HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution Affiliated to Anna University, Chennai)

(Approved by AICTE, New Delhi, Accredited by NAAC with 'A' Grade)

COIMBATORE 641 032

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

ME CSE – CURRICULUM & SYLLABI

REGULATION 2020

Common to all ME / MBA / MCA Degree Programmes

(CHOICE BASED CREDIT SYSTEM)

INDEX

S. No.	Description	Page Number
1	Vision and Mission of the Department	iii
2	PO's and PEO's	iv
3	Regulation	1
4	Curriculum and Syllabi	25

Hindusthan College of Engineering and Technology

Approved by AICTE, New Delhi and Accredited with 'A' Grade by NAAC

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

Othakalmandapam Post, Coimbatore

REGULATION- 2020

M. E. COMPUTER SCIENCE AND ENGINEERING

Vision of the Department
To provide an excellence for individuals to develop technologically superior socially conscious and nationally responsible citizens
Mission of the Department
• To develop competent Computer Science and Engineering professionals with knowledge in current technology. • To mould them to attain excellent leadership qualities there by making them excel in their careers. • To inspire and nurture students to come out with innovation and creativity solutions meeting the societal needs.

Hindusthan College of Engineering and Technology

Approved by AICTE, New Delhi and Accredited with 'A' Grade by NAAC

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

Othakalmandapam Post, Coimbatore

Program Outcomes (PO's)

Engineering Graduates will be able to:

ENGINEERING KNOWLEDGE: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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.
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.
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.
MODERN TOOL USAGE: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
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.
ETHICS: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

INDIVIDUAL AND TEAM WORK: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
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.
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.
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.

Hindusthan College of Engineering and Technology
Approved by AICTE, New Delhi and Accredited with 'A' Grade by NAAC
(An Autonomous Institution, Affiliated to Anna University, Chennai)
Othakalmandapam Post, Coimbatore

PROGRAM EDUCATIONAL OBJECTIVES (PEO's)

PEO1: To acquire knowledge in the latest technologies and innovations and an ability to identify, analyze and solve problems in computer engineering.

PEO2: To be capable of modeling, designing, implementing and verifying a computing system to meet specified requirements for the benefit of society.

PEO3: To possess critical thinking, communication skills, teamwork, leadership skills and ethical behavior necessary to function productively and professionally.

REGULATION 2020

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution Affiliated to Anna University)

Coimbatore, Tamil Nadu, India

REGULATIONS 2020 (Choice Based Credit System)

For

Master of Engineering (M.E.)

1. PRELIMINARY DEFINITIONS AND NOMENCLATURE

In this Regulation, unless the context otherwise specifies:

I. "**Programme**" means Degree Programme. e.g. M.E., Degree Programme

II. **"Specialization"** means a discipline of the Post Graduate Degree Programme like Structural Engineering, Engineering Design,etc.

III. "**Course**" means a Theory or Practical subject that is normally studied in a semester, like Applied Mathematics, Advanced Thermodynamics, High Voltage Lab.,etc.

IV. **"Controller of Examinations (COE)"** means the Authority of the College who is responsible for all activities of the Internal and End Semester Examinations of the Autonomous College.

V. "**Head of the Institution**" means the Principal of the College.

VI. **"Head of the Department"** means Head of the Department Concerned.

VII. "**University**" means ANNA UNIVERSITY, CHENNAI.

2. ADMISSION PROCEDURE

2.1 Students for admission to the first semester of the Post Graduate Degree Programme shall be required to have passed an appropriate qualifying Degree Examination of Anna University or any examination of any other University or Authority accepted by the Syndicate of Anna University, Chennai as equivalent there to.

2.2 The Syndicate of the University may decide to restrict admission in any particular year to students having the subset of qualifications prescribed at the time of admission.

2.3 Notwithstanding the qualifying examination the student might have passed, he/she shall have a minimum level of proficiency in the appropriate Programme / courses as prescribed by the Syndicate of the University from time to time.

2.4 Eligibility conditions for admission such as the marks, class obtained, the number of attempts in the qualifying examination and physical fitness shall be as prescribed by the Syndicate of the University from time to time.

3. PROGRAMMES OFFERED AND MODE OF STUDY

3.1 PROGRAMMES OFFERED

A student may be offered admission to any one of the following programme of study approved by the University and offered in our Autonomous College.

1. M.E. (Full Time)

3.2. MODES OF STUDY:

3.2.1 **Full-Time:**

Students admitted under 'Full-Time' should be available in the College during the entire duration of working hours (From Morning to Evening on Full-Time basis) for the Curricular, Co-curricular and Extra-curricular activities.

The Full-time students should not attend any other Full-time programme(s) / course(s) or take up any Full-Time job / Part-Time job during working hours in any Institution or Company during the period of Full- Time programme. Violation of the above rules will result in cancellation of admission to the PG programme.

4. STRUCTURE OF THE PROGRAMMES

4.1 Categorization of Courses

Every Post Graduate Degree Programme will have a Curriculum with Syllabi consisting of theory and practical courses that shall be categorized as follows:

i. **Foundation Courses (FC)** may include Mathematics or other basic courses

ii. **Program Core Courses (PCC)** include the core courses relevant to the chosen specialization/branch.

iii. **Program Elective Courses (PEC)** include the elective courses relevant to the chosen specialization / branch.

iv. **Research Methodology and IPR Courses (RMC)** to understand the importance and the process of creation of patents through research.

v. **Open Elective Courses (OEC)** shall provide an opportunity to study a course from any discipline that includes the courses relevant to the chosen specialization, the courses that enhance soft and managerial skills, and the courses a student can choose from the curriculum of other M.E. / M. Tech. programmes. Registration for any one of these courses is compulsory to students in III semester for M.E.

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

vii. **Audit courses (AC)** expose the students to Unnat Bharathi Abhiyan, Constitution of India, Disaster Management, Yoga, English for Research Paper Writing, Value Education, Pedagogy Studies, Stress Management, Sanskrit for Technical Knowledge and Personality Development through Life Enlightenment Skills, Registration for any of these courses is mandatory to students in II and III Semester.

4.2 Courses per Semester

The Curriculum of a semester shall normally have a blend of Lecture courses and Practical courses including Employability Enhancement Courses, Professional Elective, Open Elective. Each course may have credits assigned.

4.3 Credit Assignment

Each course is assigned certain number of credits based on the following:

Contact period per week	Credits
1 Lecture Period / 1 Tutorial Period	1
3 Practical Periods (Laboratory)	1.5
2 Seminar Periods/ 2 Project Work Periods etc.	1

4.4 Project Work

The Project work is an important component of Post-Graduate programmes. The Project work for M.E., consists of Phase – I and Phase – II. The Phase – I is to be undertaken during III semester and Phase– II, which is a continuation of Phase – I is to be undertaken during IV semester for M.E.

4.4.1 The Project work for M.E., (for Phase II Project work) shall be pursued for a minimum of 16 weeks during the final semester.

4.4.2 The Project work shall be carried out under the supervision of a “qualified teacher” in the Department concerned. In this context “qualified teacher” means a faculty member possessing (i) PG degree with a minimum of 3 years of teaching experience or (ii) Ph.D.degree.

4.4.3 A student may, however, in certain cases, be permitted to work on projects in an Industrial / Research Organization, on the recommendations of the Head of the Department. In such cases, the Project work shall be jointly guided by a supervisor of the department and an expert

as joint supervisor from the organization and the student shall be instructed to meet the supervisor periodically and to attend the review committee meetings for evaluating the progress.

4.5. Industrial Training /Internship

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

The students may undergo Internship at a Research organization / University/ industry (after due approval from the Departmental Consultative Committee) for the period prescribed in the curriculum during the summer / winter vacation, in lieu of Industrial training.

4.5.2 Industrial Training / Internship is not prescribed in the curriculum, the student may undergo Industrial Training / Internship optionally and the credits earned will be indicated in the Mark Sheet. A student can earn a maximum of one credit in one Industrial Training / Internship. However, if the number of credits earned is 1 or 2, these credits shall not be considered for classification of the degree. The student is only allowed to undergo a maximum of 4 weeks Industrial Training / Internship during the entire duration of study.

DURATION OF TRAINING / INTERNSHIP	CREDITS
2 Weeks	1
4 Weeks	2

4.6 Additional Credits

A Student can earn a maximum of 10 extra credits over and above the total credits. This may be earned through 1 credit / 2 credit courses such as value added courses / Online courses / Self Study Courses / EEC.

4.7 Value Added Courses

- The Students may optionally undergo Value Added Courses and the credits earned through the Value Added Courses shall be over and above the total credit requirement prescribed in the curriculum for the award of the degree. One / Two credit courses shall be offered by a Department **with the prior approval from the Head of the Institution/COE.**

- The details of the syllabus, time table and faculty may be sent to the Controller of Examinations after approval from the **Head of the Institution** at least one month before the course is offered. **Students can take a maximum of two one credit courses / one two credit course** during the entire duration of the Programme.

4.8 Online Courses

Students may be permitted to take Online Courses /Self Study Courses (which are provided with certificate) with prior approval of Departmental Consultative Committee, Dean Academics and Office of the Controller of Examinations. In case of credits earned through online mode from a **NPTEL, MOOC and Edx** shall be mentioned in the marksheet over and above the credits considered for the award of the degree.

4.9 Medium of Instruction

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

4.10 Credit Transfer Courses

a.) Students may be permitted to take upto 10% online courses (only theory) in III semester [1 or 2 courses] with prior approval of Departmental Consultative Committee, Dean Academics and Office of the Controller of Examinations.

b.) The Students are permitted to undergo **ONE Professional Elective Course** in NPTEL/SWAYAM/MOOCs etc. with the prior approval of Departmental Consultative Committee, Dean Academics and Office of the Controller of examinations. The student shall take up Assessments and End Semester Examinations conducted by NPTEL/SWAYAM/ MOOCs and transfer the grades and credits.

c.) The students are permitted to undergo the **ONE Open Elective course** in NPTEL/SWAYAM/ MOOCs etc. with the prior approval of Departmental Consultative Committee, Dean Academics and Office of the Controller of examinations. The Student shall take up Assessments and End Semester Examinations conducted by NPTEL/SWAYAM/ MOOCs and transfer the credits.

5. DURATION OF THE PROGRAMMES

5.1 The minimum and maximum period for the completion of the P.G. Programmes are given below:

Programme	Min. No.of Semesters	Max. No. of Semesters
M.E., (Full-Time)	4	8

5.2 Each semester shall normally consist of 85 working days (including practical exams). The Head of the Department shall ensure that every teacher imparts instruction as per the number of periods specified in the syllabus, covering the full content of the syllabus for the course being taught.

5.3 The total duration for completion of the programme reckoned from the commencement of the first semester to which the student was admitted shall not exceed the maximum duration specified in clause 5.1 irrespective of the period of break of study (vide clause 17) or prevention (vide clause 7.4) in order that the student may be eligible for the award of the degree (vide clause 15).

5.4 The Curriculum of P.G. Programmes has been designed to have the credits in the range specified below for the various programmes for the award of the degree.

PROGRAMME	PRESCRIBED CREDITS
M.E., (Full time)	70

6. COURSE ENROLLMENT AND REGISTRATION

6.1 Each student, on admission, shall be assigned to a Faculty Advisor (vide clause 8), who shall advise and counsel the student about the details of the academic programme and the choice of courses, considering the student's academic background and career objectives.

6.2 After registering for a course, a student shall attend the classes, satisfy the attendance requirements, earn Continuous Assessment marks and appear for the End Semester Examinations.

6.2.1 Each student on admission shall register for **all the courses prescribed in the curriculum in** the student's **first Semester of study.**

6.2.2 Instead of two elective in the curriculum, the student may be permitted to choose a maximum of 2 courses from other PG programmes with the approval of the Head of the Department offering such courses.

6.2.3 A student who has passed all the courses prescribed in the curriculum for the award of the degree shall not be permitted to re-enroll to improve the student's marks in a course or the aggregate marks / CGPA.

6.3 MINIMUM CREDITS TO REGISTER FOR PROJECT WORK

Minimum credits for various programmes shall be as follows:

Table 1

PROGRAMME	MINIMUM NO. OF CREDITS TO BE EARNED
M.E.,	20 (for Phase – I)

6.3.1 If the student has not earned the requisite minimum credits, the student cannot enroll for the Project work (Phase I in the case of M. E / M. Tech.) In such a case, the student can enroll for the project work in a subsequent semester, after earning the minimum credits specified.

6.4 Flexibility to add or Drop courses

6.4.1 A student has to earn the total number of credits specified in the curriculum of the respective Programme of study in order to be eligible to obtain the degree. However, if the student wishes, the student is permitted to earn more than the total number of credits prescribed in the curriculum of the student’s programme within the minimum duration of the programme.

6.4.2 From the II to final semesters, the student has the option of registering for additional courses or dropping existing courses. The total number of credits that a student can add or drop is limited to 6, subject to a maximum of 2 courses.

6.5 Redoing a Course

Redoing a course means reregistering for a course, attending all classes, fulfilling the attendance requirements as per clause 7, earning fresh Continuous Assessment marks and appearing for End Semester Examinations. A student has to redo a course in the following conditions.

6.5.1 If a student is prevented from writing end semester examination of any core course due to

lack of attendance, the student has to register for that course again when offered next and redo the course.

6.5.2 If a student is prevented from writing the end semester examination of any professional/open elective course due to lack of attendance, the student can opt to register for the same course again when offered next and redo the course, or he/she can opt to register for a different professional / open elective course when it is offered, attend classes, fulfill the attendance requirements as per clause 7, secure Continuous Assessment marks and appear for End Semester Examinations.

6.5.3 If a student fails to secure a pass in any theory or Laboratory course (including elective theory), he/she is given a maximum of three arrear attempts to complete the course as per Clause 11.2. If the student still fails to secure a pass, he/she shall register for the same when offered next and redo the course.

6.5.4 If the course in which the student fails to secure a pass even after three arrear attempts in a professional/open elective course, then the student can opt for a different professional/ open elective course, register for the same when it is offered, attend classes, fulfill the attendance requirements as per clause 7, secure Continuous Assessment marks and appear for End Semester Examinations.

6.5.5 The student who fails in any Project work / Seminar / Internship / Career Development Skills / Professional Practices / Case Study and Industrial / Practical Training shall register for the same in the subsequent semester and redo the course. In this case, the student shall attend the classes and fulfill the attendance requirements as per clause 7.

7. REQUIREMENTS FOR APPEARING FOR THE END SEMESTER EXAMINATION OF A COURSE

A student who has fulfilled the following conditions (vide clause 7.1 and 7.2) shall be deemed to have satisfied the attendance requirements for appearing for the end semester examination of a particular course.

7.1 Ideally every student is expected to attend all periods and earn 100% attendance. However, the student shall secure not less than 75% attendance, course wise, taking into account the number of periods required for that course, as specified in the curriculum.

7.2 If a student secures attendance between 65% and less than 75% in any course in the current 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 Chairman, Sports Board and Head of the Department concerned, the student shall be given exemption from the prescribed attendance requirement and the student shall be permitted to appear for the end semester examination of that course. In all such cases, the students should submit the required documents on joining after the absence to the Head of the Department through the Faculty Advisor. It is mandatory for the HOD to verify and certify the genuineness of the case before recommending the same to the Principal.

All other students who have secured attendance between 65% and less than 75%upto maximum of three courses shall apply for condonation in the prescribed format with prescribed fee of Rs.2000/- per course so as to permit them to attend the ESE.

7.3 A student shall normally be permitted to appear for the end semester examination of the course if the student has satisfied the attendance requirements (vide Clause 7.1 – 7.2) and has registered for the examination in those courses of that semester by paying the prescribed fee.

7.4 Students who do not satisfy clause 7.1 and 7.2 and who secure **less than 65%** attendance in a course will not be permitted to write the end semester examination of that course. The student has to register and redo the course when it is offered next as per Clause 6.5. If the course in which the student has been prevented is a professional / open elective, the student can opt to redo the same course or opt for different professional / open elective course as per Clause 6.5.2.

7.5 If a student has shortage of attendance in all the registered courses, he/she should not be permitted to move to the higher semester and has to repeat the current semester in the subsequent year.

