classes in Java – methods -access specifiers - static members - Arrays – Packages - – Exception Handling — I/O streaming - Applet Basics and Programming.

UNIT 2:AWT AND SWING — 9 hrs

Interfaces Threading – Multi threading - Basics of event handling – event handlers – adapter classes – actions – mouse events – AWT event hierarchy – Model-View-Controller design pattern – layout management – introduction to Swing- Swing Components – Text Fields - Text Areas – Buttons - Check Boxes – Radio Buttons – Lists - choices - Scrollbars – Windows – Menus – Dialog Boxes.

UNIT 3:**NETWORK PROGRAMMING IN JAVA** — 9 hrs

Sockets − Secure sockets − Custom sockets − UDP datagram's − Multicast sockets − URL classes − Reading data from the server − Writing data − Configuring the connection − Reading the header − Telnet application − Java messaging services - Remote method invocation.

UNIT 4:**MULTI-TIER APPLICATION DEVELOPMENT** — 9 hrs

Server side programming −Servlets − Java server pages − Applet to applet communication−Applettoservletscommunication −JDBC−UsingBLOBand CLOBobjects− Storingmultimediadataintodatabases−Multimediastreaming applications− Java media framework−JAR file creation

UNIT 5: **ENTERPRISE APPLICATIONS** — 9 hrs

Serversidecomponentarchitecture −IntroductiontoJ2EE−Sessionbeans−Entity beans − Persistent entity beans − Transactions.

Total Hours	**45**

TEXT BOOKS:

1. Herbert Schildt, "**Complete Reference –10thEdition**", Oracle Press 2017
2. Elliotte Rusty Harold, "**Java Network Programming 4th Edition**", O'Reilly Publishers, 2013.
3. EdRoman,"**MasteringEnterpriseJavaBeans 3rd Edition**", JohnWileyandSonsInc, 2008.
4. Bruce Eckel, "**Thinking in Java**", Fourth Edition Pearson Education 2006.

REFERENCES:

1. Deital and Deital, "Java How to program", 10th Edition, Pearson Education, 2015.
2. Cay S. Horstmann and Gary Cornell, "Core Java: Volume I – Fundamentals", 9thEdition, Sun Microsystems Press, 2013.
3. Hortsmannand Cornell,"CoreJava2AdvancedFeatures, VOLII",Pearson Education, 8th Edition, 2008.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES <Times New roman>Font Size, 8.

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K3	K4	K5
Course Outcomes	CO1	K3	2	-	2	-	1	-	-	-	-	-	-	-	-	2	-
	CO2	K3	1	-	2	3	-	-	-	-	-	-	-	-	-	2	-
	CO3	K2	1	1	-	2	-	-	-	-	-	--	-	-	2	-	-
	CO4	K2	2	-	3	-	2	-	-	-	-	-	-	-	2	-	-
	CO5	K4	-	3	-	-	2	2	-	-	-	-	-	-	-	2	-
Average Correlation Level			1.5	2	2.5	2.5	1.7	2	-	-	-	-	-	-	2	2	-

19CSL51	NETWORKS LABORATORY			
	L	T	P	C
	0	0	2	1

COURSE OBJECTIVES:

- Learn socket programming.
- Be familiar with simulation tools.
- Have hands on experience on various networking protocols.
- To implement the Socket Programming
- To analyze various routing algorithms

COURSE OUTCOMES:

At the end of the course, the student should be able to

CO1: Use simulation tools

CO2;Implement the various protocols.

CO3: Analyze the performance of the protocols in different layers.

CO4: Implement the Socket Programming

CO5: Analyze various routing algorithms

COURSE CONTENT:

1. Implementation of Stop and Wait Protocol and Sliding Window Protocol.
2. Study of Socket Programming and Client – Server model
3. Write a code simulating ARP /RARP protocols.
4. Write a code simulating PING and TRACEROUTE commands
5. Create a socket for HTTP for web page upload and download.
6. Write a program to implement RPC (Remote Procedure Call)
7. Implementation of Subnetting.
8. Applications using TCP Sockets like
    a. Echo client and echo server
    b. Chat
    c. File Transfer
9. Applications using TCP and UDP Sockets like
    a. DNS
    b. SNMP
    c. File Transfer
10. Study of Network simulator (NS).and Simulation of Congestion Control Algorithms usingNS
11. Perform a case study about the different routing algorithms to select the network path withits optimum and economical during data transfer.
    a. Link State routing
    b. Flooding
    c. Distance vector

Total Hours	**30**

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES <Times New roman>Font Size, 8.

Mapping			Programme Outcomes / Programme Specific Outcomes														
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	-	-	-	2	-	3	-	-	-	-	-	-	-	-	2	-
	CO2	-	-	-	3	2	-	-	-	-	-	-	-	-	-	-	2
	CO3	-	-	3	2	-	-	-	-	-	-	-	-	-	-	2	-
	CO4	-	-	-	3	3	-	-	-	-	-	-	-	-	--	-	2
	CO5	-	2	-	3	-	-	-	-	-	-	-	-	-	-	-	2
Average Correlation Level			2	3	2.6	2.5	3	-	-	-	-	-	-	-	-	2	2

19CSL52	OOPS AND JAVA PROGRAMMING LABORATORY			
L	T	P	C	
0	0	2	1	

COURSE OBJECTIVES:

- Learn the basic concepts of OOPS using java
- Hands on experience on advanced concepts like AWT.
- Hands on experience on advanced concepts like Applets, GUI
- To Construct the application using servlet, beans and JDBC.
- To Develop the application using database connectivity

COURSE OUTCOMES:

CO1: Construct the OOP concept oriented Java Programs

CO2: Construct application using Java advanced concepts

CO3: Hands on experience on advanced concepts like Applets, GUI

CO4: Construct the application using servlet, beans and JDBC.

CO5:Develop the application using database connectivity

COURSE CONTENT:

1. Classes and Objects
2. Arrays
3. Strings and String buffer
4. Inheritance
5. Interface
6. Packages
7. Applets and AWT
8. Exception Handling
9. Multithreading GUI application
10. Files
11. JDBC connectivity
12. RMI
13. Java Servlet Programming
14. Java Beans
15. JAR file creation
16. Mini Project

Total Hours	**30**

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K3	K4	K5
Course Outcomes	CO1	K3	-	-	2	-	-	-	-	-	-	-	-	-	-	2	-
	CO2	K3	-	-	2	-	-	-	-	-	-	-	-	-	-	2	-
	CO3	K3	-	-	2	-	-	-	-	-	-	-	-	-	-	2	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Average Correlation Level			-	-	2	-	-	-	-	-	-	-	-	-	-	2	-

SEMESTER VI

19CSC61	ARTIFICIAL INTELLIGENCE			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To understand the various characteristics of existing artificial intelligence problems and intelligent agents.
- To obtain knowledge about different search strategies in artificial intelligence.
- To learn to represent knowledge in solving artificial intelligence problems.
- To understand the concepts of machine learning.
- To know about the various applications of artificial intelligence.

COURSE OUTCOMES:

CO1: Understand effectively about artificial intelligence problems, algorithms, implementations and their experimental evaluations.

CO2: Use appropriate search algorithms for any artificial intelligence problem.

CO3: Know how to build simple knowledge-based systems.

CO4: Apply knowledge representation and machine learning techniques to solve real world problems.

CO5: Design and implement real world problems using artificial intelligence techniques.

COURSE CONTENT:

UNIT 1: **INTRODUCTION** — 9 hrs

Introduction toartificial intelligence - Problems,problem spaces and search - Heuristic search techniques - Intelligent agents - Agents and environments - Rationality - Nature of environments - Structure of agents.

UNIT 2: **PROBLEM SOLVING METHODS** — 9 hrs

Problem solving by searching - Problem solving agents - Uninformed search strategies - Informed search - A* search - Heuristic functions - Local search algorithms and optimization problems - Adversarial search - Games - Alpha-beta pruning - Constraint satisfaction problems.

UNIT 3: **KNOWLEDGE REPRESENTATION AND REASONING** — 9 hrs

Issues in knowledge representation -Types of knowledge representation - Predicate logic -Symbolic reasoning under uncertainty- Statistical reasoning- Weak, strong slot and filter structures - Ontological engineering-Categories and objects-Actions, situations and events.

UNIT 4: **PLANNING AND MACHINE LEARNING** — 9 hrs

Basic plan generation systems - Strips -Advanced plan generation systems - K strips - Strategic explanations – Learning- Inductive learning - Learning decision trees – Ensemble learning - Explanation based learning - Reinforcement learning - Case study: Handwritten digit recognition.

UNIT 5: APPLICATIONS	9 hrs
Communication - Communication as action– Formalgrammarforafragmentof English– Syntacticanalysis–Augmentedgrammars–Semanticinterpretation–Ambiguityanddisambiguation- Discourseunderstanding–Grammarinduction–Probabilisticlanguageprocessing - Probabilistic languagemodels - Information retrieval - Information extraction–Machinetranslation –Robotics -Robot hardware - Robotic perception.	
Total Hours	**45**

TEXT BOOKS:

1. S. Russell and P. Norvig, "**Artificial Intelligence: A Modern Approach**", Prentice Hall, Third Edition, 2010.
2. Elaine Rich, Kevin Knight, Shivashankar B. Nair, "**Artificial Intelligence**", Tata McGraw Hill, Third Edition, 2010.

REFERENCES:

1. M. Tim Jones, "Artificial Intelligence: A Systems Approach", Jones and Bartlett Publishers, Inc., First Edition, 2008.
2. Nils J. Nilsson, "The Quest for Artificial Intelligence", Cambridge University Press, 2009.
3. Gerhard Weiss, "Multi Agent Systems", MIT Press, Second Edition, 2013.
4. David L. Poole and Alan K. Mackworth, "Artificial Intelligence: Foundations of Computational Agents", Cambridge University Press, 2010.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K2	-	-	-	-	-	-	3	-	-	-	1	-	-	-	-
	CO2	K3	2	1	1	1	-	1	3	-	-	1	2	-	1	1	-
	CO3	K3	2	1	1	1	-	1	3	-	-	1	2	-	1	1	-
	CO4	K3	2	1	1	1	-	1	3	-	-	1	2	-	1	1	-
	CO5	K4	3	2	1	1	-	1	3	-	-	1	3	-	1	1	-
Average Correlation Level			2	1	1	1	-	1	3	-	-	1	2	-	1	1	-

19CSC62	COMPILER DESIGN			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

Upon completion of this course, the students will be familiar with:

- Lexical Analysis
- Syntax Analysis
- Intermediate code generation
- Code optimization
- Runtime environment and code generation

COURSE OUTCOMES:

Upon completion of this course, the students will be able to,

CO1: Develop aLexical Analyzer for recognizing the tokens of a given language.

CO2: Construct a parser using top down and bottom up techniques.

CO3: Generate intermediate codes for the source program.

CO4: Simulate run time environment and code generation.

CO5: Apply right code optimization techniques for the target code generated.

COURSE CONTENT:

UNIT 1: **LEXICAL ANALYSIS** 9 hrs

Introduction of Compilation and Interpretation -Analysis of the source program-The phases of compiler- The grouping of phases - Compiler Construction Tools.

Lexical Analysis: The role of the lexical analyzer- Input buffering-Specification of tokensRecognition of tokens- Regular Expression- Lexical Errors - Finite Automata – Conversion of Regular Expression into NFA- Conversion of NFA to DFA - minimized DFA.

UNIT 2: S**YNTAX ANALYSIS** 9 hrs

Syntax Analysis : Role of the parser – Writing grammars – Context–Free Grammars – Top downparsing – Recursive descent parsing – Predictive parsing – Bottom–Up Parsing –Shift Reduce Parsing – Operator Precedence Parsing – Precedence functions – LR Parsers – LR (0)Item– Construction of SLR Parsing –Introduction to LALR Parser – Error Handling and Recovery inSyntax Analyzer. YACC-Design of a syntax Analyzer for a Sample Language.

UNIT 3: INTERMEDIATE CODE GENERATION 9 hrs

Syntax Directed Definitions, Evaluation Orders for Syntax Directed Definitions, Syntax Directed Translation Schemes, Intermediate Languages: Syntax Tree, Three Address Code, Postfix Code, Declarations, Translation of Expressions, Type Checking, Back Patching.

UNIT 4: CODE OPTIMIZATION	9 hrs
Basic Blocks and Flow Graphs – Optimization of Basic Blocks – Principal Sources of Optimizations – Data Flow Analysis – Constant Propagation – Partial Redundancy Elimination – Peephole Optimizations.	
UNIT 5: RUNTIME AND OBJECT CODE GENERATION	9 hrs
Storage Organization, Stack Allocation Space, Access to Non-local Data on the Stack, Heap Management - Issues in Code Generation - Design of Code Generator - Register Allocation and Assignment – Instruction Selection by Tree Rewriting – Optimal Code Generation for Expressions – Dynamic Programming Code Generation.	
Total Hours	**45**

TEXT BOOKS:

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman **"Principles, Techniques and Tools"** Second Edition, Pearson Education, 2009.

REFERENCES:

1. Steven S. Muchnick, "Advanced Compiler Design and Implementation", MorganKaufmann Publishers - Elsevier Science, India, Indian Reprint 2003

2. Keith D Cooper and Linda Torczon, "Engineering a Compiler", Morgan KaufmannPublishers Elsevier Science, 2004

3. V. Raghavan, "Principles of Compiler Design", Tata McGraw Hill Education Publishers,2010

4. Randy Allen, Ken Kennedy, "Optimizing Compilers for Modern Architectures: A Dependence- based Approach", Morgan Kaufmann Publishers, 2002

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES <Times New roman>Font Size, 8.

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K6	2	-	2	-	3	-	-	-	-	-	-	-	3	-	-
	CO2	K3	-	3	2	-	2	-	-	-	-	-	-	-	-	2	-
	CO3	K6	-	-	3	-	3	-	-	--	-	-	-	-	2	-	-
	CO4	K4	-	-	2	3	2	-	-	-	-	-	-	-	-	3	-
	CO5	K3	-	2	3	2	-	-	-	-	-	-	-	-	2	-	-
Average Correlation Level			2	2.5	2.4	2.5	2.5	-	-	-	-	-	-	-	2.5	2.5	-

19CSC63	WEB APPLICATION PROGRAMMING			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- Learn the basics of static and dynamic Web page design
- Know the basics of client side and server side programming languages
- Understand and validate server side date
- To design the web framework using Ruby on Rails
- To Learn about discover and publish the Web services

COURSE OUTCOMES:

CO1: Construct a basic website using HTML and Cascading Style Sheets.

CO2: Investigate dynamic web page with validation using JavaScript objects and

CO3:onstruct simple web page in PHP, and to present data in XML format. .

CO4: Construct the framework using Ruby on Trails

CO5: Explore the web services

COURSE CONTENT:

UNIT 1: **INTRODUCTION TO THE INTERNET** — 9 hrs

Understanding websites and web servers: Understanding Internet – Difference between websites and web server- Internet technologies Overview –Understanding the difference between internet and intranet; HTML and CSS: HTML 5.0, XHTML, CSS.

UNIT 2CLIENT SIDE AND SERVER SIDE PROGRAMMING — 9 hrs

Java Script: An introduction to JavaScript–JavaScript DOM Model-Date and Objects,-Regular Expressions- Exception Handling-Validation-Built-in objects-Event Handling- DHTML with JavaScript. - JSP: Understanding Java Server Pages-JSP Standard Tag Library(JSTL)-Creating HTML forms by embedding JSP code.

UNIT 3: **PHP and XML** — 9 hrs

An introduction to PHP: PHP- Using PHP- Variables- Program control- Built-in functions-Connecting to Database – Using Cookies-Regular Expressions; XML: Basic XML- Document Type Definition-XML Schema DOM and Presenting XML, XML Parsers and Validation, XSL and XSLT Transformation, News Feed (RSS and ATOM).

UNIT 4: **WEB FRAMEWORKS** — 9 hrs

Django Template System - Interacting with a Database (Modules) - Django Administration Site, Form Processing, Advanced Views and Urlconfs, Generic Views - Extending the Template Engine - Generating Non-HTML Content, Sessions, Users, Registration, Caching, Other Contributed Sub Frameworks, Middleware, Integrating with Legacy Databases and Applications, Extending Django's Admin Interface, Internationalization, Security and Deploying Django. The Model Definition Reference, The Data Base API Reference, Generic Views Reference, Settings, Built-In Template Tags

and Filters, The Django - Admin Utility and Request and Response Objects. – Web App - Ruby Language – Ruby on Rails.

UNIT 5: **INTRODUCTION TO AJAX and WEB SERVICES**	9 hrs

AJAX: Ajax Client Server Architecture-XML Http Request Object-Call Back Methods; Web Services: Introduction- Java web services Basics – Creating, Publishing, Testing and Describing a Web services (WSDL)-Consuming a web service, Database Driven web service from an application –SOAP.

Total Hours	**45**

TEXT BOOKS:

1 HDeitel and Deitel and Nieto, "Internet **and World Wide Web - How to Program**", Prentice Hall, 5th Edition, 2011.

2 Robert W. Sebesta, **—Programming the World Wide Web‖, Eighth Edition**, Addison-Wesley, 2015.

REFERENCES:

3. Stephen Wynkoop and John Burke "Running a Perfect Website", QUE, 2nd Edition,1999.
4. Chris Bates, Web Programming – Building Intranet Applications, 3rd Edition, Wiley Publications, 2009.
5. Jeffrey C and Jackson, "Web Technologies A Computer Science Perspective", Pearson Education, 2011.
6. Gopalan N.P. and Akilandeswari J., "Web Technology", Prentice Hall of India, 2014.
7. UttamK.Roy, "Web Technologies", Oxford University Press, 2011.
8. Robert Orfali and Dan Harkey Jeri Edwards , "Client/Server survival Guide" Third Edition 1999.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K3	K4	K5
Course Outcomes	CO1	K3	-	-	2	-	-	-	-	-	-	-	-	-	3	-	-
	CO2	K4	-	-	-	2	-	-	-	-	-	-	-	-	-	3	-
	CO3	K3	-	-	2	-	-	-	-	-	-	-	-	-	3	-	-
	CO4	K3	-	-	2	-	-	-	-	-	-	-	-	-	3	-	-
	CO5	K4	-	-	-	2	-	-	-	-	-	-	-	-	-	3	-
Average Correlation Level			-	-	2	2	-	-	-	-	-	-	-	-	3	3	-

19CSC64	OBJECT ORIENTED ANALYSIS AND DESIGN				
		L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the role of objects in software process models
- To analyze the importance of use cases
- To model the system using standard design diagrams
- To design and manage object based systems
- To study standard OO patterns and their impact on testing

COURSE OUTCOMES:

CO1: Upon completion of the course, the students will be able to:
CO2: Apply object oriented concepts to design
CO3: Improvise on creative design using object orientation
CO4: Identify and analyze evolutionary requirements to design
CO5: Deploy different UML package diagrams

COURSE CONTENT:

UNIT 1: **INTRODUCTION**	8 hrs

Object Oriented Analysis and Design – Iterative, Evolutionary and Agile – NextGen POS system – Inception – Inception vs. Requirements – Evolutionary Requirements.

UNIT 2 USECASES	10 hrs

Usecases – Other requirements – Domain Model – System Sequence Diagrams – Operation Contracts - From Requirements to Design

UNIT 3: **DESIGN**	9 hrs

Logical architecture and UML package diagrams – Onto Object Design – UML Interaction Diagrams – UML Class diagrams - GRASP: Designing Objects with Responsibilities – Object Design Examples with GRASP – Designing for Visibility – Mapping Design to Code – Test Driven Development and Refactoring – UML Tools and UML as blueprint.

UNIT 4: **ELABORATION**	9 hrs

More patterns – More objects with Responsibilities – Applying GoF Design Patterns – UML Activity Diagrams and Modeling – UML State Machine Diagrams and Modeling –Relating Usecases – Domain Model Refinement – More SSDs and Contracts – Architectural Analysis – Logical Architecture Refinement – Package Design – More Object Design with GoF patterns – UML deployment and Component Diagrams.

UNIT 5: PATTERN BASED ANALYSIS AND CASE STUDY	9 hrs
Designing a Persistence Framework with Patterns – Creational Patterns: Abstract Factory – Builder – Factory Method – Prototype – Singleton - Structural Patterns: Adapter – Bridge – Composite – Decorator – Façade – Flyweight – Proxy- Behavioral Patterns: Chain of Responsibility – Command – Interpreter – Iterator – Mediator – Memento – Observer – State – Strategy – Template Method – Visitor - Case study: Bank ATM - Managing Object Oriented Projects - Agate Ltd – Food Co Ltd – ATM - Payroll.	
Total Hours	**45**

TEXT BOOKS:

1. Craig Larman, **"Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development‖",** Third Edition, Pearson Education, 2005.
2. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, **"Design Patterns: Elements of Reusable Object-Oriented Software‖"**, Addison Wesley, 1995, Thirty Seventh Reprint, 2009.

REFERENCES:

1. Simon Bennett, Steve Mc Robb and Ray Farmer, "Object Oriented Systems Analysis and Design Using UML", Fourth Edition, Mc-Graw Hill Education, 2010.
2. Martin Fowler, "UML Distilled: A Brief Guide to the Standard Object Modeling Language", Third edition, Addison Wesley, 2003.
3. Paul C. Jorgensen, "Software Testing:- A Craftsman‟s Approach", Third Edition, Auerbach Publications, Taylor and Francis Group, 2008.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K3	2	3	-	-	-	-	-	-	-	-	-	-	2	-	-
	CO2	K4	-	-	2	3	-	-	-	-	-	-	-	-	3	-	-
	CO3	K4	-	2	-	2	3	-	-	-	-	-	-	-	-	2	-
	CO4	K5	-	-	2	-	2	-	-	-	-	-	-	-	-	3	-
	CO5	K2	2	3	2	-	-	-	-	-	-	-	-	-	2	-	-
Average Correlation Level			2	2.7	2	2.5	2.5	-	-	-	-	-	-	-	2.5	2.5	-

-

19CSC65	MOBILE AND PERVASIVE COMPUTING			
L	T	P	C	
3	0	0	3	

COURSE OBJECTIVES:

The students should be made to:

- Understand the basic concepts of mobile computing
- Be familiar with the network protocol stack
- Learn the basics of mobile telecommunication system
- Be exposed to Ad-Hoc networks
- Gain knowledge about different mobile platforms and application development

COURSE OUTCOMES:

Upon completion of this course the students should be able to:

CO1: Explain the latest 4G Telecommunication System Principles.

CO2: Incorporate the pervasive concepts.

CO3: IncorporateMobile Internet Protocol

CO4: Implement the Human Machine Interface in Pervasive environment.

CO5: Work on the pervasive concepts in mobile environment.

COURSE CONTENT:

UNIT I: **INTRODUCTION** 9 hrs

Mobile Computing – Mobile Computing Vs wireless Networking-Mobile Computing Applications – Structure, Characteristic-Features-Goals-Advantages and disadvantages of Mobile Computing Application–MAC Protocols – Wireless MAC Issues– Fixed Assignment Schemes – Random Assignment Schemes – Reservation Based Schemes. - Global Systemfor Mobile Communication (GSM) – General Packet Radio Service (GPRS) – Universal Mobile Telecommunication System (UMTS)

UNIT II:**MOBILE INTERNET PROTOCOL AND TRANSPORT LAYER** 9 hrs

Overview of Mobile IP –Features of Mobile IP –Key Mechanism in Mobile IP –route Optimization-Generations of communication technologies(2G, 3G, 4G)

UNIT III:**MOBILE AD-HOC NETWORKS** 9 hrs

Ad-Hoc Basic Concepts –Characteristics –Applications –Design Issues –Routing –Essential of TraditionalRouting Protocols –Popular Routing Protocols –Vehicular Ad Hoc networks (VANET) – MANET Vs VANET–Security.

UNIT IV: **MOBILE PLATFORMS AND APPLICATIONS** 9 hrs

Mobile Device Operating Systems – Special Constrains & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – M-Commerce – Structure **–** Pros & Cons – Mobile Payment System – Security Issues.

UNIT V:PERVASIVE COMPUTING	9 hrs

Pervasive computing infrastructure-applications- Device Technology - Hardware, Human-machine Interfaces, Biometrics, and Operating systems– Device Connectivity – Protocols, Security, and Device Management- Pervasive web application architecture- Access from PCs and PDAs- Access via WAP.

Total Hours	**45**

TEXT BOOKS:

1. Prasant Kumar Pattnaik, Rajib Mall, "**Fundamentals of Mobile Computing**", PHI Learning Pvt. Ltd,New Delhi – 2012.

2. Jochen Burkhardt, "**Pervasive Computing: Technology and Architecture of Mobile Internet Applications**", Addison-Wesley Professional; 3rd edition, 2007.

REFERENCES:

1. Jochen H. Schller, "Mobile Communications", Second Edition, Pearson Education, New Delhi, 2007.

2. Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, 2005.

3. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer, 2003.

4. Frank Adelstein, Sandeep KS Gupta, Golden Richard, Fundamentals of Mobile and Pervasive Computing, McGraw-Hill 2005

5. DebashisSaha, Networking Infrastructure for Pervasive Computing: Enabling Technologies, KluwerAcademic Publisher, Springer; First edition, 2002

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	-	-	3	2	-	2	-	-	-	-	-	-	-	-	2	-
	CO2	-	-	-	3	-	-	2	2	-	-	-	-	-	-	-	2
	CO3	-	-	3	-	3	2	-	-	2	-	-	-	-	-	2	-
	CO4	-	-	-	3	-	-	-	-	2	-	2	-	-	2	-	-
	CO5	-	-	-	3	2	-	-	-	-	2	2	-	-	-	3	-
Average Correlation Level			-	3	2.75	2,5	2	2	2	2	2	2	-	-	2	2.3	2

19CSL61	COMPILER DESIGN LABORATORY			
	L	T	P	C
	0	0	2	1

COURSE OBJECTIVES:

Upon completion of this course, the students will be familiar with,

- Compiler writing tools.
- Implement the different Phases of compiler
- Control flow and data flow analysis
- Storage allocation strategies
- Simple optimization techniques

COURSE OUTCOMES:

Upon completion of this course, the students will be able to,

CO1: Implement the different Phases of compiler using tools

CO2: Analyze the control flow and data flow of a typical program

CO3: Illustrate storage allocation strategies

CO4: Optimize a given program

CO5: Generate an assembly language program equivalent to a source language program

COURSE CONTENT:

LIST OF EXPERIMENTS	30hrs

1. Token Separation and Symbol Table Manipulation.
2. Develop a lexical analyzer to recognize a few patterns in C. (Ex. identifiers, constants, comments, operators etc.)
3. Implementation of Lexical Analyzer using Lex Tool
4. Implementarecursivedescentparserforanexpressiongrammarthat generates arithmetic expressions with digits, +, -, / and *.
5. Implement SLR parser for a given grammar
6. Generate YACC specification for a few syntactic categories.
7. Implementation of Calculator using LEX and YACC
8. Syntax tree creation
9. Three address code generation from assignment statement with array references & while statements
10. Construction of flow graph from list of three address statements.
11. Implement control flow analysis and Data flow Analysis
12. Translation of three address code to assembly language with fixed number of registers.
13. Stack and heap management at run time.
14. Implementation of Simple Code Optimization Techniques (Constant Folding., etc.)
15. Implement the back end of the compiler which takes the three address code and produces the 8086 assembly language instructions that can be assembled and run using a 8086 assembler. The target assembly instructions can be simple move, add, sub, jump. Also simple addressing modes are used.

Practical: 45 Periods **Total: 45 Periods**

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES <Times New roman>Font Size, 8.

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K5	2	3	2	-	2	-	-	-	-	-	-	-	2	-	-
	CO2	K4	-	2	3	2	-	-	-	-	-	-	-	-	-	3	-
	CO3	K2	-	3	-	3	2	-	-	-	-	-	-	-	2-	-	-
	CO4	K5	2	-	-	1	2	-	-	-	-	-	-	-	-	2	-
	CO5	K2	-	-	2	3	2	-	-	-	-	-	-	-	-	-	-
Average Correlation Level			2	2.7	2.5	2.25	2	-	-	-	-	-	-	-	2	2.5	-

-

19CSL62	CASE TOOLS LABORATORY			
	L	T	P	C
	0	0	2	1

COURSE OBJECTIVES:

- Learn the basics of OO analysis and design skills.
- Be exposed to the UML design diagrams.
- Learn to map design to code.
- Create code from design.
- Be familiar with the various testing techniques

COURSE OUTCOMES:

CO1: Design and implement projects using OO concepts.
CO2: Use the UML analysis and design diagrams.
CO3: Apply appropriate design patterns.
CO4: Create code from design.
CO5: Compare and contrast various testing techniques
.

COURSE CONTENT:

TOTAL HOURS **30**

To develop a mini-project by following the 9 exercises listed below.

1. To develop a problem statement.
2. Identify Use Cases and develop the Use Case model.
3. Identify the conceptual classes and develop a domain model with UML Class diagram.
4. Using the identified scenarios, find the interaction between objects and represent them using UML Sequence diagrams.
5. Draw relevant state charts and activity diagrams.
6. Identify the User Interface, Domain objects, and Technical services. Draw the partial layered, logical architecture diagram with UML package diagram notation.
7. Develop and test the Technical services layer.
8. Develop and test the Domain objects layer.
9. Develop and test the User interface layer.

SUGGESTED DOMAINS FOR MINI-PROJECT:

Passport automation system. 2. Book bank 3. Exam Registration 4. Stock maintenance system. 5. Online course reservation system 6. E-ticketing 7. Software personnel management system 8. Credit card processing 9. e-book management system 10. Recruitment system 11. Foreign trading system 12. Conference Management System 13. BPO Management System 14. Library Management System 15. Student Information System

MAPPING OF POGRAMME OUTCOMES WITH COURSE OUTCOMES <Times New roman>Font Size, 8.

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K6	2	3	2	2	-	-	-	-	-	-	-	-	2	-	-
	CO2	K3	-	-	3	2	2	-	-	-	-	-	-	-	3	-	-
	CO3	K3	-	-	2	3	2	-	-	-	-	-	-	-	-	3	-
	CO4	K4	-	2	-	-	3	-	-	-	-	-	-	-	-	2	-
	CO5	K5	-	3	2	2	-	-	-	-	-	-	-	-	-	2	-
Average Correlation Level			2	2.7	2.25	2.25	2.5	-	-	-	-	-	-	-	2.5	2.5	-

SEMESTER VII

19CSC71	GRAPHICS AND MULTIMEDIA			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To understand the basics of various inputs and output computer graphics hardware devices and to acquire knowledge in OpenGL programming.
- Exploration of concepts of two-dimensional graphical structures.
- To develop, design and implement three-dimensional graphical structures.
- To understand various aspects of multimedia.
- To learn the hypermedia messaging and compression techniques.

