SCHOOL OF COMPUTER SCIENCE & ENGINEERING

DEPARTMENT OF COMPUTER ENGINEERING

TEACHING SCHEME& SYLLABUS

MASTER OF TECHNOLOGY

Computer Science and Engineering

(Batch 2021-23)

JULY-2021

INDEX

VISION

To create knowledge based society with scientific temper, team spirit and dignity of labor toface global competitive challenges.

Mission

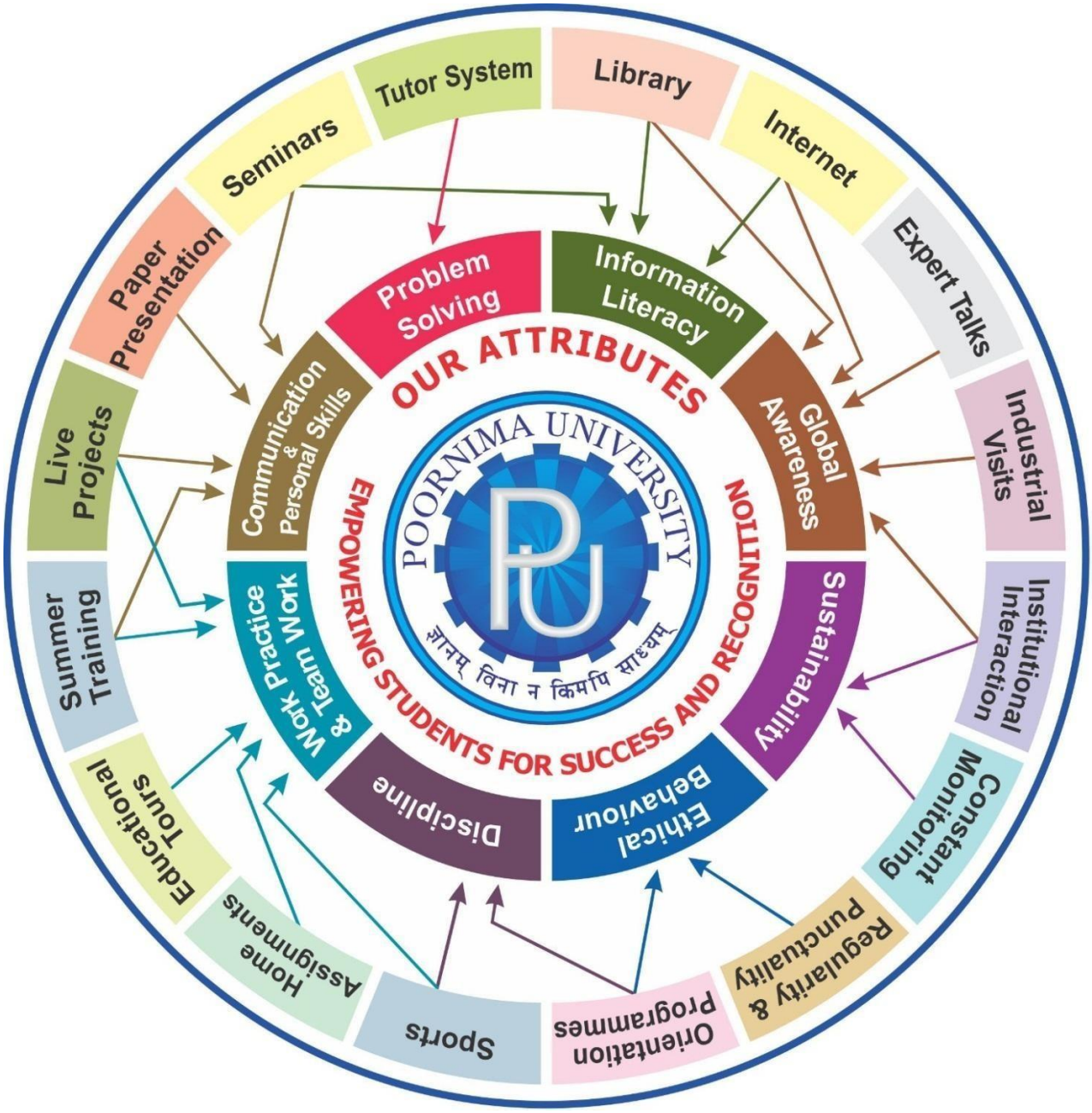
To evolve and develop skill based systems for effective delivery of knowledge so as to equip young professionals with dedication and commitment to excellence in all spheres of life.