7.6 In the case of reappearance (Arrear) registration for a course, the attendance requirement as mentioned in Clauses 7.1 - 7.3 is not applicable. However, the student has to register for examination in that course by paying the prescribed fee.

7.7 A student who has already appeared for a course in a semester and passed the examination is not entitled to reappear for the same course for improvement of letter grades /marks.

8. FACULTY ADVISOR

To help the students in planning their courses of study and for general advice on the academic programme, the Head of the Department of the students will attach a certain number of students to a teacher of the Department, who shall function as Faculty Advisor for those students throughout their period of study. The Faculty Advisor shall advise the students in registering and reappearance (Arrear) registering of courses, authorize the process, monitor their attendance and progress and counsel them periodically. If necessary, the Faculty Advisor may also discuss with or inform the parents about the progress / performance of the students concerned.

The responsibilities of the faculty advisor shall be:

i. To inform the students about the various facilities and activities available to enhance the student's curricular and co-curricular activities.
ii. To guide student enrollment and registration of the courses.
iii. To authorize the final registration of the courses at the beginning of each semester.
iv. To monitor the academic and general performance of the students including attendance and to counsel them accordingly.
v. To collect and maintain the academic and co-curricular records of the students.

9 COURSE COMMITTEES

9.1 COMMON COURSE COMMITTEE

A theory course handled by more than one teacher shall have a "Common Course Committee", comprising of all teachers teaching that course. One of the teachers shall be nominated as Course Coordinator by the Head of Department, duly approved by the Dean Academic Courses.

The first meeting of the Common Course Committee shall be held within fifteen days from the date of formation of the committee. The nature and weightage of the continuous assessments shall be decided in the first meeting, within the framework of the Regulations. Two or three subsequent meetings in a semester may be held at suitable intervals**.** In addition the "Common Course Committee" shall meet to ensure uniform evaluation of continuous assessments after arriving at a common scheme of evaluation for the assessments (vide clause 10).

Wherever feasible, the common course committee shall prepare a common question paper for the continuous assessment tests also. The question paper for the end semester examination is common and shall be set by the Course Coordinator, in consultation with all the teachers.

9.2 MULTIPLE COURSES COMMITTEE

"Multiple Courses Committee" comprises of all teachers handling courses of a particular semester, including common course teachers and two student representatives from the course concerned. One of the above teachers, nominated by the Head of the Department shall coordinate the activities of this committee. The functions of this committee are as follows:

The first meeting of the Multiple Courses Committee shall be held within fifteen days from the date of formation of the committee. The nature and weightage of the continuous assessments shall be decided in the first meeting, within the framework of the Regulations. Two or three subsequent meetings in a semester may be held at suitable intervals**.** During these meetings, the student members shall meaningfully interact and express their opinions and suggestions of all the students to improve the effectiveness of the teaching-learning process. It is the responsibility of the student representatives to convey the proceedings of these meetings to all the students.

9.3 OVERALL MONITORING COMMITTEE

In addition, there shall be an overall monitoring committee for each semester of a programme, which comprises of (i) the Head of the department (convener), (ii) the Faculty Advisors of the programme and (iii) Multiple Course Coordinator. This overall monitoring committee shall meet periodically to discuss academic related matters, progress and status of the students of the semester concerned.

9.3.1 The overall monitoring committee can also invite some of the students of the semester concerned for any of the committee meetings if necessary.

10 ASSESSMENT PROCEDURES FOR AWARDING MARKS

All PG (M.E., (Full time)) Programmes consist of Theory Courses, Laboratory Courses and Employability Enhancement Courses. Employability Enhancement Courses include Project Work, Seminar, Professional Practices, Case Study and Industrial / Practical Training.

Appearance in End Semester Examination is mandatory for all courses including Theory, Laboratory, Theory Courses with Laboratory Component and Project work.

Performance in each course of study shall be evaluated based on

i) Continuous assessments throughout the semester and

ii) End Semester Examination at the end of the semester.

If any student happened to fail in theory cum practical course he/she has to re appear for the theory courses only.

(i.e.) Each course shall be evaluated for a maximum of 100 marks as shown below:

S.No	Category of course	Continuous Assessments	End-Semester Examinations
i.	Theory Courses(FC, PC, IC and PE)	40 Marks	60 Marks
ii.	Theory Courses with Laboratory Component / Laboratory Courses	50 Marks	50 Marks
iii.	Project Work	50 Marks	50Marks
iv.	All other EEC Courses	100 Marks	-
v.	Audit Courses	100 Marks	

Every teacher is required to maintain an 'ATTENDANCE AND ASSESSMENT RECORD' for every semester, which consists of attendance marked in each theory / Laboratory/EEC class, the assessment marks and the record of class work (topics covered), separately for each course handled by the teacher. This should be submitted to the Head of the Department periodically (at least three times in a semester) for checking the syllabus coverage and the records of assessment marks and attendance. The Head of the Department will affix his/her signature and date after due verification.

The Dean-Academic and his team shall check the syllabus covered, attendance of the students and with his comments along with the log books are sent to the HOD of the concerned department. At the end of the semester, the record should be verified by an Audit team headed by Dean-Academics and return to Head of the Department who shall keep this document in safe custody (for four years). The records of attendance and assessment of both current and previous semesters should be available for any inspection at any time.

10.1 ASSESSMENT FOR THEORY COURSES

For Theory Courses out of 100 marks, the maximum marks for Continuous Assessment is fixed as 40 and the End Semester Examination carries 60 marks.

The End Semester Examinations for theory courses will be of 3 hours duration and shall normally be conducted between October and December during the odd semesters and between April and June during the even semesters. End semester Examination is a mandatory requirement for passing the course and every student should appear for the examination for theory, theory course with laboratory, laboratory courses and project work.

DISTRIBUTION OF MARKS

M.E. Programmes

S. No.	Category	Maximum Marks
1.	Assignment/Technical quiz/Research articles/Presentation or latest advancement in the field	20
2.	Attendance	5
3.	Internal tests (All the TWO internal test marks are averaged to TEN marks and FIVE marks for mid semester examination)	15
	Total	40

Question Paper pattern for Internal Test – M.E. Programmes

Maximum Marks : 50
Part A : 6 x 2 = 12 marks
Part B : 2 x 14 = 28 marks (Either or Pattern)
Part C : 1 x 10 = 10 marks (Either or Pattern)

Question Paper pattern of Mid semester Exam and ESE for M.E.

Maximum Marks : 100 **(No. of Questions x Mark = Total marks)**
Part A : 10 x 2 = 20 marks
Part B : 5 x 14 = 70 marks (Either or Pattern)
Part C : 1 x 10 = 10 marks (Compulsory question)

10.2 ASSESSMENT FOR LABORATORY COURSES

For Laboratory Courses out of 100 marks, the maximum marks for Continuous Assessment is fixed as 50 and the End Semester Examination carries 50 marks. Every laboratory exercise / experiment shall be evaluated based on the student's performance using rubrics during the laboratory class and the student's records maintained. There shall be at least one assessment test.

Practical Courses (Common for all PG programmes)

S. No.	Category	Maximum Marks
1.	Average marks of all experiments based on Rubrics	25
2.	Assessment Test marks (It should be conducted for 50marks and converted to 25marks)	25
	Total	50

The End semester examinations for Laboratory courses will be of 3 hours duration and shall normally be conducted between October and December during the odd semesters and between April and June during the even semesters.

10.3 ASSESSMENT FOR THEORY COURSES WITH LABORATORYCOMPONENT

S. No.	Category	Maximum Marks
1.	Average of two Internal tests mark conducted each for50 marks reduced to 10marks	10
2.	The sum of Mid semester marks reduced to 5marks	5
3.	All Experiment marks should be converted to 5marks. Then the end semester exam will be conducted for 50marks and converted to 20marks (20+5=25marks).	25
4.	Attendance	5
5.	Assignment	5
	Total	50

10.4 ASSESSMENT FOR PROJECTWORK

The evaluation of Project Work for Phase I and Phase II in the case M.E., shall be done independently in the respective semesters and marks shall be allotted as per the weightages given in Clause 10.4.1.

The Project work shall be evaluated for a maximum of 100 marks of which 50 marks will be through internal assessment. There should be three reviews for each phase in the case of M.E. (Phase I and Phase II) to be conducted separately with Internals 50 marks and External 50 marks. The committee for the conduct of reviews shall be constituted by the Head of the Department. The marks are to be distributed as detailed below.

Project work	**Internal (50 Marks)**			**External (50 Marks)**		
	Review I	Review II	Review III	Project Evaluation (External)	Viva – Voce (20 Marks)	
					External	Internal
Phase – I & Phase - II	10	20	30	30	10	10

10.4.1 There shall be three assessments (each 100 marks) during the semester by a review committee. The student shall make presentation on the progress made before the committee. The Head of the Department shall constitute the review committee consisting of supervisor, project coordinator and another faculty member from the Department for each branch of study. The total marks obtained in the three assessments shall be reduced to 50 marks and rounded to the nearest integer.

10.4.2 The Project Report prepared according to approved guidelines as given by the Academic Courses, Anna University and duly signed by the supervisor(s), Project Co-ordinator and the Head of the Department and shall be submitted to the Head of the Department.

10.4.3 The evaluation of the Project work Phase - I and Phase - II (M.E.) shall be based on the project report submitted in each of the Phase – I and Phase - II semesters respectively and a Viva-Voce Examination by a team consisting of the supervisor, Internal examiner (other than the supervisor) and External Examiner. The internal/external examiners will be appointed by the COE for Phase – I and Phase – II project evaluation.

10.4.4 If the student fails to obtain 50% of the internal assessment marks in the Phase–I and Phase–II he / she will not be permitted to submit the report for that particular semester and has to re-enroll for the same in the subsequent semester.

10.4.5 The deadline for submission of final Project Report is 20 calendar days from the last working day of the semester in which project / thesis / dissertation is done. However, the Phase-I of the Project report in the case M.E., shall be submitted within a maximum period of 10 calendar days from the last working day of the semester as per the academic calendar published by the COE(Autonomous).

10.4.6 If a student fails to submit the project report on or before the specified deadline, student is deemed to have failed in the Project Work and shall re-enroll for the same in a subsequent semester. This applies to both Phase–I and Phase–II in case of M.E.,

In case of students of M.E., not completing Phase - I of Project work successfully, the students can undertake Phase - I again in the subsequent semester. In such cases, the students can enroll for Phase-II, only after successful completion of Phase I.

10.4.7 A copy of the approved project report after the successful completion of viva-voice examinations shall be kept in the library of the College / Institution.

10.5 ASSESSMENT FOR SEMINAR / PROFESSIONAL PRACTICES / CASESTUDY:

The seminar / Case study shall carry 100 marks and shall be evaluated through continuous assessment only. Every student is expected to present a minimum of 2 seminars per semester before the evaluation committee and for each seminar, marks can be equally apportioned. The three member committee consisting of one coordinator and two members appointed by the Head of the Department will evaluate the seminar and at the end of the semester the marks can be consolidated and taken as the final mark. The evaluation shall be based on the seminar paper / report (40%), presentation (40%) and response to the questions asked during presentation (20%).

10.6 ASSESSMENT FOR INDUSTRIAL / PRACTICAL TRAINING / INTERNSHIP / SUMMER/MINI PROJECT

10.6.1 Practical training / Industrial Attachment / Summer Project if specified in the Curriculum shall not exceed the maximum duration of 4 weeks and should be organized by the Head of the Department for every student.

10.6.2 The Industrial / Practical Training shall carry 100 marks and shall be evaluated through continuous assessment only as per Table 2. At the end of Industrial / Practical training / Internship / Summer Project, the student shall submit a brief report on the training undergone and a certificate from the organization concerned. The evaluation will be made based on this report and a Viva-Voce Examination, conducted internally by a three member Departmental Committee consisting of one co-ordinator and two members constituted by the Head of the Department. Certificates (issued by the Organization) submitted by the student shall be attached to the mark list (with grade) and sent to Controller of Examinations by the Head of the Department.

10.6.3 The Industrial / Practical Training **which is not part of the curriculum (Clause 4.5.2),** shall carry 100 marks and shall be evaluated **through internal assessment only** as per Table 2. At the end of Industrial / Practical training / internship / Summer Project, the student shall submit a certified report (evaluated out of 100 marks by a mentor/guide) from the organization where the student has undergone training.

The Viva-Voce Examination will be conducted by a three member committee constituted by the Head of the Department. The committee comprises of one expert from an industry/organization and two members (co-ordinator and member) from the Department. Certificates (issued by the Organization) submitted by the student shall be attached to the mark list (with grade) and sent to Controller of Examinations by the Head of the Department.

Table 2

INTERNSHIP / INDUSTRIAL TRAINING		
EVALUATION		
REPORT	**PRESENTATION**	**VIVA VOCE**
40	30	30

10.7 ASSESSMENT FOR VALUE ADDEDCOURSES

The one credit course shall carry 100 marks and shall be evaluated through **continuous assessments only**. Two Assessments shall be conducted during the semester by the Department concerned. The total marks obtained in the tests shall be reduced to 100 marks and rounded to the nearest integer. The Head of the Department may identify a faculty member as coordinator for the course. A committee consisting of the Head of the Department, staff handling the course (if available), coordinator and a senior Faculty member nominated by the Head of the Department shall monitor the evaluation process. The grades shall be assigned to the students by the above committee based on their relative performance.

10.8 ASSESSMENT FOR ONLINECOURSE from NPTEL, MOOC, Edx

Students may be permitted to credit online courses (which are provided with certificate) with the approval of HOD of the department subject to a maximum of three credits. This online course of 3 credits can be considered over and above the credits for the award of degree. The Head of the Department may identify a faculty member as coordinator for the course, who is responsible for evaluation process. For the successful students the subject details will be mentioned in the marksheet under the heading online courses.

11 PASSING REQUIREMENTS

11.1 The Passing requirement for a student in a course is determined based on the marks obtained both in Continuous Assessment and End Semester Examinations. If the student gets <50% of total marks then, the student will be awarded only RA (Reappearance) grade. All other grades will be decided by the faculty concerned. While fixing the grades, the mean mark shall be at the middle of the 'A' grade range. A student who earns a minimum of 6 grade points in a course is declared to have successfully passed the course.

11.2 If a student fails to secure a pass in theory courses and laboratory courses in the current semester examination, he/she is allowed to write arrear examinations for the next three consecutive semesters and their internal marks shall be carried over for the above mentioned period of three consecutive semesters.

11.3 If a candidate fails in the end semester examinations of Phase I, he/she has to resubmit the Project Report within 30 days from the date of declaration of the results. If he / she fails in the end semester examination of Phase II of M.E., he/she shall resubmit the Project Report within 30 days from the date of declaration of the results. The resubmission of the project report and the subsequent viva- voce examination will be considered as reappearance with payment of exam fee. In case if a student fails to resubmit the project report within the stipulated period and fails in the subsequent viva-voce examination**,** the student shall register for the course again, in the subsequent semester.

11.4 The passing requirement for the courses which are assessed only through continuous assessment (EEC courses except project work), shall be fixed as minimum 50% and rest of the grades are decided by the faculty concerned.

11.5 Supplementary Examinations

After the publication of FINAL Semester ESE and the corresponding revaluation results if a student has **arrear in only one course** for the entire programme, he/she will be permitted to take up the supplementary examination within one month after the publication of the revaluation results.

12 REQUEST FOR PHOTO COPY OF THE VALUED ANSWER SCRIPT / REVALUATION

A student can apply for viewing of valued answer script and / or revaluation of his / her semester examination answer paper in theory courses, within FIVE working days from the

declaration of results, and on the dates specified by the Controller of Examinations on payment of a prescribed fee along with proper application to the Controller of Examinations. The Controller of Examinations shall arrange for viewing / revaluation and the revaluation result shall be published soon after the revaluation process is completed.

13. AWARD OF LETTER GRADES

13.1. The performance of a student will be reported using letter grades, each carrying certain points as detailed below:

Letter Grade	Grade Points
O (Outstanding)	**10**
A + (Excellent)	**9**
A (VeryGood)	**8**
B + (Good)	**7**
B (Average)	**6**
RA (Reappearance Registration)	**0**
WD(Withdrawal)	**0**
AB (Absent)	**0**

'RA' denotes Reappearance. Registration is required for that particular course.

'W' indicates withdrawal from the course.

'AB' indicates Absent in the course.