COURSE OUTCOMES:

At the end of this course, the students will be able to

CO1: Understand the various computer graphics hardware, display technologies and OpenGL.

CO2: Know how to implement various two-dimensional techniques.

CO3: Know how to implement various three-dimensional techniques.

CO4: Gain knowledge of multimedia systems.

CO5: Understand hypermedia messaging and implement compression techniques.

COURSE CONTENT:

UNIT 1: **INTRODUCTION** — 9 hrs

Overview of graphics systems –Graphics software -Coordinate representations – Graphics functions - Introduction to OpenGL – OpenGL functions for graphics – Coordinate reference frame – Two dimensional world coordinate reference frame – Point – Line – Curve – Fill area primitives – Polygon fill areas – Vertex arrays – Pixel array – Character – Picture portioning – Display list - Display window reshape.

UNIT 2: **2D GRAPHICS** — 9 hrs

2D Transformations – 2D Viewing – Normalization and window viewport transformation – Line, Polygon, Curve and Text clipping algorithms – OpenGL Functions for 2D Transformations and 2D Viewing.

UNIT 3: **3D GRAPHICS** — 9 hrs

3D Transformations – 3D Viewing – 3D Object representations – Spline representation – Visible surface detection methods – Color models – OpenGL functions for 3D transformations and 3D viewing.

UNIT 4: MULTIMEDIA SYSTEMS DESIGN AND FILE HANDLING	9 hrs

Multimedia elements − Multimedia applications − Multimedia system architecture − Evolving technologies for multimedia − Defining objects for multimedia systems − Multimedia data interface standards − Multimedia databases - Data and file format standards − Multimedia I/O technologies.

UNIT 5: COMPRESSION AND HYPERMEDIA	9 hrs

Compression and decompression − Types of compression – Binary image compression schemes - Color, gray scale and still-video image compression – Video image compression - Digital voice and audio − Video image and animation − Full motion video − Audio compression - Hypermedia messaging - Hypermedia message components - Creating hypermedia messages.

Total Hours	**45**

TEXT BOOKS:

1. Donald D. Hearn, M. Pauline Baker and Warren Carithers, "**Computer Graphics with OpenGL**", Fourth Edition, Pearson Education, 2010.
2. Andleigh, P. K and Kiran Thakrar, "**Multimedia Systems and Design**", PHI, 2003.

REFERENCES:

1. Francis S Hill Jr. and Stephen M Kelley, "Computer Graphics Using OpenGL", Third Edition, Prentice Hall, 2007.
2. Foley, Vandam, Feiner and Huges, "Computer Graphics: Principles and Practice", Pearson Education, Second Edition, 2003.
3. Ralf Steinmetz and Klara Steinmetz, "Multimedia Computing, Communications and Applications", Pearson Education, 2004.
4. Judith Jeffcoate, "Multimedia in practice: Technology and Applications", PHI, 1998.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES <Times New roman>Font Size, 8.

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K2	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
	CO2	K3	2	1	1	1	1	1	3	-	-	1	2	-	1	1	-
	CO3	K3	2	1	1	1	1	1	3	-	-	1	2	-	1	1	-
	CO4	K2	-	-	-	-	-	-	2	-	-	1	3	-	-	1	-
	CO5	K4	3	2	1	1	1	1	3	-	-	1	3	-	1	1	-
Average Correlation Level			2	1	1	1	-	1	3	-	-	1	3	-	1	1	-

19CSC72	C# AND .NET TECHNOLOGIES			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To know about the C# language,understand the foundations of CLR execution and learn the technologies of the .NET framework.
- To know the object-oriented aspects of C#language.
- To be aware of application development in .NET.
- To learn web-based applications on .NET (ASP.NET).
- To understand networking through the internet usingSystem.Net.

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Apply basic concepts of C# programming.

CO2: Apply object-oriented concepts to debug, compile and run a C# program.

CO3: Develop programs using C# on .NET

CO4: Design and develop web-based applications on .NET.

CO5: Develop programs to perform internet operations.

COURSE CONTENT:

UNIT 1: **INTRODUCTION TO C#**	8 hrs

Introducing C# - Understanding .NET - Overview of C# - Literals - Variables - Data Types -Operators -Checked and unchecked operators – Expressions – Branching - Looping – Methods -Implicit and explicit casting – Constant – Arrays - Array class - Array list – String - String builder – Structure – Enumerations - Boxing and unboxing.

UNIT 2: **OBJECT ORIENTED ASPECTS OF C#**	10 hrs

Class – Objects - Constructors and its types - Inheritance – Properties- Indexers - Index overloading - Polymorphism - Sealed class and methods –Interface -Abstract class -Abstract and interface - Operator overloading - Delegates –Events - Errors and exception - Threading.

UNIT 3: **APPLICATION DEVELOPMENT ON .NET**	9 hrs

ADO.NET : The connected layer - Data providers – Namespaces - Abstracting data providers using interfaces - ADO.NET : The disconnected layer – DataSet - Properties of the DataSet - Methods of the DataSet - Building a DataSet - Working and building with DataColumns - Working with DataRows - Working with DataTables - Binding DataTable objects to windows forms GUIs - Working with data adapters.

UNIT 4: **WEB BASED APPLICATION DEVELOPMENT ON .NET**	9 hrs

The role of HTTP - Understanding web applications and web servers - The role of HTML - The role of client-side scripting - Building a single file ASP.NET Web - Building an ASP.NET web page Using code files - ASP.NET web sites vs. ASP.NET web applications - Understanding the nature of web controls - The control and WebControl Base Classes - Major categories of ASP.NET web controls - State management techniques - The issue of state - ASP.NET state management techniques - Understanding the role of ASP.NET view state - Understanding the application/session distinction - Maintaining session data - Understanding cookies.

UNIT 5: **CLR AND .NET FRAMEWORK**	9 hrs

Assemblies – Versioning – Attributes- Reflection -Viewing meta data - Type discovery -Reflection on type – Marshalling –Remoting - Security in .NET.

Total Hours	**45**

TEXT BOOKS:

1. Herbert Schildt, "**The Complete Reference: C# 4.0**", Tata McGraw-Hill, 2010.
2. Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson, Morgan Skinner, "**Professional C# 2012 with .NET 4.5**", Wiley India, 2013.

REFERENCES:

1. Andrew Troelsen, "**Pro C# 2010 and the .NET 4 Platform**", Fifth edition, A Press, 2010.
2. Ian Griffiths, Matthew Adams, Jesse Liberty, "**Programming C# 4.0**", OReilly, Sixth Edition,2010.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K3	2	1	1	1	1	-	3	-	-	-	-	-	1	1	-
	CO2	K3	2	1	1	1	1	-	3	-	-	-	-	-	1	1	-
	CO3	K3	2	1	1	1	1	1	3	-	-	-	2	-	1	1	-
	CO4	K4	3	2	1	1	1	1	3	-	-	-	3	-	1	1	-
	CO5	K3	2	1	1	1	1	1	3	-	-	-	2	-	1	1	-
Average Correlation Level			2	1	1	1	1	1	3	-	-	-	2	-	1	1	-

19CSC73	CRYPTOGRAPHY AND NETWORK SECURITY				
		L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To describe OSI security architecture and classical encryption techniques.
- To Accquire fundamental knowledge on the concepts of finite fields and symmetric ciphers.
- To study the principles of public key cryptosystems and Asymmetric key ciphers.
- To define various authentication schemes, hash functions and digital signature.
- To Understand various standard in the security systems

COURSE OUTCOMES:

The Students will obtain knowledge on the following after completing the course.

CO1: Outline the fundamentals of networks security, security architecture, threats and vulnerabilities

CO2: Apply the different cryptographic operations of symmetric cryptographic algorithms

CO3: Apply the different cryptographic operations of public key cryptography

CO4: Use the various Authentication schemes to simulate different applications.

CO5: Implement various Security practices and System security standards.

COURSE CONTENTS:

UNIT 1: **INTRODUCTION** — 9 hrs

Services, Mechanisms and attacks-the OSI security architecture-Network security model-Security Policies-Classical Encryption techniques (Symmetric cipher model, substitution techniques, transposition techniques, steganography). Foundations of modern cryptography: perfect security – information theory – product cryptosystem – cryptanalysis.

UNIT 2:**SYMMETRIC KEY CRYPTOGRAPHY** — 9 hrs

MATHEMATICS OF SYMMETRIC KEY CRYPTOGRAPHY: Algebraic structures – Modular arithmetic-Euclid‟s algorithm- Congruence and matrices -Groups, Rings, Fields- Finite fields- SYMMETRIC KEY CIPHERS: SDES – Block cipher Principles of DES – Strength of DES – Differential and linear cryptanalysis – Block cipher design principles – Block cipher mode of operation – Evaluation criteria for AES – Advanced Encryption Standard – RC4 –Key distribution

UNIT 3: PUBLIC KEY CRYPTOGRAPHY — 9 hrs

MATHEMATICS OF ASYMMETRIC KEY CRYPTOGRAPHY: Primes – Primality Testing – Factorization – Euler‟s totient function, Fermat‟s and Euler‟s Theorem – Chinese Remainder Theorem – Exponentiation and logarithm – ASYMMETRIC KEY CIPHERS: RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange -ElGamal cryptosystem – Elliptic curve arithmetic-Elliptic curve cryptography

UNIT 4: **MESSAGE AUTHENTICATION AND INTEGRITY**	9 hrs
Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC –MD5 - SHA - HMAC – CMAC - Digital signature and authentication protocols – DSS - Authentication applications – Kerberos, X.509	
UNIT 5:**SECURITY PRACTICES AND SYSTEM SECURITY**	9 hrs
System Security: Intruder – Intrusion detection system – Virus and related threats – Countermeasures – Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology- Types of Firewalls - Firewall designs-**E Mail security:** PGP, S/MIME – **IP security**: Overview of IPSec - IP and IPv6-Authentication Header-Encapsulation Security Payload (ESP)-Internet Key Exchange – **Web Security**: SSL/TLS Basic Protocol-computing the keys- client authentication-PKI –SET for E-Commerce Transactions	
Total Hours	**45**

TEXT BOOKS:

1. William Stallings, **Cryptography and Network Security**: Principles and Practice, Pearson Education Limited 7th Edition, 2017.

REFERENCES:

1.C K Shyamala, N Harini and Dr. T R Padmanabhan: Cryptography and Network Security, Wiley India Pvt.Ltd 2011

2. BehrouzA.Foruzan, Cryptography and Network Security, Tata McGraw Hill 2010

3. Charlie Kaufman, Radia Perlman, and Mike Speciner, Network Security: PRIVATE Communication in a PUBLIC World, Prentice Hall, 2 nd Edition,2002 ISBN 0-13-046019-2

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES <Times New roman>Font Size, 8.

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K2	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-
	CO2	K3	3	-	3	-	-	-	-	-	-	-	-	-	2	-	-
	CO3	K3	3	-	3	-	-	-	-	-	-	-	-	-	2	-	-
	CO4	K4	-	-	-	2	2	-	-	-	-	-	-	-	-	3	-
	CO5	K4	-	-	-	2	3	-	-	-	-	-	-	-	-	2	-
Average Correlation Level			2.6	3	3	2	2.5	-	-	-	-	-	-	-	2	2.5	-

19CSL71	GRAPHICS AND MULTIMEDIA LABORATORY

L	T	P	C
0	0	4	1

COURSE OBJECTIVES:

- To develop, design and implement two dimensional and three-dimensional graphical structures.
- To understand various aspects of multimedia and to learn the concept of sound, images and videos.
- Be exposed to creation of three-dimensional graphical scenes using open graphics library suits.
- Be familiar with image manipulation and enhancement.
- Learn to create animations and multimedia presentation/game/project.

COURSE OUTCOMES:

At the end of the course, the student should be able to

CO1: Design and implement two dimensional and three-dimensional graphical structures.

CO2: Implement multimedia concepts for animation.

CO3: Create three-dimensional graphical scenes using open graphics library suits.

CO4: Implement image manipulation and enhancement.

CO5: Design and implement animations using tools.

COURSE CONTENT:

Experiments to be covered:

1. Implementation of Bresenham's algorithm – Line and Circle.
2. Implementation of Bresenham's algorithm – Ellipse.
3. Implementation of Line, Circle and Ellipse attributes.
4. Two Dimensional transformations - Translation, Rotation, Scaling, Reflection, Shear.
5. Cohen Sutherland 2D line clipping and windowing.
6. Sutherland – Hodgeman polygon clipping algorithm.
7. Three dimensional transformations - Translation, Rotation, Scaling.
8. Drawing three dimensional objects and scenes.
9. 3D Projections – Parallel, Perspective.
10. To implement text compression algorithm.
11. To implement image compression algorithm.
12. GIMP:
    a) Creating Logos.
    b) Simple Text Animation.
13. Audacity:
    a) Silencing, Trimming and Duplicating the Audio signal.
    b) Giving the Advanced Effect to the Audio Signal.
14. Windows Movie Maker:
    a) Applying Effect to Video.
    b) Creating Titles in Video.
15. Flash:
    a) Changing the shape of the Object.

b) Imaging Viewing using Mask.

16. Photo Impact:

a) Text Effects.

b) Image Slicing.

Total Hours	**30**

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES <Times New roman>Font Size, 8.

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K3	2	1	1	1	1	1	3	-	-	1	2	-	1	1	-
	CO2	K3	2	1	1	1	1	1	3	-	-	1	2	-	1	1	-
	CO3	K3	2	1	1	1	1	1	3	-	-	1	2	-	1	1	-
	CO4	K3	2	1	1	1	1	1	3	-	-	1	2	-	1	1	-
	CO5	K4	3	2	1	1	1	1	3	-	-	1	3	-	1	1	-
Average Correlation Level			2	1	1	1	1	1	3	-	-	1	2	-	1	1	-

19CSL72	C# & .NET LABORATORY			
L	T	P	C	
0	0	2	1	

COURSE OBJECTIVES:

- To learn the technologies of the .NET framework.
- To know the object-oriented aspects of C#.
- To be aware of application development in .NET.
- To learn web-based applications on .NET (ASP.NET).
- To learn ASP.NET Application to validate the form using controls.

COURSE OUTCOMES:

At the end of this course, the students will be able to

CO1: Debug, compile and run a simple application.
CO2: Develop programs using C# on .NET.
CO3: Design and develop web-based applications on .NET.
CO4: Develop an application using ADO.NET.
CO5: Develop an ASP.NET Application to validate the form using controls.

COURSE CONTENT:

Experiments to be covered:	30hrs

1. Find the sum of all the elements present in a jagged array of 3 inner arrays.
2. Write a Program to demonstrate abstract class and abstract methods in C#.
3. Implementation of inheritance and operator overloading in C#
4. Implementation of Properties and Indexer in C#
5. Implementation of Delegates and Events in C#.
6. Implementation of Generic Interfaces in C#.
7. Using Try, Catch and Finally blocks write a program in C# to demonstrate errorhandling.
8. Write an application to implement the Inter Thread Communication.
9. Develop an application for a library management system using ADO.NET ConnectionOriented.
10. Develop an application using ADO.NET Connectionless for an InventoryControl System.
11. Develop an ASP.NET Application to validate the form using controls.
12. Develop an ASP.NET Application to implement data binding in data grid and repeater control.
13. Develop an ASP.NET Application to implement the cookies.

Total Hours	**30**

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES <Times New roman>Font Size, 8.

Mapping			Programme Outcomes / Programme Specific Outcomes														
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K3	2	1	1	1	-	-	3	-	-	-	-	-	1	1	-
	CO2	K3	2	1	1	1	-	-	3	-	-	-	2	-	1	1	-
	CO3	K4	3	2	1	1	1	1	3	-	-	-	3	-	1	1	1
	CO4	K3	2	1	1	1	1	1	3	-	-	-	2	-	1	1	1
	CO5	K3	2	1	1	1	1	1	3	-	-	-	2	-	1	1	1
Average Correlation Level			2	1	1	1	1	1	3	-	-	-	2	-	1	1	1

PROFESSIONAL ELECTIVES

19CSE01	PARALLEL COMPUTING			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

The student should be made to:

- Understand the challenges in parallel and multi-threaded programming.
- Learn about the various parallel programming paradigms, and solutions.

COURSE OUTCOMES:

At the end of the course, the student should be able to:

CO1: Explain the architecture of multi core processors

CO2: Implement a Program on Parallel Processors.

CO3: Develop shared memory programs using OpenMP.

CO4: Execute Distributed Programming using MPI.

CO5: Compare and contrast programming for serial processors and programming for parallel processors.

COURSE CONTENT:

UNIT 1: **MULTI-CORE PROCESSORS**	9 hrs

Single core to Multi-core architectures – SIMD and MIMD systems – Interconnection networks - Symmetric and Distributed Shared Memory Architectures – Cache coherence - Performance Issues – Parallel program design.

UNIT 2: **PARALLEL PROGRAM CHALLENGES**	9 hrs

Performance – Scalability – Synchronization and data sharing – Data races – Synchronization primitives (mutexes, locks, semaphores, barriers) – deadlocks and livelocks – communication between threads (condition variables, signals, message queues and pipes).

UNIT 3: **SHARED MEMORY PROGRAMMING WITH OpenMP**	9 hrs

OpenMP Execution Model – Memory Model – OpenMP Directives – Work-sharing Constructs - Library functions – Handling Data and Functional Parallelism – Handling Loops - Performance Considerations.

UNIT 4: **DISTRIBUTED MEMORY PROGRAMMING WITH MPI**	9 hrs

MPI program execution – MPI constructs – libraries – MPI send and receive – Point-to-point and Collective communication – MPI derived datatypes – Performance evaluation

UNIT 5: PARALLEL PROGRAM DEVELOPMENT	9 hrs
Case studies - n-Body solvers – Tree Search – OpenMP and MPI implementations and comparison.	
Total Hours	**45**

TEXT BOOKS:

1. Peter S. Pacheco, "**An Introduction to Parallel Programming**", Morgan-Kauffman/ Elsevier, 2011.
2. Darryl Gove, "**Multicore Application Programming for Windows, Linux, and Oracle Solaris**", Pearson, 2011.

REFERENCES:

1. Michael J Quinn, "Parallel programming in C with MPI and OpenMP", Tata McGraw Hill, 2003.
2. Shameem Akhter and Jason Roberts, "Multi-core Programming", Intel Press, 2006.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES.

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K2	3	3	2	1	-	3	-	-	-	-	-	1	2	-	-
	CO2	K6	3	3	3	2	-	-	-	-	2	-	1	-	2	1	-
	CO3	K6	2	3	3	1	-	2	-	-	-	1	2	2	1	2	-
	CO4	K5	1	2	3	2	3	-	-	-	-	-		-	2	2	-
	CO5	K2	1	3	3	3	-	-	-	-	2	-		-	2	1	-
Average Correlation Level			2	2.8	2.8	1.8	3	2.5	-	-	2	1	1.5	1.5	1.8	1.5	-

19CSE02	DIGITAL IMAGE PROCESSING			
L	T	P	C	
3	0	0	3	

COURSE OBJECTIVES:

- Learn digital image fundamentals.
- Be exposed to simple image processing techniques.
- Be familiar with image compression and segmentation techniques.
- Learn to represent image in form of features.

COURSE OUTCOMES:

CO1: Discuss digital image fundamentals with its components.
CO2: Apply image enhancement techniques on various domains
CO3: Analyze and choose suitable image filtering techniques for their applications.
CO4: Use image compression and segmentation Techniques.
CO5: Represent features of images.

COURSE CONTENT:

UNIT 1: **DIGITAL IMAGE FUNDAMENTALS** — 9 hrs

Introduction – Origin – Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - color models.

UNIT 2: **IMAGE ENHANCEMENT** — 9 hrs

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering – **Frequency Domain:** Introduction to Fourier Transform – Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters.

UNIT 3: **IMAGE RESTORATION AND SEGMENTATION** — 9 hrs

Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering **Segmentation:** Detection of Discontinuities–Edge Linking and Boundary detection – Region based segmentation- Morphological processing- erosion and dilation.

UNIT 4: **WAVELETS AND IMAGE COMPRESSION** — 9 hrs

Wavelets – Subband coding - Multiresolution expansions - **Compression:** Fundamentals – Image Compression models – Error Free Compression – Variable Length Coding – Bit-Plane Coding – Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Compression Standards.

UNIT 5: IMAGE REPRESENTATION AND RECOGNITION	9 hrs
Boundary representation – Chain Code – Polygonal approximation, signature, boundary segments – Boundary description – Shape number – Fourier Descriptor, moments- Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.	
Total Hours	**45**

TEXT BOOKS:

1. Rafael C. Gonzales, Richard E. Woods, "**Digital Image Processing**", Third Edition, Pearson Education, 2010.

REFERENCES:

1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, "Digital Image Processing Using MATLAB", Third Edition Tata McGraw Hill Pvt. Ltd., 2011.
2. Anil Jain K. "Fundamentals of Digital Image Processing", PHI Learning Pvt. Ltd., 2011.
3. Willliam K Pratt, "Digital Image Processing", John Willey, 2002.
4. Malay K. Pakhira, "Digital Image Processing and Pattern Recognition ", First Edition, PHI Learning Pvt. Ltd., 2011

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES <Times New roman>Font Size, 8.

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	CO2	K3	-	2	3	3	2	-	-	-	-	-	-	-	3	-	-
	CO3	K4	-	3	-	2	2	-	-	-	-	-	-	-	2	-	-
	CO4	K3	-	-	-	2	3	-	-	-	-	-	-	-	-	3	-
	CO5	K1	-	-	2	3	2	-	-	-	-	-	-	-	-	-	-
Average Correlation Level			-	2	2.5	2.5	2.25	-	-	-	-	-	-	-	2.5	3	-

-

19CSE03	COMPONENT BASED TECHNOLOGY				
		L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

The student should be made to:

- Introduces in depth JAVA, Corba and .Net Component
- Deals with Fundamental properties of components, technology and architecture and middleware.
- Component Frameworks and Development are covered in-depth.

COURSE OUTCOMES

At the end of the course, the student should be able to

CO1: Explain the software components
CO2: Discuss about fundamental properties of components, technology and architecture and middleware
CO3: Explore the concepts of java, corba based technologies
CO4: Discuss the Net based Component Technologies
CO5: Describe the component frameworks and its development

COURSE CONTENT:

UNIT 1: SOFTWARE COMPONENTS	9 hrs

Software components − Objects − Fundamental properties of component technology − Modules − Interfaces − Callbacks − Directory services − Component architecture − Components and middleware.

UNIT 2 : JAVA BASED COMPONENT TECHNOLOGIES	9 hrs

Threads − Java beans − Events and connections − Properties − Introspection − JAR Files − Reflection − Object serialization − Enterprise java beans − Distributed object models − RMI − IIOP.

UNIT 3 : CORBA COMPONENT TECHNOLOGIES	9 hrs

Java and CORBA − Interface definition language − Object request broker − System object model − Portable object adapter − CORBA Services − CORBA Component model − Containers − Application server − Model driven architecture.

UNIT 4: . NET BASED COMPONENT TECHNOLOGIES	9 hrs

COM − Distributed COM − Object reuse − Interfaces and versioning − Dispatch interfaces − Connectable objects − OLE containers and servers − Active X controls − .NET Components − Assemblies − App domains − Contexts − Reflection − Remoting.

UNIT 5 : COMPONENT FRAMEWORKS AND DEVELOPMENT	9 hrs
Connectors − Contexts − EJB Containers − CLR contexts and channels − Black box Component framework − Directory objects − Cross-Development environment − Component-oriented programming − Component design and implementation tools − Testing tools − Assembly tools.	
Total Hours	**45**

TEXT BOOKS:

1. Clemens Szyperski, "**Component Software: Beyond Object-Oriented Programming**", Pearson Education Publishers, Second Edition 2011.

2. Ed Roman, "**Mastering Enterprise Java Beans**", John Wiley and Sons Inc, 2004.

REFERENCES:

1. Mowbray, "Inside CORBA", Pearson Education, 2003.
2. Freeze, "Visual Basic Development Guide for COM & COM+", BPB Publication, 2001.
3. Hortsamann and Cornell, "Core Java Vol-II" Sun Press, 2002.
4. Sudha Sadasivam, "Component Based Technology", John Wiley and Sons, 2008.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES <Times New roman>Font Size, 8.

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K1	-	3	-	2	-	-	-	-	-	-	-	-	-	2	-
	CO2	K3	-	2	-	3	-	-	-	-	-	-	-	-	-	3	-
	CO3	K4	-	-	2	-	3	-	-	-	-	-	-	-	-	2	-
	CO4	K3	-	3	2	-	-	-	-	-	-	-	-	-	-	2	-
	CO5	K1	-	-	2	-	3	-	-	-	-	-	-	-	-	2	-
Average Correlation Level			-	2.6	2	2.5	3	-	-	-	-	-	-	-	-	2.2	-

19CSE04	NATURAL LANGUAGE PROCESSING			
L	T	P	C	
3	0	0	3	

COURSE OBJECTIVES:

The student should be made to:

- To learn the fundamentals of natural language processing
- To appreciate the use of CFG and PCFG in NLP
- To understand the role of semantics and pragmatics

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: To tag a given text with basic Language features

CO2: To design an innovative application using NLP components

CO3: To implement a rule based system to tackle morphology/syntax of a language

CO4: To design a tag set to be used for statistical processing for real-time applications

CO5: To compare and contrast use of different statistical approaches for different types of NLP applications.

COURSE CONTENT:

UNIT 1: **FUNDAMENTALS** — 6 hrs

Knowledgeinspeechandlanguageprocessing−Ambiguity−Modelsandalgorithms −Language−Thoughtandunderstanding−Regularexpressionsandautomata − Regularexpressions−Finitestateautomata.morphologyandfinite −State Transducers−Surveyofenglishmorphology− Finitestatemorphologicalparsing− CombiningFSTlexiconandrules− Lexiconfreefsts:ThePorterStammer −Human morphological processing.

UNIT 2: **SYNTAX** — 10 hrs

Wordclassesandpartofspeechtagging−Englishwordclasses−Tagsetsforenglish −Partofspeechtagging−Rule-basedpartofspeechtagging −Stochasticpartof speech tagging−Transformation-basedtagging−Otherissues− Context-free grammarsforenglish: constituency−Context-freerulesandtrees −Sentence-level constructions−Nounphrase−Coordination −Agreement− Verbphaseand sub categorization −Auxiliaries−Spokenlanguagesyntax −Grammars equivalenceand normalform −Finitestateandcontext-freegrammars−Grammarsandhuman processing−Parsingwithcontext-freegrammars−Parsing assearch−Basictop-Downparser−ProblemswiththebasicTop-Downparser−Earlyalgorithm −Finite- Stateparsingmethods.

UNIT 3: **ADVANCED FEATURESAND SYNTAX** — 11 hrs

Features andunification −Featurestructures −Unificationoffeaturestructures − Features structures inthegrammar −Implementingunification−Parsingwith unification constraints − Types and inheritance − Lexicalized and probabilistic parsing−Probabilisticcontext-freegrammar −ProblemswithPCFGS−Probabilistic lexicalizedCFGS − Dependency grammars − Human parsing.

UNIT 4: SEMANTIC	9 hrs

Representing meaning − Computational desiderata for representations− Meaning structureof language − First order predicate calculus −Somelinguisticallyrelevant concepts−Relatedrepresentationalapproaches−Alternativeapproachestomeaning −Semanticanalysis−Syntaxdrivensemanticanalysis−Attachmentsforafragment ofEnglish −Integratingsemantic analysisintothe earlyparser −Idiomsand compositionality −Robust semanticanalysis −Lexicalsemantics −Relationalamong lexemes and their senses − Word net − Database of lexical relations − Internal structure of words − Creativity and the lexicon.

UNIT 5: APPLICATIONS	9 hrs

Word sense disambiguation and information retrieval − Selectional restriction − Baseddisambiguation −Robustwordsensedisambiguation−Informationretrieval − Otherinformationretrievaltasks−Naturallanguagegeneration −Introductionto languagegeneration−Architectureforgeneration−Surfacerealization −Discourse planning − Other issues − Machine translation − Language similarities and differences −Transfermetaphor−Interlinguaidea:usingmeaning −Direct translation−Using statistical techniques− Usability and systemdevelopment.

Total Hours	**45**

TEXT BOOKS:

1. DanielJurafskyand JamesH.Martin,"**SpeechandLanguageProcessing**", Pearson Education (Singapore) Pvt. Ltd., 2002.

REFERENCES:

1. James Allen, "Natural Language Understanding", Pearson Education, 2003.
2. AksharBharathi,ChaitanyaandSangal,"NaturalLanguageProcessing: A Paninian approach", PHI, 2004.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K1	1	2	2	3	2	-	3	-	2	-	2	2	3	3	2
	CO2	K6	2	-	3	3	-	-	-	-	2	3	-	2	3	3	1
	CO3	K3	2	-	3	3	3	3	-	2	-	-	-	-	2	2	3
	CO4	K6	2	-	3	3	-	2	2	2	2	3	-	2	2	2	3
	CO5	K4	2	2	3	3	3	-	-	-	-	3	2	-	-	-	3
Average Correlation Level			1.8	2	2.8	3	2.6	2.5	2.5	2	2	3	2	2	2.5	2.5	2.4

19CSE05	UNIX INTERNALS			
L	T	P	C	
3	0	0	3	

COURSE OBJECTIVES:

- To provide knowledge about Unix operating system working principles, its file system and programming for inter process communication.
- To learn shell programming and filters.
- To get an understanding on using various system calls

COURSE OUTCOMES:

CO1: Have a knowledge about Unix operating system working principles,
CO2: To write UNIX programs using file system calls
CO3: To write UNIX programs for process scheduling and page replacement
CO4: To write UNIX programs on inter-process communication
CO5: Analyze the various memory management and I/O schemes.

COURSE CONTENT:

UNIT 1: **OVERVIEW** — 9 hrs

General Overview of the System : History – System structure – User perspective – Operating system services – Assumptions about hardware. Introduction to the Kernel : Architecture of the UNIX operating system – Introduction to system concepts. The Buffer Cache: Buffer headers – Structure of the buffer pool – Scenarios for retrieval of a buffer – Reading and writing disk blocks – Advantages and disadvantages of the buffer cache.