Quality Policy

To provide Quality Education through Faculty development, updating of facilities andcontinual improvement meeting University norms and keeping stake holders satisfied.

Knowledge Wheel

At Poornima, the academic atmosphere is a rare blend of modern technical as well as soft skillsand traditional systems of learning processes.



REVISED SYLLABUS OF MASTER OF TECHNOLOGY (B.Tech)

Title of the Programme

1. Master of Technology (B.Tech)

Nature of the Programme

(i) M. Tech is two year (full-time programme).

Preamble

3. The revised curriculum for M.Tech is developed keeping in mind the national priorities and international practices. It also attempts to align the programme structure and course contents with student aspirations & recruiter expectations. This syllabus also attempts to align with National Goal of "***Make in India", "Start – Up and Stand – Up India" and "Digital India".***

Need for Revision of the Curriculum

4. There was a need for revision of the curriculum in view of the dynamism in the industry practices, evolution in technology and the evolving expectations of key stakeholders viz. students, the industry and faculty members at large. It also has relevance due to changedtechnological, social, cultural and economic environment of the nation.

5. Specifically, the triggers for the comprehensive revamp of the curriculum are

(a) New Skills & Competencies desired due to dynamic technology environment: Jobs of today were perhaps not created about 5 years ago. This aspect has a direct linkage with contents and structure of syllabus across the Knowledge, Skills and Attitude (KSA) dimensions, which calls for frequent and meaningful updating of the curriculum.

(b) Concerns expressed by the Industry: The industry has expressed concerns about the need for improvement in the communication skills, inter-personal skills, domain knowledge basics, business environment awareness, technology proficiency, and attitude of the M.Tech graduates. Newer and innovative evaluation methods are necessary to address these concerns of the industry.

(c) Application Orientation: There is a pressing need to imbibe application oriented thinking, based on sound knowledge of Technical field, principles and concepts. Technical education needs to move out of the classrooms and instead focus on group activity, field work, experiential learning, etc. This can be achieved only through a radical change in the evaluation pattern and course delivery methodology.

(d) Changing mind-set of the Learner: The profile of the students for the M. Tech programme, their learning styles and the outlook towards higher education has undergone a gradual transformation. The expectations of the students from the M. Tech programme have changed over the last decade.

(e) Integrate a basket of skill sets: SET-Schools are expected to imbibe varied aspects of 'learning beyond the syllabus through innovative curriculum design, contemporary syllabus, effective delivery and comprehensive evaluation.

(f) Entrepreneurial aspirations and preparedness for the same: The youth now aspires to become masters of their own and wish to start up their new ventures. These will create further growth opportunities.

6. Specifically, the following skill sets are in focus:-

(a) Reading & Listening Skills

(b) Problem Definition& Problem Solving Skills

(c) Application of Technology Tools

(d) Mastery of Analytics (Quantitative Aspects)

(e) Sensitization to Cross-Functional skills

(f) Sensitization to Cross-Cultural skills

(g) Sensitization to Global perspectives

(h) Peer-based Learning - Working in groups

(i) Learning by application and doing – Experiential learning

(j) Team building basics and its orientation

Programme Objectives

7. The M. Tech programme prepares a student for a career in diverse sectors of the industry domestically and globally. The M.Tech programme facilitates learning in theory and practice of different functional areas of technologies and equips the students with an integrated approach to various functions of new technologies. However, the demand for technical skills is not limited to the industry. Technical talent is much sought by the Government Sector, NGOs, non- corporate sector as well.Students also expect to become entrepreneurs. Their aspirations also require a broad based learning encompassing the end to end processes involved in developing

entrepreneurial skills. Schools, Faculty and Students need to move away from the excessive focus on industry and look at needs and demands of broader sections of the society also.

8. Specifically the objectives of the M.Tech Programme are:-

(a) To equip the students with requisite knowledge, skills &right attitude necessary to provide effective leadership in a global environment.

(b) To develop competent Technical professionals with strong ethical values, capable of assuming a pivotal role in various sectors of the Indian Economy &Society, aligned with the national priorities.

(c) To develop proactive thinking so as to perform effectively in the dynamic socio-economic and business ecosystem.

(d) To harness entrepreneurial approach and skillsets.

Highlights of the New Curriculum

9. The New Curriculum intends to add immense value to all stakeholders by effectively addressing their requirements in more than one way by:-

(a) Enhancing the brand value of the Technical programme of Poornima University, Jaipur.