'WH' indicates malpractice of any kind (witheld).

13.2 The grades O, A+, A, B+, B obtained for the one credit course shall figure in the Mark sheet under the title **'Value Added Courses'**.

14. GPA AND CGPA CALCULATION

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

- the list of courses registered during the semester and the grades scored.
- the Grade Point Average (GPA) for the semester and
- the Cumulative Grade Point Average (CGPA) of all courses registered from first semester onwards.

During each semester, the list of courses registered and the grades scored in each course are used to compute the Grade Point Average (GPA). GPA is the ratio of the sum of the products of the number of credits of courses registered and the grade points corresponding to the

grades scored in those courses, taken for all the courses, to the sum of the number of credits of all the courses in the semester.

After the results are declared, grade sheet will be issued to each student which will contain the following details. Grade Point Average **(GPA)** of a Semester **(SGPA)** and Cumulative Grade Point Average **(CGPA)** of a programme are calculated as follows.

$$SGPA = \frac{\text{Sum of the product of the GP by the corresponding credits of the courses offered in that semester}}{\text{Sum of the credits of the courses of that semester}}$$

$$i.e.,\ SGPA = \frac{\sum_{i} C_i\, GP_i}{\sum_{i} C_i}$$

$$CGPA \text{ of the entier programme} = \frac{\text{Sum of the product of the GPs by the corresponding credits of the courses offered for the entire programme.}}{\text{Sum of the credits of the courses of the entire semester}}$$

$$i.e., CGPA \text{ of the entier programme} = \frac{\sum_{n}\sum_{i} CniGPni}{\sum_{n}\sum_{i} Cni}$$

Where,

Ci is the credit fixed for the course I in the any semester
GPi is the grade point obtained for the course i in any semester
n refers to the semester in which such courses are credited

Note: RA grade will be excluded for calculating **GPA** and **CGPA**

14.2 The credits earned through one / two credit courses shall not be considered for calculating GPA and CGPA.

14.3 If a student studies more number of electives than required as per the student's programme curriculum, the courses with higher grades alone will be considered for calculation of CGPA.

15 ELIGIBILITY FOR THE AWARD OF DEGREE

15.1 A student shall be declared to be eligible for the award of the PG Degree (M.E.) provided the student has

i. Successfully gained the required number of total credits as specified in the curriculum corresponding to the student's programme within the stipulated time.

a. M.E.,(Full time)

Successfully completed the course requirements, appeared for the End-Semester examinations and passed all the subjects prescribed in all the 4 semesters within a maximum period of 4 years reckoned from the commencement of the first semester to which the candidate was admitted.

ii. Successfully passed any additional courses.

iii. No disciplinary action pending against the student.

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

15.2 CLASSIFICATION OF THE DEGREEAWARDED

15.2.1 FIRST CLASS WITH DISTINCTION:

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

M.E., (Full Time)

- Should have passed the examination in all the courses of all the four semesters in the student's First Appearance within **three** years, which includes authorized break of study of one year. Withdrawal from examination will not be considered as an appearance.
- Should have secured a CGPA of not less than **8.50**
- Should NOT have been prevented from writing End Semester Examination due to lack of attendance in any of the courses.

15.2.2 FIRSTCLASS:

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

M.E., (Full Time)

- Should have passed the examination in all the courses of all four semesters **within three years** , which includes one year of authorized break of study (if availed) or prevention from writing the End Semester Examination due to lack of attendance (if applicable).
- Should have secured a CGPA of not less than **7.00**

15.2.3 SECOND CLASS:

All other students (not covered in clauses 15.2.1 and 15.2.2) who qualify for the award of the degree **(**vide Clause 15.1) shall be declared to have passed the examination in **Second Class**.

15.2.4 A student who is absent in End Semester Examination in a course / project work after having registered for the same shall be considered to have appeared in that examination (except approved withdrawal from end semester examinations as per clause 16) for the purpose of classification.

16 PROVISION FOR WITHDRAWAL FROM EXAMINATION:

16.1 A student may, for valid reasons, (medically unfit / unexpected family situations / sports approved by HOD/physical director) be granted permission to withdraw from appearing for the end semester examination in any course or courses in **ANY ONE** of the semester examinations during the entire duration of the degree programme. The application shall be sent to COE through HOD with required documents.

16.2 Withdrawal application shall be valid only if the student is otherwise eligible to write the examination (Clause 7) and if it is made within TEN working days before the commencement of the end semester examination in that course or courses and also recommended by the Head of the Department.

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

16.4 If a student withdraws a course or courses from writing end semester examinations, he/she shall register the same in the subsequent semester and write the end semester examination(s).

16.5 Withdrawal shall not be considered as an appearance for deciding the eligibility of a student for First Class with Distinction.

16.6 Withdrawal is permitted for the End Semester Examinations in the final semester only if the period of study the student concerned does not exceed 3 years for **M.E.,**

17 BREAK OF STUDY FROM APROGRAMME

17.1 A student is permitted to go on break of study for a fixed period of one year as a single break in the entire course of study.

17.2 The student applies for break of study, the student shall apply to the COE through HOD in advance, in any case, not later than the last date of the first assessment period. The application (downloaded from website) duly filled by the student shall be submitted through the Head of the Department.

17.3 The students permitted to rejoin the programme after break of study / prevention due to lack of attendance, shall be governed by the Curriculum and Regulations in force at the time of rejoining. The students rejoining in new Regulations shall apply to the COE through HOD in

the prescribed format at the beginning of the readmitted semester itself for prescribing additional/equivalent courses, if any, from any semester of the regulations in-force, so as to bridge the curriculum in-force and the old curriculum.

17.4 The total period for completion of the programme reckoned from, the commencement of the first semester to which the student was admitted shall not exceed the maximum period specified in clause 5.1 irrespective of the period of break of study in order that the student may be eligible for the award of the degree (vide clause 15).

17.5 In case there is any period of break of study more than the permitted duration of break of study, the student shall be permitted to continue the programme only if the approval is obtained from the COE through Head of the Department before the end of the semester in which the student has taken break of study.

17.6 If a student has not reported to the department for a period of two consecutive semesters without any intimation, the name of the student shall be deleted permanently from the college enrollment. Such students are not entitled to seek readmission under any circumstances.

17.7 PROVISION OF SCRIBE:

- The Appointment of scribes for the students with disabilities shall be done by the Controller Office. In this connection the student shall submit her/his requisition through proper approval of HoD and Principal to CoE office well in advance prior to the examinations. (at least 15 days before the commencement of Examinations).
- However, students injured during the study holidays and in between the examination period and not able to write, on producing medical certificate from Civil Surgeon will be given Scribe.

18 FOR STUDENTS REJOINING THE PROGRAMME

A student who is required to repeat the study of any semester for want of attendance/ progress/conduct or who desires to rejoin the course after a period of discontinuance or who upon his/her own request is permitted by the authorities to repeat the study of any semester, may join the semester which he/she is eligible or permitted to join, only at the time of its normal commencement for a regular batch of students and after obtaining the approval from Directorate of Technical Education (DoTE) and Anna University, Chennai. No student will however be enrolled in more than one semester at any time.

In that case he/she has to come under the regulation which is being followed in that Academic year.

19 FOR TRANSFER STUDENTS

Students transferred from other Institutions may be admitted on obtaining the approval from DOTE and Anna University, Chennai. In that case he/she has to come under the regulation which is being followed in that Academic year and also should obtain equivalence from the Controller of Examinations.

20 DISCIPLINE

20.1 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/ Department. The Head of the Institution shall constitute a disciplinary committee consisting of Head of the Institution, Head of the departments to which the student concerned belongs, and the Head of another department to enquire into acts of indiscipline and notify the Institution about the disciplinary action recommended for approval. In case of any serious disciplinary action which leads to suspension or dismissal, then a committee shall be constituted by the COE of the college for taking final decision.

20.2 If a student indulges in malpractice in any of the examinations, the student shall be liable for punitive action as prescribed by the University from time to time.

21 REVISION OF REGULATIONS, CURRICULUM AND SYLLABI

The college may from time to time revise, amend or change the Regulations, Curriculum, Syllabus and Scheme of Examinations through the Academic Council.

CHAIRMAN BOS DEAN PRINCIPAL

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY

M.E. COMPUTER SCIENCE AND ENGINEERING

REGULATIONS – 2020

CHOICE BASED CREDIT SYSTEM

I - IV SEMESTER CURRICULUM AND SYLLABI

SEMESTER I

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			CREDITS	CIA	ESE	TOTAL
				L	T	P				
THEORY										
1.	20MA1103	Mathematical foundation of CSE	FC	3	1	0	4	40	60	100
2.	20CP1201	Advance Data Structures	PCC	3	1	0	4	40	60	100
3.	20CP1202	Advanced Database Management System	PCC	3	0	0	3	40	60	100
4.	20CP1203	Software Architecture	PCC	3	0	0	3	40	60	100
5.	20RM1161	Research Methodology and IPR	RMC	2	0	0	2	40	60	100
6.	20AC10XX	Audit Course I	AC	2	0	0	0	100	0	100
PRACTICALS										
7.	20CP1001	Advance Data Structures Laboratory	PCC	0	0	4	2	50	50	100
8.	20CP1002	Advanced Database Management System Laboratory	PCC	0	0	4	2	50	50	100
TOTAL							**20**			

SEMESTER II

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			CREDITS	CIA	ESE	TOTAL
				L	T	P				
THEORY										
1.	20CP2201	Advanced algorithms	PCC	3	0	0	3	40	60	100
2.	20CP2202	Cloud Computing Technologies	PCC	3	0	0	3	40	60	100
3.	20CP23XX	Program Elective I	PEC	3	0	0	3	40	60	100
4.	20CP23XX	Program Elective II	PEC	3	0	0	3	40	60	100
5.	20AC20XX	Audit Course II	AC	2	0	0	0	100	0	100
THEORY WITH LAB COMPONENT										
6.	20CP2251	Machine learning Techniques	PCC	3	0	2	4	50	50	100
PRACTICALS										
7.	20CP2001	Advanced Algorithms Laboratory	PCC	0	0	4	2	50	50	100
8.	20CP2002	Internship / Mini Project	EEC	0	0	2	1	50	50	100
TOTAL							**19**			

SEMESTER III

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			CREDITS	CIA	ESE	TOTAL
				L	T	P				
THEORY										
1.	20CP33XX	Program Elective III / NPTEL	PEC	3	0	0	3	40	60	100
2.	20CP33XX	Program Elective IV	PEC	3	0	0	3	40	60	100
3.	20CP33XX	Program Elective V	PEC	3	0	0	3	40	60	100
4.	20XX3401	Open Elective	OEC	3	0	0	3	40	60	100
PRACTICALS										
5.	20CP3901	Project Phase I	EEC	0	0	14	7	50	50	100
TOTAL							**19**			

SEMESTER IV

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			CREDITS	CIA	ESE	TOTAL
				L	T	P				
PRACTICALS										
1.	20CP4901	Project Phase II	EEC	0	0	24	12	100	100	200
TOTAL				**0**	**0**	24	12	100	100	200
			TOTAL				**70**			

TOTAL NO. OF CREDITS: 70

FOUNDATION COURSES (FC)

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			CREDITS	CIA	ESE	TOTAL
				L	T	P				
1.	20MA1103	Mathematical foundation of CSE	FC	3	1	0	4	40	60	100

PROGRAM CORE COURSES (PCC)

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			CREDITS	CIA	ESE	TOTAL
				L	T	P				
1.	20CP1201	Advance Data Structures	PCC	3	0	0	3	40	60	100
2.	20CP1202	Advanced Database Management System	PCC	3	0	0	3	40	60	100
3.	20CP1203	Software Architecture	PCC	3	0	0	3	40	60	100
4.	20CP1001	Advance Data Structures Laboratory	PCC	0	0	4	2	50	50	100
5	20CP1002	Advanced Database Management System Laboratory	PCC	0	0	4	2	50	50	100
6	20CP2201	Advanced algorithms	PCC	3	0	0	3	40	60	100
7	20CP2202	Cloud Computing Technologies	PCC	3	0	0	3	40	60	100
8	20CP2251	Machine learning Techniques	PCC	3	0	2	4	50	50	100
9	20CP2001	Advanced Algorithms	PCC	3	0	0	3	40	60	100

RESEARCH METHODOLOGY COURSE (RMC)

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			CREDITS	CIA	ESE	TOTAL
				L	T	P				
1.	20RM1161	Research Methodology and IPR	RMC	2	0	0	2	40	60	100

PROGRAM ELECTIVE COURSES (PEC)

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			CREDITS	CIA	ESE	TOTAL
				L	T	P				
NPTEL COURSES										
1.	20CP3301	Big Data Computing	PEC	3	0	0	3	40	60	100
PROGRAM ELECTIVE COURSES										
Professional Elective - I										
1.	20CP2301	Agent Based Intelligent Systems	PEC	3	0	0	3	40	60	100

2.	20CP2302	Multicore Architecture	PEC	3	0	0	3	40	60	100
3.	20CP2303	Software Design Patterns	PEC	3	0	0	3	40	60	100
Professional Elective - II										
4.	20CP2304	Compiler Optimization Techniques	PEC	3	0	0	3	40	60	100
5.	20CP2305	Distributed Operating Systems	PEC	3	0	0	3	40	60	100
6.	20CP2306	Software Process and Project Management	PEC	3	0	0	3	40	60	100
Professional Elective - III										
7.	20CP3302	Image Processing and Analysis	PEC	3	0	0	3	40	60	100
8.	20CP3303	Data Mining Techniques	PEC	3	0	0	3	40	60	100
Professional Elective - IV										
9.	20CP3304	Deep Learning Techniques	PEC	3	0	0	3	40	60	100
10.	20CP3305	Soft Computing Techniques	PEC	3	0	0	3	40	60	100
Professional Elective - V										
11.	20CP3306	Linguistic Computing	PEC	3	0	0	3	40	60	100
12.	20CP3307	Advanced Cryptography Techniques	PEC	3	0	0	3	40	60	100

OPEN ELECTIVE COURSES (OEC)
***(out of 2 courses one course must be selected)**

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			CREDITS	CIA	ESE	TOTAL
				L	T	P				
1.	20CP3401	Data Science for Engineers (NPTEL)	OEC	3	0	0	3	40	60	100
2.	20CP3402	Cyber Security	OEC	3	0	0	3	40	60	100

AUDIT COURSES SEMESTER - I

S. No	Course Code	Course Name	L	T	P	C
1	20AC1091	English for Research Paper writing	2	0	0	0
2	20AC1092	Disaster Management	2	0	0	0
3	20AC1093	Sanskrit for Technical knowledge	2	0	0	0
4	20AC1094	Pedagogy Studies	2	0	0	0
5	20AC1095	Constitution of India	2	0	0	0

AUDIT COURSES SEMESTER - II

S. No	Course Code	Course Name	L	T	P	C
1	20AC2091	Value Education	2	0	0	0
2	20AC2092	Stress Management by Yoga	2	0	0	0
3	20AC2093	Personality Development Through Life Enlightenment Skills	2	0	0	0
4	20AC2094	Unnat Bharat Abhiyan	2	0	0	0

Programme	Course Code	Name of the Course	L	T	P	C
ME	**20MA1103**	**Mathematical Foundation of CSE**	**3**	**1**	**0**	**4**

Course Objective

1. To apply mathematical linear programming techniques to solve constrained problems.
2. To appreciate the use of simulation techniques.
3. To enable them to estimate the value of the parameters involved in the specific distribution from a possible continuum of alternatives.
4. To give an idea of testing the statistical hypothesis claimed based on a set of data points using standard sampling distributions.
5. To impart knowledge of handling random vectors which represent random variables in multidimensional space.