UNIT 2: **FILE SUBSYSTEM** — 9 hrs

Internal representation of files: Inodes – Structure of a regular file – Directories – Conversion of a path name to an Inode – Super block – Inode assignment to a new file – Allocation of disk blocks.

UNIT 3: **SYSTEM CALLS FOR THE FILE SYSTEM** — 9 hrs

Open – Read – Write – File and record locking – Adjusting the position of file I/O – Lseek – Close – File creation – Creation of special files – Changing directory, root, owner, mode – stat and fstat – Pipes – Dup – Mounting and unmounting file systems – link – unlink.

UNIT 4: **PROCESSES** — 9 hrs

Process states and transitions – Layout of system memory – The context of a process – Saving the context of a process – Manipulation of the process address space - Sleep. Process Control : Process creation – Signals – Process termination – Awaiting process termination – Invoking other programs – user id of a process – Changing the size of a process - Shell – System boot and the INIT process– Process Scheduling.

UNIT 5: MEMORY MANAGEMENT AND I/O	9 hrs
Memory Management Policies : Swapping – Demand paging. The I/O Subsystem: Driver Interface – Disk Drivers – Terminal Drivers– Streams – Inter process communication.	
Total Hours	**45**

TEXT BOOKS:

1. Maurice J. Bach, "**The Design of the Unix Operating System**", First Edition, Pearson Education, 1999.

REFERENCES:

1. B. Goodheart, J. Cox, "The Magic Garden Explained", Prentice Hall of India, 1986.
2. S. J. Leffler, M. K. Mckusick, M. J. .Karels and J. S. Quarterman., "The Design and Implementation of the 4.3 BSD Unix Operating System", Addison Wesley, 1998.
3. Uresh Vahalia, "Unix Internals: The New Frontiers", Pearson Education, 1996.
4. Steve D Pate, "UNIX File systems: Evolution, Design and Implementation", Wiley Publishing Inc., 2003.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K1	1	2	2	3	2	-	3	-	2	-	2	2	3	3	2
	CO2	K6	2	-	3	3	-	-	-	-	2	3	-	2	3	3	1
	CO3	K3	2	-	3	3	3	3	-	2	-	-	-	-	2	2	3
	CO4	K6	2	-	3	3	-	2	2	2	2	3		2	2	2	3
	CO5	K4	2	2	3	3	3	-	-	-	-	3	2	-	-	-	3
Average Correlation Level			1.8	2	2.8	3	2.6	2.5	2.5	2	2	3	2	2	2.5	2.5	2.4

19CSE06	OPEN SOURCE SOFTWARE			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

The student should be made to:

- Be exposed to the context and operation of free and open source software (FOSS) communities and associated software projects.
- Be familiar with participating in a FOSS project
- Learn scripting language like Python
- Learn some important FOSS tools

COURSE OUTCOMES:

Upon completion of the course, the student should be able to:

CO1: Install and run open-source operating systems.

CO2: Gather information about Free and Open Source Software projects from software releases and from sites on the internet.

CO3: Build and modify one or more Free and Open Source Software packages.

CO4: Use a version control system.

CO5: Contribute software to and interact with Free and Open Source Software development projects.

COURSE CONTENT:

UNIT 1: **LINUX FUNDAMENTALS**	9 hrs

Overview of Free/Open source software −Definition of FOSS and GNU−History of GNU/Linuxandthefreesoftwaremovement −Advantagesof freesoftware and GNU/Linux −FOSS Usage −Trends and potential −Global and indian − GNU/Linux OSinstallation−Detecthardware−Configurediskpartitionsandfilesystems− InstallAGNU/Linuxdistribution −Basicshellcommands−Loggingin−Listing files−Editingfiles−Copying/Movingfiles−Viewingfilecontents −Changingfile modes and permissions − Process management − User and group management − File ownershipsandpermissions−PAM authentication−Introductiontocommonsystem configurationfilesandlogfiles −Configuringnetworking−Basicsof TCP/IP networking and routing − Connecting to the internet. (Through Dialup −DSL- Ethernet −Leased Line).

UNIT 2: **SYSTEM ADMINISTRATION**	9 hrs

Configuring additionalhardware − Soundcards−Displaysanddisplaycards − Networkcards– Modems−USBDrives−CDWriters−UnderstandingtheOSboot- Upprocess

−PerformingeverydaytasksusingGnu/Linux−Accessing theinternet- Playingmusic−Editing documentsandspreadsheets−Sendingandreceivingemail− Copyfilesfrom disksandoverthenetwork−Playinggames−WritingCDS−X windowsystem configurationandutilities −ConfigureXwindows−Detectdisplay devices −Installingsoftware−Fromsourcecodeaswellasusingbinarypackages − Setting up email servers −Using postfix (SMTP Services)− Courier (IMAP & POP3 Services)−Squirrelmail(WebMailServices)−Settingupwebservers−Using apache(HTTPServices) −PHP(Server-SideScripting)−Perl(CGISupport)− Setting up file services − Using samba (File and Authentication Services for WindowsNetworks) −UsingNFS(FileServicesforGnu/Linux/UnixNetworks) − Setting up proxy services − Using squid (Http / Ftp / Https Proxy Services) − Setting up printer services− Using CUPS (Print Spooler) − Foomatic.(Printer Database).	
UNIT 3: **FOSS PROGRAMMING PRACTICES**	9 hrs
Setting upafirewall−UsingnetfilterandIP tables−UsingtheGNUcompiler collection−Assembler(GAS) −Understandingbuildsystems− Constructing make files and using make − GNU debugging tools, Using source code versioning and managing tools, Review of common programming practices and guidelines for GNU/Linux and FOSS, Documentation.	
UNIT 4: **PROGRAMMING TECHNIQUES**	9 hrs
Application programming – Basics of X Windows server architecture – QT programming – GTK + Programming- Python programming – Open source equivalent of existing Commercial software.	
UNIT 5: **PROJECTS AND CASE STUDIES**	9 hrs
Linux for portable Devices, Creation of Bootable CD and USB from command line, Case Studies – Samba, Libre office, Assistive technology.	
Total Hours	**45**

TEXT BOOKS:

1. Ellen Siever, Stephen Figgins, Robert Love, Arnold Robbins, "**Linux in a nutshell**", Sixth edition, OReilly media, September 2009.
2. N. B. Venkateshwarlu, "**Introduction toLinux: Installation and Programming**", B S Publishers, 2005.

REFERENCES:

1. Matt Welsh, Matthias Kalle Dalheimer, TerryDawson and Lar Kaufman, “Running Linux”, FourthEdition, O'Reilly Publishers, 2002.
2. CarlaSchroder,“Linux Cookbook”,FirstEdition,O'ReillyCookbooksSeries, November 2004.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	k3	3	-	3	3	2	-	-	-	2	-	-	3	3	2	3
	CO2	k6	2	3	-	3	2	-	2	1	2	2	-	2	2	2	3
	CO3	k3	2	3	3	2	2	-	-	-	3	2	1	3	-	3	2
	CO4	k3	2	-	3	3	-	-	-	-	2	2	1	-	3	2	3
	CO5	k6	-	-	2	3	-	3	1	2	-	-	3	-	2	-	2
Average Correlation Level			2.25	3	2.75	2.8	3	3	1.5	1.5	2.25	2	2.5	2.6	2.5	2.25	2.6

19CSE07	TCP/IP DESIGN AND IMPLEMENTATION			
L	T	P	C	
3	0	0	3	

COURSE OBJECTIVES:

The student should be made to:

- To learn about the design of TCP/IP Protocol structure
- To learn about the implementation of TCP and IP functionalities in the form of data structures
- To learn about how TCP handles input and output with synchronization
- To learn about the importance of timers and how it is managed in a TCP communication.
- To learn about the functionality of ICMP error processing routines.

COURSE OUTCOMES:

At the end of this course the student should be able to

CO1: Understand the internals of the TCP/IP protocols

CO2: Understand how TCP/IP is actually implemented

CO3: Describe how TCP handles input and output with synchronization

CO4: Understand the interaction among the protocols in a protocol stack

CO5: Apply and manage the timer and low control in TCP communications

COURSE CONTENT:

UNIT 1: **FUNDAMENTALS** — 9 hrs

Internetworking concepts - IP and datagram forwarding - TCP services - Interactive data flow - Timeout and retransmission - Bulk data flow - Persist timer – Keep-alive timer.

UNIT 2: **ARP AND IP** — 9 hrs

Structure of TCP/IP in OS - Data structures for ARP - Cache design and management - IP software design and organization - Sending a datagram to IP.

UNIT 3: **IP ROUTING IMPLEMENTATION** — 9 hrs

Routing table - Routing algorithms - Fragmentation and reassembly - Error processing (ICMP) - Multicast Processing (IGMP).

UNIT 4: **TCP I/O PROCESSING AND FSM** — 9 hrs

Data structure and input processing - Transmission control blocks – Segment format - Comparison - Finite state machine implementation - Output processing - Mutual exclusion - Computing TCP data length.

UNIT 5: TCP TIMER AND FLOW CONTROL	9 hrs
Timers - Events and messages - Timer process - Deleting and inserting timer event - Flow control and adaptive retransmission - Congestion avoidance and control – Urgent data processing and push function. .	
Total Hours	**45**

TEXT BOOKS:

1. Douglas E. Comer, "**Internetworking with TCP/IP Principles, Protocols and Architecture**", Vol. 1 Fifth edition, Pearson Education Asia, 2006.
2. Douglas E. Comer, "**Internetworking withTCP/IP-Design, Implementation and Internals**", Vol. 2 Third edition, Pearson Education Asia, 1999.

REFERENCES:

1. W. Richard Stevens, "TCP/IP illustrated-The Protocols", Volume 1, Pearson Education, 2003.
2. Forouzan , "TCP/IP Protocol Suite" ,2nd Edition, TMH, 2003.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	k2	2	1	2	-	3	-	-	-	-	1	-	-	-	2	3
	CO2	k2	3	2	1	2	3	-	3	-	-	-	-	2	-	2	3
	CO3	k5	2	-	3	-	-	-	2	1	3	-	3	1	1	2	3
	CO4	k2	3	3	2	2	-	2	3	-	3	2	-	-	3	2	3
	CO5	k3	3	-	3	-	3	3	-	-	-	-	3	-	3	1	2
Average Correlation Level			2.6	2	2.2	2	3	2.5	2.6	1	3	1.5	3	1.5	2.3	1.8	2.8

19CSE08	SOCIAL NETWORKING CONCEPTS			
L	T	P	C	
3	0	0	3	

COURSE OBJECTIVES:

The student should be made to:

- Know the basic concepts and structure of social networks
- Understand human behaviour in social web and related communities.
- Learn the concept of semantic web and related applications.
- Analyze and result the social networks

COURSE OUTCOMES:

Upon completion of the course, the student should be able to:

CO1: Explain the basic concepts and structure of social networks

CO2: Analyze the electronic sources for the network

CO3: Develop semantic web related applications.

CO4: Analyze the social networks and its data

CO5: Visualize social networks.

COURSE CONTENT:

UNIT 1: **SOCIAL NETWORK DATA** 9 hrs

Social network perspectives – What are network data – boundary specifications – Sampling – types of networks – network data measurements and collections – notations for social network - Development of Social Networks Analysis - Key concepts – The global structure of networks - The macro-structure of social networks - Personal networks.

UNIT 2: **GRAPHS AND SOCIAL NETWORKS** 9 hrs

Why graphs – graphs – Directed graphs – Signed graphs and Signed directed graphs – Valued graphs and valued directed graphs – Multigraphs – relations – matices for graphs – properties.

UNIT 3: **ELECTRONIC SOURCES FOR NETWORK ANALYSIS** 9 hrs

Electronic Discussion networks - Blogs and Online Communities - Web-based networks. - Modelling and aggregating social network data - State-of-art in network data representation-Ontological representation of social individuals - Ontological representation of social relationships - Aggregating and reasoning with social network data.

UNIT 4: **DEVELOPING SOCIAL-SEMANTIC APPLICATIONS** 9 hrs

Building Semantic Web Applications with social network – features - Flink: the social networks of the Semantic Web community - Evaluation of web-based social network extraction.

UNIT 5: SOCIAL NETWORK ANALYSIS IN THE SCIENCES	9 hrs
Methodology – Data acquisition, Representation - storage and reasoning - Visualization and Analysis, Results – Descriptive analysis - Structural and cognitive effects on scientific performance.	
Total Hours	**45**

TEXT BOOKS:

1. Stanley Wasserman, Katherine Fasust, "**Social Network Analysis: Methods and Applications**", Cambridge University Press,1994..
2. **Social Networks and the Semantic Web** ,Peter Mika,Springer,2007.

REFERENCES:

1. David Easley and Jon Kleinberg, "Nwtworks, Crowds, and Markets:Reasoning about a highly connected World", Cambridge University Press, 2010.
2. Peter R. Monge, Noshir S. Contractor, "Theories of Communication Networks" Oxford University Press, 2003.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K2	-	-	3	-	2	-	3	2	-	-	3	2	2	2	3
	CO2	K4	2	3	-	3	3	2	-	-	2	1	-	-	2	3	3
	CO3	K6	2	3	3	-	3	-	2	-	2	-	3	2	3	3	2
	CO4	K2	2	3	-	3	3	2	-	-	2	1	-	-	2	3	3
	CO5	K6	2	2	3	3	2	1	3	-	2	-	-	3	2	3	3
Average Correlation Level			2	2.75	3	3	2.6	1.6	2.6	2	2	1	3	2.3	2.2	2.8	2.8

19CSE09	COMPUTER HARDWARE AND TROUBLE SHOOTING				
		L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Understand the basics of computer organization and Architecture
- Knowledge about various peripheral devices
- Learn about inside of the CPU
- Knowledge about Assembling and installation
- Learn about the troubleshooting of hardware and repair

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Explain the architecture of computer systems

CO2: Describe the various peripheral devices with its functions.

CO3: Identify the parts of PC hardware

CO4: Assemble the parts of hardware to make the CPU

CO5: Troubleshoot the hardware bugs and repair it.

COURSE CONTENT:

UNIT 1: **INTRODUCTION**	9 hrs

Introduction - Computer Organization – Number Systems and Codes – Memory – ALU – CU – Instruction prefetch – Interrupts – I/O Techniques – Device Controllers – Error Detection Techniques – Microprocessor – Personal Computer Concepts – Advanced System Concepts – Microcomputer Concepts – OS – Multitasking and Multiprogramming – Virtual Memory – Cache Memory – Modern PC and User.

UNIT 2: **PERIPHERAL DEVICES**	9 hrs

Introduction – Keyboard – CRT Display Monitor – Printer – Magnetic Storage Devices – FDD – HDD – Special Types of Disk Drives – Mouse and Trackball – Modem – Fax Modem – CD ROM Drive – Scanner – Digital Camera – DVD – Special Peripherals.

UNIT 3: **PC HARDWARE OVERVIEW**	9 hrs

Introduction – Hardware BIOS DOS Interaction – The PC family – PC hardware – Inside the System Box – Motherboard Logic – Memory Space – Peripheral Interfaces and Controllers – Keyboard Interface – CRT Display interface – FDC – HDC.

UNIT 4: INSTALLATION AND PREVENTIVE MAINTENANCE	9 hrs
Introduction – system configuration – pre installation planning – Installation practice – routine checks – PC Assembling and integration – BIOS setup – Engineering versions and compatibility – preventive maintenance – DOS – Virus – Data Recovery.	
UNIT 5: TROUBLESHOOTING	9 hrs
Introduction – computer faults – Nature of faults – Types of faults – Diagnostic programs and tools – Microprocessor and Firmware – Programmable LSI's – Bus Faults – Faults Elimination process – Systematic Troubleshooting – Symptoms observation and analysis – fault diagnosis – fault rectification – Troubleshooting levels – FDD, HDD, CD ROM Problems.	
Total Hours	**45**

TEXT BOOKS:

1. B. Govindarajalu, "**IBM PC Clones Hardware, Troubleshooting and Maintenance**", 2/E, TMH, 2002.

REFERENCES:

1. Peter Abel, Niyaz Nizamuddin, "IMB PC Assembly Language and Programming",Pearson Education, 2007
2. Scott Mueller, "Repairing PC's", PHI,1992.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K2	-	-	3	-	2	-	3	2	-	-	3	2	2	2	3
	CO2	K4	2	3	-	3	3	2	-	-	2	1	-	-	2	3	3
	CO3	K6	2	3	3	-	3	-	2	-	2	-	3	2	3	3	2
	CO4	K2	2	3	-	3	3	2	-	-	2	1	-	-	2	3	3
	CO5	K6	2	2	3	3	2	1	3	-	2	-	-	3	2	3	3
Average Correlation Level			2	2.75	3	3	2.6	1.6	2.6	2	2	1	3	2.3	2.2	2.8	2.8

19CSE10	VISUAL PROGRAMMING			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- Demonstrate fundamental skills in utilizing the tools of a visual environment
- Understand the delegates and events for producing event-driven application
- Learn SDI and MDI applications while using forms, dialogs
- Learn message passing mechanism between components and threads using messaging

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Explain the tools in visual environment

CO2:use of delegates and events for producing event-driven application

CO3: Implement SDI and MDI applications using forms, dialogs, and other types.

CO4: Apply to development by designing projects with menus and submenus

CO5: Describe the message passing mechanism between components and threads using messaging

COURSE CONTENT:

UNIT 1: **WINDOWS PROGRAMMING** — 9 hrs

Windowsenvironment−Asimplewindowsprogram −Windowsandmessages− Creating the window −Displayingthewindow −Messageloop− TheWindow procedure−Messageprocessing−Textoutput− Painting and repainting − Introduction to GDI− Device context − Basic drawing− Child window controls.

UNIT 2: **VISUAL C++ PROGRAMMING FUNDAMENTALS** — 9 hrs

Applicationframework−MFClibrary−VisualC++components−Eventhandling − Mappingmodes−Colors−Fonts− Modalandmodelessdialog−Windowscommon controls – Bitmaps.

UNIT 3: **THE DOCUMENT AND VIEW ARCHITECTURE** — 9 hrs

Menus −Keyboard accelerators −Rich edit control − Toolbars − Status bars− Reusableframewindowbaseclass−Separatingdocumentfrom itsview −Reading and writing SDI and MDI Documents − Splitter window and multiple views − Creating DLLs − Dialog based applications.

UNIT 4: **ACTIVEX AND OBJECT LINKING AND EMBEDDING (OLE)** — 9 hrs

ActiveXControlsVsOrdinarywindowscontrols−InstallingActiveX Controls− CalendarControl −ActiveX control container programming −CreateActiveXcontrol atruntime−ComponentObjectModel(COM) −Containmentand AggregationVs Inheritance−OLEDragandDrop−OLE embeddedcomponentandcontainers − Sample applications.

UNIT 5: ADVANCED CONCEPTS	9 hrs
DatabasemanagementwithmicrosoftODBC−Structuredquerylanguage −MFC ODBCClasses−Sampledatabaseapplications −FilterandSortStrings−DAO Concepts− Displaying databaserecordsinscrollingview−Threading−VC++ Networkingissues− WinSock−WinInet− Buildingawebclient−Internet Informationserver−ISAPIserverextension −Chatapplication−Playingand multimedia (sound and video) files.	
Total Hours	**45**

TEXT BOOKS:

1. Charles Petzold, **"Windows Programming"**, Microsoft Press, 1996.
2. DavidJ.Kruglinski,GeorgeShepherdandScotWingo,**"ProgrammingVisual C++"**, Microsoft press, 1999.

REFERENCES:

1. Steve Holtzner, "Visual C++ 6 Programming", Wiley Dreamtech India Pvt. Ltd., 2003.
2. Mueller and John, "Visual C++ fromthe Ground up", 2nd Edition, Tata McGraw Hill, 1999.
3. Bates and Tompkins, "Practical Visual C++", Prentice Hall of India, 2002.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	2	2	-	2	-	3	1	1	-	2	1	2	1	2	3	3
	CO2	3	2	-	3	3	1	-	2	-	-	2	1	2	1	3	2
	CO3	6	3	2	2	2	3	1	2	-	2	-	3	1	-	3	2
	CO4	3	3	2	3	-	3	3	-	2	-	-	2	-	3	2	3
	CO5	2	1	-	3	-	2	2	-	2	-	-	3	3	1	2	3
Average Correlation Level			2.2	2	2.4	2.5	2.4	1.75	1.6	2	2	1.5	2.2	1.75	1.75	2.6	2.6

19CSE11	ADVANCED DATABASES

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To know advanced concepts in databases in large scale analytics
- To learn concepts behind parallel, distributed, active, spatial, temporal and object databases
- To learn reasoning and query processing
- To understand the challenges in designing multimedia databases

COURSE OUTCOMES:

CO1: To estimate query cost in distributed databases
CO2: To explain the concept of active databases
CO3: To use MapReduce in data analytics
CO4: To evaluate the performance of temporal and spatial databases
CO5: To write suitable indexing programs for multimedia databases.

COURSE CONTENT:

UNIT 1: **PARALLEL AND DISTRIBUTED DATABASES** — 9 hrs

Inter and Intra Query Parallelism – Architecture – Query evaluation – Optimization – Distributed Architecture – Storage – Catalog Management – Query Processing - Transactions – Recovery- Large-scale Data Analytics in the Internet Context – Map Reduce Paradigm - run-time system for supporting scalable and fault-tolerant execution - paradigms: PigLatin and H ive and parallel databases versus Map Reduce

UNIT 2: **ACTIVE DATABASES** — 9 hrs

Syntax and Sematics (Starburst, Oracle, DB2) – Taxonomy – Applications – Integrity Management – Workflow Management – Busines Rules – Design Principles – Properties – Rule Modularization – Rule Debugging – IDEA methodology – Open Problems.

UNIT 3: **TEMPORAL AND OBJECT DATABASES** — 9 hrs

Overview – Data types – Associating Facts – Temporal Query Language – TSQL2 – Time Ontology – Language Constructs – Architecture – Temporal Support – Object Database and Change Management – Change of Schema – Implementing Database Updates in O2 – Benchmark Database Updates – Performance Evaluation.

UNIT 4: COMPLEX QUERIES AND REASONING	9 hrs
Logic of Query Languages – Relational Calculi – Recursive rules – Syntax and semantics of Datalog – Fixpoint semantics – Implementation Rules and Recursion – Rule rewriting methods – Compilation and Optimization – Recursive Queries in SQL – Open issues.	
UNIT 5: SPATIAL, TEXT AND MULTIMEDIA DATABASES	9 hrs
Traditional Indexing Methods (Secondary Keys, Spatial Access Methods) – Text Retrieval – Multimedia Indexing – 1D Time Series – 2d Color images – Subpattern Matching – Open Issues – Uncertainties	
Total Hours	**45**

TEXT BOOKS:

1. Raghu Ramakrishnan "**Database Management System**", Mc Graw Hill Publications, 2000.

REFERENCES:

1. Carlo Zaniolo, Stefano Ceri "Advanced Database Systems", Morgan Kauffmann Publishers.VLDB Journal, 1997
2. Abraham Silberschatz, Henry F. Korth and S. Sudharshan, "Database System Concepts", Sixth Edition, Tata McGraw Hill, 2011 .

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES <Times New roman>Font Size, 8.

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K5	-	2	3	-	-	-	-	-	-	-	-	-	2	-	-
	CO2	K1	2	2	-	-	-	-	-	-	-	-	-	-	2	-	-
	CO3	K3	-	-	3	-	2	-	-	-	-	-	-	-	2	-	-
	CO4	K4	-	-	2	3	-	-	-	-	-	-	-	-	-	1	-
	CO5	K1	1	3	2	-	-	-	-	-	-	-	-	-	-	3	-
Average Correlation Level			1.5	3.5	2.5	3	2	-	-	-	-	-	-	-	2	2	-

19CSE12	ADVANCED OPERATING SYSTEMS			
L	T	P	C	
3	0	0	3	

COURSE OBJECTIVES:

- To learn the fundamentals of Operating Systems
- To gain knowledge on Distributed operating system concepts that includes architecture, Mutual exclusion algorithms, Deadlock detection algorithms and agreement protocols
- To gain insight on to the distributed resource management components
- implementation of distributed shared memory, recovery and commit protocols
- To know the components and management aspects of Real time, Mobile operating systems and learn the fundamentals of Operating Systems

COURSE OUTCOMES:

Upon Completion of the course, the students should be able to:

CO1: Discuss the various synchronization, scheduling and memory management issues

CO2: Demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system

CO3: Discuss the various resource management techniques for distributed systems

CO4: Identify the different features of real time and mobile operating systems

CO5: Install and use available open source kernel

CO6: Modify existing open source kernels in terms of functionality or features used

COURSE CONTENT:

UNIT 1: **FUNDAMENTALS OF OPERATING SYSTEMS**	9 hrs

Overview – Synchronization Mechanisms – Processes and Threads - Process Scheduling –Deadlocks: Detection, Prevention and Recovery – Models of Resources – Memory Management Techniques.

UNIT 2: **DISTRIBUTED OPERATING SYSTEMS**	9 hrs

Issues in Distributed Operating System – Architecture – Communication Primitives – Lamport‟s Logical clocks – Causal Ordering of Messages – Distributed Mutual Exclusion Algorithms – Centralized and Distributed Deadlock Detection Algorithms – Agreement Protocols.

UNIT 3: **DISTRIBUTED RESOURCE MANAGEMENT**	9 hrs

Issues in Distributed Operating System – Architecture – Communication Primitives – Lamport‟s Logical clocks – Causal Ordering of Messages – Distributed Mutual Exclusion Algorithms – Centralized and Distributed Deadlock Detection Algorithms – Agreement Protocols.

UNIT 4: **REAL TIME AND MOBILE OPERATING SYSTEMS**	9 hrs

Basic Model of Real Time Systems - Characteristics- Applications of Real Time Systems – Real Time Task Scheduling - Handling Resource Sharing - Mobile Operating Systems –Micro Kernel Design - Client Server Resource Access – Processes and Threads - Memory Management – File system.

UNIT 5: CASE STUDIES	9 hrs
Linux System: Design Principles - Kernel Modules - Process Management Scheduling – Memory Management - Input-Output Management - File System – Inter process Communication. iOS and Android: Architecture and SDK Framework - Media Layer - Services Layer - Core OS Layer – File System.	
Total Hours	**45**

TEXT BOOKS:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "**Operating System Concepts**", 9th Edition, John Wiley and Sons Inc., 2012.

REFERENCES:

1.Mukesh Singhal and Niranjan G. Shivaratri, Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems, Tata McGraw-Hill, 2001.
2.Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, Operating System Concepts, Seventh Edition, John Wiley &Sons, 2004.
3.Daniel P Bovet and Marco Cesati, Understanding the Linux kernel, 3rd edition, O"Reilly, 2005.
4.Rajib Mall, Real-Time Systems: Theory and Practice, Pearson Education India, 2006.
Neil Smyth, iPhone iOS 4 Development Essentials – Xcode, Fourth Edition, Payload media, 2011.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES <Times New roman>Font Size, 8.

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K5	-	3	3	-	-	-	-	-	-	-	-	-	-	2	-
	CO2	K1	-	3	2	-	-	-	-	-	-	-	-	-	-	2	-
	CO3	K3	-	-	2	-	3	-	-	-	-	-	-	-	-	2	-
	CO4	K4	-	2	-	3	-	-	-	-	-	-	-	-	-	2	-
	CO5	K1	-	-	3	-	2	-	-	-	-	-	-	-	-	2	-
Average Correlation Level			-	2.6	2.5	3	2.5	-	-	-	-	-	-	-	-	2	-

19CSE13	EMBEDDED SYSTEMS			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To learn the architecture and programming of ARM processor
- To learn the architecture and programming of 8051 Microcontroller
- To familiarize with the embedded computing platform design and analysis
- To be exposed to the basic concepts of real time operating systems
- To run and debug programs in an IDE
- To design an embedded processor based system for a real-time application

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Describe the architecture and programming of ARM processor and Microcontroller.

CO2: Outline the concepts of embedded systems.

CO3: Explain the basic concepts of real time Operating system design.

CO4: Use the system design techniques to develop software for embedded systems.

CO5: Differentiate between the general purpose operating system and the real time operating System.

COURSE CONTENT:

UNIT 1: **INTRODUCTION TO EMBEDDED SYSTEMS**	9 hrs

Introduction – Complex Systems and Microprocessors - System Design Process – ARM Processor – Architecture - Instruction Set – Programming. Programming Input and Output- Supervisor Mode, Exceptions and Traps.

UNIT 2: **8051 MICROCONTROLLERS**	9 hrs

8051 Microcontroller – Architecture, Instruction Set and Programming – Programming Parallel Ports, Timers and Serial Port – Memory System Mechanisms – Memory and IO Devices and Interfacing – Interrupt Handling.

UNIT 3: **PROCESSES AND OPERATING SYSTEMS**	9 hrs

Introduction – Multiple Tasks and Multiple Processes – Preemptive Real - Time Operating Systems – Priority Based Scheduling– Inter-Process Communication Mechanisms – Evaluating Operating System Performance –Power Management and Optimization for Processes – Design Example.

UNIT 4: **EMBEDDED C PROGRAMMING**	9 hrs

Programming Embedded Systems in C – Programming using Microcontroller/OS II Functions – Inline Functions and Inline Assembly – Portability Issues – Meeting Real Time Constraints – Multistate Systems and Function Sequences.