(b) Providing the much needed flexibility to carve a niche for themselves.

(c) Emphasizing the centrality of the student and teacher-student relationship in the learning process.

(d) Focusing on 'Continuous Evaluation' i.e. continuous evaluation throughout the programme.

(e) Empowering the Schools through cafeteria approach – by providing Generic Core, Subject Core, Generic Elective, and Subject Elective Courses. This shall provide in-built flexibility in the curriculum to help the Schools to offer tailor made courses preferred by students, from a wider basket of courses.

(f) More weightage is given on Continuous Evaluation Pattern.

(g) Emphasizing Experiential learning aspect through Lab Credit Courses.

(h) Supplementing traditional classroom teaching/learning with focus on group activity, field work, experiential learning, self-study, projects, Industry Exposure Programmes etc.

(i) A thorough revamp of Systems and Operations Specializations to make them more meaningful and attractive to M.Tech students.

(j) Providing opportunity to students to choose courses from other electives to explore cross-functional issues.

(j) Emphasizing on Research, Inter-personal, Analytical, Cross-Cultural, Entrepreneurial Skills, and Global aspects of managerial careers throughout the curriculum.

Pattern

10. The Programme comprises of 4 Semesters for M.Tech, adopts the Choice Based Credit System (CBCS) and Grading System.

Choice Based Credit System

11. Choice Based Credit System (CBCS) offers wide ranging choice for students to opt for courses based on their aptitude and their career goals. CBCS works on the fundamental premise that students are mature individuals, capable of making their own decisions.

12. CBCS enables a student to obtain a degree by accumulating required number of credits prescribed for that degree. The number of credits earned by the student reflects the knowledge or skill acquired him / her. Each course is assigned a fixed number of credits based on the contents to be learnt & the expected effort of the student. The grade points earned for each course reflects the student's proficiency in that course. CBCS is a process of evolution of educational reforms that would yield the result in subsequent years and after a few cycles of its implementation.

Key Features of CBCS

13. (a) **Enriching Learning Environment**. A student is provided with an academically rich, highly flexible learning system blended with abundant provision for skill practice andactivity orientation that he/she could learn in depth without sacrificing his/her creativity. There is a definite movement away from the traditional lectures and written examination.

(b) **Learn at your own pace**: A student can exercise the option to decide his/her own pace of learning- slow, normal or accelerated plan. Students can select courses according to their aptitude, tastes and preferences.

(c) **Continuous Learning & Student Centric Continuous Evaluation.**CBCS makes the learning process continuous and the evaluation process is not only made continuous but also made learnercentric. The evaluation is designed to recognize the capability and talent of a student.

(d) **Active Student-Teacher Participation**. CBCS leads to quality education withactive teacher-student participation. This provides avenues to meet student's scholastic needsand aspirations.

(e) **Industry Institute Collaboration**. CBCS provides opportunities for meaningful collaboration with industry and foreign partners to foster innovation, by introduction of

electives and half credit courses through the cafeteria approach. This will go a long way in capacity building of students and faculty.

(f) **Interdisciplinary Curriculum**. Cutting edge developments generally occur at the interface of two or more discipline. Interdisciplinary approach enables integration of concepts, theories, techniques, and perspectives from two or more disciplines to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline.

(g) **Employability Enhancement**. CBCS shall ensure that students enhance their skill/employability by taking up project work, entrepreneurship and vocational training.

(h) **Faculty Expertise**. CBCS shall give the Schools the much needed flexibility to make best use of the expertise of available faculty.

Programme Structure in Choice Based Credit System

14.14.

PROGRAMME			
SEMESTER			
COURSES			
CORE COURSES		***ELECTIVE COURSES***	
Generic Core	***Subject Core***	***Generic Elective***	***Subject Elective***

Time Schedule

15. An academic year is divided into two Semesters – Odd and Even. Odd Semester shall have I and III whereas Even semester shall have IIand IV. In each semester, courses are offered in 15 teaching weeks and the remaining 5 weeks are to be utilized for conduct of examinations and evaluation purposes.

16. For students, each week has 42 working hours spread over 5/6 days consisting of lectures, tutorials, assignments, class participation, library work, special counseling, Sports, project work, field visit, youth welfare and social activities.

17. Course. A "Course" is a component of programme, i.e. in the new system; papers will be referred to as courses. Each course is identified by a unique course code. While designing curriculum, course can have defined weightage. These weightages are called credits.