Unit	Description	Instructional Hours
I	**LINEAR PROGRAMMING** Formulation – Graphical solution – Simplex method – Two phase method – Transportation and Assignment Problems	12
II	**SIMULATION** Discrete Event Simulation – Monte – Carlo Simulation – Stochastic Simulation – Applications to real time problems	12
III	**ESTIMATION THEORY** Estimators: Unbiasedness, Consistency, Efficiency and Sufficiency – Maximum Likelihood Estimation – Method of moments	12
IV	**TESTING OF HYPOTHESIS** Sampling distributions – Estimation of parameters – Statistical hypothesis – Tests based on Normal, t, Chi-square and F distributions for mean, variance and proportion, Tests for independence of attributes and goodness of fit.	12
V	**MULTIVARIATE ANALYSIS** Random vectors and Matrices – Mean vectors and Covariance matrices – Multivariate Normal density and its properties – Principal components: Population principal components – Principal components from standardized variables	12
	Total Instructional Hours	**60**

Course Outcome

CO1:	Formulate and find optimal solution in the real life optimizing/allocation/assignment problems involving conditions and resource constraints.
CO2:	Simulate appropriate application/distribution problems.
CO3:	Obtain the value of the point estimators using the method of moments and method of maximum likelihood.
CO4:	Apply the concept of various test statistics used in hypothesis testing for mean and variances of large and small samples.
CO5:	Get exposure to the principal component analysis of random vectors and matrices.

REFERENCE BOOKS:

R1: Jay L.Devore, "Probability and Statistics for Engineering and the Sciences", Cengage Learning, 9th Edition, Boston, 2016

R2: Johnson, R.A, Irwin Miller and John Freund., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, 9th Edition, New York, 2016.

R3: Ross. S.M., "Probability Models for Computer Science", Academic Press, SanDiego, 2002.

R4: Taha H.A.,, "Operations Research: An Introduction", Prentice Hall of India Pvt. Ltd. 10th Edition, New Delhi, 2017

R5: Winston, W.L., "Operations Research", Thomson – Brooks/Cole, Fourth Edition, Belmont, 2003.

Signed By

Dr Shankar S
CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K
PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	**20CP1201**	**Advance Data Structures**	**3**	**1**	**0**	**4**

Course Objective

1. To extend the students' knowledge of algorithms and data structures.
2. To enhance their expertise in algorithmic analysis and algorithm design techniques.
3. To understand various types of search and heap structures.
4. To study various types of geometric, randomized and approximation algorithms.
5. To extrapolate from them in order to apply those algorithms and techniques to solve problems

Unit	Description	Instructional Hours
I	**FUNDAMENTALS** Properties of Big-oh Notation –Conditional Asymptotic Notation – Algorithm Analysis – Amortized Analysis – Introduction to NP-Completeness/NP-Hard – Recurrence Equations – Solving Recurrence Equations – Time-Space Tradeoff	12
II	**SEARCH STRUCTURES** Binary Search Trees – AVL Trees – Red-Black trees – Multi-way Search Trees –B-Trees – Splay Trees – Tries.	12
III	**HEAP STRUCTURES** Min/Max heaps – Deaps – Leftist Heaps – Binomial Heaps – Fibonacci Heaps – Skew Heaps – Lazy Binomial Heaps	12
IV	**GEOMETRIC ALGORITHMS** Segment Trees – 1-Dimensional Range Searching – k-d Trees – Line Segment Intersection – Computing the Overlay of Two Subdivisions – Range Trees – Voronoi Diagram	12
V	**ADDITIONAL TOPICS** Approximation Algorithms: Vertex Cover & Euclidean Travelling Salesperson Problem – Randomized Algorithms: Closest Pair Problem & Minimum Spanning Trees – Online Algorithm: Euclidean Spanning Tree	12
	Total Instructional Hours	**60**

Course Outcome

CO1: Analyze algorithms.
CO2: Determine algorithm correctness.
CO3: Choose appropriate data structures for the problems to be solved.
CO4: Design algorithms for problems from different domains.
CO5: Identify various research strategies on algorithmic design

REFERENCE BOOKS:

R1: Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C",Second Edition, University Press, 2008

R2: Gilles Brassard, Paul Bratley, "Algorithmics: Theory and Practice", Prentice Hall, 1988.

R3: Mark de Berg, Otfried Cheong, Marc van Kreveld, Mark Overmars, "Computational Geometry Algorithms and Applications", Third Edition, Springer, 2008.

R4: R.C.T Lee, S.S Tseng, R.C Chang and Y.T Tsai, "Introduction to the Design and Analysis of Algorithms", Tata McGraw-Hill Edition, 2012.

R5: Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", MIT Press, 2009

Signed By

Dr Shankar S
CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K
PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	**20CP1202**	**Advanced Database Management System**	**3**	**0**	**0**	**3**

Course Objective

1. To comprehend the underlying principles of Relational Database Management System..
2. To develop database models using parallel and distributed databases.
3. To understand the concepts of XML and Web databases.
4. To apprehend the design and implementation of active temporal and deductive databases.
5. To develop applications based on NoSQL database

Unit	Description	Instructional Hours
I	**RELATIONAL MODEL** Entity Relationship Model – Relational Data Model – Mapping Entity Relationship Model to Relational Model – Relational Algebra – Structured Query Language-Database Normalization – Transaction Management-Recovery	9
II	**PARALLEL AND DISTRIBUTED DATABASES** Parallel Databases– I/O Parallelism– Inter-Query and Intra-Query Parallelism– Inter-Operation and Intra-operation Parallelism – Performance evaluation for Parallel DB Systems – Distributed Database Architecture-Distributed Data Storage – Distributed Transactions – Distributed Query Processing –Distributed Transaction Management – Load balancing tools for DDB – DDB Security.	9
III	**XML AND WEB DATABASES** XML Data Model – DTD – XML Schema – XML Querying – Web Databases – Open Database Connectivity-Java Database Connectivity– Accessing Relational database using PHP – User Driven Querying – Writing to Web Databases – Session Management	9
IV	**ACTIVE TEMPORAL AND DEDUCTIVE DATABASES** Event Condition Action Model – Design and Implementation Issues for Active Databases – Termination, Confluence, Determination and Modularization – Temporal Databases –Interpreting Time in Relational Databases – Deductive Databases – Datalog Queries	9
V	**NoSQL DATABASES** NoSQL database vs traditional RDBMS database – Migrating from RDBMS to NoSQL– CRUD operations – Querying NoSQL stores – Indexing and Ordering Datasets – MongoDB-Database creation and Querying– Web Application development using MongoDB	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Design and implement relational databases
CO2: Design and implement parallel and distributed databases.
CO3: Design and implement XML databases, Active, Temporal and Deductive databases.
CO4: Implement the concept of database connectivity with the applications.
CO5: Design and implement NoSQL database.

REFERENCE BOOKS:

R1: R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Addison-Wesley, 2011.

R2: Han, Jiawei, Jian Pei, and MichelineKamber. Data mining: Concepts and Techniques. 2011.

R3: Thomas Cannolly and Carolyn Begg, "Database Systems, A Practical Approach to Design, Implementation and Management", Third Edition, Pearson Education, 2007

R4: Henry F Korth, Abraham Silberschatz, S. Sudharshan, "Database System Concepts", Fifth Edition, McGraw Hill, 2006

R5: C. J. Date, A.Kannan and S. Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.

Signed By

Dr Shankar S
CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K
PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	**20CP1203**	**Software Architecture**	**3**	**0**	**0**	**3**

Course Objective

1. To understand the need, design approaches for software architecture to bridge the dynamic requirements and implementation
2. To learn the design principles and to apply for large scale systems
3. To design architectures for distributed heterogeneous systems environment through brokerage interaction
4. To build design knowledge on service oriented and model driven architectures and the aspect oriented architecture.
5. To develop appropriate architectures for various Case studies like semantic web services, supply chain cloud services.

Unit	Description	Instructional Hours
	INTRODUCTION TO SOFTWARE ARCHITECTURE	
I	Introduction to Software Architecture-Bridging Requirements and Implementation, Design Guidelines, Software Quality attributes. Software Architecture Design Space. Agile Approach to Software Architecture Design, Models for Software Architecture Description Languages (ADL).	9
	OBJECT-ORIENTED PARADIGM	
II	Object-Oriented Paradigm -Design Principles. Data-Centered Software Architecture: Repository Architecture, Blackboard Architecture. Hierarchical Architecture Main-Subroutine, Master-Slave, Layered, Virtual Machine. Interaction-Oriented Software Architectures: Model-View-Controller (MVC), Presentation-Abstraction-Control (PAC).	9
	DISTRIBUTED ARCHITECTURE	
III	Distributed Architecture: Client-Server, Middleware, Multi-tiers, Broker Architecture – MOM,CORBA Message Broker Architecture- Service-Oriented Architecture (SOA), SOAP, UDDI, SOA Implementation in Web Services, Grid/cloud Service Computing. Heterogeneous Architecture-Methodology of Architecture Decision, Quality Attributes	9
	ARCHITECTURE OF USER INTERFACES	
IV	Architecture of User Interfaces containers, case study-web service. Product Line Architectures - methodologies, processes and tools. Software Reuse and Product Lines -Product Line Analysis, Design and implementation, configuration Models. Model Driven Architectures (MDA) –why MDA-Model transformation and software architecture, SOA and MDA. Eclipse modeling framework.	9
	ASPECT ORIENTED ARCHITECTURES	
V	Aspect Oriented Architectures- AOP in UML,AOP tools, Architectural aspects and middleware Selection of Architectures, Evaluation of Architecture Designs, Case Study: Online Computer Vendor, order processing, manufacture &shipping – inventory, supply chain cloud service Management, semantic web services	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Understand the need of software architecture for sustainable dynamic systems

CO2: Have a sound knowledge on design principles and to apply for large scale systems

CO3: Design architectures for distributed heterogeneous systems

CO4: Have good knowledge on service oriented and model driven architectures and the aspect oriented architecture

CO5: Have a working knowledge to develop appropriate architectures through various case studies.

REFERENCE BOOKS:

R1: Essentials of software Architecture , Ion Gorton, Second Edition, Springer-verlag, 2011

R2: Software Architecture Design Illuminated, Kai Qian Jones and Bartlett Publishers Canada, 2010

Signed By

Dr Shankar S
CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K
PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	**20RM1161**	**Research Methodology and IPR**	**2**	**0**	**0**	**2**

Course Objective

1. Identify an appropriate research problem in their interesting domain.
2. Understand ethical issues Understand the Preparation of a research project thesis report.
3. Understand the Preparation of a research project thesis report
4. Understand the law of patent and copyrights.
5. Understand the Adequate knowledge on IPR

Unit	Description	Instructional Hours
I	**RESEARCH PROBLEM FORMULATION** Meaning of research problem- Sources of research problem, criteria characteristics of a good research problem, errors in selecting a research problem, scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, necessary instrumentations	06
II	**LITERATURE REVIEW** Effective literature studies approaches, analysis, plagiarism, and research ethics.	06
III	**TECHNICALWRITING /PRESENTATION** Effective technical writing, how to write report, paper, developing a research proposal, format of research proposal, a presentation and assessment by a review committee	06
IV	**INTRODUCTION TO INTELLECTUAL PROPERTY RIGHTS (IPR)** Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.	06
V	**INTELLECTUAL PROPERTY RIGHTS (IPR)** Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System, IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.	06
	Total Instructional Hours	**30**

Course Outcome

CO1: Ability to formulate research problem.
CO2: Ability to carry out research analysis.
CO3: Ability to follow research ethics.
CO4: Ability to understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
CO5: Ability to understand about IPR and filing patents in R & D.

REFERENCE BOOKS:

R1: Asimov, “Introduction to Design”, Prentice Hall, 1962

R2: Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd ,2007

R3: Mayall, “Industrial Design”, McGraw Hill, 1992.

R4: Niebel, “Product Design”, McGraw Hill, 1974.

R5: Ranjit Kumar, 2nd Edition, “Research Methodology: A Step by Step Guide for beginners” 2010

Signed By

Dr Shankar S
CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K
PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	**20CP1001**	**Advanced Data Structures Laboratory**	**0**	**0**	**4**	**2**

Course Objective

1. To familiarize various data structure implementations.
2. To implement heap and various tree structures like AVL, Red-black, B-Tree and segment trees.
3. To understand efficient implementation of line segment intersection.
4. To understand various search structures.
5. To get understanding of problem to program mapping.

S.No	Description of the Experiments
1.	Binary Search Trees
2.	Min/Max Heaps
3.	Leftist Heaps
4.	AVL Trees
5.	Red-Black Trees
6.	B-Trees
7.	Segment Trees
8.	Line segment intersection
	Total Practical Hours	**60**

Course Outcome

CO1: Achieve programming skill to convert a problem to a programming logic.
CO2: Apply suitable data structure for the problem in hand.
CO3: Implement heap and various tree structures like AVL, Red-black, B-Tree and segment trees.
CO4: Understand the usage of data structures for geometric problems.
CO5: Understand the importance of height balancing in search structures.

Signed By

Dr Shankar S
CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K
PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	**20CP1002**	**Advanced Database Management System Laboratory**	**0**	**0**	**4**	**2**

Course Objective

1.To explore the features of a Database Management Systems
2.To interface a database with front end tools
3.To understand the internals of a database system

Description of the Experiments

S.No	
1.	Basic SQL
2.	Intermediate SQL
3.	Advanced SQL
4.	ER Modeling
5.	Database Design and Normalization
6.	Accessing Databases from Programs using JDBC
7.	Building Web Applications using PHP & MySQL
8.	Indexing and Query Processing
9.	Query Evaluation Plans
10.	Concurrency and Transactions
11.	Big Data Analytics using Hadoop

Total Instructional Hours **60**

Course Outcome

CO1: Ability to use databases for building web applications
CO2: Gaining knowledge about the internals of a database system

Signed By

Dr Shankar S
CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K
PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	**20CP2201**	**Advanced algorithms**	**3**	**0**	**0**	**3**

COURSE OUTCOMES:

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

CO 1: analyze the algorithm's efficiency of any given problem.(K4)

CO 2: apply different algorithmic design techniques to solve the problem.(S2,K3)

CO 3: use various efficient optimization techniques and parallel algorithms to reduce space complexity. (S5,K2)

CO 4: develop different approximation algorithm for P and NP class Problems. (S3,A2)

UNIT I ANALYSIS OF ALGORITHMIC PERFORMANCE 9

Introduction of Analysis of algorithm - Average and worst case analysis- Probabilistic and Randomized algorithm - Computation Analysis - Algorithm Redesign and Adaptation - Asymptotic Notation - Amortized Efficiency.

UNIT II ALGORITHMIC DESIGN TECHNIQUES 9

Divide and Conquer: Binary Search – Analysis - Greedy Method: Prim's Algorithm – Analysis - Dynamic Programming strategies: Computing Binomial Co-efficient – Analysis - Backtracking: Eight Queen's Problem- Analysis - Branch and Bound- 0 / 1 Knapsack Problem

UNIT III EFFICIENT DATA PROCESSING 9

Searching algorithms - Priority queues - Binary heaps - Binomial heaps - Dictionaries - Hash tables - String Matching - Introduction to string-matching problem- Naïve algorithm - Rabin Karp - Knuth Morris Pratt - Boyer-Moore algorithms and complexity analysis- Data compression algorithms - Huffman compression -Lempel-Ziv compression

UNIT IV PROBABILISTIC & PARALLEL ALGORITHMS 9

Probabilistic Algorithm - Numerical probabilistic algorithms - Monte Carlo algorithms-Las Vegas algorithms - Parallel algorithms: Introduction - Complexity measure for a parallel algorithmparallel searching algorithm - parallel sorting algorithm - parallel algorithm for matrix manipulation

UNIT V COMPUTATIONAL COMPLEXITY & APPROXIMATION ALGORITHMS 9

The class P and NP: NP- Completeness Problem, NP-Hard Problems - Approximation Algorithms: Introduction- approximation factor- Polynomial Time Approximation Scheme (PTAS) - Fully Polynomial Time Approximation Scheme (FPTAS) - Approximation algorithms: Travelling Salesman Problem – knapsack problem - Bin packing- subset sum problem

TOTAL: 45 PERIODS

REFERENCES

1. Dave, Dave Parag Himanshu, "Design and Analysis of Algorithms", 2nd Edition, Pearson Education India, 2007.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction To Algorithms ", 3rd Edition, MIT Press, 2008.
3. Sara Baase, "Computer Algorithms: Introduction to Design and Analysis, Second Edition", Addison-Wesley, 2008.
4. Banachowski. L, Kreczmar. A, Wojciech. R, "Analysis of Algorithms and Data Structures", 2nd Edition, Addison Wesley, 2006.
5. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", 2nd Edition, Pearson Education, 2011.