UNIT 5: EMBEDDED COMPUTING PLATFORM DESIGN	9 hrs
The CPU Bus – Memory Devices – I/O Devices – Component Interfacing – Embedded Software Development Tools – Emulators and Debuggers. Challenges of Embedded Systems – Embedded System Design Process – Design Issues – Design Methodologies – Complete Design of Example Embedded Systems –Optimization and Performance Analysis – Introduction to Multiprocessors in Embedded Systems – Networks for Embedded Systems.	
Total Hours	**45**

TEXT BOOKS:

1. Wayne Wolf, "**Computers as Components - Principles of Embedded Computing System Design**", Third Edition "Morgan Kaufmann Publisher (An imprint from Elsevier), 2012
2. Muhammed Ali Mazidi, Janice Gillispie Mazidi and Rolin D. McKinlay ,‖The 8051 **Microcontroller and Embedded Systems —**, Pearson Education, Second edition, 2008

REFERENCES:

1. David. E. Simon, "An Embedded Software Primer", First Edition, Fifth Impression, Addison-Wesley Professional, 2007.
2. Andrew N Sloss, D. Symes, C. Wright, ―ARM System Developer's Guide‖, First Edition, Morgan Kaufmann/Elsevier, 2006
3. Steve Heath, ―Embedded Systems Design‖, Second Edition, Elsevier, 2008

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K2	3	3	3	-	-	3	2	-	1	-	3	2	2	3	3
	CO2	K2	3	3	2	2	-	3	2	2	2	2	-	3	3	3	3
	CO3	K5	3	2	3	-	2	-	3	2	-	-	3	2	3	3	2
	CO4	K3	2	-	3	3	-	-	-	-	2	2	1	-	3	2	3
	CO5	K4	-	-	2	3	-	3	1	2	-	-	3	-	2	-	2
Average Correlation Level			2.75	2.6	2.6	2.6	2	3	2	2	2.5	2	2.5	2.3	2.6	2.75	2.6

19CSE14	KNOWLEDGE BASED DESICION SUPPORT SYSTEMS			
L	T	P	C	
3	0	0	3	

COURSE OBJECTIVES:

The student should be made to:

- Understand the fundamentals of decision making systems
- Know the methodologies and tools of developing support systems
- Learn the methods of managing the knowledge
- methods to intelligent support systems development

COURSE OUTCOMES:

At the end the student will be able to:

CO1: Explain the phases of decision support systems
CO2: Design and develop the decision support systems
CO3: Describe the methods of knowledge management
CO4: Build the intelligent support systems
CO5: Implement and integrate Management support systems.

COURSE CONTENT:

UNIT 1: **FUNDAMENTALS** — 9 hrs

Decisionmakingsystems−Modeling andsupport−Basicsanddefinition–Systems models −Modeling process −Decision making −Intelligence phase − Design phase − Choice phase −Evaluation −Implementationphase −Alternative decision making models − Decision support systems − Decision makers − Case applications.

UNIT 2: **DECISION SUPPORTSYSTEM DEVELOPMENT** — 9 hrs

Decision support systemdevelopment − Basics −Life cycle− Methodologies − Prototype−Technologylevelsandtools−Developmentplatforms −Toolselection− DevelopingDSS−Enterprisesystems−Conceptsanddefinition −Evolutionof informationsystems−Informationneeds−Characteristicsandcapabilities − ComparingandintegratingEISandDSS−EISdataaccess−Datawarehouse− OLAP−Multidimensionalanalysis −PresentationandtheWeb−Includingsoft informationenterpriseonsystems−OrganizationalDSS −Supplyandvaluechains− Decisionsupport − Supply chain problems and solutions − Computerizedsystems MRP − ERP − SCM − Frontline decision support systems.

UNIT 3: **KNOWLEDGE MANAGEMENT** — 9 hrs

Organizationallearningandmemory −Knowledgemanagement−Development− Methods−Technologiesandtools −Success−Knowledgemanagementandartificial intelligence −ElectronicDocumentManagement −KnowledgeAcquisitionand Validation− KnowledgeEngineering−Scope−AcquisitionMethods− Interviews− Tracking Methods −

ObservationandotherMethods− GridAnalysis−Machine Learning − RuleInduction− Case-Based Reasoning − Neural Computing − Intelligent Agents−Selectionof an appropriateKnowledgeAcquisitionMethods −Multiple Experts −ValidationandVerificationoftheKnowledgeBase−Analysis-Coding- Documenting- and Diagramming − Numeric and Documented Knowledge Acquisition−KnowledgeAcquisitionandtheInternet/Intranets −Knowledge Representation Basics− Representation in Logic and other Schemas− Semantic Networks −Production Rules−Frames −Multiple Knowledge Representation − Experimental Knowledge Representations − Representing Uncertainty.	
UNIT 4: **INTELLIGENT SYSTEMDEVELOPMENT**	9 hrs
InferenceTechniques−ReasoninginArtificialIntelligence−InferencewithRules − InferenceTree −Inferencewith Frames−ModelBasedandCaseBasedReasoning − ExplanationandMetaKnowledge−InferencewithUncertainty− Representing Uncertainty −ProbabilitiesandRelatedApproaches−TheoryofCertainty− ApproximateReasoningusingFuzzyLogic − IntelligentSystemsDevelopment − Prototyping−ProjectInitialization−System AnalysisandDesign−Software Classification −BuildingExpertSystemswithTools − ShellsandEnvironments − SoftwareSelection−Hardware−RapidPrototypinganda DemonstrationPrototype− SystemDevelopment − Implementation − Post Implementation.	
UNIT 5: **MANAGEMENT SUPPORTSYSTEMS**	9 hrs
Implementing and Integrating Management Support Systems− Implementation−MajorIssues −Strategies−SystemIntegration−GenericModelsMSS−DSS−ES−IntegratingEIS−DSS andES −GlobalIntegration −IntelligentDSS −Intelligent ModelingandModelManagement−Examples of IntegratedSystems −Problemsand Issues in Integration − ImpactsofManagementSupportSystems −Overview− Organizational Structure and Related Areas − MSS Support to Business Process Re-Engineering−PersonnelManagementIssues−ImpactonIndividuals–Productivity −QualityandCompetitiveness−DecisionMakingandtheManagerManager's Job − IssuesofLegality– Privacy andEthics−IntelligentSystemsandEmployment Levels −Internet Communication − Other Societal Impacts − Managerial Implications and Social Responsibilities.	
Total Hours	**45**
TEXT BOOKS:	
1. EfrainTurbanandJayE.Aronson,"**DecisionSupportSystemsandIntelligent Systems**", Sixth Edition, Pearson Education, 2001.	

REFERENCES:

1. GaneshNatarajanandSandhyaShekhar, "KnowledgeManagementEnabling Business Growth", Tata McGraw Hill, 2002.
2. George M. Marakas,"Decision Support System", Prentice Hall India, 2003.
3. EfremA.Mallach,"DecisionSupportandDataWarehouseSystems",Tata McGraw-Hill, 2002.
4. Dalkar, "Knowledge Management – Theory and Practice", Elsevier, 2007.
5. Becerra Fernandez and Laidener, "Knowledge Management – An Evolutionary View", PHI, 2009.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K2	-	3	-	2	-	-	-	2	-	2	2	3	2	3	2
	CO2	K6	-	2	3	2	-	3	-	-	3	-	2	-	2	3	-
	CO3	K2	2	-	3	3	-	2	-	2	2	3	-	2	3	3	2
	CO4	K3	3	2	3	2	3	2	-	3	2	2	2	2	3	3	2
	CO5	K6	-	2	3	3	-	-	3	-	-	3	3	-	2	3	3
Average Correlation Level			2.5	2.25	3	2.4	3	2.3	3	2.3	2.3	2.5	2.25	2.3	2.4	3	2.25

19CSE15	GREEN COMPUTING			
L	T	P	C	
3	0	0	3	

COURSE OBJECTIVES:

The student should be made to:

- To acquire knowledge to adopt green computing practices
- To minimize negative impacts on the environment
- To learn about energy saving practices
- To understand the impact of e-waste and carbon waste.

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: To explain the necessity of Green IT

CO2: To outline methodologies for creating Green Assets and their management

CO3: To appreciate the use of Grid Framework in Green IT

CO4: To explore the transformation on green enterprise and its standards.

CO5: To develop case studies related to Environmentally Responsible Business Strategies

COURSE CONTENT:

UNIT 1: **FUNDAMENTALS** — 9 hrs

Green IT Fundamentals: Business, IT, and the Environment – Benefits of a Green Data Centre - Green Computing: Carbon Foot Print, Scoop on Power – Green IT Strategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics.

UNIT 2: **GREEN ASSETS AND MODELING** — 9 hrs

Green Assets: Buildings, Data Centers, Networks, Devices, Computer and Earth Friendly peripherals, Greening Mobile devices – Green Business Process Management: Modeling, Optimization, and Collaboration – Green Enterprise Architecture – Environmental Intelligence – Green Supply Chains – Green Information Systems: Design and Development Models.

UNIT 3: **GRID FRAMEWORK** — 9 hrs

Virtualizing of IT Systems – Role of Electric Utilities, Telecommuting, Teleconferencing and Teleporting – Materials Recycling – Best Ways for Green PC – Green Data Center – Green Grid Framework. Optimizing Computer Power Management, Seamless Sharing Across Systems. Collaborating and Cloud Computing, Virtual Presence.

UNIT 4: **GREEN COMPLIANCE** — 9 hrs

Socio-Cultural Aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future. Best Ways to Make Computer Greener.

UNIT 5: GREEN INITIATIVES WITH IT and CASE STUDIES	9 hrs
Green Initiative Drivers and Benefits with IT - Resources and Offerings to Assist Green Initiatives. - Green Initiative Strategy with IT - Green Initiative Planning with IT - Green Initiative Implementation with IT - Green Initiative Assessment with IT. The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs – Case Studies – Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.	
Total Hours	**45**

TEXT BOOKS:

1. Bhuvan Unhelkar, **—Green IT Strategies and Applications**-Using Environmental Intelligence‖, CRC Press, June 2011
2. Carl Speshocky, **—Empowering Green Initiatives with IT‖,** John Wiley and Sons, 2010.

REFERENCES:

1. Alin Gales, Michael Schaefer, Mike Ebbers, —Green Data Center: Steps for the Journey‖, Shoff/IBM rebook, 2011.
2. John Lamb, —The Greening of IT‖, Pearson Education, 2009.
3. Jason Harris, —Green Computing and Green IT- Best Practices on Regulations and Industry‖, Lulu.com, 2008.
4. Woody Leonhard, Katherrine Murray, —Green Home computing for dummies‖, August 2009.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K2	-	3	-	2	-	-	-	2	-	2	2	3	2	3	2
	CO2	K2	3	3	2	2	-	3	2	2	2	2	-	3	3	3	3
	CO3	K5	3	-	2	2	3	-	2	-	2	2	3	3	2	3	3
	CO4	K4	3	2	3	2	3	2	-	3	-	-	2	3	2	2	3
	CO5	K3	-	2	3	3	-	3	3	2	-	2	2	2	2	3	2
Average Correlation Level			3	2.5	2.5	2.2	3	2.6	2.3	2.25	2	2	2.25	2.8	2.2	3.4	2.6

19CSE16	XML AND WEB TECHNOLOGY			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- Learn to describe fundamental concepts of XML
- Learn to identify the building blocks of web services
- Learn to analyze the XML based applications in E-business
- Learn to describe the secure content management

COURSE OUTCOMES:

CO1 : Explain the basic components of XML

CO2 : Develop the XML based web service application

CO3 : Discuss the building blocks of web services

CO4 : Illustrate of XML in E-business

CO5: Describe secure web service content management.

COURSE CONTENT:

UNIT 1: **XML TECHNOLOGY FAMILY** — 9 hrs

XML – Benefits – Advantages of XML over HTML – EDI – Databases – XML based standards – Structuring with schemas – DTD – XML schemas – XML processing – DOM – SAX – Presentation technologies – XSL – XFORMS – XHTML – Transformation – XSLT – XLINK – XPATH – Xquery.

UNIT 2ARCHITECTING WEB SERVICES — 9 hrs

Business motivations for web services – B2B – B2C – Technical motivations – Limitations of CORBA and DCOM – Service Oriented Architecture (SOA) – Architecting web services – Implementation view – Web services technology stack – Logical view – Composition of web services – Deployment View – From application server to peer to peer – Process view – Life in the runtime.

UNIT 3: **WEB SERVICES BUILDING BLOCKS** — 9 hrs

Transport protocols for web services – Messaging with web services – Protocols – SOAP – Describing web services – WSDL – Anatomy of WSDL – Manipulating WSDL – Web service policy – Discovering web services – UDDI – Anatomy of UDDI – Web service inspection – Ad hoc discovery – Securing web services.

UNIT 4: **IMPLEMENTING XML IN E–BUSINESS** — 9 hrs

B2B – B2C applications – Different types Of B2b interaction – Components of E -Business XML systems – EBXML – RosettaNet – Applied XML in vertical industry – Web services for mobile devices.

UNIT 5: XML CONTENT MANAGEMENT AND SECURITY	9 hrs
Semantic Web – Role of meta data in web content – Resource description framework – RDF Schema – Architecture of semantic web – Content management workflow – XLANG – WSFL – Securing web services	
Total Hours	**45**

TEXT BOOKS:

3. Ron Schmelzer and Travis Vandersypen, "XML and Web Services Unleashed", Pearson Education, 2002.
4. Keith Ballinger, ". NET Web Services Architecture and Implementation", Pearson Education, 2003.

REFERENCES:

9. David Chappell, "Understanding .NET A Tutorial and Analysis", Addison Wesley, 2002.
10. Kennard Scibner and Mark C. Stiver, "Understanding SOAP", SAMS publishing,2000.
11. Alexander Nakhimovsky and Tom Myers, "XML Programming: Web Applicationsand Web Services with JSP and ASP", Apress, 2002.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES <Times New roman>Font Size, 8.

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K3	K4	K5
Course Outcomes	CO1	K3	3	-	-	-	-	-	-	1	-	-	-	-	3	-	-
	CO2	K3	-	2	2	3	2	1	2	1	-	1	1	2	-	2	-
	CO3	K2	2	-	-	-	-	-	1	-	1	2	1	2	2	-	2
	CO4	K2	-	1	-	2	-	-	3	1	-	3	2	-	2	-	1
	CO5	K2	2	-	-	1	-	-	-	-	-	-	-	-	2	-	-
Average Correlation Level			2.33	1.5	2	2	2	1	2	1	1	2	1	2	2.25	2	1.5

19CSE17	USER INTERFACE DESIGN			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- Understand the concepts of various characteristic and principles user interfaces.
- Learn about menus.
- Know the characteristicsof interfaces and various controls for windows.
- Understand about various problems in windows design with color, text, and graphics.
- Learn about layout testing methods.

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Understand the concepts of various characteristic and principles user interfaces.

CO2: Design the menus.

CO3: Understand the characteristics, components and various controls for windows.

CO4: Represent issues in windows design with color, text, and graphics.

CO5: Apply the layout testing methods.

COURSE CONTENT:

UNIT 1: USER INTERFACE BASICS	9 hrs

Importance−Human−Computerinterface−Characteristicsofgraphicsinterface – Directmanipulationgraphicalsystem –Webuserinterface−Popularity− Characteristic and principles.

UNIT 2:INTERFACE DESIGN	9 hrs

Userinterfacedesignprocess −Obstacles− Usability−Humancharacteristicsin design−Humaninteractionspeed –Businessfunctions−Requirementanalysis− Direct − Indirect methods − Basic business functions − Design standards − System timings−Human consideration in screen design

−Structuresofmenus−FunctionsofMenus−Contentsofmenu−Formatting−Phrasingthemenu−Selecting menu choice − Navigating menus − Graphical menus.

UNIT 3: INTERFACE CHARACTERISTICS	9 hrs

Windows:Characteristics components−Presentationstyles−Types−Managements −Organizations−Operations− Websystems−Devicebasedcontrols − Characteristics – Screenbasedcontrols−Operatecontrol – TextBoxes−Selection control − Combination control – Customcontrol − Presentation control.

UNIT 4: WEB PRESENTATION	9 hrs

Text for web pages − Effective feedback guidance and assistance − Internationalization − Accessibility− Icons −Image − Multimedia – Coloring – Textual graphic screens, Statistical graphics screens and Web pages.

UNIT 5: LAYOUT TESTING	9 hrs
Windowslayouttest−Prototypes−Kindsoftests−Retest−Informationsearch− Visualization − Hypermedia − WWW− Software tools.	
Total Hours	**45**

TEXT BOOKS:

1. Wilbent. O. Galitz, "**TheEssential Guide to UserInterface Design**", John Wiley and Sons, 2001.

REFERENCES:

2. Ben Sheiderman, "Design the User Interface",Pearson Education, 1998.
3. Alan Cooper, "The Essential of User Interface Design", Wiley DreamTech Ltd., 2002.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES <Times New roman>Font Size, 8.

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K2	-	-	-	-	-	-	2	-	-	-	1	-	-	-	-
	CO2	K3	2	1	1	1	1	1	3	-	-	1	2	-	1	1	-
	CO3	K2	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-
	CO4	K3	2	1	1	1	1	1	3	-	-	1	2	-	1	1	-
	CO5	K3	2	1	1	1	1	1	3	-	-	1	2	-	1	1	-
Average Correlation Level			2	1	1	1	1	1	2	-	-	1	1	-	1	1	-

19CSE18	INFORMATION SECURITY			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To introduce the concepts and models of security in computing
- To design physical and logical level of security
- To explain the security standards followed at the network level and at the application level
- To estimate the level of security risk faced by an organization and the counter measures to handle the risk
- To learn secured software development

COURSE OUTCOMES:

CO1: Explain the concepts and models of security in computing
CO2: Apply the basic security algorithms and policies required by computing system.
CO3: Describe risk analysis and management system
CO4: Describe security standards followed at the network level and at the application level
CO5: Predict the vulnerabilities across any computing system and hence be able to design a security solution for any computing system.

COURSE CONTENT:

UNIT 1: **SECURITY - AN OVERVIEW** — 9 hrs

Basics of Security - CIA Triad - Threats, Attacks and Controls - Security Models- Bell-LaPadula model - Biba Integrity model - Chinese Wall model - Malicious Logic - Viruses, Worms, Logic Bombs - Basics of Cryptography - Mathematics for Cryptography - Modulo Arithmetic - Euclidean and extended Euclidean Theorem - Chinese Remainder Theorem - Euler and Fermat theorem - Classical Cryptosystems - Substitution and Transposition.

UNIT 2: **LOGICAL AND PHYSICAL DESIGN** — 9 hrs

Blueprintforsecurity−Informationsecuritypolicy−Standardsandpractices−ISO 17799/BS7799−NISTModels−VISAInternationalSecurityModel−Designof Security architecture− Planning for continuity. Securitytechnology−IDS−Scanningandanalysistools–Access Control devices − Physical security

UNIT 3: **SECURITY STANDARDS** — 9 hrs

Public Key Infrastructure - Kerberos - X.509 - IPSec - Virtual Private Networks - E-Mail Security - PGP and PEM - Web Security - Secured DNS - SSL, TLS and SET - CoBIT Framework - Compliances - Credit Card Applications – GLBA

UNIT 4: **SECURITY PRACTICES** — 9 hrs

Vulnerability Analysis - Flaw Hypothesis Methodology, NRL taxonomy and Aslam‘s model - Auditing - Anatomy of an Auditing System - Design of Auditing Systems - Posteriori Design - Auditing

mechanisms - Risk Analysis and Management - Disaster Recovery Planning/Incident Response Planning.

UNIT 5: SECURE DEVELOPMENT | 9 hrs

Secure Coding - OWASP/SANS Top Vulnerabilities - Buffer Overflows - Incomplete mediation - XSS - Anti Cross Site Scripting Libraries - Canonical Data Format - Command Injection - Redirection - Inference – Application Controls - Secured Software Development Life Cycle - Evaluation of Security Systems- Case Studies-Legal and Ethical Issues- Cybercrime and computer crime - Intellectual property-Copyright, patent, trade secret - Hacking and Intrusion privacy-Identity theft

Total Hours | **45**

TEXT BOOKS:

1. Charles Pfleeger, Shari Lawrence Pfleeger, Devin N Paul, ―Security in Computing‖, Pearson, 2007.
2. Michael E Whitman and Herbert J Mattord, "Principles of Information Security", Vikas Publishing House, 2003.

REFERENCES:

1. William Stallings, ―Cryptography and Network Security – Principles and Practices‖, Pearson Education, Sixth Edition, 2013.
2. Wade Trappe, Lawrence C Washington, ―Introduction to Cryptography with Coding and Theory‖, Second Edition, Pearson, 2007.
3. Behrouz A Forouzan and Debdeep Mukhopadhyay, "Cryptography and Network Security", Tata Mc Graw Hill Ltd. 2010.
4. Micki Krause and Harold F. Tipton, "Handbook of Information SecurityManagement", Vol 1-3 CRC Press LLC, 2004.
5. Patel, "Information Security : Theory and Practice", PHI, 2006.
6. Straub, "Information Security: Policy, Processes and Practices", PHI, 2009.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K2	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
	CO2	K3	-	2	2	3	-	-	-	-	-	-	-	-	2	-	-
	CO3	K1	-	2	3	-	-	-	-	-	-	-	-	-	3	-	-
	CO4	K1	-	2	2	-	-	-	-	-	-	-	-	-	2	-	-
	CO5	K4	-	-	-	1	2	-	-	-	-	-	-	-	3	-	-
Average Correlation Level			3	2	.5	2	2	-	-	-	-	-	-	-	2.4	-	-

19CSE19	INFORMATION STORAGE AND RETRIEVAL			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

The student should be made to:

- Learn the information retrieval models.
- Be familiar with Web Search Engine.
- Be exposed to Link Analysis.
- Understand Hadoop and Map Reduce.
- Learn document text mining techniques.

COURSE OUTCOMES:

Upon completion of the course, students will be able to

CO1: Apply information retrieval models.

CO2: Design Web Search Engine.

CO3: Use Link Analysis.

CO4: Use Hadoop and Map Reduce.

CO5: Apply document text mining techniques.

COURSE CONTENT:

UNIT 1: INTRODUCTION 9 hrs

Introduction -History of IR- Components of IR - Issues –Open source Search engine Frameworks - The impact of the web on IR - The role of artificial intelligence (AI) in IR – IR Versus Web Search - Components of a Search engine- Characterizing the web.

UNIT 2: INFORMATION RETRIEVAL 9 hrs

Boolean and vector-space retrieval models- Term weighting - TF-IDF weighting- cosine similarity – Preprocessing - Inverted indices - efficient processing with sparse vectors – Language Model based IR - Probabilistic IR –Latent Semantic Indexing - Relevance feedback and query expansion.

UNIT 3: WEB SEARCH ENGINE-INTRODUCTION AND CRAWLING 9 hrs

Web search overview, web structure, the user, paid placement, search engine optimization/ spam. Web size measurement - search engine optimization/spam – Web Search Architectures - crawling - meta-crawlers- Focused Crawling - web indexes – Near-duplicate detection - Index Compression - XML retrieval.

UNIT 4: WEB SEARCH-LINK ANALYSIS AND SPECIALIZED SEARCH 9 hrs

Link Analysis –hubs and authorities – Page Rank and HITS algorithms -Searching and Ranking – Relevance Scoring and ranking for Web – Similarity - Hadoop &Map Reduce - Evaluation - Personalized search - Collaborative filtering and content-based recommendation of documents and products – handling invisible Web - Snippet generation, Summarization, Question Answering, Cross-Lingual Retrieval.

UNIT 5: DOCUMENT TEXT MINING	9 hrs
Information filtering; organization and relevance feedback – Text Mining -Text classification and clusteringCategorization algorithms: naive Bayes; decision trees; and nearest neighbor - Clustering algorithms: agglomerative clustering; k-means; expectation maximization (EM).	
Total Hours	**45**

TEXT BOOKS:

1.C. Manning, P. Raghavan, and H. Schütze, Introduction to Information Retrieval , Cambridge University Press,2008

2.RicardoBaeza -Yates and BerthierRibeiro - Neto, Modern Information Retrieval: The Concepts and Technology behind Search 2nd Edition, ACM Press Books 2011.

3.Bruce Croft, Donald Metzler and Trevor Strohman, Search Engines: Information Retrieval in Practice, 1st Edition Addison Wesley, 2009.

4.MarkLevene, An Introduction to Search Engines and Web Navigation, 2nd Edition Wiley, 2010.

REFERENCES:

1.StefanBuettcher, Charles L. A. Clarke, Gordon V. Cormack, Information Retrieval: Implementing and Evaluating Search Engines, The MIT Press, 2010.

2.OphirFrieder Information Retrieval: Algorithms and Heuristics: The Information Retrieval Series , 2nd Edition, Springer, 2004.

3.ManuKonchady, Building Search Applications: Lucene, Ling Pipe, and First Edition, Gate Mustru Publishing, 2008.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K2	-	-	3	3	-	-	-	-	-	-	-	-	-	2	-
	CO2	K3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	2
	CO3	K1	-	-	-	3	2	-	-	-	-	-	-	-	-	3	-
	CO4	K1	-	3	3	-	-	-	-	-	-	-	-	-	-	-	2
	CO5	K4	-	-	3	3	-	-	-	-	-	-	-	-	-	2	-
Average Correlation Level			-	2	3	3	2.5	-	-	-	-	-	-	-	-	2.3	2

19CSE20	WIRELESS NETWORKS SYSTEMS			
L	T	P	C	
3	0	0	3	

COURSE OBJECTIVES:

The student should be made to:

- To learn the fundamental technologies that help in the networking of wireless devices.
- To learn about different wireless technologies
- To learn about the evolution of cellular systems
- To understand the various wireless standards used right from 2G to 5G cellular networks

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Explore the concepts of new technologies in wireless networks.

CO2: Demonstrate various protocols of wireless and cellular networks.

CO3: Discuss the features of different wireless networks

CO4: Discuss the scope of Adhoc Network

CO5: Explore the features of Network Generations

COURSE CONTENT:

UNIT 1: INTRODUCTION AND WIRELESS LANS 9 hrs

Frequency Spectrum – Signal Propagation – Modulation – Multiplexing – Spread Spectrum – IEEE 802.11 Wireless LANs – Wireless LAN Equipment – WLAN Topologies – WLAN Technologies - Architecture and Protocols – Data Link Layer – Beacon Frame – Joining an Existing Basic Service Set – Roaming in a Wireless LAN – Security in Wireless LANs – Power Management – Other WLAN Standards – Bluetooth – Overview – Architecture – Radio and Baseband – L2CAP and Frame Format – RFCOMM – SDP – Performance of a Bluetooth Piconet in the Presence of IEEE 802.11 WLANs.

UNIT 2: WIRELESS NETWORKS AND ADHOC NETWORKS 9 hrs

Ultra-Wideband – Standard and Applications – Radio-Frequency Identification – System – Applications – Wireless Metropolitan Area Networks – Wireless Broadband : IEEE 802.16 – WiMAX – PHY – MAC – Spectrum Allocation – Satellite – Communication – Systems – Wireless Sensor Networks – Applications -Sensor Node – Self-Organized Networks – ZigBee.- Characteristics of Adhoc networks-Classification of Mac Protocols-Table driven and Source

UNIT 3: 2G,2.5G CELLULAR NETWORKS 9 hrs

Global System for Mobile (GSM) – Network Architecture – Location Area Update – Call Routing – Handoff – General Packet Radio Service (GPRS) – Packet Switching – GPRS Architecture – GPRS Services – GPRS Terminals – Packet Data Protocol Context – Enhanced Data Rates for Global Evolution (EDGE) – High Speed Circuit Switched Data (HSCSD) – Code Division Multiple Access (CDMA) – Concept – IS-95 – Software Handoff – GSM vs. CDMA – 2G Mobile Wireless Services – WAP and iMode – SMS.

UNIT 4: 3G CELLULAR NETWORKS	9 hrs
UMTS/WCDMA – cdma2000 – UMTS/WCDMA versus cdma2000 – UMTS – Channel Structure on the Air Interface – UTRAN – Core and Radio Network Management – UMTS Security – HSDPA.	
UNIT 5: 4G CELLULAR NETWORKS	9 hrs
4G Features and Challenges – 4G Applications – Multicarrier modulation – Smart Antenna Techniques – OFDM - MIMO Techniques – Adaptive Modulation and Coding with Time-Slot Scheduler – BLAST system – Software-Defined Radio – Cognitive Radio – LTE – Network Architecture and Interfaces – FDD Air Interface and Radio Networks – Scheduling – Mobility Management and Power Optimization – LTE Security Architecture – Interconnection with UMTS and GSM – LTE Advanced- Mesh Networks:Optimal routing and Scheduling.	
Total Hours	**45**

TEXT BOOKS:

1.Pei Zheng, Feng Zhao, David Tipper, JinmeiTatuya, Keiichi Shima, Yi Qian, larry L. Peterson, Lionel M. Ni, Manjunath D, Qing Li, Joy Kuri, Anurag Kumar, Prashant Krishnamurthy, Leonidas Guibas, Vijay K. Garg, Adrian Farrel, Bruce S. Davie, ―Wireless Networking Complete‖, Elsevier, 2010.
2.MaritnSauter, ―From GSM to LTE: An Introduction to Mobile Networks and Mobile Broadband‖, John Wiley and Sons, 2011.

REFERENCES:

1.Asoke K Talukder, RoopaYavagal, ―Mobile Computing – Technology, Application and Service Creation‖, McGraw Hill, 2007.
2.LeonhardKorowajczuk, ―LTE, WiMAX and WLAN Network Design, Optimization and
3.Performance Analysis‖, Wiley-Blackwell, 2011.
Erik Dahlman, Stefan Parkvall, Johan Skold, ―4G: LTE/LTE-Advanced for Mobile Broadband‖, Second Edition, Academic Press Inc., 2013.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K2	-	2	-	3	-	-	-	-	-	-	-	-	-	2	-
	CO2	K3	-	-	2	-	3	-	-	-	-	-	-	-	-	2	-
	CO3	K1	-	3	-	2	-	-	-	-	-	-	-	-	-	2	-
	CO4	K1	-	-	2	-	2	-	-	-	-	-	-	-	-	3	-
	CO5	K4	-	2	-	-	3	-	-	-	-	-	-	-	-	2	-
Average Correlation Level			-	2.3	2	2.5	2.6	-	-	-	-	-	-	-	-	2.2	-

19CSE21	SERVICE ORIENTED ARCHITECTURE			
L	T	P	C	
3	0	0	3	

COURSE OBJECTIVES:

The student should be made to:

- To learn the concepts of distributed application development
- To differentiate XML based web services from other standard models
  To study the importance of service composition.

COURSE OUTCOMES:

On Completion of the course, the students should be able to:

CO1: Explore the SOA life cycle

CO2: Analyze and design SOA based solutions

CO3: Create RESTful and SOAP based services

CO4: Define workflow automation and develop BPM based applications

CO5: Apply secure SOA Transactions.

COURSE CONTENT:

UNIT 1: **SOA FUNDAMENTALS** — 9 hrs

SOA – Services – Loose Coupling – The Enterprise service bus – Service Classification – Business process management – SOA and the organization – SOA and the organization - SOA in context – Message exchange patterns – SOA life cycle – Versioning – Web services.