Each course, in addition to having a syllabus, has learning objectives and learning outcomes. A course may be designed to comprise lectures/ tutorials/ laboratory work/ field work/ project work/vocational training /viva voce etc. or a combination of some of these.

Core Courses

18. The Curriculum comprises of Core Courses and Elective Courses. Core courses are the foundation courses of technical education. They are compulsory for all the students. Core courses are of two types: Generic Core & Subject Core.

(a) **Generic Core.**This is the course which should compulsorily be studied by a candidate as a core requirement to complete the requirement of a degree in a said discipline of study. Therefore, Generic Core courses are mandatory and fundamental in nature. These courses cannot be substituted by any other courses. Such courses are also known as Hard Core Courses. A Hard core course may be a Theory, Practical, Seminar, Field based or Project Work based subject which is a compulsory component in the Programme Structure.

(b) **Subject Core:** A Core course may be a Subject Core if there is a choice or an option for the candidate to choose from a broad category (grouping) of subjects (specializations). These are also known as Soft Core Courses.

19. Following specializations shall be offered

S.No.	Course	Year of Starting
1	B.Tech. (Civil Engg.)	2012
3	B.Tech. (Mechanical Engg.)	2012
4	B.Tech. (Electrical Engg.)	2012
5	B. Tech. (Electronics & Communication Engg.)	2012
6	M. Tech. (Computer Engg.)	2012
7	M. Tech. (VLSI Design)	2012
8	M. Tech. (Power System)	2012
9	M. Tech. (Digital Communication)	2012
10	M. Tech. (Structural Engineering)	2012
11	M. Tech. (Transportation Engg.)	2012
12	M. Tech. (Thermal Engineering)	2012
13	M. Tech. (Industrial Auto. & Control)	2012
14	M. Tech. (Product Design & Manufacturing)	2012
15	Ph. D (in relevant Streams)	2012

For B. Tech Course:

21. Generic Core courses in Semester I and II provide foundations of Technical and Science Knowledge.
22. Generic Core courses in Semester III and IV focus on functional areas, principles and technical hand on experiences.
23. Generic Core courses in the Semester V and VI are integrative in nature along with the Core subjects, Technical Seminars and Industrial Training Seminar-I.
24. Generic Core courses in the Semester VII and VIII are integrative in nature along with the Core subjects, Technical report writing, Minor Project work, Industrial Training Seminar-II and Major Project/Dissertation.

For M.Tech Course:

25. Generic Core courses in Semester I and II provide strong foundations of Technical and Science Knowledge.
26. Generic Core courses in Semester III and IV focus on functional areas, research paper publications, thesis writing and technical software based analysis experiences.

Elective Course

27. Elective course is a course which can be chosen from a pool of courses. It may be:-

    (a) Very Specialized or advanced course focusing on a specific aspect

    (b) Supportive to the discipline of study

    (c) Providing an extended scope

    (d) Enabling an exposure to some other discipline/domain

    (e) Nurturing candidate's proficiency/skill.

28. **Open Elective (Generic Elective)**. An elective course which is common across disciplines / subjects is called a generic or open elective. 'Open Elective' courses develop generic proficiencies amongstthe students.

    (a) Open elective (Generic Elective) courses, in Semester III, facilitate self-development and skill building.

29. **Subject Elective/ Department Elective**. A 'Discipline centric' elective is called 'Subject/ Department Elective.

30. ***Open Elective:*** A subject elective course chosen generally from an unrelated discipline/subject, with an intention to seek cross-functional exposure is called an Open Elective. A Subject Elective offered in a discipline / subject may be treated as an Open Elective by other discipline / subject and vice versa.

Pre-requisites for successful implementation of CBCS

31. The success of the CBCS also requires certain commitments from both the students and the teachers.

(a) The student should be regular and punctual to his/ her classes, studious in carrying out the assignments and should maintain consistency in his tempo of learning. He should make maximum use of the available library, internet and other facilities.

(b) The teachers are expected to be alert and punctual and strictly adhere to the schedules of teaching, tests, seminars, evaluation and notification of results.

(c) All teachers should notify the tentative schedule of teaching and tests of the entire semester, including the dates of tests, dates of score notification and all other schedules, which can be planned in advance.

(d) The teachers are expected to adhere to unbiased and objective evaluation and marking of continuous evaluation scores (internal examinations) which will not only maintain the confidence of the students, but, at the same time, ensure that merit is given due credit.

(e) Transparency, objectivity and quality are the key factors that will sustain a good CBCS system.