Signed By

Dr Shankar S
CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K
PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	**20CP2202**	**Cloud Computing Technologies**	**3**	**0**	**0**	**3**

Course Objective

1. To understand the concept of cloud and utility computing.
2. To understand the various issues in cloud computing.
3. To familiarize themselves with the lead players in cloud.
4. To appreciate the emergence of cloud as the next generation computing paradigm.
5. To be able to set up a private cloud.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Introduction- Historical Development – Cloud Computing Architecture – The Cloud Reference Model – Cloud Characteristics –Cloud Deployment Models: Public, Private, Community, Hybrid Clouds- Cloud Delivery Models: IaaS, PaaS, SaaS – Open Source Private Cloud Software: Eucalyptus, Open Nebula, Open Stack.	09
II	**VIRTUALIZATION** Data Center Technology – Virtualization – Characteristics of Virtualized Environments - Taxonomy of Virtualization Techniques – Virtualization and Cloud Computing –Pros and Cons of Virtualization – Implementation Levels of Virtualization – Tools and Mechanisms: Xen, VMWare, Microsoft Hyper-V, KVM, Virtual Box	09
III	**CLOUD COMPUTING MECHANISM** Cloud Infrastructure Mechanism: Cloud Storage, Cloud Usage Monitor, Resource Replication – Specialized Cloud Mechanism: Load Balancer, SLA Monitor, Pay-per-use Monitor, Audit Monitor, Failover System, Hypervisor, Resource Cluster, Multi Device Broker, State Management Database – Cloud Management Mechanism: Remote Administration System, Resource Management System, SLA Management System, Billing Management System	09
IV	**HADOOP AND MAP REDUCE** Apache Hadoop – Hadoop Map Reduce –Hadoop Distributed File System- Hadoop I/O- Developing a Map Reduce Application – Map Reduce Types and Formats – Map Reduce Features– Hadoop Cluster Setup –Administering Hadoop.	09
V	**SECURITY IN THE CLOUD** Basic Terms and Concepts – Threat Agents – Cloud Security Threats –Cloud Security Mechanism: Encryption, Hashing, Digital Signature, Public Key Infrastructure, Identity and Access Management, Single Sign-on, Cloud Based Security Groups, Hardened Virtual Server Images.	09
	Total Instructional Hours	**45**

Course Outcome

CO1:	Articulate the main concepts, key technologies, strengths and limitations of cloud computing
CO2:	Identify the architecture, infrastructure and delivery models of cloud computing.
CO3:	Explain the core issues of cloud computing such as security, privacy and interoperability.
CO4:	Choose the appropriate technologies, algorithms and approaches for the related issues.
CO5:	Facilitate Service Level Agreements (SLA).

REFERENCE BOOKS:

R1: Thomas Erl, Zaigham Mahood, Ricardo Puttini, "Cloud Computing, Concept, Technology & Architecture", Prentice Hall, 2013.

R2: Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, "Mastering Cloud Computing", Tata McGraw-Hill,2013.

R3: Toby Velte, Anthony Velte, Robert C. Elsenpeter, "Cloud Computing, A Practical Approach", Tata McGraw-Hill Edition, 2010.

R4: Arshdeep Bahga, Vijay Madisetti, "Cloud Computing: A Hands-On Approach", Universities Press(India) Private Limited, 2014.

R5: Tom White, "Hadoop: The Definitive Guide", O'Reilly Media, 4th Edition, 2015.

James E Smith and Ravi Nair, "Virtual Machines", Elsevier, 2005.

Signed By

Dr Shankar S
CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K
PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	**20CP2251**	**Machine Learning Techniques**	**3**	**0**	**2**	**4**

Course Objective

1. To understand the concepts of Machine Learning.
2. To appreciate supervised learning and their applications.
3. To appreciate the concepts and algorithms of unsupervised learning.
4. To understand the theoretical and practical aspects of Probabilistic Graphical Models.
5. To appreciate the concepts and algorithms of advanced learning.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Machine Learning–Types of Machine Learning –Machine Learning process-preliminaries, testing Machine Learning algorithms, turning data into Probabilities, and Statistics for Machine Learning- Probability theory – Probability Distributions – Decision Theory.	08
II	**SUPERVISED LEARNING** Linear Models for Regression – Linear Models for Classification- Discriminant Functions, Probabilistic Generative Models, Probabilistic Discriminative Models – Decision Tree Learning – Bayesian Learning, Naïve Bayes – Ensemble Methods, Bagging, Boosting, Neural Networks, Multi-layer Perceptron, Feed- forward Network, Error Back propagation - Support Vector Machines	10
III	**UNSUPERVISED LEARNING** Clustering- K-means – EM Algorithm- Mixtures of Gaussians – Dimensionality Reduction, Linear Discriminant Analysis, Factor Analysis, Principal Components Analysis, Independent Components Analysis.	09
IV	**PROBABILISTIC GRAPHICAL MODELS** Graphical Models – Undirected Graphical Models – Markov Random Fields – Directed Graphical Models –Bayesian Networks – Conditional Independence properties – Markov Random Fields- Hidden Markov Models – Conditional Random Fields(CRFs).	09
V	**ADVANCED LEARNING** Sampling-Basic Sampling methods, Monte Carlo, Gibbs Sampling – Computational Learning Theory – Mistake Bound Analysis – Reinforcement learning – Markov Decision processes, Deterministic and Non-deterministic Rewards and Actions, Temporal Difference Learning Exploration	09
	Total Instructional Hours	**45**

Course Outcome

CO1: Design a learning model appropriate to the application.
CO2: Design a Neural Network for an application of your choice.
CO3: Implement Probabilistic Discriminative and Generative algorithms for an application of your choice and analyze the results.
CO4: Use a tool to implement typical Clustering algorithms for different types of applications.
CO5: Design and implement an HMM for a Sequence Model type of application.

REFERENCE BOOKS:

R1: Christopher Bishop, “Pattern Recognition and Machine Learning” Springer, 2007.

R2: Stephen Marsland, “Machine Learning – An Algorithmic Perspective”, Chapman andHall, CRC Press, Second Edition, 2014

R3: Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.

R4: Ethem Alpaydin, “Introduction to Machine Learning”, MIT Press, Third Edition, 2014.

R5: Tom Mitchell, “Machine Learning”, McGraw-Hill, 1997.

Signed By

Dr Shankar S
CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K
PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	**20CP2251**	**Machine Learning Techniques Laboratory**	**0**	**0**	**4**	**2**

Course Objective

1. To apply the concepts of Machine Learning to solve real-world problems
2. To implement basic algorithms in clustering & classification applied to text & numeric data
3. To implement algorithms emphasizing the importance of bagging & boosting in classification & regression
4. To implement algorithms related to dimensionality reduction
5. To apply machine learning algorithms for Natural Language Processing applications

S.No	Description of the Experiments
1.	Solving Regression & Classification using Decision Trees
2.	Root Node Attribute Selection for Decision Trees using Information Gain
3.	Bayesian Inference in Gene Expression Analysis
4.	Pattern Recognition Application using Bayesian Inference
5.	Bagging in Classification
6.	Bagging, Boosting applications using Regression Trees
7.	Data & Text Classification using Neural Networks
8.	Using Weka tool for SVM classification for chosen domain application
9.	Data & Text Clustering using K-means algorithm
10.	Data & Text Clustering using Gaussian Mixture Models
11.	Dimensionality Reduction Algorithms in Image Processing applications
12.	Application of CRFs in Natural Language Processing

Total Instructional Hours 60

Course Outcome

CO1:	To learn to use Weka tool for implementing machine learning algorithms related to numeric data
CO2:	To learn the application of machine learning algorithms for text data
CO3:	To use dimensionality reduction algorithms for image processing applications
CO4:	To apply CRFs in text processing applications
CO5:	To use fundamental and advanced neural network algorithms for solving real-world data

Signed By

Dr Shankar S
CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K
PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	**20CP2001**	**Advanced Algorithms Laboratory**	**0**	**0**	**4**	**2**

Course Objective

1. To learn mathematical background for analysis of algorithm
2. To learn various advanced data structures.
3. To understand the concept of designing an algorithm.
4. To understand the concept of pattern matching
5. To learn advanced tree and graph applications.

Description of the Experiments

S.No	
1.	Singly linked list
2.	Doubly linked list.
3.	Write a Java program to implement priority queue ADT
4.	Write a Java program to perform the following operations: i.Construct a binary search tree of elements. ii.Search for a key element in the above binary search tree. iii.Delete an element from the above binary search tree.
5.	Write a Java program to implement all the functions of a dictionary (ADT) using Hashing.
6.	Write a Java program to implement Dijkstra's algorithm for Single source shortest path problem.
7.	Write Java programs that use recursive and non-recursive functions to traverse the given binary tree in i.Preorder ii.Inorder iii.Postorder.
8.	Write Java programs for the implementation of bfs and dfs for a given graph.
9.	Write Java programs for implementing the following sorting methods: i.Heap sort ii.Quick sort iii.Radix sort
10.	Write a Java program to perform the following operations: i.Insertion into a B-tree ii.Searching in a B-tree
11.	Write a Java program that implements Kruskal's algorithm to generate minimum cost spanning tree.
12.	Write a Java program that implements KMP algorithm for pattern matching.

Total Instructional Hours 60

Course Outcome

CO1: Students will be able to choose appropriate advanced data structure for given problem.
CO2: Students will be able to calculate complexity.
CO3: Students will be able to select appropriate design techniques to solve real world problems.
CO4: Students will able to apply the dynamic programming technique to solve the problems.
CO5: Students will be able to select a proper pattern matching algorithm for given problem

Signed By

Dr Shankar S
CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K
PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	**20CP3301**	**Big Data Computing**	**3**	**0**	**0**	**3**

Course Objective

1. Introduce Big Data and Hadoop
2. Introduce Big Data Platform
3. Introduce Big data streaming platform for fast Data
4. To Learn about Machine learning
5. To understand the Application of Big Data.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO BIG DATA** Introduction to Big Data-Big Data enabling Technologies- Hadoop Stack for Big Data-Hadoop Distributed File System-Hadoop Map Reduce 1.0- Hadoop Map Reduce 2.0-Map Reduce examples.	9
II	**BIG DATA PLATFORM** Parallel Programming with spark-Introduction to Spark- Spark Built-in Libraries-Design of Key Value stores-Data placement Strategies-CAP Theorem-Consistency Solutions-Design of Zookeeper-CQL(Cassandra Query Language)	9
III	**BIG DATA STREAMING PLATFORMS FOR FAST DATA** Introduction to Big Data Streaming Platforms for Fast Data-Introduction to Big Data Streaming Systems-Big Data Pipelines for Real-Time computing -Design of HBase-Spark Streaming and Sliding Window Analytics- Sliding Window Analytics-Introduction to Kafka.	9
IV	**MACHINE LEARNING** Big Data Machine Learning-Machine Learning Algorithm K-Means Using Map Reduce for Big Data Analytics -Parallel K-Means Using Map Reduce On Big Data Cluster Analysis-Decision Trees for Big Data Analytics-Big Data Predictive Analytics .	9
V	**BIG DATA APPLICATIONS** Introduction to Big Data Applications (Graph Processing-Introduction to Pregel-Parameter Servers-PageRank Algorithm in Big Data-Spark GraphX & Graph Analytics-Case Study: Flight Data Analysis Using Spark GraphX	9
	Total Instructional Hours	**45**

Course Outcome

CO1:	Understand the Big Data and Hadoop
CO2:	Understand the Big Data Platform
CO3:	Understand the Big data streaming platform for fast Data
CO4:	Explore the Machine learning
CO5:	Illustrate Various Big Data applications

TEXT BOOK :

T1: Bart Baesens, Analytics in a Big Data World: The Essential Guide to Data Science and its Applications, Wiley, 2014

REFERENCE BOOKS:

R1: https://nptel.ac.in/courses/106/104/106104189/

R2: Dirk Deroos et al., Hadoop for Dummies, Dreamtech Press, 2014.

R3: Chuck Lam, Hadoop in Action, December, 2010.

Signed By

Dr Shankar S
CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K
PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	**20CP2301**	**Agent Based Intelligent System**	**3**	**0**	**0**	**3**

Course Objective

1. Demonstrate good knowledge of basic theoretical foundations of the following common intelligent systems methodologies: Rule-based systems, Fuzzy inferencing and artificial neural networks.
2. Determine which type of intelligent system methodology would be suitable for a given type of application problem.
3. Demonstrate, in the form of a major project work, the ability to design and Develop an intelligent system for a selected application.
4. Demonstrate, in the form of a major project work, the ability to design and develop an intelligent system for a selected application The learning mechanisms of agents
5. Demonstrate, in the form of a major project work, the ability to design and develop an the communication and cooperation within agents

Unit	Description	Instructional Hours
I	**INTRODUCTION** Definitions - Foundations - History - Intelligent Agents-Problem Solving-Searching -Heuristics -Constraint Satisfaction Problems - Game playing.	9
II	**KNOWLEDGE REPRESENTATION AND REASONING** Logical Agents-First order logic-First Order Inference-Unification-Chaining-Resolution Strategies-Knowledge Representation-Objects-Actions-Events	9
III	**PLANNING AGENTS** Planning Problem-State Space Search-Partial Order Planning-Graphs-Nondeterministic Domains-Conditional Planning-Continuous Planning-MultiAgent Planning.	9
IV	**AGENTS AND UNCERTAINITY** Acting under uncertainty – Probability Notation-Bayes Rule and use – Bayesian Networks-Other Approaches-Time and Uncertainty-Temporal Models- Utility Theory - Decision Network – Complex Decisions.	9
V	**HIGHER LEVEL AGENTS** Knowledge in Learning-Relevance Information-Statistical Learning Methods Reinforcement Learning-Communication-Formal Grammar-Augmented Grammars Future of AI.	9
	Total Instructional Hours	**45**

Course Outcome

CO1:	Students will gain deep understanding of the basic artificial intelligence techniques.
CO2:	Students will apply their knowledge to design solutions to different problems.
CO3:	Students will have the ability to design and develop an intelligent system for a selected application.
CO4:	An ability to work individually or as a member with responsibility to function on multidisciplinary teams.
CO5:	Ability to understand and apply computational platforms and software tools for Information Technology applications

TEXT BOOKS:

T1: Stuart Russell and Peter Norvig, "Artificial Intelligence - A Modern Approach",2nd Edition, Prentice Hall, 2002

REFERENCE BOOKS:

R1: Michael Wooldridge, "An Introduction to Multi Agent System", John Wiley, 2002.

R2: Patrick Henry Winston, Artificial Intelligence, 3rd Edition, AW, 1999.

R3: Nils.J.Nilsson, Principles of Artificial Intelligence, Narosa Publishing House, 1992

Signed By

Dr Shankar S

CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K

PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	**20CP2302**	**Multicore Architectures**	**3**	**0**	**0**	**3**

Course Objective

1. To introduce the students to the recent trends in the field of Computer Architecture and identify performance related parameters.
2. To understand the different multiprocessor issues.
3. To expose the different types of multicore architectures.
4. To understand the design of the memory hierarchy.
5. To understand how the various forms of parallelism are exploited by the architecture.

Unit	Description	Instructional Hours
I	**FUNDAMENTALS OF COMPUTER DESIGN AND ILP** Fundamentals of Computer Design – Measuring and Reporting Performance – Instruction Level Parallelism and its Exploitation – Concepts and Challenges – Limitations of ILP – Multithreading – SMT and CMP Architectures – The Multicore era.	9
II	**MEMORY HIERARCHY DESIGN** Introduction – Optimizations of Cache Performance – Memory Technology and Optimizations – Protection: Virtual Memory and Virtual Machines – Design of Memory Hierarchies – Case Studies.	9
III	**MULTIPROCESSOR ISSUES** Symmetric and Distributed Shared Memory Architectures – Cache Coherence Issues – Performance Issues – Synchronization Issues – Models of Memory Consistency – Interconnection Networks – Buses, Crossbar and Multi-stage Interconnection Networks.	9
IV	**MULTICORE ARCHITECTURES** Homogeneous and Heterogeneous Multi-core Architectures – Intel Multicore Architectures – SUN CMP architecture – IBM Cell Architecture. Introduction to Warehouse-Scale computers, Cloud Computing – Architectures and Issues – Case Studies.	9
V	**VECTOR, SIMD AND GPU ARCHITECTURES** Vector Architecture – SIMD Extensions for Multimedia – Graphics Processing Units – Case Studies – GPGPU Computing – Detecting and Enhancing Loop Level Parallelism – Introduction to Domain Specific Architectures.	9
	Total Instructional Hours	**45**

Course Outcome

CO1:	Identify the limitations of ILP and the need for multicore architectures.
CO2:	Discuss the issues related to multiprocessing and suggest solutions.
CO3:	Point out the salient features of different multicore architectures and how they exploit parallelism.
CO4:	Point out the various optimizations that can be performed to improve the memory hierarchy design.
CO5:	Point out the salient features of vector, GPU and domain specific architectures.