UNIT 2: **SERVICE-ORIENTED ANALYSIS AND DESIGN** — 9 hrs

SOA Terminology and Concepts - REST Design Constraints and Goals - RESTful Service-Orientation - Service Contracts with REST - Service-Orientation and REST Service-Oriented Analysis and Design with REST - Mainstream SOA Methodology - Analysis and Service Modeling with REST - Service-Oriented Design with REST HTML - Cookies - Simple PHP scripts .

UNIT 3: **SERVICE COMPOSITION** — 9 hrs

Service Composition with REST - Fundamental Service Composition with REST - Advanced Service Composition with REST - Service Composition with REST Case Study - Design Patterns for SOA with REST - Service Versioning with REST - Uniform Contract Profiles.

UNIT 4:RESTFUL SERVICES AND THE RESOURCE- ORIENTED ARCHITECTURE — 9 hrs

Introducing the Simple Storage Service - Object-Oriented Design of S3 - URIs - Addressability - Statelessness - Representations - Links and Connectedness - The Uniform Interface - Resource Design - Turning Requirements into Read-Only Resources - Service Implementation - Web service case studies - Connect Resources to Each Other - Controller Code - Model Code .

UNIT 5: SOA TRANSACTION AND SECURITY	9 hrs
SOA and performance - SOA and security – Service Management - Model driven service deployment – Establishing SOA and SOA governance .	
Total Hours	**45**

TEXT BOOKS:

1. Nicolai M.Josuttis, SOA in design - The art of distributed system design, O'REILLY publication, 2007.
2. Raj Balasubramanian, Benjamin Carlyle, Thomas Erl, Cesare Pautasso, "SOA with REST - Principles, Patterns & Constraints for building Enterprise solutions with REST", Prentice Hall/PearsonPTR , 2012.
3. Leonard Richardson and Sam Ruby, RESTful Web Services, O'REILLY publication, 2007.

REFERENCES:

1. Thomas Erl, ―Service Oriented Architecture: Concepts, Technology, and Design‖, Pearson education,2005.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K4	3	2	3	2	3	2	-	3	-	-	2	3	2	2	3
	CO2	K4	2	3	3	3	2	-	-	2	2	2	2	-	2	3	2
	CO3	K6	2	-	3	2	-	2	3	3	2	-	2	2	2	3	3
	CO4	K1	2	2	3	3	2	-	-	2	3	3	3	3	3	3	3
	CO5	K3	3	-	-	-	2	3	-	3	2	-	2	-	3	3	-
Average Correlation Level			2.4	2.3	3	2.5	2.25	2.3	3	2.6	2.25	2.25	2.2	2.6	2.4	2.8	2.75

19CSE22	REAL TIME SYSTEMS			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To expose the students to the fundamentals of Real Time systems
- To teach the fundamentals of Real time system design techniques.
- To introduce the real time intertask communication and synchronization

To teach the different algrorithms and techniques used for real time systems integration

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Describe the basic concepts of real time systems

CO2:use the specification to design the real time systems

CO3: Analyse the inter task communication mechanism on real time systems

CO4: Explain the Queuing models and services of RTS

CO5:use the tools to integrate the real time hardware with software

COURSE CONTENT:

UNIT 1: BASIC REAL TIME CONCEPTS — 9 hrs

Basic computer architecture − Some terminology − Real time design issues − Example real time systems − Input and output − Otherdevices − Language features.

UNIT 2: REAL TIME SPECIFICATION AND DESIGN TECHNIQUES — 9 hrs

Naturallanguages−Mathematicalspecification −Flowcharts−Structuredcharts− Pseudocodeandprogrammingdesignlanguages−Finitestateautomata −DataFlow Diagrams−PetriNets−WarnierorNotation−StateCharts −PolledLoopSystems− Phase/State Driven Code − Co-routines − Interrupt driven systems − Foreground/backgroundsystem− Full featured Real Time Operating Systems.

UNIT 3: INTERTASKCOMMUNICATIONANDSYNCHRONIZATION — 9 hrs

BufferingData −Mailboxes−CriticalRegions −Semaphores−Deadlock−Process StackManagement−DynamicAllocation− StaticSchemes−ResponseTime Calculation −InterruptLatency−TimeLoadinganditsMeasurement−Schedulingis NPComplete− Reducingresponsetimesandtimeloading−Analysis of Memory Requirements −Reducing memory loading − I/O Performance.

UNIT 4: QUEUING MODELS — 9 hrs

Probability Functions− Discrete−Basicbufferingcalculation−ClassicalQueuing Theory−Little'sLaw − Erlong'sFormula−Faults −Failures−BugsandEffects− Reliability− Testing−FaultTolerance −Classificationofarchitecture − Distributing Systems −Non von neuman architecture.

UNIT 5: HARDWARE/SOFTWARE INTEGRATION	9 hrs
Goalsofrealtimesystemintegration−Tools−Methodology−SoftwareHeinsberg Uncertaintyprinciple − Real time applications.	
Total Hours	**45**

TEXT BOOKS:

1.Philip A. Laplante,"Real Time SystemDesign and Analysis– An Engineer's Handbook", 3rd Edition, Wiley-IEEE Press, 2006.

REFERENCES:

1. C. M. Krishna and Kang G Shin, "Real Time Systems", TMH, 1997.
2. StuartBennelt,"RealTimeComputerControlandIntroduction", Pearson Education,2003.
3. Allen Burns and Andy Wellings, "Real Time Systems and Programming Languages", Pearson Education, 2003.
4. Williams, "Real Time Systems Development", Elsevier, 2008.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K2	3	2	3	-	2	2	3	2	-	-	3	2	3	3	2
	CO2	K3	2	-	3	3	-	1	2	-	2	2	1	-	3	2	3
	CO3	K4	2	3	3	3	2	-	-	2	2	2	2	-	2	3	2
	CO4	K5	-	3	-	2	-	2	-	2		2	2	3	2	3	2
	CO5	K3	2	-	3	3	-	1	2	-	2	2	1	-	3	2	3
Average Correlation Level			2.25	2.6	3	2.75	2	1.5	2.3	2	2	2	1.8	2.5	2.6	2.6	2.4

19CSE23	SOFT COMPUTING				
		L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the knowledge of fuzzy sets & fuzzy logic.
- To learn the fundamentals of optimization techniques.
- To learn and apply Neural Networks with learning techniques.
- To introduce the ideas of Neuro – fuzzy modeling.
- To familiarize with genetic algorithms and other random search procedures useful while seeking global optimum in self-learning situations.

COURSE OUTCOMES:

CO1: Acquire knowledge of fuzzy sets & fuzzy logic.
CO2: Analyze the procedures of various optimization techniques.
CO3: Learn and analyze the concepts of Neural Networks with learning techniques.
CO4: Analyze the concepts of Neuro – fuzzy modeling.
CO5: Known the basics of genetic algorithms.

COURSE CONTENT:

UNIT 1: **Fuzzy set theory**	10 hrs

Neuro−Fuzzyandsoftcomputing−FuzzySets −Basicdefinitionandterminology− Set-Theoretic operations − Member function formulation and parameterization − Fuzzy rules and Fuzzy reasoning − Extension principle and fuzzy relations − Fuzzy if-thenRules−Fuzzyreasoning−FuzzyInferenceSystems – types of fuzzymodels - Input space partitioning and fuzzy modeling.

UNIT 2 : Optimization	9 hrs

Derivative−Basedoptimization−Descentmethods−Methodofsteepestdescent−ClassicalNewton'sMethod−Stepsizedetermination−Derivative-Freeoptimization− Genetic algorithms −Simulated annealing − Random search− Downhill simplex search.

UNIT 3: **Neural Networks**	9 hrs
Supervised learningneuralnetworks−Perceptrons −Adaline−Backpropagation Multilayerperceptrons−Radialbasisfunctionnetworks −Unsupervisedlearning neural networks − Competitive learning networks − Self-organizing networks − Learning vector quantization− Hebbian learning.	
UNIT 4: **Neuro fuzzy modelling**	9 hrs
Adaptive neuro − Fuzzy inference systems − Architecture − Hybrid learning algorithm − Learning methods that cross-fertilize ANFIS and RBFN − Coactive Neurofuzzymodeling−Frameworkneuronfunctionsforadaptivenetworks −Neuro Fuzzy spectrum.	
UNIT 5: **Genetic algorithms**	8 hrs
Basic Concepts- Working Principle -Procedures of GA -Flow Chart of GA -Genetic Representations - (Encoding) Initialization and Selection - Genetic Operators- Applications.	
Total Hours	**45**

TEXT BOOKS:

1. J. S. R. Jang , C. T. Sun and E. Mizutani, "**Neuro-Fuzzyand Soft Computing**", Pearson Education, 2015.
2. Timothy J. Ross, "**Fuzzy Logic with Engineering Applications**", Third Edition, TMH, 2010.

REFERENCES:

1. S.RajasekaranandG.A.V.Pai, "NeuralNetworks-FuzzyLogicandGenetic Algorithms",PHI, 2013.
2. S.N. Sivanandam, S. N. Deepa, "Introduction to Genetic Algorithms", Springer, 2008.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K6	K5
Course Outcomes	CO1	K2	2	-	-	-	-	-	2	-	-	3	-	-	2	-	-
	CO2	K3	3	-	-	-	-	-	-	2	2	1	2	-	3	-	-
	CO3	K3	-	2	-	-	-	-	2	2	2	2	-	-	3	-	-
	CO4	K4	-	3	-	-	-	-	2		2	2	-	-	-	2	-
	CO5	K4	-	3	-	-	-	-	-	2	2	1	-	-	-	2	-
Average Correlation Level			2.5	2.6	-	-	-	-	-	-	2	2	2	1.8	2.6	2	-

19CSE24	SOFTWARE PROJECT MANAGEMENT			
L	T	P	C	
3	0	0	3	

COURSE OBJECTIVES:

- To understand the roles of the project manager.
- To understand the threats and opportunities in project management.
- To gain Expertise in size, effort and cost estimation techniques.
- To understand how to approach non-technical problems.
- To appreciate management issues like team structure, group dynamics.

COURSE OUTCOMES:

CO1: Identify the threats and opportunities in project management.
CO2: Gain knowledge about size, effort and cost estimation techniques.
CO3: Apply the techniques available to keep the project‘s aims and objectives, under control.
CO4: Analyze the different approaches of non-technical problems.
CO5: Appreciate the management issues like team structure, group dynamics.

COURSE CONTENT:

UNIT 1: **INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT** 9 hrs

Project Definition – Contract Management – Activities Covered by Software Project Management, Plan, Methods and Methodologies- Ways of Categorizing Software Projects Problem with Software Projects – Setting Objectives Stakeholders- Requirements Specification, Management Control – Overview of Project Planning – Stepwise Project Planning.

UNIT 2: **PROJECT EVALUATION** 9 hrs

Programme Management, Managing the Allocation of Resources, Strategic Programme Management, Creating a Programme, Aids to Programme Management, Benefits Management-Evaluation of Individual Projects – Technical Assessment – Cost Benefit Analysis – Cost Benefit Evaluation Techniques – Risk Evaluation –Cash Flow Forecasting –Software Effort Estimation.

UNIT 3: **ACTIVITY PLANNING** 9 hrs

Objectives of Activity Planning – Project Schedule – Project and Activities - Sequencing and Scheduling Activities – Network Planning Models – Formulating a Network Model – Adding the Time Dimension -Forward Pass – Backward Pass –Identifying Critical Path - Activity Float – Shortening Project Duration – Identifying Critical Activities - Activity on Arrow Networks – Risk Management – Categories -Risk - Framework – Identification – Assessment – Planning – Management – Evaluating Risk to the Schedule – PERT Technique – Mote Carlo Simulation – Resource Allocation – Nature Of Resources – Identifying Resource Requirements – Scheduling Resources – Creating Critical Paths – Counting the Cost - Publishing the Resource Schedule.

UNIT 4: **MONITORING AND CONTROL** 9 hrs

Framework – Collecting the Data –Visualizing Progress – Cost Monitoring – Earned Value Analysis – Prioritizing Monitoring – Getting Project Back to Target – Change Control – Managing Contracts –

Introduction – The ISO 12207 Approach –Supply process –Types of Contract – Stages in Contract Placement – Typical Terms Of a Contract – Contract Management – Acceptance.

UNIT 5: MANAGING PEOPLE AND ORGANIZING TEAMS	9 hrs

Introduction – Understanding Behavior – Organizational Behavior - Selecting the Right Person for the Job – Instruction in the Best Methods – Motivation – The Oldham – Hackman Job Characteristics Model – Working in Groups – Becoming a Team –Decision Making – Leadership – Organizational Structures – Stress – Health and Safety.

Total Hours	**45**

TEXT BOOKS:

1. Bob Hughes, Mike Cotterell and Rajib Mall, "**Software Project Management** ", Fifth Edition, Tata McGraw Hill, New Delhi, 2012.
2. Robert K. Wysocki "**Effective Software Project Management**", Wiley Publication,2011.

REFERENCES:

1. Gopalaswamy Ramesh, "Managing Global Software Projects" – McGraw Hill Education (India), Fourteenth Reprint 2013.
2. Walker Royce "Software Project Management"- Addison-Wesley, 2008.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K2	2	-	2	-	-	3	-	-	-	-	-	-	2	-	-
	CO2	K3	3	-	-	2	2	1	-	-	-	-	-	-	3	-	-
	CO3	K2	2	-	2	2	2	2	-	-	-	-	-	-	2	-	-
	CO4	K4	-	3	2	-	2	2	-	-	-	-	-	-	2	-	-
	CO5	K3	2	-	-	2	2	1	-	-	-	-	-	-	3	-	-
Average Correlation Level			2.3	3	2	2	2	1.8	-	-	-	-	-	-	2.4	-	-

19CSE25	RESOURCE MANAGEMENT TECHNIQUES			
L	T	P	C	
3	0	0	3	

COURSE OBJECTIVES:

The student should be made to:

- Be familiar with resource management techniques.
- Learn to solve problems in linear programming and Integer programming.
- Be exposed to CPM and PERT.

COURSE OUTCOMES:

At the end of the course, the students will

CO1: Solve optimization problems using simplex method.

CO2: Apply transport and assignment problems in real time networks.

CO3: Apply integer programming and linear programming to solve real-life applications.

CO4: Explain the classical optimization techniques.

CO5: Apply PERT and CPM for problems in project management

COURSE CONTENT:

UNIT I	**LINEAR PROGRAMMING**	9 hrs

Principalcomponentsofdecisionproblem −Modelingphases−LPformulationand graphic solution − Resource allocation problems−Simplex method − Sensitivity analysis.

UNIT II	**DUALITY AND NETWORKS**	9 hrs

Definitionofdualproblem −Primal−Dualrelationships−Dual simplexmethods− Postoptimalityanalysis −Transportationandassignmentmodel−Shortestroute problem.

UNIT III	**INTEGER PROGRAMMING**	9 hrs

Cutting planalgorithm−Branchand bound methods − Multistage (Dynamic) programming.

UNIT IV	**CLASSICAL OPTIMIZATION THEORY**	9 hrs

Unconstrainedexternalproblems−Newton-Ralphsonmethod−Equalityconstraints − Jacobian methods − Lagrangian method − Kuhn-Tucker conditions − Simple problems.

UNIT V	**OBJECT SCHEDULING**	9 hrs

Networkdiagramrepresentation−Criticalpathmethod−Timechartsandresource Leveling −PERT.

Total Hours	**45**

TEXT BOOKS:

1. Kanti swarup, Man Mohan, P.K.Guptha "**Operations Research**" , Sixteenth revised Edition, Sultan & sons, New Delhi2012.
2. H. A. Taha, "**Operation Research**", PHI, 2002.

REFERENCES:

1. Anderson, "Quantitative Methods for Business", 8th Edition, Thomson Learning, 2002.
3. Winston, "Operation Research", Thomson Learning, 2003.
4. Vohra, "Quantitative Techniques in Management" , TMH, 2002.
5. Anand Sarma, "Operation Research",Himalaya Publishing House,2003.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K3	3	2	1	1	-	-	-	-	-	-	-	-	1	1	1
	CO2	K3	3	2	1	1	-	-	-	-	-	-	-	-	1	1	1
	CO3	K3	3	2	1	1	-	-	-	-	-	-	-	-	1	1	1
	CO4	K3	3	2	1	1	-	-	-	-	-	-	-	-	1	1	1
	CO5	K3	3	2	1	1	-	-	-	-	-	-	-	-	1	1	1
Average Correlation Level			3	2	1	1	-	-	-	-	-	-	-	-	1	1	1

19CSE26	SOFTWARE QUALITY MANAGEMENT			
L	T	P	C	
3	0	0	3	

COURSE OBJECTIVES:

- To know the fundamentals of Software quality models, quality measurement and metrics.
- To Learn about quality tools including CASE tools.
- To understand the Quality control & reliability.
- To understand the Quality management system models and Complexity metrics.
- To Learn about International quality standards.ISO, CMM.

COURSE OUTCOMES:

CO1: Understand the fundamentals of software quality models, quality measurement and metrics.

CO2: Prepare Documentation on review and audits.

CO3: Design the application using quality control tools including case tools.

CO4 : Understand quality management system models and complexity metrics

CO5: Understand international quality standards – ISO CMM.

COURSE CONTENT:

UNIT 1: **FUNDAMENTALS OF SOFTWARE QUALITY** — 9 hrs

Softwarequality − HierarchicalmodelsofBoehmandMcCall−Quality measurement− Metrics measurement and analysis− Gilb's approach – GQM model.

UNIT 2: SOFTWARE QUALITY — 9 hrs

Quality tasks − SQA plan − Teams − Characteristics − Implementation − Documentation − Reviews and audits.

UNIT 3: **QUALITY CONTROL & RELIABILITY** — 9 hrs

Toolsforquality−Ishikawa'sbasictools−CASE tools−Defectpreventionand removal−Reliabilitymodels−Rayleighmodel−Reliabilitygrowthmodelsfor quality assessment.

UNIT 4: **QUALITY MANAGEMENT SYSTEM** — 9 hrs

ElementsofQMS−Rayleighmodelframework−Reliabilitygrowthmodelsfor QMS − Complexity metrics and models − Customer satisfaction analysis.

UNIT 5: **QUALITY STANDARDS** — 9 hrs

Needforstandards−ISO9000Series−ISO9000-3forsoftwaredevelopment− CMM and CMMI − Six sigma concepts.

Total Hours	**45**

TEXT BOOKS:

1. Stephen H. Kan, "**Metrics and Models in Software Quality Engineering**", Pearson Education (Singapore) Pvt. Ltd., 2nd edition 2014.
2. Allan C. Gillies, "**Software Quality: Theory and Management**", Thomson Learning, 2012.

REFERENCES:

1. Norman E. Fenton and Shari Lawrence Pfleeger, "Software Metrics", Thomson, 2014.
2. Mordechai Ben, Menachem and Garry S.Marliss, "Software Quality" Thomson Asia Pvt. Ltd., 2083.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES <Times New roman>Font Size, 8.

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K2	2	-	-	2	-	-	3	-	-	2	-	-	2	2	-
	CO2	K3	3	-	-	-	2	2	1	-	-	3	-	-	3	2	-
	CO3	K2	2	-	-	2	2	2	2	-	-	2	-	-	2	2	-
	CO4	K4	-	3	-	2	-	2	2	-	-	-	-	-	2	2	-
	CO5	K3	2	-	-	-	2	2	1	-	-	2	-	-	3		-
Average Correlation Level			2.3	3	-	2	2	2	1.8	-	-	2.3	-	-	2.4	2	-

19CSE27	BIG DATA ANALYTICS				
		L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

The student should be made to:

- To know the fundamental concepts of big data and analytics.
- To explore tools and practices for working with big data
- To learn about stream computing.
- To know about the research that requires the integration of large amounts of data.

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Work with big data tools and its analysis techniques

CO2: Design efficient algorithms for mining the data from large volumes

CO3: Design an efficient recommendation system

CO4: Design the tools for visualization

CO5: Learn No SQL databases and management.

COURSE CONTENT:

UNIT 1: **INTRODUCTION TO BIG DATA**	9 hrs

Evolution of Big data - Best Practices for Big data Analytics - Big data characteristics - Validating - The Promotion of the Value of Big Data - Big Data Use Cases- Characteristics of Big Data Applications - Perception and Quantification of Value -Understanding Big Data Storage - A General Overview of High-Performance Architecture - HDFS - MapReduce and YARN - Map Reduce Programming Model.

UNIT 2: **CLUSTERING AND CLASSIFICATION**	9 hrs

Advanced Analytical Theory and Methods: Overview of Clustering - K-means - Use Cases - Overview of the Method - Determining the Number of Clusters - Diagnostics - Reasons to Choose and Cautions .- Classification: Decision Trees - Overview of a Decision Tree - The General Algorithm - Decision Tree Algorithms - Evaluating a Decision Tree - R-Programming concepts -Decision Trees in R - Naïve Bayes - Bayes‘ Theorem - Naïve Bayes Classifier.

UNIT 3: **ASSOCIATION AND RECOMMENDATION SYSTEM**	9 hrs

Advanced Analytical Theory and Methods: Association Rules - Overview - Apriori Algorithm - Evaluation of Candidate Rules - Applications of Association Rules - Finding Association& finding similarity - Recommendation System: Collaborative Recommendation- Content Based Recommendation - Knowledge Based Recommendation- Hybrid Recommendation Approaches.

UNIT 4: **GRAPH MEMORY AND STREAM MEMORY**	9 hrs
Using Graph Analytics for Big Data: Graph Analytics - The Graph Model - Representation as Triples - Graphs and Network Organization - Choosing Graph Analytics - Graph Analytics Use Cases - Graph Analytics Algorithms and Solution Approaches - Technical Complexity of Analyzing Graphs- Features of a Graph Analytics Platform - Considerations: Dedicated Appliances for Graph - Introduction to Streams Concepts – Stream Data Model and Architecture - Stream Computing, Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating moments – Counting oneness in a Window – Decaying Window – Real time Analytics Platform(RTAP) applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.	
UNIT 5: **NOSQL DATA MANAGEMENT FOR BIG DATA AND VISUALIZATION**	9 hrs
NoSQL Databases : Schema-less Models‖: Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores - Tabular Stores - Object Data Stores - Graph Databases Hive - Sharding –- Hbase – Analyzing big data with twitter - Big data for E-Commerce Big data for blogs - Review of Basic Data Analytic Methods using R.	
Total Hours	**45**

TEXT BOOKS:

1. Anand Rajaraman and Jeffrey David Ullman, "**Mining of Massive Datasets**", Cambridge University Press, 2012.
2. David Loshin, "**Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph",** 2013.

REFERENCES:

1. EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publishers, 2015.
2. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers, 2015.
3. Dietmar Jannach and Markus Zanker, "Recommender Systems: An Introduction", Cambridge University Press, 2010.
4. Kim H. Pries and Robert Dunnigan, "Big Data Analytics: A Practical Guide for Managers " CRC Press, 2015.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K3	3	2	2	2	3	-	1	2	-	-	3	3	3	3	2
	CO2	K6	2	2	3	2	-	3	-	-	3	-	2	-	2	3	-
	CO3	K6	1	2	3	2	-	3	-	-	3	-	2	-	2	3	-
	CO4	K6	3	2	3	2	-	3	-	-	3	-	2	-	2	3	2
	CO5	K2	2	2	3	1	-	3	2	2	-	3	-	3	3	2	3
Average Correlation Level			2.2	2	2.8	1.8	3	3	1.5	2	3	3	2.25	3	2.4	2.8	2.3

19CSE28	BIO INFORMARTICS			
L	T	P	C	
3	0	0	3	

COURSE OBJECTIVES:

- Exposed to the need for bioinformatics technologies.
- Learn the concepts of data warehousing and datamining in bioinformatics.
- Be familiar with the modelling techniques.
- Exposed to pattern matching and visualization.
- Learn microarray analysis.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

CO1: Understandthedata format of biological data.

CO2: Understand the concepts of data warehousing and datamining in bioinformatics.

CO3: Use the modelling techniques in bioinformatics.

CO4: Apply pattern matching techniques to bioinformatics data – protein data, genomic data.

CO5: Apply micro array technology for genomic expression study.

COURSE CONTENT:

UNIT 1: **INTRODUCTION**	9 hrs

Need for bioinformatics technologies – Overview of bioinformatics technologies - Structural bioinformatics – Data format and processing – Secondary resources and applications – Role of structural bioinformatics - Biological data integration system.

UNIT 2:**DATAWAREHOUSING AND DATAMINING IN BIOINFORMATICS**	9 hrs

Bioinformatics data – Data warehousing architecture – Data quality – Biomedical data analysis – DNA data analysis – Protein data analysis – Machine learning – Neural network architecture and applications in bioinformatics – Genetics algorithm.

UNIT 3: **MODELING FOR BIOINFORMATICS**	9 hrs

Hidden Markov modeling for biological data analysis – Sequence identification –Sequence classification – Multiple alignment generation – Comparative modelling –Protein modelling – Genomic modelling – Probabilistic modelling – Bayesian networks – Boolean networks - Molecular modelling – Computer programs for molecular modelling.

UNIT 4: **PATTERN MATCHING AND VISUALIZATION**	9 hrs

Gene regulation – Motif recognition – Motif detection – Strategies for motif detection – Visualization – Fractal analysis – DNA walk models – One dimension – Two dimension – Higher dimension – Game representation of Biological sequences – DNA, Protein, Amino acid sequences.

UNIT 5: MICROARRAY ANALYSIS	9 hrs
Microarray technology for genome expression study – Image analysis for data extraction – Pre-processing – Segmentation – Gridding – Spot extraction – Normalization, Filtering – Cluster analysis – Temporal expression profile analysis and gene - Gene regulatory network analysis.	
Total Hours	**45**

TEXT BOOKS:

1. Yi-Ping Phoebe Chen (Ed), "**BioInformatics Technologies**", First Indian Reprint, Springer Verlag, 2007.

REFERENCES:

1. Bryan Bergeron, "Bio Informatics Computing", Second Edition, Pearson Education, 2003.
2. Arthur M Lesk, "Introduction to Bioinformatics", Second Edition, Oxford University Press, 2005.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES <Times New roman>Font Size, 8.

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K2	-	-	-	-	-	-	2	-	-	-	1	-	-	-	-
	CO2	K2	-	-	-	-	-	-	2	-	-	-	1	-	-	-	-
	CO3	K3	-	1	1	1	-	1	3	-	-	-	2	-	1	1	-
	CO4	K3	2	1	1	1	-	1	3	-	-	-	2	-	1	1	-
	CO5	K3	2	1	1	1	-	1	3	-	-	-	2	-	1	1	-
Average Correlation Level			2	1	1	1	--	1	2	-	-	-	1	-	1	1	-

19CSE29	CYBER FORENSICS			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- Describe the security issues network layer and transport layer
- Describe the security issues of the application layer
- Discuss computer forensics
- Learn to analyze forensics tools
- Learn to analyze and validate forensics data

COURSE OUTCOMES:

CO1 : Discuss the security issues network layer and transport layer
CO2 : Apply security principles in the application layer
CO3 : Explain computer forensics
CO4 : Apply forensics tools
CO5 : Analyze and validate forensics data

COURSE CONTENT:

UNIT 1: **NETWORK LAYER SECURITY &TRANSPORT LAYER SECURITY** — 9 hrs

IPSec Protocol - IP Authentication Header - IP ESP - Key Management Protocol for IPSec . Transport layer Security: SSL protocol, Cryptographic Computations – TLS Protocol.

UNIT 2E-MAIL SECURITY & FIREWALLS — 9 hrs

PGP - S/MIME - Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology- Types of Firewalls - Firewall designs - SET for E-Commerce Transactions.

UNIT 3: **INTRODUCTION TO COMPUTER FORENSICS** — 9 hrs

Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Introduction to Identity Theft & Identity Fraud. Types of CF techniques - Incident and incident response methodology - Forensic duplication and investigation. Preparation for IR: Creating response tool kit and IR team. - Forensics Technology and Systems - Understanding Computer Investigation – Data Acquisition.

UNIT 4: **EVIDENCE COLLECTION AND FORENSICS** — 9 hrs

Processing Crime and Incident Scenes – Working with Windows and DOS Systems. Current Computer Forensics Tools: Software/ Hardware Tools.

UNIT 5: ANALYSIS AND VALIDATION	9 hrs
Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics.	
Total Hours	**45**

TEXT BOOKS:

1. Man Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms and Protocols", Wiley Publications, 2003.
2. Nelson, Phillips, Enfinger, Steuart, "Computer Forensics and Investigations", Cengage Learning, India 4th Edition, 2010.

REFERENCES:

1. John R.Vacca, "Computer Forensics", Cengage Learning, 2005
2. Richard E.Smith, "Internet Cryptography", 3rd Edition Pearson Education, 2008.
3. Marjie T.Britz, "Computer Forensics and Cyber Crime": An Introduction", 3rd Edition, Prentice Hall, 2013.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K3	K4	K5
Course Outcomes	CO1	K2	2	-	-	-	2	1	-	-	-	-	-	-	2	1	-
	CO2	K3	-	-	2	-	-	-	1	-	-	1	3	-	3	-	1
	CO3	K3	3	-	-	-	-	-	-	-	1	-	-	3	3	-	-
	CO4	K3	-	2	-	-	-	-	-	-	-	-	-	-	3	3	3
	CO5	K4	-	-	2	-	2	-	-	-	1	1	-	-	3	-	-
Average Correlation Level			2.5	2	2	-	2	1	1	-	1	1	3	3	2.8	2	2

19CSE30	COMPUTER VISION			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To analyze image processing techniques for computer vision.
- To understand shape, region and motion analysis.
- To understand Hough Transform and its applications to detect lines, circles, ellipses.
- To understand three-dimensional image analysis techniques.
- To study some applications of computer vision algorithms.

COURSE OUTCOMES:

CO1 : Analyze the fundamental image processing techniques required for computer vision
CO2 : Understand the boundary tracking and motion related techniques
CO3 : Apply Hough Transform for line, circle, and ellipse detections
CO4: Analyze the 3D vision techniques.
CO5: Develop applications using computer vision techniques.

COURSE CONTENT:

UNIT 1: **Image processing foundations**	9 hrs

Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology.

UNIT 2 : Shapes and regions	9 hrs

Binary shape analysis – connectedness – object labeling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors – moments.

UNIT 3: **Hough transform**	9 hrs

Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection – accurate center location – speed problem – ellipse detection – Case study: Human Iris location – hole detection – generalized Hough Transform – spatial matched filtering – GHT for ellipse detection – object location – GHT for feature collation.

UNIT 4: **3D vision & motion**	9 hrs

Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion –

triangulation – bundle adjustment – translational alignment – parametric motion – sp linebased motion – optical flow – layered motion.