(f) At the post-graduate level, and in a professional programme, the syllabus is tobe looked upon as the bare minimum requirement to be fulfilled and sufficient emphasis shall belaid on contemporary aspects, going beyond the syllabus.

Credits

32. **Credit**. The definition of 'credits' can be based on various parameters—such as the learning hours put in, learning outcomes and contact hours, the quantum of content/syllabus prescribed for the course. The credit system requires that a student progresses in the academic programmes not in terms of time (years or semesters), but in terms of courses.

33. Each course is assigned a certain credit, depending on the estimated effort put in by a student. When the student passes that course, he/she earns the credits associated with that course. In the Credit system the emphasis is on the hours put in by the learner and not on the workload of the teacher. Each credit can be visualized as a combination of 3 components viz. Lecture (L) + Tutorial (T) + Practical / Project Work (P) i.e. LTP Pattern.

34. The effort of the learner for each Credit Point may be considered under two parts:-

(a) One part consisting of the hours actually spent in class room / practical / Project work/ field work instructions.

(b) The other part consisting of notional hours spent by the Learner in self-study, in the library, peer interactions, case study, writing of technical report, research paper and assignments, projects etc. for the completion of that course.

35. Every course offered shall have three components associated with the teaching-learning process of the course, in example,

(a) Lecture – L: Classroom sessions delivered by faculty in an interactive mode.

(b) Tutorial- T: Session consisting of participatory discussion/ solving tutorial problems/ self-study by students and such other novelmethods that make a student to absorb and assimilate more effectively the contents delivered in the Lecture sessions.

(c) Practice - P: Practice session /Project Work consisting of Hands-on experience / Field Studies / Case studies that equip students to acquire the much required skill component.

36. In terms of credits, for a period of one semester of 15 weeks:-

(a) Every ONE hour session per week of L amounts to 1 credit per semester

(b) AONE hours per week of T amounts to 0.5 credit per semester

(c) A minimum of TWO hours per week of P amounts to 1 credit per semester,

37. The teaching / learning as well as evaluation are to be interpreted in a broader perspective as follows:-

(a) Teaching – Learning Processes: Classroom sessions, Group Exercises, Seminars, Small Group Projects, Self-study, etc.

(b) Evaluation: Tutorials, Class Tests, Presentations, Field work, Assignments, Term papers, etc.

38. A course shall have either or all the three components, i.e. a course may have only lecture component, or only practice component or a combination of any two or all the three components. The total credits earned by a student at the end of the semester upon successfully completing a course are 'L + T + P'. The credit pattern of the course is indicatedas L: T: P. If a course is of 3 credits then the different credit distribution patterns in L: T: P format could be 3:1:1, 3: 0 : 1, 0: 0: 1, 3: 0: 1, etc. In no instance the credits of a course can be greater than the number of hours (per week for 15 weeks) allotted to it.

39. (a) Full Credit Course: A course with weightage of 3 credits is considered as a full course. (Except for Major Project/Dissertation which are full credit courses with 12 Credits each.)

(b) Half Credit Course: A course with weightage of 2 credits is considered as a half course.

40. The B. Tech programme is a combination of

(a) Full Credit Courses (100 Marks each) :Minimum 3 Credits each

(b) Half Credit Courses (100 Marks each) :Maximum 2 Credits each

Rationale for adoption of the Credit and Grading System

41. (a) **Learner's Perspective**. The current practice of evaluation of student's performance at the end of a semester is flawed. The students are expected to express their understanding or mastery over the content included in their curriculum for a complete semester within a span of three hours and their efforts over the semester are often completely ignored. It also promotes to an unhealthy practice of cramming before the examinations and focusing on marks rather than on learning.

(b) **Evaluation Perspective**: The present system of evaluation does not permit the flexibility to deploy multiple techniques of assessment in a valid and reliable way. Moreover,the current practice of awarding numerical marks for reporting the performance of learners suffers from several drawbacks and is a source of a variety of errors. Further, the problem gets compounded due to the variations in the marks awarded in different subjects. The 'raw score' obtained by the learner, is, therefore, not a reflection of his true ability.

42. In view of the above lacunae, it is desirable that the marking system used for the declaration of results is replaced by the grading system. The system of awarding grades provides a more realistic picture of learner's ability than the prevailing marking system. Excellence in quality education can be achieved by evaluating the true ability of the learners with the help of continuous evaluation.

Salient Features of the Grading System

43. (a) In this system, students (learners) are placed in ability bands that represent a range of scores. This ability range may be designated with alphabetical letters called as 'GRADE'.