REFERENCE BOOKS:

R1: John L. Hennessey and David A. Patterson, "Computer Architecture – A Quantitative Approach", Morgan Kaufmann / Elsevier, 5th edition, 2012.

R2: Darryl Gove, "Multicore Application Programming: For Windows, Linux, and Oracle Solaris", Pearson, 2011.

R3: David B. Kirk, Wen-mei W. Hwu, "Programming Massively Parallel Processors", Morgan Kauffman, 2010.

R4: Wen–mei W.Hwu,"GPU Computing Gems", Morgan Kaufmann / Elsevier, 2011.

Signed By

Dr Shankar S

CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K

PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	**20CP2303**	**Software Design Patterns**	**3**	**0**	**0**	**3**

Course Objective

1. Demonstration of patterns related to object oriented design.
2. Describe the design patterns that are common in software applications.
3. Analyze a software development problem and express it.
4. Design a module structure to solve a problem, and evaluate alternatives.
5. Implement a module so that it executes efficiently and correctly.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO DESIGN PATTERN** What is a Design Pattern?, Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalogue of Design Patterns, Organizing The Cato log, How Design Patterns solve Design Problems, How to Select a Design pattern, How to Use a Design Pattern.	9
II	**A CASE STUDY OF DESIGN PATTERN** A Case Study: Designing a Document Editor, Design Problems , Document Structure, Formatting , Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary, Creational Patterns, Abstract Factory, Builder , Factory Method, Prototype, Singleton, Discussion of Creational Patterns	9
III	**STRUCTURAL PATTERN PART-I & II** Structural Pattern Part-I, Adapter, Bridge, Composite. Structural Pattern Part-II, Decorator, Facade, Flyweight, Proxy.	9
IV	**BEHAVIORAL PATTERNS PART: I & II** Behavioral Patterns Part: I, Chain of Responsibility, Command, Interpreter, Iterator. Behavioral Patterns Part: II, Mediator, Memento, Observer, Discussion of Behavioral Patterns.	9
V	**BEHAVIORAL PATTERNS PART:III** Behavioral Patterns Part: III, State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns. What to Expect from Design Patterns, A Brief History, The Pattern Community, An Invitation, A Parting Thought	9
	Total Instructional Hours	**45**

Course Outcome

CO1:	Construct a design consisting of a collection of modules.
CO2:	Exploit well-known design patterns (such as Iterator, Observer, Factory and Visitor).
CO3:	Distinguish between different categories of design patterns.
CO4:	Ability to understand and apply common design patterns to incremental/iterative development.
CO5:	Ability to identify appropriate patterns for design of given problem.
CO6:	Design the software using Pattern Oriented Architectures.

TEXT BOOKS:

T1: Design Patterns By Erich Gamma, Pearson Education

REFERENCE BOOKS:

R1: Patterns in JAVA Vol-I (or) Vol-II By Mark Grand, Wiley Dream Tech.

R2: Java Enterprise Design Patterns Vol-III By Mark Grand Wiley Dream Tech

Signed By

Dr Shankar S

CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K

PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	**20CP2304**	**Compiler Optimization Techniques**	**3**	**0**	**0**	**3**

Course Objective

1. To understand different forms of intermediate languages and analyzing programs.
2. To understand optimizations techniques for single program blocks.
3. To apply optimizations on procedures and low level code.
4. To explore and enhance inter procedural optimizations.
5. To enhance resource utilization.

Unit	Description	Instructional Hours
I	**INTERMEDIATE REPRESENTATION OF PROGRAMS AND ANALYSIS** Structure of an Optimizing Compiler – Compiler Construction tools – LIR, MIR, HIR, DAG, SyntaxTree and Postfix. Analysis: Control Flow Analysis, Iterative Data Flow Analysis, Static Single Assignment – A Linear Time Algorithm for Placing φ-Nodes, Basic Block Dependence, Alias Analysis. Introduction to LLVM – Compiling a language	9
II	**LOCAL AND LOOP OPTIMIZATIONS** Early Optimizations: Constant-Expression Evaluation – Scalar Replacement of Aggregates – Algebraic Simplifications and Re-association – Value Numbering – Copy Propagation – Sparse Conditional Constant Propagation. Redundancy Elimination: Common – Subexpression Elimination – Loop-Invariant Code Motion – Partial-Redundancy Elimination – Redundancy Elimination and Reassociation – Code Hoisting. Loop Optimizations: Induction Variable Optimizations – Unnecessary Bounds Checking Elimination. LLVM pass –LLVM Test Infrastructure.	9
III	**PROCEDURE OPTIMIZATION AND SCHEDULING** Procedure Optimizations: Tail-Call Optimization and Tail-Recursion Elimination – Procedure Integration – In-Line Expansion – Leaf-Routine Optimization and Shrink Wrapping. Code Scheduling: Instruction Scheduling – Speculative Loads and Boosting – Speculative Scheduling – Software Pipelining – Trace Scheduling – Percolation Scheduling. Control-Flow and Low-Level Optimizations: Unreachable-Code Elimination – Straightening – If Simplifications – Loop Simplifications –Loop Inversion Un-switching – Branch Optimizations – Tail Merging or Cross Jumping – Conditional Moves – Dead-Code Elimination – Branch Prediction – Machine Idioms and Instruction Combining. LLVM API procedure optimization.	9
IV	**INTER PROCEDURAL OPTIMIZATION** Symbol table Runtime Support – Interprocedural Analysis and Optimization: Interprocedural Control- Flow Analysis – The Call Graph – Interprocedural Data-Flow Analysis – Interprocedural Constant Propagation – Interprocedural Alias Analysis – Interprocedural Optimizations – Interprocedural Register Allocation – Aggregation of Global References. LLVM – Interprocedural Analyses.	9
V	**OPTIMIZING FOR MEMORY** Register Allocation: Register Allocation and Assignment – Local Methods – Graph Coloring Priority Based Graph Coloring. Computations on Iteration Spaces-Optimization for the Memory Hierarchy: Impact of Data and Instruction Caches – Instruction-Cache Optimization – Scalar Replacement of Array Elements – Data-Cache Optimization – Scalar vs. Memory-Oriented Optimizations. Software	9

Prefetching – Parallelization – Instruction Level Parallelism – Automatic Parallelization

Total Instructional Hours 45

Course Outcome	CO1:	Identify the different optimization techniques that are possible for a sequence of code.
	CO2:	Design performance enhancing optimization techniques.
	CO3:	Manage procedures with optimal overheads.
	CO4:	Understand modern programming language features and constructs.
	CO5:	Learn to work on a larger software project
	CO6:	

REFERENCE BOOKS:

R1: Steven.S. Muchnick, Advanced Compiler Design and Implementation, Morgan Kaufman Publishers, 1997.

R2: Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, "Compilers: Principles, Techniques, and Tools", Addison Wesley, Second Edition, 2007.

R3: Y.N.Srikant, Priti Shankar, "The Compiler Design Handbook – Optimizations and Machine Code Generation", CRC Press, Second Edition, 2008.

R4: Andrew W. Appel, Jens Palsberg, "Modern Compiler Implementation in Java", Cambridge University Press, Second Edition, 2002.

R5: Keith Cooper, Linda Torczon, "Engineering a Compiler", Morgan Kaufmann, Second Edition, 2011.

R6: Randy Allen and Ken Kennedy, Optimizing Compilers for Modern Architectures: A Dependence based Approach, Morgan Kaufman, 2001.

Signed By

Dr Shankar S

CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K

PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	20CP2305	Distributed Operating Systems	3	0	0	3

Course Objective

1. To understand the concepts of distributed systems.
2. To get an insight into the various issues and solutions in distributed operating systems.
3. To learn about real-time operating systems.
4. To gain knowledge on the design concepts of mobile operating systems.
5. To understand cloud operating systems

Unit	Description	Instructional Hours
I	**INTRODUCTION** Distributed Operating Systems – Issues – Communication Primitives – Limitations of a Distributed System – Lamport's Logical Clocks – Vector Clocks – Causal Ordering of Messages	9
II	**DISTRIBUTED OPERATING SYSTEMS** Distributed Mutual Exclusion Algorithms – Classification – Preliminaries – Simple Solution – Lamport's Algorithm – Ricart-Agrawala Algorithm – Suzuki-Kasami's Broadcast Algorithm – Raymond's Tree-Based Algorithm – Distributed Deadlock Detection – Preliminaries – Centralized Deadlock Detection Algorithms – Distributed Deadlock Detection Algorithms – Path Pushing Algorithm – Edge Chasing Algorithm – Hierarchical Deadlock Detection Algorithms – Agreement Protocols – Classification – Solutions to the Byzantine Agreement Problem – Lamport-Shostak- Pease Algorithm	9
III	**DISTRIBUTED RESOURCE MANAGEMENT** Distributed File Systems – Design Issues – Google File System – Hadoop Distributed File System-Distributed Shared Memory – Algorithms for Implementing Distributed Shared Memory – Load Distributing Algorithms – Synchronous and Asynchronous Check Pointing and Recovery – Fault Tolerance – Two-Phase Commit Protocol – Nonblocking Commit Protocol	9
IV	**REAL TIME OPERATING SYSTEMS** Basic Model of Real - Time Systems – Characteristics – Application of Real - Time Systems – Real - Time Task Scheduling – Handling Resource Sharing	9
V	**MOBILE AND CLOUD OPERATING SYSTEMS** Android – Overall Architecture – Linux Kernel – Hardware Support – Native User-Space – Dalvik and Android's Java – System Services – Introduction to Cloud Operating Systems.	9
	Total Instructional Hours	**45**

Course Outcome

CO1:	Identify the features of distributed operating systems.
CO2:	Demonstrate the various protocols of distributed operating systems.
CO3:	Identify the different features of real time operating systems.
CO4:	Discuss the features of mobile operating systems.
CO5:	Discuss the features of cloud operating systems.

REFERENCE BOOKS:

R1: Mukesh Singhal and Niranjan G. Shivaratri, "Advanced Concepts in Operating Systems – Distributed, Database and Multiprocessor Operating Systems", Tata MC Graw-Hill, 2001

R2: Rajib Mall, "Real-Time Systems: Theory and Practice", Pearson Education India, 2006.

R3: Karim Yaghmour, "Embedded Android", O'Reilly, First Edition, 2013.

R4: Nikolay Elenkov, "Android Security Internals: An In-Depth Guide to Android's Security Architecture", No Starch Press, 2014.

Signed By

Dr Shankar S
CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K
PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	**20CP2306**	**Software Process And Project Management**	**3**	**0**	**0**	**3**

Course Objective

1. To understand overall SDLC and adopt suitable processes
2. To elicite, analyze, prioritize, and manage both functional and quality requirements
3. To estimate efforts required, plan, and track the plans
4. To understand and apply configuration and quality management techniques
5. To evaluate, manage, and design processes

Unit	Description	Instructional Hours
I	**DEVELOPMENT LIFE CYCLE PROCESSES** Overview of software development life cycle – introduction to processes – Personal Software Process (PSP) – Team software process (TSP) – Unified processes – agile processes – choosing the right process Tutorial: Software development using PSP	9
II	**REQUIREMENTS MANAGEMENT** Functional requirements and quality attributes – elicitation techniques – Quality Attribute Workshops (QAW) – analysis, prioritization, and trade-off – Architecture Centric Development Method (ACDM) – requirements documentation and specification – change management – traceability of requirements Tutorial: Conduct QAW, elicit, analyze, prioritize, and document requirements using ACDM	9
III	**ESTIMATION, PLANNING, AND TRACKING** Identifying and prioritizing risks – risk mitigation plans – estimation techniques – use case points – function points – COCOMO II – top-down estimation – bottom-up estimation – work breakdown structure – macro and micro plans – planning poker – wideband delphi – documenting the plan – tracking the plan – earned value method (EVM) Tutorial: Estimation, planning, and tracking exercises	9
IV	**CONFIGURATION AND QUALITY MANAGEMENT** identifying artifacts to be configured – naming conventions and version control – configuration control – quality assurance techniques – peer reviews – Fegan inspection – unit, integration, system, and acceptance testing – test data and test cases – bug tracking – causal analysis Tutorial: version control exercises, development of test cases, causal analysis of defects	9
V	**SOFTWARE PROCESS DEFINITION AND MANAGEMENT** Process elements – process architecture – relationship between elements – process modeling – process definition techniques – ETVX (entry-task-validation-exit) – process baselining – process assessment and improvement – CMMI – Six Sigma Tutorial: process measurement exercises, process definition using ETVX	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Explain software development life cycle

CO2: Elicit functional and quality requirements

CO3:	Perform trade-off among conflicting requirements
CO4:	Estimate the efforts required for software development
CO5:	Control the artifacts during software development

REFERENCE BOOKS:

R1: Pankaj Jalote, "Software Project Management in Practice", Pearson, 2002.

R2: Chris F. Kemerer, "Software Project Management – Readings and Cases", McGraw Hill, 1997.

R3: Watts S. Humphrey, "PSP: A self-improvement process for software engineers", Addison- Wesley, 2005.

R4: Watts S. Humphrey, "Introduction to the Team Software Process", Addison-Wesley, 2000.

R5: Orit Hazzan and Yael Dubinsky, "Agile software engineering", Springer, 2008.

R6: James R. Persse, "Process Improvement Essentials", O'Reilly, 2006.

R7: Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Seventh Edition, McGraw Hill, 2010.

Signed By

Dr Shankar S
CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K
PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	**20CP3302**	**Image Processing And Analysis**	**3**	**0**	**0**	**3**

Course Objective

1. Describe and explain basic principles of digital image processing.
2. Design and implement algorithms that perform basic image processing (e.g. noise removal and image enhancement).
3. Design and implement algorithms for advanced image analysis (e.g. image compression, image segmentation).
4. Assess the performance of image processing algorithms and systems
5. Assess image processing algorithms in practical applications.

Unit	Description	Instructional Hours
I	**IMAGE PROCESSING FUNDAMENTALS** Introduction – Elements of visual perception, Steps in Image Processing Systems – Digital Imaging System - Image Acquisition – Sampling and Quantization – Pixel Relationships – File Formats – colour images and models - Image Operations – Arithmetic, logical, statistical and spatial operations.	9
II	**IMAGE ENHANCEMENT AND RESTORATION** Image Transforms -Discrete and Fast Fourier Transform and Discrete Cosine Transform ,Spatial Domain - Gray level Transformations Histogram Processing Spatial Filtering – Smoothing and Sharpening. Frequency Domain: Filtering in Frequency Domain – Smoothing and Sharpening filters – Homomorphic Filtering., Noise models, Constrained and Unconstrained restoration models.	9
III	**IMAGE SEGMENTATION AND MORPHOLOGY** Detection of Discontinuities – Edge Operators – Edge Linking and Boundary Detection – Thresholding – Region Based Segmentation – Motion Segmentation, Image Morphology: Binary and Gray level morphology operations - Erosion, Dilation, Opening and Closing Operations Distance Transforms- Basic morphological Algorithms. Features – Textures - Boundary representations and Descriptions- Component Labeling – Regional descriptors and Feature Selection Techniques.	9
IV	**IMAGE ANALYSIS AND CLASSIFICATION** Image segmentation- pixel based, edge based, region based segmentation. Active contour models and Level sets for medical image segmentation, Image representation and analysis, Feature extraction and representation, Statistical, Shape, Texture, feature and statistical image classification	9
V	**IMAGE REGISTRATION AND VISUALIZATION** Rigid body visualization, Principal axis registration, Interactive principal axis registration, Feature based registration, Elastic deformation based registration, Image visualization – 2D display methods, 3D display methods, virtual reality based interactive visualization	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Analyze general terminology of digital image processing.

CO2: Examine various types of images, intensity transformations and spatial filtering.