UNIT 5: **Applications**	9 hrs

Application: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters – Chamfer matching, tracking– combining views from multiple cameras. Application: In-vehicle vision system: locating roadway – road markings – identifying road signs .

Total Hours	**45**

TEXT BOOKS:

1. E. R. Davies, "**Computer & Machine Vision**", Fourth Edition, Academic Press, 2017.
2. Richard Szeliski, "**Computer Vision: Algorithms and Applications**", Springer 2011.

REFERENCES:

1. Mark Nixon and Alberto S. Aquado, "**Feature Extraction & Image Processing for Computer Vision**", Third Edition, Academic Press, 2012.
2. Jan Erik Solem, "**Programming Computer Vision with Python: Tools and algorithms for analyzing images**", O'Reilly Media, 2012.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K3	K4	K5
Course Outcomes	CO1	K2	2	-	-	-	-	2	1	-	-	-	-	-	2	-	-
	CO2	K3	3	-	-	2	-	-	-	1	-	-	-	-	3	-	-
	CO3	K3	-	2	-	-	-	-	-	-	-	1	-	-	3	-	-
	CO4	K4	-	3	-	-	-	-	-	-	-	-	-	-	-	2	-
	CO5	K4	-	3	-	2	-	2	-	-	-	1	-	-	-	2	-
Average Correlation Level			2.5	2.6	-	2	-	2	1	1	-	1	-	-	2.6	2	-

19CSP31	PATTERN RECOGNITION			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To know the concept of a pattern and the basic approach to the development of pattern recognition and machine intelligence algorithms.
- To know about unsupervised learning.
- Understand the important schemes for feature extraction and feature selection.
- To explore different classification models.
- To learn about advanced classification techniques.

COURSE OUTCOMES:

On Completion of the course, the students should be able to:

CO1: Understand the concepts of pattern classifier.

CO2: Apply unsupervised learning to real world problems.

CO3: Extract feature set and select the features from given data set.

CO4: Apply different classifiers to solve the problem.

CO5: Apply recent advanced classification techniques to the problems.

UNIT 1: **PATTERN CLASSIFIER** — 9 hrs

Overview of Pattern recognition – Discriminant functions – Supervised learning – Parametric estimation – Maximum Likelihood Estimation – Bayesian parameter Estimation – Problems with Bayes approach– Pattern classification by distance functions – Minimum distance pattern classifier.

UNIT 2:**CLUSTERING** — 9 hrs

Clustering for unsupervised learning and classification – Clustering concept – C Means algorithm – Hierarchical clustering – Graph theoretic approach to pattern Clustering – Validity of Clusters.

UNIT 3: **FEATURE EXTRACTION AND STRUCTURAL PATTERN RECOGNITION** — 9 hrs

KL Transforms – Feature selection through functional approximation – Binary selection -Elements of formal grammars - Syntactic description - Stochastic grammars - Structural representation.

UNIT 4: **HIDDEN MARKOV MODELS AND SUPPORT VECTOR MACHINE** — 9 hrs

State Machines – Hidden Markov Models – Training – Classification – Support vector Machine – Feature Selection.

UNIT 5: **RECENT ADVANCES** — 9 hrs

Multilayer perceptron's - Overview ofartificial neural networks - Multilayer feedforward neural networks with sigmoidal activation functions - Backpropagation algorithm - Representational

abilities of feedforward networks- Introduction to deep neural networks -Convolutional neural networks - Recurrent neural networks.

Total Hours	**45**

TEXT BOOKS:

1. M. Narasimha Murthy and V.Susheela Devi, “Pattern Recognition”, Springer 2011.
2. S.Theodoridis and K.Koutroumbas, “Pattern Recognition”, 4th Edition., Academic Press, 2009.

REFERENCES:

4. M. Narasimha Murthy and Der V.Susheela Devi “Introduction to Pattern Recognition and Machine Learning” World Scientific Publishing, 2015.
5. Robert J.Schalkoff, “Pattern Recognition Statistical, Structural and Neural Approaches”, John Wiley & Sons Inc., New York, 1992.
6. C.M.Bishop,”Pattern Recognition and Machine Learning”, Springer, 2006.
7. R.O.Duda, P.E.Hart and D.G.Stork, “Pattern Classification”, John Wiley, 2001.
8. Andrew Webb, “Stastical Pattern Recognition”, Arnold publishers, London, 1999.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES <Times New roman>Font Size, 8.

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K2	-	-	-	-	-	-	2	-	-	-	1	-	-	-	-
	CO2	K3	2	1	1	1	1	1	3	-	-	1	2	-	1	1	-
	CO3	K3	2	1	1	1	1	1	3	-	-	1	2	-	1	1	-
	CO4	K3	2	1	1	1	1	1	3	-	-	1	2	-	1	1	-
	CO5	K3	2	1	1	1	1	1	3	-	-	1	2	-	1	1	-
Average Correlation Level			2	1	1	1	1	1	2	-	-	1	1	-	1	1	-

19CSE32	GRID AND CLOUD COMPUTING			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

The student should be made to:

- Understand how Grid computing helps in solving large scale scientific problems.
- Gain knowledge on the concept of virtualization that is fundamental to cloud computing.
- Learn how to program the grid and the cloud.
- Understand the security issues in the grid and the cloud environment.

COURSE OUTCOMES:

At the end of the course, the student should be able to:

CO1: Apply grid computing techniques to solve large scale scientific problems.
CO2: Describe the various services provided by the Grid and Cloud.
CO3: Apply the concept of virtualization.
CO4: Use the grid and cloud tool kits.
CO5: Apply the security models in the grid and the cloud environment.

COURSE CONTENT:

UNIT 1: **INTRODUCTION**	9 hrs

Evolution of Distributed computing: Scalable computing over the Internet – Technologies for network based systems – clusters of cooperative computers - Grid computing Infrastructures – cloud computing - service oriented architecture – Introduction to Grid Architecture and standards – Elements of Grid – Overview of Grid Architecture.

UNIT 2: **GRID SERVICES**	9 hrs

Introduction to Open Grid Services Architecture (OGSA) – Motivation – Functionality Requirements – Practical & Detailed view of OGSA/OGSI – Data intensive grid service models – OGSA services.

UNIT 3: **VIRTUALIZATION**	9 hrs

Cloud deployment models: public, private, hybrid, community – Categories of cloud computing: Everything as a service: Infrastructure, platform, software - Pros and Cons of cloud computing – Implementation levels of virtualization – virtualization structure – virtualization of CPU, Memory and I/O devices – virtual clusters and Resource Management – Virtualization for data center automation.

UNIT 4: **PROGRAMMING MODEL**	9 hrs

Open source grid middleware packages – Globus Toolkit (GT4) Architecture , Configuration – Usage of Globus – Main components and Programming model - Introduction to Hadoop Framework - Mapreduce, Input splitting, map and reduce functions, specifying input and output parameters, configuring and running a job – Design of Hadoop file system, HDFS concepts, command line and java interface, dataflow of File read & File write.

UNIT 5: SECURITY	9 hrs

Trust models for Grid security environment – Authentication and Authorization methods – Grid security infrastructure – Cloud Infrastructure security: network, host and application level – aspects of data security, provider data and its security, Identity and access management architecture, IAM practices in the cloud, SaaS, PaaS, IaaS availability in the cloud, Key privacy issues in the cloud.

Total Hours	**45**

TEXT BOOKS:

1. Kai Hwang, Geoffery C. Fox and Jack J. Dongarra, "**Distributed and Cloud Computing: Clusters, Grids, Clouds and the Future of Internet**", First Edition, Morgan Kaufman Publisher, an Imprint of Elsevier, 2012.

REFERENCES:

1. Jason Venner, "Pro Hadoop- Build Scalable, Distributed Applications in the Cloud", A Press, 2009
2. Tom White, "Hadoop The Definitive Guide", First Edition. O"Reilly, 2009.
3. Bart Jacob (Editor), "Introduction to Grid Computing", IBM Red Books, Vervante, 2005
4. Ian Foster, Carl Kesselman, "The Grid: Blueprint for a New Computing Infrastructure", 2nd Edition, Morgan Kaufmann.
5. Frederic Magoules and Jie Pan, "Introduction to Grid Computing" CRC Press, 2009.
6. Daniel Minoli, "A Networking Approach to Grid Computing", John Wiley Publication, 2005.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K3	3	2	-	-	2	3	2	3	2	-	2	-	3	3	-
	CO2	K2	2	-	3	3	-	2	-	2	2	3	-	2	3	3	2
	CO3	K3	3	-	-	-	2	3	2	3	2	-	2	-	3	3	-
	CO4	K3	2	2	3	3	-	-	1	-	2	2	1	2	3	2	3
	CO5	K3	3	-	-	-	2	3	-	3	2	-	2	-	3	3	-
Average Correlation Level			2	2	3	3	2	2.75	2.5	2.75	2	2.5	1.75	2	3	2.8	2.5

19CSE33	SEMANTIC WEB			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

The student should be made to:

- To learn the fundamentals of semantic web and to conceptualize and depict Ontology for semantic web.
- To make a study of languages for semantic web.
- To learn about the ontology learning algorithms and to utilize in the development of an application.
- To know the fundamental concepts of management of ontology.

COURSE OUTCOMES:

On Completion of the course, the students should be able to:

CO1: Explore the fundamentals of semantic web and to conceptualize and depict Ontology.
CO2: Analyze the languages for semantic web and Ontology.
CO3: Create Ontology for a given domain.
CO4: Develop an application using ontology languages and tools.
CO5: Design and develop web service applications using semantic portals.

COURSE CONTENT:

UNIT 1: **THE QUEST FOR SEMANTICS** — 9 hrs

Building Models - Calculating with Knowledge - Exchanging Information - Semantic Web Technologies – Layers – Architecture - Components –Types – Ontological Commitments – Ontological Categories – Philosophical Background - Sample Knowledge Representation Ontologies –Top Level Ontologies – Linguistic Ontologies – Domain Ontologies – Semantic Web – Need – Foundation.

UNIT 2: **LANGUAGES FOR SEMANTIC WEB AND ONTOLOGIES** — 9 hrs

Web Documents in XML – RDF - Schema – Web Resource Description using RDF - RDF Properties –Topic Maps and RDF – Overview – Syntax Structure – Semantics – Pragmatics -Traditional Ontology Languages – LOOM - OKBC – OCML - Flogic Ontology Markup Languages – SHOE – OIL - DAML + OIL - OWL.

UNIT 3: **ONTOLOGY LEARNING FOR SEMANTIC WEB** — 9 hrs

Taxonomy for Ontology Learning – Layered Approach – Phases of Ontology Learning –Importing and Processing Ontologies and Documents – Ontology Learning Algorithms –Evaluation.

UNIT 4: **ONTOLOGY MANAGEMENT AND TOOLS** — 9 hrs

Overview – Need for management – development process – target ontology – ontology mapping – Skills management system – Ontological class – Constraints – Issues. Evolution –Development of Tools and Tool Suites – Ontology Merge Tools – Ontology based Annotation Tools.

UNIT 5: **APPLICATIONS** — 9 hrs

Web Services – Semantic Web Services - Case Study for specific domain – Security issues – Web Data Exchange and Syndication - Semantic Wikis - Semantic Portals - Semantic Metadata in Data Formats - Semantic Web in Life Sciences - Ontologies for Standardizations - RIF Applications.

Total Hours	**45**

TEXT BOOKS:

1. Asuncion Gomez-Perez, Oscar Corcho, Mariano Fernandez-Lopez ― Ontological Engineering: with examples from the areas of Knowledge Management, e-Commerce and the Semantic Web‖ Springer, 2004.
2. Pascal Hitzler, Markus Krötzsch, Sebastian Rudolph, "Foundations of Semantic Web Technologies", Chapman & Hall/CRC, 2009.

REFERENCES:

1. Grigoris Antoniou, Frank van Harmelen, ―A Semantic Web Primer (Cooperative Information Systems)‖, The MIT Press, 2004.
2. John Davies, Dieter Fensel, Frank Van Harmelen, ―Towards the Semantic Web: Ontology – Driven Knowledge Management‖, John Wiley & Sons Ltd., 2003.
3. John Davies(Editor), Rudi Studer(Co-Editor), Paul Warren(Co-Editor)―Semantic Web Technologies: Trends and Research in Ontology-based Systems‖Wiley Publications, Jul 2006.
4. Michael C. Daconta, Leo J. Obrst, Kevin T. Smith, ―The Semantic Web: A Guide to the Future of XML, Web Services, and Knowledge Management‖, Wiley, 2003.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K4	3	2	3	2	3	2	-	3	-	-	2	3	2	2	3
	CO2	K4	2	3	3	3	2	-	-	2	2	2	2	-	2	3	2
	CO3	K6	2	-	3	2	-	2	3	3	2	-	2	2	2	3	3
	CO4	K3	3	-	2	3	3	-	3	3	2	-	2	2	2	3	2
	CO5	K6	-	2	3	2	-	3	-	-	3	-	2	-	2	3	-
Average Correlation Level			2.5	2.3	2.8	2.4	2.6	2.3	3	2.75	2.25	2	2	2.3	2	2.8	2.5

19CSE34	REQUIREMENTS ENGINEERING			
L	T	P	C	
3	0	0	3	

COURSE OBJECTIVES:

The student should be made to:

- Understand the basics of requirements engineering
- Learn different techniques used for requirements elicitation
- Know the role played by requirements analysis in requirement integration
- Appreciate the use of various methodologies for requirements development
- Study the current trends in requirements prioritization and validation.

COURSE OUTCOMES:

At the end the student will be able to:

CO1: Describe basics of requirements engineering

CO2: Prepare SRS including the details of requirements engineering

CO3: Describe the stages of requirements elicitation

CO4: Analyze software requirements gathering

CO5: Analyze current trends in requirements prioritization and validation

COURSE CONTENT:

UNIT 1: **REQUIREMENTS ENGINEERING OVERVIEW** 9 hrs

Software Requirement Overview – Software Development Roles –Software Development Process Kernels – Commercial Life Cycle Model – Vision Development – Stakeholders Needs & Analysis – Stakeholder needs –Stakeholder activities.

UNIT 2: **REQUIREMENTS ELICITATION** 9 hrs

The Process of Requirements Elicitation – Requirements Elicitation Problems – Problems of Scope – Problems of Understanding – Problems of Volatility – Current Elicitation Techniques – Information Gathering – Requirements Expression and Analysis – Validation – An Elicitation Methodology Framework – A Requirements Elicitation Process Model – Methodology over Method – Integration of Techniques – Fact-Finding – Requirements Gathering – Evaluation and Rationalization – Prioritization – Integration and Validation.

UNIT 3: **REQUIREMENTS ANALYSIS** 9 hrs

Identification of Functional and Non Functional Requirements – Identification of Performance Requirements – Identification of safety Requirements – Analysis – Feasibility and Internal Compatibility of System Requirements – Definition of Human Requirements Baseline.

UNIT 4: **REQUIREMENTS DEVELOPMENT** 9 hrs

Requirements analysis – Requirements Documentation – Requirements Development Workflow – Fundamentals of Requirements Development – Requirements Attributes Guidelines Document – Supplementary Specification Document – Use Case Specification Document – Methods for Software

Prototyping – Evolutionary prototyping –Throwaway prototyping.

UNIT 5: REQUIREMENTS VALIDATION	9 hrs

Validation objectives – Analysis of requirements validation – Activities – Properties – Requirementreviews – Requirements testing – Case tools for requirements engineering.

Total Hours	**45**

TEXT BOOKS:

1. Ian Graham, ―Requirements Engineering and Rapid Development‖, Addison Wesley, 1998
   Wiegers, Karl, Joy Beatty, ‖Software requirements‖, Pearson Education, 2013

REFERENCES:

1. Ian Sommerville, Pete Sawyer, ―Requirements Engineering: A Good Practice Guide‖, Sixth Edition, Pearson Education, 2004
2. Dean Leffingwe, Don Widrig, ―Managing Software Requirements A Use Case Approach‖, Second Addition, Addison Wesley, 2003
3. Karl Eugene Wiegers, ―Software Requirements‖, Word Power Publishers, 2000

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K4	3	2	3	2	3	2	-	3	-	-	2	3	2	2	3
	CO2	K4	2	3	3	3	2	-	-	2	2	2	2	-	2	3	2
	CO3	K6	2	-	3	2	-	2	3	3	2	-	2	2	2	3	3
	CO4	K3	3	-	2	3	3	-	3	3	2	-	2	2	2	3	2
	CO5	K6	-	2	3	2	-	3	-	-	3	-	2	-	2	3	-
Average Correlation Level			2.5	2.3	2.8	2.4	2.6	2.3	3	2.75	2.25	2	2	2.3	2	2.8	2.5

19CSE35	QUANTUM COMPUTING			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

The student should be made to:

- Understand the model of computation and functions
- Know the quantum circuit model and its states
- Learn the various algorithms for performing quantum operations
- Explore the complexity and error correction in quantum

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Explain the model and functions of quantum computing
CO2: Describe states and operations of quantum circuit model
CO3: Expose the different algorithms for quantum functioning.
CO4: Analyse the computational complexity of quantum
CO5: Identify the errors in quantum and correct it.

COURSE CONTENT:

UNIT 1: **FOUNDATION** — 9 hrs

Overview of traditional computing – Church-Turing thesis – circuit model of Computation – reversible computation – quantum physics – quantum physics and computation – Dirac notation and Hilbert Spaces – dual vectors – operators – the spectral theorem – functions of operators – tensor products – Schmidt decomposition theorem.

UNIT 2: **QUBITS AND QUANTUM MODEL OF COMPUTATION** — 9 hrs

State of a quantum system – time evolution of a closed system – composite systems – measurement – mixed states and general quantum operations – quantum circuit model – quantum gates – universal sets of quantum gates – unitary transformations – quantum circuits.

UNIT 3: **QUANTUM ALGORITHMS – I** — 9 hrs

Superdense coding – quantum teleportation – applications of teleportation – probabilistic versus quantum algorithms – phase kick-back – the Deutsch algorithm – the Deutsch-Jozsa algorithm – Simon's algorithm – Quantum phase estimation and quantum Fourier Transform – eigenvalue estimation.

UNIT 4: **QUANTUM ALGORITHMS – II** — 9 hrs

Order-finding problem – eigenvalue estimation approach to order finding – Shor's algorithm for order finding – finding discrete logarithms – hidden subgroups – Grover's quantum search algorithm – amplitude amplification – quantum amplitude estimation – quantum counting – searching without knowing the success probability.

UNIT 5: QUANTUM COMPUTATIONAL COMPLEXITY AND ERROR CORRECTION	9 hrs
Computational complexity – black-box model – lower bounds for searching – general black-box lower bounds – polynomial method – block sensitivity – adversary methods – classical error correction – classical three-bit code – fault tolerance – quantum error correction – three- and nine-qubit quantum codes – fault-tolerant quantum computation.	
Total Hours	**45**

TEXT BOOKS:

1. P. Kaye, R. Laflamme, and M. Mosca, "An introduction to Quantum Computing", Oxford University Press, 1999.

REFERENCES:

1. V. Sahni, "Quantum Computing", Tata McGraw-Hill Publishing Company, 2007.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K4	3	2	3	2	3	2	-	3	-	-	2	3	2	2	3
	CO2	K4	2	3	3	3	2	-	-	2	2	2	2	-	2	3	2
	CO3	K6	2	-	3	2	-	2	3	3	2	-	2	2	2	3	3
	CO4	K3	3	-	2	3	3	-	3	3	2	-	2	2	2	3	2
	CO5	K6	-	2	3	2	-	3	-	-	3	-	2	-	2	3	-
Average Correlation Level			2.5	2.3	2.8	2.4	2.6	2.3	3	2.75	2.25	2	2	2.3	2	2.8	2.5

19CSE36	NUMERICAL METHODS			
L	T	P	C	
3	1	0	3	

COURSE OBJECTIVES:

The objective of the Course is

- To enable the students to solve numerical problems that occur in vibrating strings due to one-dimensional wave motion which involve partial
- Provide the students with numerical integration techniques to find the value of an integral and single step and multistep methods to obtain the solution of ordinary differential equations.

COURSE OUTCOMES:

At the end of the Course, the students will be able to

CO1 : Solve algebraic and transcendental equations, a system of linear algebraic equations and Obtain the eigen values of a matrix by numerical method technique.

CO2 : Use interpolation to find the intermediate values of a function from a set of valuesgiven in a tabulated form by divided difference and finite difference interpolation formulae.

CO3 : Compute the derivative of a function of a single variable based on finite differenceoperators and interpolation and also evaluate the value of an integral and double integrals using Numerical integration rules.

CO4 : Apply numerical solution methods for most of the engineering problems that involve ordinary Differential equations with initial conditions.

CO5 : Solve boundary value problems in partial differential equations using finite difference iterative procedure.

COURSE CONTENT:

UNIT 1: **SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS** — 12 hrs

Solution of equation- Fixed point iteration: $x = g(x)$ method- Newton's method- Solution of linear system by Gaussian elimination and Gauss Jordan method- Iterative method- Gauss-Seidel method- Inverse of a matrix by Gauss Jordan method- Eigenvalue of a matrix by power method.

UNIT 2:**INTERPOLATION AND APPROXIMATION** — 12 hrs

Lagrangian Polynomials- Divided differences- Interpolating with a cubic spline- Newton's forward and backward difference formulae.

UNIT 3: **NUMERICAL DIFFERENTIATION AND INTEGRATION** — 12 hrs

Differentiation using interpolation formulae- Numerical integration by Trapezoidal and Simpson's 1/3 and 3/8 rules- Romberg's method- Two and Three point Gaussian quadrature formulae- Double integrals using Trapezoidal and Simpson's rules.

UNIT 4: INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS	12 hrs
Single step methods- Taylor series method- Euler's method and Modified Euler's method for solving first order equations - Runge-Kutta fourth order method for solving first and second order equations- Multistep methods- Milne's and Adam's predictor and corrector methods	
UNIT 5: BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS	12 hrs
Finite difference solution of second order ordinary differential equation- Finite difference solution of one-dimensional heat equation by explicit and implicit methods- One-dimensional wave equation and Two-dimensional Laplace and Poisson equations.	
Total Hours	**60**

TEXT BOOKS:

5. Veerarajan.T and Ramachandran T, "Numerical Methods with Programming in C" , Second Edition , Tata McGraw-Hill Pub.Co.Ltd, 2007.
6. Sankara Rao K, "Numerical Methods for Scientists and Engineers",3rd Edition, Prentice Hall of India, 2007.

REFERENCES:

1. Kandasamy.P, Thilagavathy.K&Gunavathy.K, "Numerical Methods", 2nd Edition, S.Chand& Company Ltd., 2003.
2. Gerald C.F and Wheatley P.O, " Applied Numerical Analysis", 6th Edition, Pearson education, 2006.
3. Grewal.B.S and Grewal J.S, "Numerical methods in Engineering and Science", 6th Edition, Khanna Publishers, Delhi, 2004.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K3	3	2	1	1	-	-	-	-	-	-	-	-	1	1	1
	CO2	K3	3	2	1	1	-	-	-	-	-	-	-	-	1	1	1
	CO3	K3	3	2	1	1	-	-	-	-	-	-	-	-	1	1	1
	CO4	K3	3	2	1	1	-	-	-	-	-	-	-	-	1	1	1
	CO5	K3	3	2	1	1	-	-	-	-	-	-	-	-	1	1	1
Average Correlation Level			3	2	1	1	-	-	-	-	-	-	-	-	1	1	1

3: High 2: Medium 1: Low

19CSE37	DATA WAREHOUSING AND MINING			
L	T	P	C	
3	0	0	3	

COURSE OBJECTIVES:

- To make the students to understand data mining principles and techniques
- To discover the knowledge imbibed in the high dimensional system.
- To study algorithms for finding the hidden interesting patterns in data.
- To expose the students to the concepts of Data warehousing Architecture and Implementation.
- To study the overview of developing areas – Web mining, Text mining and Big Data Mining Tools of Data mining.

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: To build a data warehouse for a real-world system

CO2: To write programs for classification and clustering

CO3: To evaluate various mining techniques on complex data objects

CO4: To develop applications using Big Data Mining Tool

CO5: To understand the latest trends in Big Data Mining Applications

COURSE CONTENT:

UNIT 1: INTRODUCTION TO DATA WAREHOUSING 9 hrs

Evolution of Decision Support Systems- Data Warehousing Components –Building a Data Warehouse, Data Warehouse and DBMS, Data Marts, Metadata, Multidimensional Data Model, OLAP vs. OLTP, OLAP Operations, Data Cubes, Schemas for Multidimensional Database: Stars, Snowflakes and Fact Constellations.

UNIT 2: DATA WAREHOUSE PROCESS AND ARCHITECTURE 9 hrs

Types of OLAP Servers, 3 –Tier Data Warehouse Architecture, Distributed and Virtual Data Warehouses. Data Warehouse Implementation, Tuning and Testing of Data Warehouse. Data Staging (ETL) Design and Development, Data Warehouse Visualization, Data Warehouse Deployment, Maintenance, Growth, Business Intelligence Overview - Data Warehousing and Business Intelligence Trends - Business Applications - Tools – SAS

UNIT 3:INTRODUCTION TO DATA MINING 9 hrs

Data Mining - KDD versus Data Mining, Stages of the Data Mining Process- Task primitives, Data Mining Techniques - Data Mining Knowledge Representation – Data Mining Query Languages, Integration of a Data Mining System with a Data Warehouse – Issues, Data preprocessing – Data Cleaning, Data Transformation, Feature Selection, Dimensionality Reduction, Discretization and Generating Concept Hierarchies - MiningFrequent Patterns Association- Correlation

UNIT 4: CLASSIFICATION AND CLUSTERING	9 hrs
Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods - Clustering techniques – Partitioning Methods - k-means- Hierarchical Methods - Distance-based Agglomerative and Divisible Clustering, Density-Based Methods – Expectation Maximization - Grid Based Methods – Model-Based Clustering Methods – Constraint – Based Cluster Analysis – Outlier Analysis.	
UNIT 5: TRENDS IN DATA MINING AND BIG DATA MINING	9 hrs
Introduction to Big Data-Case Studies on Big Data Mining Tools: Apache Hadoop, Apache Mahout and RMining Complex Data Objects, Spatial Databases, Temporal Databases, Multimedia Databases, Time Series and Sequence Data; Text Mining – Web Mining- Application and Trends in Data Mining- Social network analysis-Biological applications.	
Total Hours	**45**

TEXT BOOKS:

1.Jiawei Han and MichelineKamber, ―Data Mining: Concepts and Techniques‖, Morgan Kaufmann Publishers, Third Edition, 2011.
2.PaulZikopoulos, Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, ― Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming‖, McGraw-Hill Osborne Media, First Edition, 2011.

REFERENCES:

1.MehmedKantardzic, ―Datamining Concepts, Models, Methods, and Algorithms‖, Wiley Interscience, 2003.
2.Alex Berson and Stephen J. Smith, ―Data Warehousing, Data Mining and OLAP‖, Tata McGraw Hill Edition, Tenth Reprint 2007.
3.G. K. Gupta, ―Introduction to Data Mining with Case Studies‖, Easter Economy Edition, Prentice Hall of India, 2006.
4.Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, ―An Introduction to Statistical Learning: with Applications in R‖, Springer, 2014.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES <Times New roman>Font Size, 8.

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K3	-	-	3	2	-	-	-	-	-	3	-	-	1	2	-
	CO2	K3	-	-	-	3	3	-	-	-	-	-	-	-	-	2	-
	CO3	K3	-	3	3	-	-	-	-	-	1	3	-	-	-	-	2
	CO4	K3	-	3	-	-	3	-	-	-	2	-	-	3	-	2	-
	CO5	K3	-	-	3	-	-	3	-	-	1	3	-	-	-	2	-
Average Correlation Level			-	3	3	2.5	3	3	-	-	1	3	-	3	1	2	2

19CSE38	AD-HOC & SENSOR NETWORKS			
L	T	P	C	
3	0	0	3	

COURSE OBJECTIVES:

- To make the students to understand the design issues in ad hoc and sensor networks.
- Learn the different types of MAC protocols.
- Be familiar with different types of adhoc routing protocols.
- Be expose to the TCP issues in adhoc networks.
- Learn the architecture and protocols of wireless sensor networks.

COURSE OUTCOMES:

CO1 : Explain the concepts, network architectures and applications of ad hoc and wireless sensor networks

CO2 : Analyze the protocol design issues of ad hoc and sensor networks

CO3 : Construct routing protocols for ad hoc and wireless sensor networks with respect to some protocol design issues

CO4: Analyze the architecture of sensor networks with MAC layer protocols.

CO5 : Evaluate the QoS related performance measurements of ad hoc and sensor networks

COURSE CONTENT:

UNIT 1: **INTRODUCTION**	9 hrs

Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum – Radio propagation Mechanisms – Characteristics of the Wireless Channel -mobile ad hoc networks (MANETs) and wireless sensor networks (WSNs) :concepts and architectures. Applications of Ad Hoc and Sensor networks. Design Challenges in Ad hoc and Sensor Networks.

UNIT 2MAC PROTOCOLS FOR AD HOC WIRELESS NETWORKS	9 hrs

Issues in designing a MAC Protocol- Classification of MAC Protocols- Contention based protocols- Contention based protocols with Reservation Mechanisms- Contention based protocols with Scheduling Mechanisms – Multi channel MAC-IEEE 802.11.

UNIT 3: **ROUTING PROTOCOLS AND TRANSPORT LAYER**	9 hrs

Issues in designing a routing and Transport Layer protocol for Ad hoc networks- proactive routing, reactive routing (on-demand), hybrid routing- Classification of Transport Layer solutions-TCP over Ad hoc wireless Networks.

UNIT 4: WIRELESS SENSOR NETWORKS AND MAC PROTOCOLS	9 hrs
Single node architecture: hardware and software components of a sensor node - WSN Network architecture: typical network architectures-data relaying and aggregation strategies -MAC layer protocols: self-organizing, Hybrid TDMA/FDMA and CSMA based MAC- IEEE 802.15.4.	
UNIT 5: WSN ROUTING, LOCALIZATION & QOS	9 hrs
Issues in WSN routing – OLSR- Localization – Indoor and Sensor Network Localization-absolute and relative localization, triangulation-QOS in WSN-Energy Efficient Design-Synchronization-Transport Layer issues.	
Total Hours	**45**

TEXT BOOKS:

1. C. Siva Ram Murthy, and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols ", Prentice Hall Professional Technical Reference, 2008.