CO3: Develop Fourier transform for image processing in frequency domain.
CO4: Evaluate the methodologies for image segmentation, restoration etc.
CO5: Implement image process and analysis algorithms.

REFERENCE BOOKS:

R1: Alasdair McAndrew, ―Introduction to Digital Image Processing with Matlab‖, Cengage Learning 2011,India

R2: Anil J Jain, ―Fundamentals of Digital Image Processing‖, PHI, 2006

R3: Kavyan Najarian and Robert Splerstor,‖ Biomedical signals and Image processing‖,CRC – Taylor and Francis, New York, 2006

R4: Rafael C.Gonzalez and Richard E.Woods, ―Digital Image Processing‖, Third Edition, Pearson Education, 2008, New Delhi

R5: S.Sridhar, ―Digital Image Processing‖, Oxford University Press, 2011

Signed By

Dr Shankar S
CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K
PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	**20CP3303**	**Data Mining Techniques**	**3**	**0**	**0**	**3**

Course Objective

1. To understand data mining principles and techniques and Introduce DM as a cutting edge business intelligence.
2. To expose the students to the concepts of data warehousing architecture and implementation.
3. To learn various Data Mining techniques such as classification, clustering & Association rule mining
4. To study the overview of developing areas – web mining, text mining and ethical aspects of data mining.
5. To identify business applications and trends of data mining.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO DATA WAREHOUSING** 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	9
II	**DATA WAREHOUSE PROCESS AND ARCHITECTURE** 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	9
III	**INTRODUCTION TO DATA MINING** 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-Mining frequent patterns-association-correlation	9
IV	**CLASSIFICATION AND CLUSTERING** 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	9
V	**PREDICTIVE MODELING OF BIG DATA AND TRENDS IN DATA MINING** Statistics and Data Analysis – EDA – Small and Big Data –Logistic Regression Model - Ordinary Regression Model-Mining complex data objects – Spatial databases – Temporal databases – Multimedia databases – Time series and sequence data – Text mining – Web mining – Applications in Data mining	9

Total Instructional Hours 45

Course Outcome	CO1:	Evolve multidimensional intelligent model from typical system.
	CO2:	Discover the knowledge imbibed in the high dimensional system and gain knowledge on dataware house process.
	CO3:	Acquire knowledge of data processing and data quality.
	CO4:	Design and deploy classification and clustering techniques.
	CO5:	Evaluate various mining techniques on complex data objects.

REFERENCE BOOKS:

R1: Jiawei Han, Micheline Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufmann, Third edition, 2011.

R2: Alex Berson, Stephen J. Smith, "Data Warehousing, Data Mining & OLAP", Tata McGraw Hill, Tenth Reprint, 2007.

R3: G. K. Gupta, "Introduction to Data Mining with Case Studies", Eastern Economy Edition, Prentice Hall of India, Third Edition, 2014.

R4: Ian.H.Witten, Eibe Frank and Mark.A.Hall, "Data Mining: Practical Machine Learning Tools and Techniques", Morgan Kaufmann, Third edition, 2011

R5: Bruce Ratner, "Statistical and Machine - Learning Data Mining: Techniques for Better Predictive Modeling and Analysis of Big Data", CRC Press, Second Edition, 2012

R6: Mehmed kantardzic, "Data mining: Concepts, Models, Methods, and Algorithms", Wiley-Blackwell, Second Edition, 2011.

R7: Ian Witten, Eibe Frank, "Data Mining: Practical Machine Learning Tools and Techniques", ThirdEdition, Morgan Kaufmann, 2011.

R8: George M Marakas, "Modern Data Warehousing, Mining and Visualization: Core Concepts", Prentice Hall, 2002.

Signed By

Dr Shankar S
CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K
PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	**20CP3304**	**Deep Learning Techniques**	**3**	**0**	**0**	**3**

Course Objective

1. 1. To understand the basic ideas and principles of Neural Networks
2. To understand the basic concepts of Big Data and Statistical Data Analysis
3. To familiarize the student with The Image Processing facilities like Tensorflow and Keras
4. To appreciate the use of Deep Learning Applications
5. To understand and implement Deep Learning Architectures

Unit	Description	Instructional Hours
I	**BASICS OF NEURAL NETWORKS** Basic concept of Neurons – Perceptron Algorithm – Feed Forward and Back Propagation Networks. **Suggested Activities:** Discussion of role of Neural Networks, External learning – Boltzmann Machine and Perceptron, Practical – Installation of Tensor Flow and Keras. **Suggested Evaluation Methods:** Tutorial – Perceptron,Assignment problems on backpropagation networks, Quizzes on Neural Networks.	9
II	**INTRODUCTION TO DEEP LEARNING** Feed Forward Neural Networks – Gradient Descent – Back Propagation Algorithm – Vanishing Gradient problem – Mitigation – RelU Heuristics for Avoiding Bad Local Minima – Heuristics for Faster Training – Nestors Accelerated Gradient Descent – Regularization – Dropout. **Suggested Activities:** Discussion of role of Gradient Descent in Deep Learning, External learning – Feature extraction and feature learning, Survey of Deep Learning Development Frameworks,Discussion of Gradient Descent Problem. **Suggested Evaluation Methods** Tutorial – Gradient descent in deep learning, Assignment problems in optimization. Quizzes on deep learning regularization and optimization.	9
III	**CONVOLUTIONAL NEURAL NETWORKS** CNN Architectures – Convolution – Pooling Layers – Transfer Learning – Image Classification using Transfer Learning **Suggested Activities:** Discussion of role of Convolutional Networks in Machine Learning, External learning – Concept of convolution and need for Pooling. **Suggested Evaluation Methods:** Tutorial – Image classification and recurrent nets,Assignment problems in image classification performances,Quizzes on Convolutional Neural Networks.	9
IV	**MORE DEEP LEARNING ARCHITECTURES** LSTM, GRU, Encoder/Decoder Architectures – Autoencoders – Standard- Sparse – Denoising – Contractive- Variational Autoencoders – Adversarial	9

	Generative Networks – Autoencoder and DBM **Suggested Activities:** Discussion of role of Deep Learning architectures,External learning – Compression of features using Autoencoders. **Suggested Evaluation Methods:** Tutorial – LSTM and Autoencoders,Assignment problems in deep generative models, Deep Belief Networks,Quizzes on deep learning architectures.	
V	**APPLICATIONS OF DEEP LEARNING** Image Segmentation – Object Detection – Automatic Image Captioning – Image generation with Generative Adversarial Networks – Video to Text with LSTM Models – Attention Models for Computer Vision – Case Study: Named Entity Recognition – Opinion Mining using Recurrent Neural Networks – Parsing and Sentiment Analysis using Recursive Neural Networks – Sentence Classification using Convolutional Neural Networks – Dialogue Generation with LSTMs. **Suggested Activities:** Discussion of role of Deep Learning in Image and NLP applications,External learning – NLP concepts. **Suggested Evaluation Methods:** Tutorial – Image segmentation,Assignment problems in parsing and sentiment analysis,Quizzes on deep learning architectures.	9
	Total Instructional Hours	**45**

Course Outcome	CO1:	Understand the role of Deep learning in Machine Learning Applications.
	CO2:	To get familiar with the use of TensorFlow/Keras in Deep Learning Applications.
	CO3:	To design and implement Deep Learning Applications.
	CO4:	Critically Analyse Different Deep Learning Models in Image Related Projects.
	CO5:	To design and implement Convolutional Neural Networks, To know about applications of Deep Learning in NLP and Image Processing.

REFERENCE BOOKS:

R1: Ian Good Fellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press, 2017.
R2: Francois Chollet, “Deep Learning with Python”, Manning Publications, 2018.
R3: Phil Kim, “Matlab Deep Learning: With Machine Learning, Neural Networks and Artificial Intelligence”, Apress , 2017.
R4: Ragav Venkatesan, Baoxin Li, “Convolutional Neural Networks in Visual Computing”, CRC Press, 2018.
R5: Navin Kumar Manaswi, “Deep Learning with Applications Using Python”, Apress, 2018
R6: Joshua F. Wiley, “R Deep Learning Essentials”, Packt Publications, 2016.

Signed By

Dr Shankar S
CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K
PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	**20CP3305**	**Soft Computing Techniques**	**3**	**0**	**0**	**3**

Course Objective

1. To learn the key aspects of Soft computing and Neural networks.
2. To study the fuzzy logic components.
3. To gain insight onto neuro fuzzy modeling and control.
4. To know about the components and building block hypothesis of genetic algorithm.
5. To gain knowledge in machine learning through neural networks

Unit	Description	Instructional Hours
I	**INTRODUCTION TO SOFT COMPUTING** Evolution of Computing – Soft Computing Constituents – From Conventional AI to Computational Intelligence – Machine Learning Basics	9
II	**GENETIC ALGORITHMS** Introduction to Genetic Algorithms (GA) – Applications of GA – Building Block Hypothesis- Representation– Fitness Measures – Genetic Operators-. GA based Machine Learning	9
III	**NEURAL NETWORKS** Machine Learning using Neural Network, Adaptive Networks – Feed Forward Networks – Supervised Learning Neural Networks – Radial Basis Function Networks – Reinforcement Learning – Unsupervised Learning Neural Networks – Adaptive Resonance Architectures – Advances in Neural Networks	9
IV	**FUZZY LOGIC** Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations – Membership Functions-Fuzzy Rules and Fuzzy Reasoning – Fuzzy Inference Systems – Fuzzy Expert Systems – Fuzzy Decision Making.	9
V	**NEURO-FUZZY MODELING** Adaptive Neuro-Fuzzy Inference Systems – Coactive Neuro-Fuzzy Modeling – Classification and Regression Trees – Data Clustering Algorithms – Rule based Structure Identification – Neuro- Fuzzy Control – Case Studies.	9
	Total Instructional Hours	**45**

Course Outcome

CO1:	Differentiate Conventional AI and Computational Intelligence.
CO2:	Discuss on machine learning through neural networks.
CO3:	Apply knowledge in developing a Fuzzy expert system.
CO4:	Model Neuro Fuzzy system for clustering and classification.
CO5:	Discover knowledge to develop Genetic Algorithm and Support vector machine based machine learning system

REFERENCE BOOKS:

R1: Jyh-Shing Roger Jang, Chuen-Tsai Sun, EijiMizutani, “Neuro-Fuzzy and Soft Computing”, Prentice-Hall of India, 2002.

R2: KwangH.Lee, “First course on Fuzzy Theory and Applications”, Springer, 2005.

R3: George J. Klir and Bo Yuan, “Fuzzy Sets and Fuzzy Logic-Theory and Applications”, Prentice Hall, 1996.

R4: James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Addison Wesley, 2003.

R5: David E.Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning", Addison Wesley, 1989.

R6: Mitchell Melanie, "An Introduction to Genetic Algorithm", MIT Press, 1996

R7: S.N.Sivanandam, S.N.Deepa, "Introduction to Genetic Algorithms", Springer, 2008 edition

Signed By

Dr Shankar S
CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K
PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	**20CP3306**	**Linguistic Computing**	**3**	**0**	**0**	**3**

Course Objective

1. To learn the fundamentals of natural language processing
2. To appreciate the use of CFG and PCFG in NLP
3. To understand the role of semantics and pragmatics
4. To Understanding semantics and pragmatics of English language for processing
5. To Writing programs in Python to carry out natural Language processing

Unit	Description	Instructional Hours
I	**INTRODUCTION** Words - Regular Expressions and Automata - Words and Transducers - N-grams - Part-ofSpeech – Tagging - Hidden Markov and Maximum Entropy Models.	9
II	**SPEECH** Speech – Phonetics - Speech Synthesis - Automatic Speech Recognition – Speech Recognition: - Advanced Topics - Computational Phonology	9
III	**SYNTAX** Formal Grammars of English - Syntactic Parsing - Statistical Parsing - Features and Unification - Language and Complexity.	9
IV	**SEMANTICS AND PRAGMATICS** The Representation of Meaning - Computational Semantics - Lexical Semantics - Computational Lexical Semantics - Computational Discourse	9
V	**APPLICATIONS** Information Extraction - Question Answering and Summarization - Dialogue and Conversational Agents - Machine Translation	9
	Total Instructional Hours	**45**

Course Outcome

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

TEXT BOOKS:

T1: Daniel Jurafsky, ―Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech‖, Pearson Publication, 2014.

T2: Steven Bird, Ewan Klein and Edward Loper, ―Natural Language Processing with Python‖, First Edition, O'Reilly Media, 2009

REFERENCE BOOKS:

R1: Breck Baldwin, ―Language Processing with Java and LingPipe Cookbook‖, Atlantic Publisher, 2015.

R2: Richard M Reese, ―Natural Language Processing with Java‖, O'Reilly Media, 2015.

R3: Nitin Indurkhya and Fred J. Damerau, ―Handbook of Natural Language Processing‖, Second Edition, Chapman and Hall/CRC Press, 2010

Signed By

Dr Shankar S
CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K
PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	**20CP3307**	**Advanced Cryptography Techniques**	**3**	**0**	**0**	**3**

Course Objective

1. To understand the mathematical foundations of security principles.
2. To appreciate the different aspects of encryption techniques.
3. To understand various attacks present over encryption and authentications techniques.
4. To understand the role played by authentication in security.
5. To appreciate the current trends of security practices.

Unit	Description	Instructional Hours
I	**CLASSICAL ENCRYPTION AND BLOCKCIPHERS** Classical Encryption – Substitution Cipher – One-time-pad Encryption – Block Ciphers – DES – Key Recovery Attacks on Block Ciphers – Iterated-DES and DESX – AES – Limitations of Key- recovery based Security	9
II	**PSEUDO RANDOM FUNCTIONS AND SYMMETRIC ENCRYPTION** Random Functions – Permutations – Pseudo Functions – Pseudo-random Permutations – Modelling Blockciphers – Security Against Key Recovery – The Birthday Attack – Symmetric Encryption Schemes – Chosen Plaintext Attacks – Semantic Security – Security of CTR and CBC-Chosen Ciphertext Attack.	9
III	**HASH FUNCTIONS AND MESSAGE AUTHENTICATION** Hash Function SHA1 – Collision resistant Hash Functions – Collision Finding Attacks – Onewayness of Collision resistant Hash Functions – MD Transform – Syntax for message Authentication – PRF as a MAC Paradigm – CBC MAC – Universal-hashing Approach – Authenticated Encryption.	9
IV	**NUMBER THEORY AND ASYMMETRIC ENCRYPTION** Computational Number Theory – Number Theoretic Primitives – Diffie Hellman Problem – Asymmetric Encryption Schemes – Hybrid Encryption – ElGamal Scheme and its Variants – Homomorphic Encryption – Digital Signatures	9
V	**SECURITY PRACTICES AND ADVANCED TOPICS** Electronic Mail Security – IP Security – Digital Cash – Schnorr's Identification Protocol and Signature – Blind Signature – Distributed Ledger and Bitcoin — Secret Sharing – Shamir Threshold Scheme – Security in Routing – Mixnet	9
	Total Instructional Hours	**45**

Course Outcome

CO1:	Demonstrate the various classical encryption techniques and the adversary capabilities.
CO2:	Apply computational secrecy and semantic security to find out the probability of how strong are the security schemes.
CO3:	Illustrate the various MAC and HASH functions and apply the Birthday attack over Hash.
CO4:	Apply number theory in public key encryption techniques.
CO5:	Analyze the application of cryptography for secure E-Commerce and other secret transactions.

REFERENCE BOOKS:

R1: MihirBellare and Phillip Rogaway, “Introduction to Modern Cryptography”, 2005.

R2: Jonathan Katz and Yehuda Lindell, “Introduction to Modern Cryptography ”,Chapman and Hall/CRC Press Second Edition,2015.

R3: Hans Delfts and Helmut Knebl, “Introduction to Cryptography – Principles and Applications”, Springer, Third Edition by,2015.

Signed By

Dr Shankar S
CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K
PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	**20CP3401**	**Data Science for Engineers**	**3**	**0**	**0**	**3**

Course Objective

1. Introduce R as a programming language
2. Introduce the mathematical foundations required for data science
3. Introduce the first level data science algorithms
4. Introduce a data analytics problem solving framework
5. Introduce a practical capstone case study

Unit	Description	Instructional Hours
I	**INTRODUCTION TO R** Introduction to R– Variables and Data types in R-Data Frames-Recasting and joining of data frames-Arithmetic, Logical and Matrix operations in R-advanced programming in R:Functions-Control structures-Data visualization in R basic graphics.	9
II	**LINEAR ALGEBRA AND STATISTICS** Solving Linear Equations-Linear Algebra-Distances ,Hyper planes and Half space, Eigen values, Eigen vectors-Statistical Modeling-Random variables and probability Mass/Density functions-Sample Statistics-hypotheses Testing	9
III	**OPTIMIZATION** Optimization for Data science-Unconstrained Multivariate Optimization-Gradient Descent (Learning Rule)- Multivariate Optimization with Equality constraints-Multivariate Optimization with Inequality constraints-Introduction to Data science-Solving Data Analysis problems –A Guided Thought process-	9
IV	**REGRESSION** Module: Predictive Modeling-Linear Regression-Model Assessment-Diagnostics to Improve linear model Fit-Simple Linear Regression Model building- Simple Linear Regression Model Assessment -Multiple Linear Regression- assessing importance of different variables-subset selection	9
V	**CLASSIFICATION AND CLUSTERING** Cross Validation- Multiple Linear Regression modeling Building and selection-Classification- Logistic Regression –Performance Measures- Logistic Regression implementation in R- K-Nearest Neighbors- K-Nearest Neighbors implementation in R-K-means Clustering-K-Means implementation in R	9
	Total Instructional Hours	**45**

Course Outcome

CO1:	Describe a flow process for data science problems
CO2:	Classify data science problems into standard typology
CO3:	Develop R codes for data science solutions
CO4:	Correlate results to the solution approach followed
CO5:	Assess the solution approach

REFERENCE BOOKS:

R1: Https://Nptel.Ac.In/Courses/106/106/106106179/

R2: Introduction To Linear Algebra - By Gilbert Strang.

R3: Applied Statistics And Probability For Engineers – By Douglas Montgomery

Signed By

Dr Shankar S
CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K
PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	**20CP3402**	**Industrial Safety**	**3**	**0**	**0**	**3**

Course Objective

1. Summarize basics of industrial safety
2. Describe fundamentals of maintenance engineering
3. Explain wear and corrosion
4. Illustrate fault tracing
5. Identify preventive and periodic maintenance

Unit	Description	Instructional Hours
I	**INTRODUCTION** Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.	09
II	**FUNDAMENTALS OF MAINTENANCE ENGINEERING** Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment	09
III	**WEAR AND CORROSION AND THEIR PREVENTION** Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods	09
IV	**FAULT TRACING** Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.	09
V	**PERIODIC AND PREVENTIVE MAINTENANCE** Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance	09
	Total Instructional Hours	**45**

Course Outcome	CO1:	Ability to summarize basics of industrial safety
	CO2:	Ability to describe fundamentals of maintenance engineering
	CO3:	Ability to explain wear and corrosion
	CO4:	Ability to illustrate fault tracing
	CO5:	Ability to identify preventive and periodic maintenance

REFERENCE BOOKS:

R1: Audels, Pump-hydraulic Compressors, Mcgrew Hill Publication, 1978.

R2: Garg H P,Maintenance Engineering, S. Chand and Company,1987

R3: Hans F. Winterkorn, Foundation Engineering Handbook, Chapman & Hall London, 2013.

R4: Higgins & Morrow, Maintenance Engineering Handbook, Eighth Edition,2008

Signed By

Dr Shankar S
CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K
PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	**20AC1091**	**English For Research Paper Writing**	**2**	**0**	**0**	**0**

Course Objective

1. Teach how to improve writing skills and level of readability
2. Tell about what to write in each section
3. Summarize the skills needed when writing a Title
4. Infer the skills needed when writing the Conclusion
5. Ensure the quality of paper at very first-time submission

Unit	Description	Instructional Hours
I	**INTRODUCTION TO RESEARCH PAPER WRITING** Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness	06
II	**PRESENTATION SKILLS** Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Introduction	06
III	**TITLE WRITING SKILLS** Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check	06
IV	**RESULT WRITING SKILLS** Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions	06
V	**VERIFICATION SKILLS** Useful phrases, checking Plagiarism, how to ensure paper is as good as it could possibly be the first- time submission	06
	Total Instructional Hours	**30**

Course Outcome

CO1: Understand that how to improve your writing skills and level of readability
CO2: Learn about what to write in each section
CO3: Understand the skills needed when writing a Title
CO4: Understand the skills needed when writing the Conclusion
CO5: Ensure the good quality of paper at very first-time submission

REFERENCE BOOKS:

R1: Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011
R2: Day R How to Write and Publish a Scientific Paper, Cambridge University Press 2006
R3: Goldbort R Writing for Science, Yale University Press (available on Google Books) 2006
R4: Highman N, Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book 1998.

Signed By

Dr Shankar S
CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K
PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	**20AC1092**	**Disaster Management**	**2**	**0**	**0**	**0**

Course Objective

1. Summarize basics of disaster
2. Explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.
3. Illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
4. Describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
5. Develop the strengths and weaknesses of disaster management approaches

Unit	Description	Instructional Hours
I	**INTRODUCTION** Disaster: Definition, Factors and Significance; Difference between Hazard And Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.	06
II	**REPERCUSSIONS OF DISASTERS AND HAZARDS** Economic Damage, Loss of Human and Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.	06
III	**DISASTER PRONE AREAS IN INDIA** Study of Seismic Zones; Areas Prone To Floods and Droughts, Landslides And Avalanches; Areas Prone To Cyclonic and Coastal Hazards with Special Reference To Tsunami; Post-Disaster Diseases and Epidemics	06
IV	**DISASTER PREPAREDNESS AND MANAGEMENT** Preparedness: Monitoring Of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological And Other Agencies, Media Reports: Governmental and Community Preparedness.	06
V	**RISK ASSESSMENT** Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival	06
	Total Instructional Hours	**30**

Course Outcome

CO1:	Ability to summarize basics of disaster
CO2:	Ability to explain a critical understanding of key concepts in disaster risk reduction and humanitarian response
CO3:	Ability to illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
CO4:	Ability to describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations
CO5:	Ability to develop the strengths and weaknesses of disaster management approaches

REFERENCE BOOKS:

R1: Goel S. L., Disaster Administration And Management Text And Case Studies",Deep & Deep Publication Pvt. Ltd., New Delhi,2009.

R2: NishithaRai, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'NewRoyal book Company,2007.

R3: Sahni, PardeepEt.Al. ," Disaster Mitigation Experiences And Reflections", Prentice Hall OfIndia, New Delhi,2001.

Signed By

Dr Shankar S
CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K
PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	**20AC1093**	**Sanskrit for Technical Knowledge**	**2**	**0**	**0**	**0**

Course Objective

1. Illustrate the basic sanskrit language.
2. Recognize sanskrit, the scientific language in the world.
3. Appraise learning of sanskrit to improve brain functioning.
4. Relate sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power.
5. Extract huge knowledge from ancient literature.

Unit	Description	Instructional Hours
I	**ALPHABETS** Alphabets in Sanskrit	06
II	**TENSES AND SENTENCES** Past/Present/Future Tense - Simple Sentences	06
III	**ORDER AND ROOTS** Order - Introduction of roots	06
IV	**SANSKRIT LITERATURE** Technical information about Sanskrit Literature	06
V	**TECHNICAL CONCEPTS OF ENGINEERING** Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics	06
	Total Instructional Hours	**30**

Course Outcome

CO1: Understanding basic Sanskrit language
CO2: Write sentences.
CO3: Know the order and roots of Sanskrit.
CO4: Know about technical information about Sanskrit literature.
CO5: Understand the technical concepts of Engineering.

REFERENCE BOOKS:

R1: "Abhyaspustakam" – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi

R2: "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication

R3: "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi, 2017.

Course Outcome

Approved By

Signed By

Dr Shankar S
CHAIRMAN, BOARD OF STUDIES

Dr Karunakaran K
PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	20AC1094	Pedagogy Studies	2	0	0	0

Course Objective

1. Review existing evidence on there view topic to inform programme design and policy
2. Making under taken by the DfID, other agencies and researchers.
3. Identify critical evidence gaps to guide the development.
4. Identify their Professional Development.
5. Improve the Research and Future Direction.

Unit	Description	Instructional Hours
I	**INTRODUCTION AND METHODOLOGY** Aims and rationale, Policy background, Conceptual framework and terminology - Theories of learning, Curriculum, Teacher education - Conceptual framework, Research questions - Overview of methodology and Searching.	06
II	**THEMATIC OVERVIEW** Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries - Curriculum, Teacher education.	06
III	**EVIDENCE ON THE EFFECTIVENESS OF PEDAGOGICAL PRACTICES** Methodology for the in depth stage: quality assessment of included studies - How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? - Theory of change - Strength and nature of the body of evidence for effective pedagogical practices - Pedagogic theory and pedagogical approaches - Teachers' attitudes and beliefs and Pedagogic strategies.	06
IV	**PROFESSIONAL DEVELOPMENT** Professional development: alignment with classroom practices and follow up support - Peer support - Support from the head teacher and the community - Curriculum and assessment - Barriers to learning: limited resources and large class sizes	06
V	**RESEARCH GAPS AND FUTURE DIRECTIONS** Research design – Contexts – Pedagogy - Teacher education - Curriculum and assessment - Dissemination and research impact.	06
	Total Instructional Hours	**30**

Course Outcome

CO1: What pedagogical practices are being used by teachers informal and informal classrooms in developing countries?

CO2: What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?

CO3: How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

CO4: How can teacher to develop their Professional development support effective pedagogy?

CO5: How can improve the Research and Future Direction using effective pedagogy.

REFERENCE BOOKS:

R1: Ackers J, HardmanF (2001) Classroom interaction in Kenyan primary schools, Compare, 31(2): 245-261.

R2: Agrawal M (2004)Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36(3):361-379.

R3: Akyeampong K (2003) Teacher training in Ghana-does it count? Multi-site teacher education research project (MUSTER) country report 1.London:DFID

R4: Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33(3): 272–282.

R5: Alexander RJ(2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.

R6: Chavan M(2003) Read India: Amass scale, rapid, 'learning to read' campaign.

Signed By

Dr Shankar S
CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K
PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	20AC1095	Constitution of India	2	0	0	0

Course Objective

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional
3. Role and entitlement to civil and economic rights as well as the emergence nation hood in the early years of Indian nationalism.
4. To address the role of socialism in India after the commencement of the Bolshevik Revolutionin1917and its impact on the initial drafting of the Indian Constitution
5. To understand the central and state relation, financial and administrative.

Unit	Description	Instructional Hours
I	**HISTORY OF MAKING OF THE INDIAN CONSTITUTION & PHILOSOPHY OF THE INDIAN CONSTITUTION** History, Drafting Committee, (Composition & Working), Preamble, Salient Features	06
II	**CONTOURS OF CONSTITUTIONAL RIGHTS AND DUTIES** Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.	06
III	**ORGANS OF GOVERNANCE** Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions	06
IV	**LOCAL ADMINISTRATION** District's Administration head: Role and Importance Municipalities: Introduction, Mayor and role of Elected Representative, CEO, Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy(Different departments), Village level:Role of Elected and Appointed officials, Importance of grass root democracy	06
V	**ELECTION COMMISSION** Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners - Institute and Bodies for the welfare of SC/ST/OBC and women.	06
	Total Instructional Hours	**30**

Course Outcome

CO1:	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
CO2:	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
CO3:	Discuss the circumstances surrounding the foundation of the Congress Socialist Party[CSP] under the leadership of Jawaharlal Nehru
CO4:	The eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
CO5:	Discuss the passage of the Hindu Code Bill of 1956.

REFERENCE BOOKS:

R1: The Constitution of India,1950(Bare Act),Government Publication.

R2: Dr.S.N.Busi, Dr.B. R.Ambedkar framing of Indian Constitution,1st Edition, 2015.

R3: M.P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis,2014.

R4: D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Signed By

Dr Shankar S
CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K
PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	20AC2091	Value Education	2	0	0	0

Course Objective

1. Understand value of education and self-development
2. Imbibe good values in students
3. Let the should know about the importance of character
4. To teach and inculcate the importance of value based living.
5. To give students a deeper understanding about the purpose of life.

Unit	Description	Instructional Hours
I	**VALUES AND SELF-DEVELOPMENT** Values and self-development–Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non-moral valuation. Standards and principles. Value judgements	7
II	**IMPORTANCE OF CULTIVATION OF VALUES** Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline	7
III	**PERSONALITY AND BEHAVIOR DEVELOPMENT** Personality and Behavior Development-Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault Thinking. Free from anger, Dignity of labour. Universal brother hood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature	8
IV	**CHARACTER AND COMPETENCE** Character and Competence–Holy books vs Blind faith. Self-management and Good health. Science of reincarnation. Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively.	8
	Total Instructional Hours	**30**

Course Outcome

CO1: Students will understand the importance of value based living.

CO2: Students will gain deeper understanding about the purpose of their life.

CO3: Students will understand and start applying the essential steps to become good leaders.

CO4: Students will emerge as responsible citizens with clear conviction to practice values and ethics in life.

CO5: Students will become value based professionals and building a healthy nation

REFERENCE BOOKS:

R1: Chakroborty, S.K.“Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

Signed By

Dr Shankar S
CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K
PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	20AC2092	Stress Management By Yoga	2	0	0	0

Course Objective

1. To achieve overall health of body and mind
2. To overcome stress
3. To possess emotional stability.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO YOGA** Definitions of Eight parts of yoga.(Ashtanga)	10
II	**DO`S AND DON'T'S IN LIFE** Yam and Niyam - Do`s and Don't's in life - i) Ahinsa, satya, astheya, bramhacharya and aparigraha, ii) Ahinsa, satya, astheya, bramhacharya and aparigraha.	10
III	**ASAN AND PRANAYAM** Asan and Pranayam - Various yog poses and their benefits for mind & body - Regularization of breathing techniques and its effects-Types of pranayam	10
	Total Instructional Hours	**30**

Course Outcome

CO1: Develop healthy mind in a healthy body thus improving social health also

CO2: Improve efficiency

CO3: The student will apply forces and exert themselves using rarely used muscle groups

REFERENCE BOOKS:

R1: Yogic Asanas for Group Tarining-Part-I":Janardan Swami Yoga bhyasi Mandal

R2: "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

Signed By

Dr Shankar S
CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K
PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
ME	**20AC2093**	**Personality Development Through Life Enlightenment Skills**	**2**	**0**	**0**	**0**

11

1. To learn to achieve the highest goal happily
2. To become a person with stable mind, pleasing personality and determination
3. To awaken wisdom in students

Unit	Description	Instructional Hours
I	**NEETISATAKAM-HOLISTIC DEVELOPMENT** Neetisatakam-holistic development of personality - Verses- 19,20,21,22 (wisdom) - Verses- 29,31,32 (pride & heroism) – Verses- 26,28,63,65 (virtue) - Verses- 52,53,59 (dont's) - Verses- 71,73,75,78 (do's)	10
II	**DAY TO DAY WORK AND DUTIES** Approach to day to day work and duties - Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48 - Chapter 3-Verses 13, 21, 27, 35 Chapter 6-Verses 5,13,17,23, 35 - Chapter 18-Verses 45, 46, 48.	10
III	**STATEMENTS OF BASIC KNOWLEDGE** Statements of basic knowledge - Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 Chapter 12 -Verses 13, 14, 15, 16,17, 18 - Personality of role model - shrimad bhagwad geeta - Chapter2-Verses 17, Chapter 3-Verses 36,37,42 -Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37,38,63	10
	Total Instructional Hours	**30**

Course Outcome

CO1: Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life

CO2: The person who has studied Geeta will lead the nation and mankind to peace and prosperity

CO3: Study of Neet is hatakam will help in developing versatile personality of students.

REFERENCE BOOKS:

R1: Gopinath, Rashtriya Sanskrit Sansthanam P, Bhartrihari's Three Satakam, Niti-sringar-vairagya, New Delhi,2010

R2: Swami Swarupananda , Srimad Bhagavad Gita, Advaita Ashram, Publication Department, Kolkata, 2016.

Signed By

Dr Shankar S
CHAIRMAN, BOARD OF STUDIES

Approved By

Dr Karunakaran K
PRINCIPAL