REFERENCES:

1. Carlos De Morais Cordeiro, Dharma Prakash Agrawal “Ad Hoc & Sensor Networks: Theory and Applications”, World Scientific Publishing Company, 2006.
2. Feng Zhao and Leonides Guibas, "Wireless Sensor Networks", Elsevier Publication - 2004.
3. Holger Karl and Andreas Willig “Protocols and Architectures for Wireless Sensor Networks”, Wiley, 2005
4. Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks-Technology, Protocols, and Applications”, John Wiley, 2010.
4. Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K3	K4	K5
Course Outcomes	CO1	K2	2		-	-	1	-	-	-	-	-	-	-	2	-	-
	CO2	K4	-	3	-	-	-	1	-	-	2	-	-	-	-	3	-
	CO3	K4	-	3	-	-	-	-	1	2	-	-	2	1	-	3	-
	CO4	K3	-	2	-	-	-	-	-	-	-	1	-	-	-	2	-
	CO5	K4	-	3	-	-	-	-	-	-	-	-	-	3	-	3	-
Average Correlation Level			2	2.75	-	-	1	1	1	2	2	1	2	1.5	2	2.75	-

19CSE39	ADVANCED MOBILE COMPUTING			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

The student should be made to:

- To learn the characteristics of mobile applications.
- To learn about the intricacies of UI required by mobile applications.
- To study about the design aspects of mobile application.
- To learn development of mobile applications.

COURSE OUTCOMES:

On Completion of the course, the students should be able:

CO1: Understand the mobile application development life cycle.

CO2: To design and implement the user interfaces for mobile applications.

CO3: To design the mobile applications with the resource constraints of mobile devices.

CO4: To develop advanced mobile applications that accesses the databases and the web.

CO5: To develop useful mobile applications in the current scenario using Google Android and Eclipse simulator.

COURSE CONTENT:

UNIT 1: **INTRODUCTION**	9 hrs

Mobile Applications – Characteristics and Benefits – Application Model – Infrastructure and Managing Resources – Mobile Software Engineering – Frameworks and Tools – Mobile devices Profiles.

UNIT 2: **USER INTERFACE**	9 hrs

Generic UI Development – VUIs and Mobile Applications – Text to Speech techniques – Designing the right UI – Multimodal and Multichannel UI – Gesture based UIs – Screen Elements and Layouts – Voice XML – Java API.

UNIT 3: **APPLICATION DESIGN**	9 hrs

Memory Management – Design patterns for limited memory – Work flow for Application Development – Techniques for composing Applications – Dynamic Linking – Plug ins and rules of thumb for using DLLs – Concurrency and Resource Management – Look and feel.

UNIT 4: **APPLICATION DEVELOPMENT**	9 hrs

Intents and Services – Storing and Retrieving data – Communication via the Web – Notification and Alarms – Graphics and Multimedia – Telephony – Location based services – Packaging and Deployment – Security and Hacking.

UNIT 5: TOOLS	9 hrs
Google Android Platform – Eclipse Simulator – Android Application Architecture – Event based programming – Apple iPhone Platform – UI tool kit interfaces – Event handling and Graphics services – Layer Animation.	
Total Hours	**45**

TEXT BOOKS:

1. Share Conder, Lauren Darcey, "Android Wireless Application Development" Pearson 3rd Edition.
2. Zigurd Mednieks, Laird Dornin, G, Blake Meike and Masumi Nakamura, ―Programming Android‖, O"Reilly, 2011.

REFERENCES:

1. Professional mobile Application Development paperback,2012 Jeff Mcherter (Author),Scott Gowell (Author), Wiley India Private Limited
2. Reto Meier, Wrox Wiley, ―Professional Android 2 Application Development‖, 2010.
3. Alasdair Allan, ―iPhone Programming‖, O"Reilly, 2010.
4. Wei-Meng Lee, ―Beginning iPhone SDK Programming with Objective-C‖, Wrox Wiley, 2010.
5. Pro iOS Table VIews: for iPhone, iPad and IPod Touch Paperback,2012, Tim Duckett, Apress
6. iOS Programming: The Big Nerd Ranch Guide Paperback, 2014, Joe COnway, Aaron Hilegass, Christian Keur.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K3	K4	K5
Course Outcomes	CO1	K2	2	-	1	2	2	1	-	-	-	-	2	-	2	-	-
	CO2	K4	-	3	-	-	1	-	-	-	-	1	1	-	-	3	-
	CO3	K4	-	3	-	-	-	-	-	-	-	-	1	-	-	3	-
	CO4	K3	-	2	-	-	-	-	2	-	-	-	-	-	-	2	-
	CO5	K4	-	3	-	-	-	-	-	-	-	-	-	-	-	3	-
Average Correlation Level			2	2.75	1	2	1.5	1	2	-	-	1	1.3	-	2	2.75	-

19CSE40	AGILE METHODOLOGIES			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

The student should be made to:

- To provide students with a theoretical as well as practical understanding of agile software development practices
- To provide a good understanding of software design and a set of software technologies
- To do a detailed examination and demonstration of Agile development and testing techniques.
- To understand the benefits and pitfalls of working in an Agile team.
- To understand Agile development and testing.

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Perform iterative software development processes: how to plan them, how to execute them.

CO2: Point out the impact of social aspects on software development success.

CO3: Develop techniques and tools for improving team collaboration and software quality.

CO4: Perform Software process improvement as an ongoing task for development teams.

CO5: Show how agile approaches can be scaled up to the enterprise level.

COURSE CONTENT:

UNIT 1: **AGILE METHODOLOGY**	9 hrs

Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values.

UNIT 2: **AGILE PROCESSES**	9 hrs

Lean Production - SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

UNIT 3: **AGILITY AND KNOWLEDGE MANAGEMENT**	9 hrs

Agile Information Systems – Agile Decision Making - Earl_S Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment , Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM).

UNIT 4: **AGILITY AND REQUIREMENTS ENGINEERING**	9 hrs

Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction

Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.

UNIT 5: **AGILITY AND QUALITY ASSURANCE** | 9 hrs

Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance - Test Driven Development – Agile Approach in Global Software Development.

Total Hours | **45**

TEXT BOOKS:

1. David J. Anderson and Eli Schragenheim, ―Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results‖, Prentice Hall, 2003.
2. Hazza and Dubinsky, ―Agile Software Engineering, Series: Undergraduate Topics in Computer Science‖, Springer, 2009.

REFERENCES:

1. Craig Larman, ―Agile and Iterative Development: A Manager_s Guide‖, Addison-Wesley, 2004.
2. Kevin C. Desouza, ―Agile Information Systems: Conceptualization, Construction, and Management‖, Butterworth-Heinemann, 2007

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K3	K4	K5
Course Outcomes	CO1	K2	2		-	-	1	-	-	-	-	-	-	-	2	-	-
	CO2	K4		3	-	-	-	1	-	-	2	-	-	-	-	3	-
	CO3	K4		3	-	-	-	-	1	2	-	-	2	1	-	3	-
	CO4	K3		2	-	-	-	-	-	-	-	1	-	-	-	2	-
	CO5	K4		3	-	-	-	-	-	-	-	-	-	3	-	3	-
Average Correlation Level			2	2.75	-	-	1	1	1	2	2	1	2	2	2	1.5	2

19CSE41	DATABASE TUNING			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To get the feel of basics of database tuning.
- To learn concepts behind database design optimization.
- To write procedures involving query planning.

COURSE OUTCOMES:

CO1: Design databases involving normalization.
CO2: Write optimized code for accessing multiple databases.
CO3: Use tuning tools for different database operations.
CO4: Troubleshoot database issues.
CO5: Use benchmark databases for demonstrating concepts behind database tuning.

COURSE CONTENT:

UNIT 1: **FUNDAMENTALS OF TUNING** — 9 hrs

Review of Relational Databases – Relational Algebra - Locking and Concurrency Control– Correctness Consideration – Lock Tuning – Transaction Chopping – Logging and the Recovery Subsystem – Principles of Recovery – Tuning the Recovery Subsystem – Recovery Tuning– Operating Systems Considerations – Hardware Tuning

UNIT 2: **LOGICAL AND PHYSICAL DESIGN** — 9 hrs

Indexes – Clustering Indexes – Non Clustering Indexes – Composite Indexes – Comparison of Indexing and Hashing techniques – Hot Table – Storage Structure Optimization through Index Tuning.

UNIT 3: **SECURITY STANDARDS** — 9 hrs

Tuning Relational Systems – Normalization – Tuning De-normalization – Clustering Two Tables – Aggregate Maintenance – Record Layout –Triggers – Client Server Mechanisms – Types of Queries – Query Tuning

UNIT 4: **SECURITY PRACTICES** — 9 hrs

Objects, Application Tools and Performance –Tuning the Application Interface – Bulk Loading Data – Accessing Multiple Databases – ODBC – JDBC Tuning — Case Studies: Tuning E-Commerce Application– Data Warehouse Tuning.

UNIT 5: **SECURE DEVELOPMENT** — 9 hrs

Query Plan Explainers – Performance Monitors – Event Monitors – Finding ―Suspicious‖ Queries – Understanding Access Plans – Analyzing a Query‘s Access Plan – Profiling a Query Execution –

Analyzing DBMS Subsystems and Hardware Resources – SQL performance Analyzer – Time Series Databases – Configuration Parameters: Oracle; SQL Server; DB2UDB.

Total Hours	**45**

TEXT BOOKS:

1. Dennis Shasha and Philippe Bonnet ―Database Tuning, Principles, Experiments, and Troubleshooting Techniques‖, Morgan Kaufmann: An Imprint of Elsevier, 2003.
2. Richard Niemiec, ―Oracle Database 11g Release 2 Performance Tuning Tips and Techniques‖, McGraw Hill Osborne, 2012

REFERENCES:

1. Peter Gulutzan and Trudy Pelzer, ―SQL Performance Tuning‖, Addison-Wesley, First Edition, 2002.
2. Thomas Connolly and Carolyn Begg, ―Database Systems: A Practical Approach to Design, Implementation and Management‖, Fifth Edition, Pearson Education, 2009.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES <Times New roman>Font Size, 8.

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K4	-	2	3	-	-	-	-	-	-	-	-	-	2	3	-
	CO2	K2	-	3	-	2	-	-	-	-	-	-	-	-	2	-	-
	CO3	K3	1	-	-	-	2	-	-	-	-	-	-	-	3	-	-
	CO4	K5	-	-	-	3	2	-	-	-	-	-	-	-	-	2	-
	CO5	K3	2	1	3	-	-	-	-	-	-	-	-	-	2	-	-
Average Correlation Level			1.5	2	3	2.5	2	-	-	-	-	-	-	-	2.25	2.5	-

19CSE42	GAME PROGRAMMING			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

The student should be made to:

- Understand the concepts of Game design and development.
- Learn the processes, mechanics and issues in Game Design.
- Be exposed to the Core architectures of Game Programming.
- Know about Game programming platforms, frame works and engines.

  Learn to develop games.

COURSE OUTCOMES:

Upon completion of the course, students will be able to

CO1: Discuss the concepts of Game design and development.

CO2: Design the processes, and use mechanics for game development.

CO3: Explain the Core architectures of Game Programming.

CO4: Use Game programming platforms, frame works and engines.

CO5: Create interactive Games.

COURSE CONTENT:

UNIT 1: **3D GRAPHICS FOR GAME PROGRAMMING**	9 hrs

3D Transformations, Quaternions, 3D Modeling and Rendering, Ray Tracing, Shader Models, Lighting, Color, Texturing, Camera and Projections, Culling and Clipping, Character Animation, Physics-based Simulation, Scene Graphs.

UNIT 2: **GAME ENGINE DESIGN**	9 hrs

Game engine architecture, Engine support systems, Resources and File systems, Game loop and real-time simulation, Human Interface devices, Collision and rigid body dynamics, Game profiling.

UNIT 3: **GAME PROGRAMMING**	9 hrs

Application layer, Game logic, Game views, managing memory, controlling the main loop, loading and caching game data, User Interface management, Game event management.

UNIT 4: **GAMING PLATFORMS AND FRAMEWORKS**	9 hrs

2D and 3D Game development using Flash, DirectX, Java, Python, Game engines - DX Studio, Unity.

UNIT 5: GAME DEVELOPMENT	9 hrs
Developing 2D and 3D interactive games using DirectX or Python – Isometric and Tile Based Games, Puzzle games, Single Player games, Multi Player games.	
Total Hours	**45**

TEXT BOOKS:

1. Mike Mc Shaffrfy and David Graham, "Game Coding Complete", Fourth Edition, Cengage Learning, PTR, 2012.
2. Jason Gregory, "Game Engine Architecture", CRC Press / A K Peters, 2009.
3. David H. Eberly, "3D Game Engine Design, Second Edition: A Practical Approach to Real-Time Computer Graphics" 2nd Editions, Morgan Kaufmann, 2006.

REFERENCES:

1. Ernest Adams and Andrew Rollings, "Fundamentals of Game Design", 2nd Edition Prentice Hall / New Riders, 2009.
2. Eric Lengyel, "Mathematics for 3D Game Programming and Computer Graphics", 3rd Edition, Course Technology PTR, 2011.
3. Jesse Schell, The Art of Game Design: A book of lenses, 1st Edition, CRC Press, 2008.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K3	K4	K5
Course Outcomes	CO1	K2	2	-	-	-	1	-	2	1	-	-	-	-	2	-	-
	CO2	K4	-	3	-	-	2	-	2	-	-	3	-	-	-	3	-
	CO3	K4	-	3	-	-	1	-	-	1	-	-	-	-	-	3	-
	CO4	K3	-	2	-	-	-	1	-	-	-	-	-	-	-	2	-
	CO5	K4	-	3	-	-	-	-	-	-	-	-	-	1	-	3	-
Average Correlation Level			2	2.75	-	-	1.3	1	2	1	-	3	-	1	2	2.75	-

19CSE43	GPU ARCHITECTURE AND PROGRAMMING			
L	T	P	C	
3	0	0	3	

COURSE OBJECTIVES:

The student should be made to:

- To understand the basics of programming for heterogeneous architectures
- To know programming for massively parallel processors
- To understand the issues in mapping algorithms for GPUs

To introduce different GPU programming models

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Describe GPU Architecture and its components

CO2: Write programs using CUDA

CO3: Analyze the development issues on GPU programming.

CO4: Implement algorithms in GPUs to get maximum occupancy and throughput

Program in any heterogeneous programming model

COURSE CONTENT:

UNIT 1: **GPU ARCHITECTURE**	9 hrs

Understanding Parallelism with GPU –Typical GPU Architecture - CUDA Hardware Overview - Threads, Blocks, Grids, Warps, Scheduling - Memory Handling with CUDA: Shared Memory, Global Memory, Constant Memory and Texture Memory.

UNIT 2: **GPU PROGRAMMING**	9 hrs

Using CUDA - Multi GPU - Multi GPU Solutions - Optimizing CUDA Applications: Problem Decomposition, Memory Considerations, Transfers, Thread Usage, Resource Contentions, Self-tuning Applications.

UNIT 3: **PROGRAMMING ISSUES**	9 hrs

Common Problems: CUDA Error Handling, Parallel Programming Issues, Synchronization, Algorithmic Issues, Finding and Avoiding Errors.

UNIT 4: **ALGORITHMS ON GPU**	9 hrs

Parallel Patterns: Convolution, Prefix Sum, Sparse Matrix - Matrix Multiplication - Programming Heterogeneous Cluster - CUDA Dynamic Parallelism.

UNIT 5: OTHER GPU PROGRAMMING MODELS	9 hrs
Introducing OpenCL, OpenACC, Thrust.	
Total Hours	**45**

TEXT BOOKS:

1. Shane Cook, CUDA Programming: ―A Developer's Guide to Parallel Computing with GPUs (Applications of GPU Computing)‖, First Edition, Morgan Kaufmann, 2012.
2. David B. Kirk, Wen-mei W. Hwu,‖ Programming Massively Parallel Processors - A Hands-on Approach‖, Second Edition, Morgan Kaufmann, 2012.

REFERENCES:

1. Nicholas Wilt, ―CUDA Handbook: A Comprehensive Guide to GPU Programming‖, Addison - Wesley, 2013.
2. Jason Sanders, Edward Kandrot, ―CUDA by Example: An Introduction to General Purpose GPU Programming‖, Addison - Wesley, 2010.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES <Times New roman>Font Size, 8.

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K2	-	-	3	2	-	-	-	-	-	-	-	-	-	2	-
	CO2	K4	-	-	-	3	3	-	-	-	-	1	-	1	2	2	-
	CO3	K4	-	3	3	-	-	-	-	-	-	1	-	-	-	-	2
	CO4	K3	-	3	-	-	3	-	-	-	-	2	-	1	-	2	-
	CO5	K4	-	-	3	-	-	3	-	-	-	-	2	1	-	2	-
Average Correlation Level			-	3	3	2.5	3	3	-	-	-	1.3	2	1	2	2	2

19CSE44	GRAPH THEORY			
L	T	P	C	
3	0	0	3	

COURSE OBJECTIVES:

The objective of the Course is

- To comprehend graphs as modeling and analysis tool
- To introduce various data structures with graph theory
- To explore modern applications of graph theory

COURSE OUTCOMES:

At the end of the Course, the students will be able to

CO1 : Understand the concept of graphs and its types

CO2 : Learn spanning trees and connectivity in a graph which have more applications in Computer Science..

CO3 : Familiarize with digraphs and network flows

CO4 : Learn to correlate graphs and matrices.

CO5 : Apply suitable graph model and algorithm for solving application problems.

COURSE CONTENT:

UNIT I GRAPHS 9hrs

Introduction - Graph Terminologies - Types of Graphs - Sub Graph- Multi Graph - Regular Graph - Isomorphism - Isomorphic Graphs - Sub-graph - Euler graph - Hamiltonian Graph - Related Theorems

UNIT II TREES, CONNECTIVITY &SEPARABILITY 9hrs

Trees -Properties- Distance and Centres - Types - Rooted Tree-- TreeEnumeration Labeled Tree - Unlabeled Tree - Spanning Tree - Fundamental Circuits- Cut Sets - Properties - Fundamental Circuit and Cut-set- Connectivity- Separability -Related Theorems.

UNIT III PLANARITYAND DIRECTED GRAPH 9hrs

Network Flows - Planar Graph - Representation - Detection - Dual Graph - Geometric and Combinatorial Dual - Related Theorems - Digraph - Properties - Euler Digraph.

UNIT IV MATRICES, COLOURING, MATCHING AND COVERING 9hrs

Matrix Representation - Adjacency matrix- Incidence matrix- Circuit matrix - Cut-set matrix - Path Matrix- Properties - Related Theorems - Correlations. Graph Coloring - Chromatic Polynomial - Chromatic Partitioning - Matching - Covering - Related Theorems

UNIT V GRAPH ALGORITHMS AND APPLICATIONS	9hrs
Graph Algorithms- Connectedness and Components- Spanning Tree- Fundamental Circuits- Cut Vertices- Directed Circuits- Shortest Path - Applications overview	
Total Hours	**45**

TEXT BOOKS:

1. Narsingh Deo, “Graph Theory: With Application to Engineering and Computer Science”, Prentice Hall of India, 2003.
2. L.R.Foulds , "Graph Theory Applications", Springer ,2016.

REFERENCES:

1. Clark J. and Holton D.A, “A First Look at Graph Theory”, Allied Publishers, 1995.
2. Bondy, J. A. and Murty, U.S.R., "Graph Theory with Applications", North Holland Publication,2008.
3. West, D. B., ―Introduction to Graph Theory‖, Pearson Education, 2011.Liu C.L., “Elements of Discrete Mathematics”, Mc Graw Hill, 1985.
4. Diestel, R, "Graph Theory", Springer,3rd Edition,2006

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K2	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	CO2	K3	3	2	1	1	-	-	-	-	-	-	-	-	1	1	1
	CO3	K3	3	2	1	1	-	-	-	-	-	-	-	-	1	1	1
	CO4	K2	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	CO5	K3	3	2	1	1	-	-	-	-	-	-	-	-	1	1	1
Average Correlation Level			2.6	1.6	1	1	-	-	-	-	-	-	-	-	1	1	1

3: High 2: Medium 1: Low

19CSE45	NANO COMPUTING				
		L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

The student should be made to:

- Learn nano computing challenges.
- Be familiar with the imperfections.
- Be exposed to reliability evaluation strategies.
- Learn nano scale quantum computing.
- Understand Molecular Computing and Optimal Computing.

COURSE OUTCOMES:

Upon completion of the course, the student should be able to:

CO1: Discuss nano computing challenges.
CO2: Handle the imperfections.
CO3: Apply reliability evaluation strategies.
CO4: Use nano scale quantum computing.
CO5: Utilize Molecular Computing and Optimal Computing.

COURSE CONTENT:

UNIT 1: **NANOCOMPUTING-PROSPECTS AND CHALLENGES**	9 hrs

Introduction - History of Computing - Nanocomputing - Quantum Computers – Nanocomputing Technologies - Nano Information Processing - Prospects and Challenges - Physics of Nanocomputing : Digital Signals and Gates - Silicon Nanoelectronics - Carbon Nanotube Electronics - Carbon Nanotube Field-effect Transistors – Nanolithography.

UNIT 2: **NANOCOMPUTING WITH IMPERFECTIONS**	9 hrs

Introduction - Nanocomputing in the Presence of Defects and Faults - Defect Tolerance - Towards Quadrillion Transistor Logic Systems.

UNIT 3: **RELIABILITY OF NANOCOMPUTING**	9 hrs

Markov Random Fields - Reliability Evaluation Strategies - NANOLAB - NANOPRISM - Reliable Manufacturing and Behavior from Law of Large Numbers.

UNIT 4: **NANOSCALE QUANTUM COMPUTING**	9 hrs

Quantum Computers - Hardware Challenges to Large Quantum Computers - Fabrication, Test, and Architectural Challenges - Quantum-dot Cellular Automata (QCA) - Computing with QCA - QCA Clocking - QCA Design Rules.

UNIT 5: QCADESIGNER SOFTWARE AND QCA IMPLEMENTATION	9 hrs
Basic QCA Circuits using QCA Designer - QCA Implementation - Molecular and Optical Computing: Molecular Computing - Optimal Computing - Ultrafast Pulse Shaping and Tb/sec Data Speeds.	
Total Hours	**45**

TEXT BOOKS:

1. Sahni V. and Goswami D., Nano Computing, McGraw Hill Education Asia Ltd. (2008), ISBN (13): 978007024892.

REFERENCES:

1. Sandeep K. Shukla and R. Iris Bahar., Nano, Quantum and Molecular Computing, Kluwer Academic Publishers 2004, ISBN: 1402080670.
2. Sahni V, Quantum Computing, McGraw Hill Education Asia Ltd. 2007.
3. Jean-Baptiste Waldner, Nanocomputers and Swarm Intelligence, John Wiley & Sons, Inc. 2008, ISBN (13): 978-1848210097.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES <Times New roman>Font Size, 8.

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K4	-	2	3	-	-	-	-	-	-	-	-	-	2	3	-
	CO2	K2	-	3	-	2	-	-	-	-	-	-	-	-	2	-	-
	CO3	K3	1	-	-	-	2	-	-	-	-	-	-	-	3	-	-
	CO4	K5	-	-	-	3	2	-	-	-	-	-	-	-		2	-
	CO5	K3	2	1	3	-	-	-	-	-	-	-	-	-	2	-	-
Average Correlation Level			1.5	2	3	2.5	2	-	-	-	-	-	-	-	2.25	2.5	-

19CSE46	ROBOTICS				
		L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

The student should be made to:

- To understand robot locomotion and mobile robot kinematics
- To understand perception in robotics
- To understand mobile robot localization
- To understand mobile robot mapping
- To understand simultaneous localization and mapping (SLAM)
- To understand robot planning and navigation

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

CO1: Apply robot locomotion, kinematics models and constraints

CO2: Implement vision algorithms for robotics

CO3: Implement robot localization and mapping techniques

CO4: Implement SLAM algorithms

CO5: Explain planning and navigation in robotics

UNIT 1: **LOCOMOTION AND KINEMATICS**	9 hrs

Introduction to Robotics – key issues in robot locomotion – legged robots – wheeled mobile robots – aerial mobile robots – introduction to kinematics – kinematics models and constraints – robot maneuverability

UNIT 2: **ROBOT PERCEPTION**	9 hrs

Sensors for mobile robots – vision for robotics – cameras – image formation – structure from stereo – structure from motion – optical flow – color tracking – place recognition – range data.

UNIT 3: **MOBILE ROBOT LOCALIZATION**	9 hrs

Introduction to localization – challenges in localization – localization and navigation – belief representation – map representation – probabilistic map-based localization – Markov localization – EKF localization – UKF localization – Grid localization – Monte Carlo localization – localization in dynamic environments.

UNIT 4: **MOBILE ROBOT MAPPING**	9 hrs

Autonomous map building – occupancy grip mapping – MAP occupancy mapping – SLAM – extended Kalman Filter SLAM – graph-based SLAM – particle filter SLAM – sparse extended information filter – fastSLAM algorithm.

UNIT 5: PLANNING AND NAVIGATION	9 hrs
Introduction to planning and navigation – planning and reacting – path planning – obstacle avoidance techniques – navigation architectures – basic exploration algorithms.	
Total Hours	**45**

TEXT BOOKS:

1. Roland Seigwart, Illah Reza Nourbakhsh, and Davide Scaramuzza, "Introduction to autonomous mobile robots", Second Edition, MIT Press, 2011.

REFERENCES:

1. Sebastian Thrun, Wolfram Burgard, and Dieter Fox, "Probabilistic Robotics", MIT Press, 2005.
2. Howie Choset et al., "Principles of Robot Motion: Theory, Algorithms, and Implementations", A Bradford Book, 2005.
3. Gregory Dudek and Michael Jenkin, "Computational Principles of Mobile Robotics", Second Edition, Cambridge University Press, 2010.
4. Maja J. Mataric, "The Robotics Primer", MIT Press, 2007.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K3	K4	K5
Course Outcomes	CO1	K4	-	3	-	-	3	-	-	-	2	1	-	-	-	3	-
	CO2	K4	-	3	-	-	3	1	-	-	-	-	-	-	-	3	-
	CO3	K1	1	-	-	-	3	-	-	-	2	3	-	-	1	-	-
	CO4	K2	2	-	-	-	-	-	-	-	-	-	-	1	2	-	-
	CO5	K4	-	3	1	-	-	-	-	-	-	-	-	1	-	3	-
Average Correlation Level			1.5	3	1	-	3	1	-	-	2	2	-	1	1.5	3	-

19CSE47	ADVANCED COMPUTER ARCHITETURE			
L	T	P	C	
3	0	0	3	

COURSE OBJECTIVES:

- Learn to explain the micro-architectural design of processors
- Learn to analyze about the various techniques used to obtain performance improvement and power savings in current processors

COURSE OUTCOMES:

CO1: Evaluate performance of different architectures with respect to various parameters
CO2: Analyze performance of different ILP techniques
CO3: Identify cache and memory related issues in multi-processors
CO4 : Describe the architecture of Multi core processors.
CO5: Analyze the performance issues of thread level parallelism.

COURSE CONTENT:

UNIT 1: **INSTRUCTION LEVEL PARALLELISM** — 9 hrs

ILP – Concepts and challenges – Hardware and software approaches – Dynamic scheduling – Speculation - Compiler techniques for exposing ILP – Branch prediction.

UNIT 2MULTIPLE ISSUE PROCESSORS — 9 hrs

VLIW & EPIC – Advanced compiler support – Hardware support for exposing parallelism – Hardware versus software speculation mechanisms – IA 64 and Itanium processors – Limits on ILP.

UNIT 3: **MULTIPROCESSORS AND THREAD LEVEL PARALLELISM** — 9 hrs

Symmetric and distributed shared memory architectures – Performance issues – Synchronization – Models of memory consistency – Introduction to Multithreading.

UNIT 4: **MEMORY AND I/O** — 9 hrs

Cache performance – Reducing cache miss penalty and miss rate – Reducing hit time – Main memory and performance – Memory technology. Types of storage devices – Buses – RAID – Reliability, availability and dependability – I/O performance measures – Designing an I/O system.

UNIT 5: **MULTI-CORE ARCHITECTURES** — 9 hrs

Software and hardware multithreading – SMT and CMP architectures – Design issues – Case studies – Intel Multi-core architecture – SUN CMP architecture - heterogenous multi-core processors – case study: IBM Cell Processor

Total Hours	**45**

TEXT BOOKS:

1. John L. Hennessey and David A. Patterson, " Computer architecture – A quantitative approach", Morgan Kaufmann / Elsevier Publishers, 6th. edition, 2017.

REFERENCES:

1. David E. Culler, Jaswinder Pal Singh, "Parallel computing architecture: A hardware / software approach" , Morgan Kaufmann /Elsevier Publishers, 1999.
2. Kai Hwang and Zhi.Wei Xu, "Scalable Parallel Computing", Tata McGraw Hill, New Delhi, 2003.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K3	K4	K5
Course Outcomes	CO1	K4	-	3	-	-	-	-	-	-	-	-	-	-	-	3	-
	CO2	K4	-	3	-	-	-	-	-	-	-	-	-	-	-	3	-
	CO3	K1	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
	CO4	K2	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-
	CO5	K4	-	3	-	-	-	-	-	-	-	-	-	-	-	3	-
Average Correlation Level			1.5	3	-	-	-	-	-	-	-	-	-	-	1.5	3	-

19CSE48	SOFTWARE TESTING				
		L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

The student should be made to:

- Expose the criteria for test cases.
- Learn the design of test cases.
- Be familiar with test management and test automation techniques.
- Be exposed to test metrics and measurements.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Design test cases suitable for a software development for different domains.
CO2: Identify suitable tests to be carried out.
CO3: Prepare test planning based on the document.
CO4: Document test plans and test cases designed.
CO5: Develop and validate a test plan.

UNIT 1: **TESTING BASICS** — 9 hrs

Testingasanengineeringactivity–Roleof Processinsoftwarequality–Testingasa process– Basicdefinitions–Softwaretesting principles–Thetester'sroleina softwaredevelopmentorganization– Originsof defects–Defectclasses–Thedefect repository and test design – Defect examples – Developer / tester support for developing a defect repository.

UNIT 2: **TEST CASE DESIGN** — 9 hrs

Introduction to testing design strategies –The smarter tester – Test case design strategies– Usingblackboxapproachtotestcasedesign–Random testing– Equivalenceclasspartitioning– Boundaryvalueanalysis–Otherblackboxtest design approaches – Black box Testing and COTS – Using white box approach to test design – Test adequacy criteria – Coverage and control flow graphs – Covering code logic – Paths – Their role in white box based test design – Additional white box test design approaches – Evaluating test adequacy criteria.

UNIT 3: **LEVELS OF TESTING** — 9 hrs

Theneedforlevelsoftesting–Unittest–Unittestplanning–Designingtheunit tests – The class as a testable unit – Thetestharness–Runningtheunittestsand recordingresults–Integration tests – Designing integration tests – Integration test planning–System test–Thedifferenttypes– Regressiontesting–Alpha,betaand acceptancetests.

UNIT 4: **TEST MANAGEMENT** — 9 hrs

Basic concepts–Testinganddebugginggoalsandpolicies–Testplanning–Test plancomponents– Testplanattachments–Locatingtestitems–Reportingtest results– Theroleof threegroupsin testplanningandpolicydevelopment–Process and the engineering disciplines – Introducing the test

specialist– Skills neededby a test specialist – Building a testing group.

UNIT 5: TEST AUTOMATION | 9 hrs

Software test automation – skill needed for automation – scope of automation – design and architecture for automation – requirements for a test tool – challenges in automation – Test metrics and measurements – project, progress and productivity metrics.

Total Hours | **45**

TEXT BOOKS:

1. IleneBurnstein,"PracticalSoftwareTesting",SpringerInternationalEdition, 2003.
2. EdwardKit,"SoftwareTestingintheRealWorld–ImprovingtheProcess", Pearson Education, 1995.

REFERENCES:

1. Elfriede Dustin, "Effective Software Testing", Pearson Education, 2003.
2. RenuRajaniandPradeepOak,"SoftwareTesting–EffectiveMethods,Tools and Techniques", Tata McGraw Hill, 2003.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K3	K4	K5
Course Outcomes	CO1	K4	-	3	-	-	-	-	-	-	-	-	-	-	-	3	-
	CO2	K4	-	3	-	-	-	-	-	-	-	-	-	-	-	3	-
	CO3	K1	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
	CO4	K2	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-
	CO5	K4	-	3	-	-	-	-	-	-	-	-	-	-	-	3	-
Average Correlation Level			1.5	3	-	-	-	-	-	-	-	-	-	-	1.5	3	-

19CSE49	MACHINE LEARNING TECHNIQUES				
		L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

The student should be made to:

- Understand basic concepts and techniques of Machine Learning.
- Thorough understanding of the Supervised and Unsupervised learning techniques.
- Study the various probability based learning techniques
- Understand graphical models of machine learning algorithms

COURSE OUTCOMES

At the end of the course, the student should be able to

CO1: Distinguish between, supervised, unsupervised and semi-supervised learning
CO2: Apply the apt machine learning strategy for any given problem
CO3: Suggest supervised, unsupervised or semi-supervised learning algorithms for any given problem
CO4: Design systems that uses the appropriate graph models of machine learning
CO5: Modify existing machine learning algorithms to improve classification efficiency

COURSE CONTENT:

UNIT 1: INTRODUCTION 9 hrs

Learning – Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Design a Learning System – Perspectives and Issues in Machine Learning – Concept Learning Task – Concept Learning as Search – Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm – Linear Discriminants – Perceptron – Linear Separability – Linear Regression.

UNIT 2: LINEAR MODELS 9 hrs

Multi-layer Perceptron – Going Forwards – Back Propagation Error – Multi-layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back-Propagation – Radial Basis Functions and Splines – Concepts – RBF Network – Curse of Dimensionality – Interpolations and Basis Functions – Support Vector Machines.

UNIT 3 : TREE AND PROBABILISTIC MODELS 9 hrs

Learning with Trees – Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers – Probability and Learning – Data into Probabilities – Basic Statistics – Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms – Vector Quantization – Self Organizing Feature Map

UNIT 4 : DIMENSIONALITY REDUCTION AND EVOLUTIONARY MODELS	9 hrs
Dimensionality Reduction – Linear Discriminant Analysis – Principal Component Analysis – Factor Analysis – Independent Component Analysis – Locally Linear Embedding – Isomap – Least Squares Optimization – Evolutionary Learning – Genetic algorithms – Genetic Offspring: - Genetic Operators – Using Genetic Algorithms – Reinforcement Learning – Overview – Getting Lost Example – Markov Decision Process	
UNIT 5 : GRAPHICAL MODELS	9 hrs
Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods	
Total Hours	**45**

TEXT BOOKS:

1. Stephen Marsland, ―Machine Learning – An Algorithmic Perspective‖, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

2. Tom M Mitchell, ―Machine Learning‖, First Edition, McGraw Hill Education, 2013.

REFERENCES:

1. Peter Flach, ―Machine Learning: The Art and Science of Algorithms that Make Sense of Data‖, First Edition, Cambridge University Press, 2012.

2. Jason Bell, ―Machine learning – Hands on for Developers and Technical Professionals‖, First Edition, Wiley, 2014

3. Ethem Alpaydin, ―Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series)‖, Third Edition, MIT Press, 2014

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES <Times New roman>Font Size, 8.

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K2	3	-	-	-	3	-	-	-	-	-	-	-	-	2	-
	CO2	K3	-	3	-	2	-	-	-	-	-	-	-	-	-	2	-
	CO3	K4	-	-	3	2	-	-	-	-	-	-	-	-	-	2	-
	CO4	K1	-	2	-	3	-	-	-	-	-	-	-	-	-	2	-
	CO5	K2	2	-	-	-	3	-	-	-	-	-	-	-	-	2	-
Average Correlation Level			2.5	2.5	3	2.3	3	-	-	-	-	-	-	-	-	2	-

19CSE50	MULTICORE ARCHITECTURE AND PROGRAMMING			
L	T	P	C	
3	0	0	3	

COURSE OBJECTIVES:

The student should be made to:

- Understand the concepts of Multi core processors
- Understand the challenges in parallel and multi-threaded programming.
- Learn about shared memory programming.
- Learn about distributed memory programming
- Develop Parallel Program

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Define the concepts and architecture of multicore processors.
- Examine the challenges of parallel programming
- Develop shared memory programming with OpenMP
- Develop distributed memory programming with MPI
- Compare and contrast programming for serial processors and programming for parallel processors.

COURSE CONTENT:

UNIT 1: MULTI-CORE PROCESSORS **9 hrs**

Single core to Multi-core architectures – SIMD and MIMD systems – Interconnection networks - Symmetric and Distributed Shared Memory Architectures – Cache coherence - Performance Issues – Parallel program design.

UNIT 2: PARALLEL PROGRAM CHALLENGES **9 hrs**

Performance – Scalability – Synchronization and data sharing – Data races – Synchronization primitives (mutexes, locks, semaphores, barriers) – deadlocks and livelocks – communication between threads (condition variables, signals, message queues and pipes).

UNIT 3: SHARED MEMORY PROGRAMMING WITH OpenMP **9 hrs**

OpenMP Execution Model – Memory Model – OpenMP Directives – Work-sharing Constructs - Library functions – Handling Data and Functional Parallelism – Handling Loops - Performance Considerations.

UNIT 4: DISTRIBUTED MEMORY PROGRAMMING WITH MPI **9 hrs**

MPI program execution – MPI constructs – libraries – MPI send and receive – Point-to-point and Collective communication – MPI derived datatypes – Performance evaluation

UNIT 5: PARALLEL PROGRAM DEVELOPMENT	**9 hrs**
Case studies - n-Body solvers – Tree Search – OpenMP and MPI implementations and comparison.	
Total Hours	**45**

TEXT BOOKS: .

1.Peter S. Pacheco, "An Introduction to Parallel Programming", Morgan-Kauffman/Elsevier, 2011.

2. Darryl Gove, "Multicore Application Programming for Windows, Linux, and Oracle Solaris",Pearson, 2011

REFERENCES:

1.Michael J Quinn, "Parallel programming in C with MPI and OpenMP", Tata McGraw Hill, 2003.

2. Shameem Akhter and Jason Roberts, "Multi-core Programming", Intel Press, 2006.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K3	K4	K5
Course Outcomes	CO1	K2	1	-	3	-	3	-	-	-	-	-	-	-	2	-	-
	CO2	K4	-	3	-	2	2	-	-	-	-	-	-	-	-	3	-
	CO3	K4	2	3	-	1	-	-	-	-	-	-	-	-	-	3	-
	CO4	K3	3	-	2	2	-	-	-	-	-	-	-	-	3	-	-
	CO5	K4	-	3	-	2	-	-	-	-	-	-	-	-	-	3	-
Average Correlation Level			2	3	2.5	1.5	2.5	-	-	-	-	-	-	-	2.5	3	-

19CSE51	ADVANCED MICROPROCESSORS AND MICROCONTROLLERS			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To introduce the concepts in internal programming model of Intel family of microprocessors.
- To introduce the programming techniques using MASM, DOS and BIOS function calls.
- To introduce the basic architecture of Pentium family of processors
- To introduce the architecture programming and interfacing of 16 bit microcontrollers.
- To introduce the concepts and architecture of RISC processor and ARM

COURSE OUTCOMES:

Upon completion of this course, students are able to

CO1: Define the concepts of advanced microprocessor architecture.
CO2: Experiment with modular programming concepts
CO3: Examine the working of Pentium processors.
CO4: Portray the diverse units of 8096/8097 Microcontroller architecture.
CO5: Explain the architecture of ARM and RISC

COURSE CONTENT:

UNIT 1: ADVANCED MICROPROCESSOR ARCHITECTURE **9 hrs**

Internal Microprocessor Architecture-Real mode memory addressing – Protected Mode Memory addressing –Memory paging - Data addressing modes – Program memory addressing modes – Stack memory addressing modes – Data movement instructions – Program control instructions- Arithmetic and Logic Instructions.

UNIT 2: MODULAR PROGRAMMING AND ITS CONCEPTS **9 hrs**

Modular programming –Using keyboard and Video display –Data Conversions- Disk files- Interrupt hooks- using assembly languages with C/ C++

UNIT 3: PENTIUM PROCESSORS **9 hrs**

Introduction to Pentium Microprocessor – Special Pentium registers- Pentium memory management – New Pentium Instructions –Pentium Processor –Special Pentium pro features – Pentium 4 processor

UNIT 4: 16-BIT MICRO CONTROLLER **9 hrs**

8096/8097 Architecture-CPU registers –RALU-Internal Program and Data memory Timers-High speed Input and Output –Serial Interface-I/O ports –Interrupts –A/D converter-Watch dog timer – Power down feature –Instruction set- External memory Interfacing –External I/O interfacing.

UNIT 5: RISC PROCESSORS AND ARM	**9 hrs**
The RISC revolution – Characteristics of RISC Architecture – The Berkeley RISC – Register Windows – Windows and parameter passing – Window overflow – RISC architecture and pipelining – Pipeline bubbles – Accessing external memory in RISC systems – Reducing the branch penalties – Branch prediction – The ARM processors – ARM registers – ARM instructions – The ARM built-in shift mechanism – ARM branch instructions – sequence control – Data movement and memory reference instructions.	
Total Hours	**45**

TEXT BOOKS:

1. Barry B.Brey, "The Intel Microprocessors 8086/8088, 80, 86, 80286, 80386 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium 4, Architecture, Programming and interfacing," Prentice Hall of India Private Limited, New Delhi, 2003. (UNIT I, II and III)
2. John Peatman, "Design with Microcontroller ",McGraw Hill Publishing Co Ltd, New Delhi. (UNIT IV)
3. Alan Clements, "The principles of computer Hardware", Oxford University Press, 3rd Edition, 2003. (UNIT V)

REFERENCES:

1. Rajkamal, The concepts and feature of micro controllers 68HC11, 8051 and 8096; S Chand Publishers, New Delhi.

Mapping			PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5
C	CO 1	K3	3	3	3	-	-	-	-	-	-	-	-	-	3
	CO 2	K3	3	3	3	-	-	-	-	-	-	-	-	3	3
	CO 3	K4		3	3	3	3	1	-	-	1	3	2	3	3
	CO 4	K3	3	3	3	3	3	-	-	-	-	3	2	-	3
	CO 5	K4		3	3	3	3	1	-	-	1	3	-	3	3
Average Correlation Level			1.8	3.0	3.0	1.8	1.8	0.4	-	-	0.4	1.8	0.8	1.8	3.0

19CSE52	DEEP LEARNING			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To present the mathematical, statistical and computational challenges of building neural networks
- To study the concepts of deep learning
- To introduce dimensionality reduction techniques
- To enable the students to know deep learning techniques to support real-time applications
- To examine the case studies of deep learning techniques

COURSE OUTCOMES:

Upon completion of the course, the students will be able to

- Understand basics of deep learning
- Implement various deep learning models
- Realign high dimensional data using reduction techniques
- Analyze optimization and generalization in deep learning
- Explore the deep learning applications

COURSE CONTENT:

UNIT 1: INTRODUCTION — 9 hrs

Introduction to machine learning- Linear models (SVMs and Perceptrons, logistic regression)- Intro to Neural Nets: What a shallow network computes- Training a network: loss functions, back propagation and stochastic gradient descent- Neural networks as universal function approximates

UNIT 2: DEEP NETWORKS — 9 hrs

History of Deep Learning- A Probabilistic Theory of Deep Learning- Back propagation and regularization, batch normalization- VC Dimension and Neural Nets-Deep Vs Shallow Networks Convolutional Networks- Generative Adversarial Networks (GAN), Semi-supervised Learning

UNIT 3: DIMENTIONALITY REDUCTION — 9 hrs

Linear (PCA, LDA) and manifolds, metric learning - Auto encoders and dimensionality reduction in networks - Introduction to Convnet - Architectures – AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyper parameter optimization

UNIT 4: OPTIMIZATION AND GENERALIZATION — 9 hrs

Optimization in deep learning– Non-convex optimization for deep networks- Stochastic Optimization Generalization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM - Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience

UNIT 5: CASE STUDY AND APPLICATIONS	9 hrs
Imagenet- Detection-Audio WaveNet-Natural Language Processing Word2Vec - Joint Detection BioInformatics- Face Recognition- Scene Understanding- Gathering Image Captions	
Total Hours	**45**

TEXT BOOKS:

1.Cosma Rohilla Shalizi, Advanced Data Analysis from an Elementary Point of View, 2015.

REFERENCES:

1. Deng & Yu, Deep Learning: Methods and Applications, Now Publishers, 2013.
2. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016.
3. Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K3	K4	K5
Course Outcomes	CO1	K2	1	-	3	-	3	-	-	-	-	-	-	-	2	-	-
	CO2	K4	-	3	-	2	2	-	-	-	-	-	-	-	-	3	-
	CO3	K4	2	3	-	1	-	-	-	-	-	-	-	-	-	3	-
	CO4	K3	3	-	2	2	-	-	-	-	-	-	-	-	3	-	-
	CO5	K4	-	3	-	2	-	-	-	-	-	-	-	-	-	3	-
Average Correlation Level			2	3	2.5	1.5	2.5	-	-	-	-	-	-	-	2.5	3	-

19CSE53	INTERNET OF THINGS			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

The student should be made to:

- To learn about the fundamentals of Internet of Things
- To build a small low cost embedded system using Arduino/ Raspberry Pi or equivalent boards
- To apply the concept of Internet of Things in real world scenario

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Explain the concepts of IoT fundamentals
- Design a portable IoT using Arduino/Equivalent boards and relevant protocols
- Develop web services to access/control IoT devices
- Deploy an IoT application and connect to the cloud
- Analyze applications of IoT in real time scenario

.

COURSE CONTENT:

UNIT I FUNDAMENTALS OF IOT	9 hrs
Introduction-Characteristics - Physical design - Protocols-Logical design - Enabling technologies - IoT levels-Domain specific IoTs - IoTvs M2M	
UNIT II IOT DESIGN METHODOLOGY	9 hrs
IoT systems management - IoT design methodology-Specifications - Integration and Application Development	
UNIT III IOT COMPONENTS	9 hrs
Sensors and activators - Communication modules - Zigbee-RFID-Wi-Fi-Power sources.	
UNIT IV BUILDING IOT WITH HARDWARE PLATFORMS	9 hrs
Platform - Arduino/Intel Galileo/Raspberry Pi- Physical device - Interfaces - Programming - APIs/Packages - Web services.	
UNIT V CASE STUDIES AND ADVANCED TOPICS	9 hrs
Various Real time applications of IoT-Connecting IoT to cloud-Cloud storage for IoT-Data Analytics for IoT- Software & Management Tools for IoT.	

Total Hours	**45**

TEXT BOOKS:

3. ArshdeepBahga, Vijay Madisetti, "Internet of Things-A hands-on approach", Universities Press, 2015

REFERENCES:

3. Manoel Carlos Ramon, ―Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers‖, Apress, 2014.
4. Marco Schwartz, ―Internet of Things with the Arduino Yun‖, Packt Publishing, 2014.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES.

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K2	3	3	2	1	-	3	-	-	-	-	-	1	2	-	-
	CO2	K6	3	3	3	2	-	-	-	-	2	-	1	-	2	1	-
	CO3	K6	2	3	3	1	-	2	-	-	-	1	2	2	1	2	-
	CO4	K5	1	2	3	2	3	-	-	-	-	-		-	2	2	-
	CO5	K2	1	3	3	3	-	-	-	-	2	-		-	2	1	-
Average Correlation Level			2	2.8	2.8	1.8	3	2.5	-	-	2	1	1.5	1.5	1.8	1.5	-

OPEN ELECTIVES

19CSP01	FUNDAMENTALS OF COMPUTING			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To enable the student to learn the major components of a computer system.
- To learn about computer arithmetic and software.
- To know the correct and efficient ways of solving problems and to use office automation tools.
- To learn to program in C.
- To understand the concept of functions and pointers.

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Understand effectively about major components of a computer system.
CO2: Know how to handle arithmetic in computers.
CO3: Know how to solve problems and apply office automation tools.
CO4: Develop programs in C.
CO5: Design and implement in real world problems using functions and pointers.

COURSE CONTENT:

UNIT 1: **INTRODUCTION** — 9 hrs

Introduction – Characteristics of computers – The evolution of computers - The computer generations - Classification of computers - Basic computer organization- Number systems – Data and Information - Computer Network – Operating system -Internet and Intranet.

UNIT 2: C**OMPUTER ARITHMETIC AND SOFTWARE** — 9 hrs

Computer codes – Computer arithmetic – Binary arithmetic – Addition – Subtraction – Multiplication - Division - Computer software – Types of software – Logical system architecture – Software development steps.

UNIT 3: **PROBLEM SOLVING AND OFFICE AUTOMATION** — 9 hrs

Planning the computer program – Purpose – Algorithm – Flow charts – Pseudocode - Application software packages- Word processing – Spreadsheet – Graphics – Personal assistance.

UNIT 4: INTRODUCTION TO C	9 hrs
Overview of C – Constants, Variables and Data Types – Operators and expression – Managing input and output operators – Decision making and branching – Decision making and looping.	
UNIT 5: FUNCTIONS AND POINTERS	9 hrs
Arrays – Handling of character strings – User Defined functions - Structures and unions – Pointers – The preprocessor – Developing a C Program: Some Guidelines.	
Total Hours	**45**

TEXT BOOKS:

1.Pradeep K.Sinha and Priti Sinha, "Computer Fundamentals: Concepts, Systems and Applications", BPB Publications, 2007.

2.E. Balagurusamy, "Programming in ANSI C", TMH, New Delhi, Eighth edition, 2019.

REFERENCES:

5. Allen B.Tucker et.al, "Fundamentals of Computing I", TMH New Delhi, 1998.
6. V.Rajaraman, "Fundamentals of Computers", Prentice-Hall of India, Sixth Edition, 2015.
7. Herbert Schidt, "C Made Easy", McGraw Hill, 1989.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K2	-	-	-	-	-	-	2	-	-	-	1	-	-	-	-
	CO2	K2	-	-	-	-	-	-	2	-	-	-	1	-	-	-	-
	CO3	K3	2	1	1	1	-	1	3	-	-	-	2	-	1	1	-
	CO4	K3	2	1	1	1	-	1	3	-	-	-	2	-	1	1	-
	CO5	K4	3	2	2	1	-	1	3	-	-	-	3	-	1	1	-
Average Correlation Level			2	1	1	1	-	1	3	-	-	-	1	-	1	1	-

19CSP02	DATA STRUCTURES AND ALGORITHMS			
L	T	P	C	
3	0	0	3	

COURSE OBJECTIVES:

- To master the design and applications of linear, tree, and graph structures.
- Tounderstand various algorithm design and analysis techniques.

COURSE OUTCOMES:

CO1: Define basic static and dynamic data structures and relevant standard algorithms for them: stack, queue, dynamically linked lists, trees, graphs,

CO2: Demonstrate advantages and disadvantages of specific algorithms and data structures,

CO3: Select basic data structures and algorithms for autonomous realization of simple programs or program parts

CO4: Determine and demonstrate bugs in program, recognize needed basic operations with data structures

CO5: Formulate new solutions for programming problems or improve existing code using learned algorithms and data structures

UNIT 1: LINEAR STRUCTURES	9 hrs

Abstract Data Types (ADT) – List ADT – array-based implementation – linked listimplementation – doubly-linked lists – applications of lists –Stack ADT – Queue ADT – circular queue implementation Applications of stacks and queues.

UNIT 2: TREE STRUCTURES	9 hrs

Tree ADT – tree traversals – left child right sibling data structures for general trees –Binary Tree ADT – expression trees – applications of trees – binary search tree ADT –AVL trees – binary heaps.

UNIT 3: HASHING AND SORTING , SEARCHING	9 hrs

Hashing – Separate chaining – open addressing – rehashing – extendible hashing –Introduction to Sorting Techniques - Bubble sort –Selection sort –Insertion sort - Searching Techniques - Linear - Binary Searching.

UNIT 4: GRAPHS	9 hrs

Definitions – Topological sort – breadth-first traversal - shortest-path algorithms –minimum spanning tree – Prim's and Kruskal's algorithms – Depth-first traversal –biconnectivity – Euler circuits – applications of graphs.

UNIT 5: ALGORITHM DESIGN AND ANALYSIS	9 hrs
Introduction to algorithm design techniques: Greedy algorithms, Divide and conquer, Dynamic programming, backtracking, branch and bound, Randomized algorithms –Introduction to algorithm analysis: asymptotic notations, recurrences – Introduction to NP-complete problems.	
Total Hours	**45**

TEXT BOOKS:

1. M. A. Weiss, “Data Structures and Algorithm Analysis in C”, Second Edition, Pearson Education, 1997.

REFERENCES:

1. A. V. Aho, J1. M. A. Weiss, “Data Structures and Algorithm Analysis in C”, Second Edition, Pearson Education, 1997.
2. E. Hopcroft, and J. D. Ullman, “Data Structures and Algorithms”, Pearson Education, 198UNIT III
3. R. F. Gilberg, B. A. Forouzan, “Data Structures”, Second Edition, Thomson India Edition, 2005.
4. A. M. Tenenbaum, Y. Langsam, and M. J. Augenstein, “Data Structures using C”, Pearson Education, 1998.
5. K.S. Easwarakumar, Object Oriented Data Structures using C++, Vikas Publishing House pvt. Ltd., 2000
6. Sara Baase and A. Van Gelder, “Computer Algorithms”, Third Edition, Pearson Education, 2000.
7. T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, "Introduction to algorithms", Second Edition, Prentice Hall of India Ltd, 2001

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K2	-	-	-	-	-	-	2	-	-	-	1	-	-	-	-
	CO2	K2	-	-	-	-	-	-	2	-	-	-	1	-	-	-	-
	CO3	K3	2	1	1	1	-	1	3	-	-	-	2	-	1	1	-
	CO4	K3	2	1	1	1	-	1	3	-	-	-	2	-	1	1	-
	CO5	K4	3	2	2	1	-	1	3	-	-	-	3	-	1	1	-
Average Correlation Level			2	1	1	1	-	1	3	-	-	-	1	-	1	1	-

19CSP03	FUNDAMENTALS OF DATABASE			
L	T	P	C	
3	0	0	3	

COURSE OBJECTIVES:

- To expose the students to the fundamentals of Database Management Systems.
- To make the students understand the relational model & SQL
- To expose the students to designing the database.
- To understand the fundamentals of Transaction Processing and Query Processing.
- To familiarize the students with the different types of databases

COURSE OUTCOMES:

The Students will obtain knowledge on the following after completing the course.

CO1: Design Databases for various applications.
CO2: Use the Relational model, ER diagrams.
CO3: Apply the Normalization for Efficient Data tables' management.
CO4: Apply concurrency control and recovery mechanisms for practical problems.
CO5: Design the Query Processor and Transaction Processor.

COURSE CONTENT:

UNIT 1: **FUNDAMENTALS** — 9 hrs

Purpose of database system – Views of data – Data models – Database languages– Databasesystem architecture – Database users and administrator – Entity Relationship model (E-R Model) – E-R diagrams – Introduction to DB Models- Hierarchical, Network and Relational models

UNIT 2: **RELATIONAL MODEL** — 9 hrs

The catalog – Types – Keys – Relational algebra – Domain relational calculus – Tuple relational calculus – Fundamental operations – Additional operations – SQL fundamentals – Integrity – Triggers – Security – Advanced SQL features – Embedded SQL – Dynamic SQL – Missing information – Views.

UNIT 3: **DATABASE DESIGN** — 9 hrs

Functional dependencies – Non-loss decomposition – Functional dependencies – First – Second – Third normal forms – Dependency preservation – Boyce/codd normal form – Multi-valued dependencies and fourth normal form – Join dependencies and fifth normal form.

UNIT 4: **TRANSACTIONS** — 9 hrs

Transaction concepts – Transaction recovery – ACID properties – System recovery – Media recovery – Two phase commit – Save points – SQL facilities for recovery – Concurrency – Need for concurrency – Locking protocols – Two phase locking – Intent locking – Deadlock – Serializability – Recovery Isolation Levels – SQL Facilities for Concurrency**.**

UNIT 5: IMPLEMENTATION TECHNIQUES	9 hrs
Overview of Physical Storage Media – Magnetic Disks – RAID – Tertiary Storage – File Organization – Organization of Records in Files – Indexing and Hashing – Ordered Indices – B+ Tree Index Files – B Tree index files – Static hashing – Dynamic hashing – Query processing overview – Catalog information for cost estimation – Selection operation – Sorting – Join operation – Database Tuning.	
Total Hours	**45**

TEXT BOOKS:

1. Silberschatz, A., Korth, H.F. and Sudharshan, S., "Database System Concepts", 6th Edition, Tata Mc-Graw Hill, 2011.

REFERENCES:

1. Elmasri, R. and Navathe, S.B., "Fundamentals of Database Systems", 5th Edition, Pearson / Addison Wesley, 2008.
2. Ramakrishnan, R., "Database Management Systems", 4 t h Edition, Mc-Graw Hill, 2010.
3. Singh,S.K., "Database Systems Concepts, Design and Applications", 1st Edition, Pearson Education, 2006.
4. Date, C. J., Kannan, A. and Swamynathan, S., "An Introduction to Database Systems", 8th Edition, Pearson Education, 2006.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			**Programme Outcomes / Programme Specific Outcomes**													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K5	-	-	2	-	-	-	-	-	-	-	2	-	-	3	-
	CO2	K3	-	-	3	-	3	-	-	-	-	-	-	-	-	2	-
	CO3	K3	3	-	-	-	3	-	-	-	-	-	-	-	3	-	-
	CO4	K2	2	-	-	3	-	-	-	-	-	-	-	-	2	-	-
	CO5	K4	2	-	3	-	2	-	-	-	-	-	-	-	-	3	-
			2.3	**-**	**2.6**	**3**	**2.6**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**2.5**	**2.6**	**-**

19CSP04	OPERATING SYSTEM CONCEPTS			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To introduce students with basic concepts of operating system its function and services.
- To understand the concepts of process scheduling.
- To obtain knowledge about of the various memory management techniques.
- To learn the various file-system design and implementation issues.
- To obtain knowledge about distributed systems.

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Understand operating system its function and services.

CO2: Develop algorithms for process scheduling for a given specification of CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time.

CO3: For a given specification of memory organization develop the techniques for optimally allocating memory to processes by increasing memory utilization and for improving the access time.

CO4: Design and implement file management system.

CO5: Understand distributed systems.

COURSE CONTENT:

UNIT 1: **INTRODUCTION**	9 hrs

Operating systems – Definition – Types - Functions - Abstract view of OS - System structures –System calls - Virtual machines – Process concepts –Threads – Multithreading.

UNIT 2: **PROCESS MANAGEMENT**	9 hrs

Process scheduling - Process Co-ordination – Synchronization – Semaphores – Monitors hardware synchronization – Deadlocks – Methods for handling deadlocks.

UNIT 3: **MEMORY MANAGEMENT**	9 hrs

Memory management strategies – Contiguous and non-contiguous allocation –Virtual memory management – Demand paging - Page placement and replacement policies.

UNIT 4: **FILE MANAGEMENT**	9 hrs

File system – Basic concepts - File system design and implementation – Case study: Linux file systems - Mass storage structure – Disk scheduling – Disk management – I/O systems - System protection and security.

UNIT 5: **DISTRIBUTED SYSTEMS**	9 hrs

Distributed systems – Distributed operating systems – Distributed file systems –Distributed synchronization.

Total Hours	**45**

TEXT BOOKS:

1. Silberschatz, Galvin, and Gagne, “Operating System Concepts”, Wiley India Pvt Ltd, 9th Edition 2013.

REFERENCES:

1. William Stallings, “Operating Systems internals and design principles”, Prentice Hall, 7thEdition, 2011.
2. Andrew S. Tanenbaum, “Modern Operating Systems”, 4/E, Pearson Publications, 2014.

MAPPING OF PROGRAMME OUTCOMES WITH COURSE OUTCOMES

Mapping			Programme Outcomes / Programme Specific Outcomes													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
			K3	K4	K5	K5	K5	K5	K2	A5	A5	K5	K3	A3	K5	K5	K5
Course Outcomes	CO1	K2	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
	CO2	K3	2	1	1	1	-	1	3	-	-	-	1	-	1	1	-
	CO3	K3	2	1	1	1	-	1	3	-	-	-	1	-	1	1	-
	CO4	K3	2	1	1	1	-	1	3	-	-	-	1	-	1	1	-
	CO5	K2	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
Average Correlation Level			2	1	1	1	-	1	3	-	-	-	1	-	1	1	-