(b) Grading reflects an individual learner's performance in the form of a certain level of achievement.

(c) The Grading system ensures natural classification in qualitative terms rather than quantitative terms since it expresses a range /band of scores to which a learner belongs such as O, A, B, C, D, E& F.

(d) Grades can be interpreted easily and directly and can be used to prepare an accurate 'profile' of a learner.

(e) A properly introduced grading system not only provides for a comparison of the learners' performance but it also indicates the quality of performance with respect to the amount of efforts put in and the amount of knowledge acquired at the end of the course by the learners.

Basics of Credit and Grading System

44. Grading is a method of reporting the result of a learner's performance subsequent to his evaluation. It involves a set of alphabets which are clearly defined and designated and uniformly understood by all the stake holders. Grading is carried out in a variety of ways. The classification of grades depends upon the reference point.

45. With 'Approach towards Grading' as the reference point, Grading may be classified as:

(a) Direct grading. When the performance exhibited by the examinees is assessed in qualitative terms and the impressions so obtained by the examiners are directly expressed in terms of letter grades, it is called, 'Direct Grading'.

(b) Indirect grading.When the performance displayed by the examinees is first assessed in terms of marks and subsequently transformed into letter grades by using different modes, it is called, 'Indirect Grading.'

46. With 'Standard of Judgment', as the reference point Grading may be classified as:-

(a) Absolute grading: The method that is based on a predetermined standard which becomes a reference point for the learner's performance is called 'Absolute Grading'. This involves direct conversion of marks into grades irrespective of the distribution of marks in a subject.

(b) Relative grading: Relative Grading is popularly known as grading on the curve. The curve refers to the normal distribution curve or some symmetric variant of it. This method amounts to determining in advance approximately what percentage of learners can be expected to receive different grades, such as O,A,B,C,D,E,F. In this grading system the gradeis not determined by the learner's performance but on the basis of group performance.

47. Absolute grading has several advantages such as

(a) The procedure is simple and straightforward to use

(b) Each grade is distinctly understandable

(c) The learner has the freedom to strive for the attainment of the highest possible grade and it enables the learners to know their strengths and weaknesses.

48. The few limitations in Absolute Grading method are that:-

(a) The distribution of scores is taken at its face value regardless of the errors of measurement creeping in due to various types of subjectivity.

(b) Besides, the cut-offs of different categories are also arbitrarily decided.

49. It is proposed to use the Indirect and Absolute Grading System for the B. Tech and M. Tech programme, i.e. the assessment of individual Courses in the concerned examinations will be on the basis of marks, but the marks shall later be converted into Grades by a defined mechanism wherein the overall performance of the Learners can be reflected after considering the Credit Points for any given course. However, theoverall evaluation shall be designated in terms of Grade.

Session Duration

50. Each teaching-learning, Assessment session shall be of 60 minutes. Batch size for tutorials shall be 50% of the normal class size, subject to a minimum of 30 students.

Registration

51. It is mandatory for every student, to register every semester, for the courses opted under CBCS system, for that semester. Such registration forms the basis for a student to undergo continuous evaluation, online evaluation and end-semester examination. Application forms for University examinations are to be filled up based on the choices finalized during the registration process and submitted to the University along with the prescribed examination fee.

Examination

52. (a) Pattern of Examination: The evaluation scheme comprises of

(i) University Evaluation

(ii) Continuous Evaluation

53. for each full credit course

(a) 60 marks shall be evaluated by the University and

(b) 40 marks shall be evaluated by the respective Department

54. For each half credit course:-

(a) 60 marks shall be evaluated by the respective Department.

(b) 40 marks shall be evaluated by the University.

University Evaluation

55. There shall be University evaluation for each full credit course as per the time table announced by the University. The evaluation by the University for Full Credit Courses shall be in Written Mode (subjective – concept plus case study / application oriented type) for 100 marks.

56. **Instructions to External Paper Setters / Chairman/ Examiners**. The syllabus for each course is organized in 5 units. The end-semester University evaluation shall cover the entire syllabus prescribed for the course. For University evaluation (ESE-Written Examination – subjective type of 60 marks) of each full credit course, the question pattern shall be as follows:-

(a) Pattern of Question Paper. There shall be five questions each of 12 marks

(b) All questions shall be compulsory with internal choice within the questions. i.e. There shall be 2 questions from each unit of the curriculum with an internal option.

(c) A Question may be subdivided into sub-questions a, b, c… and the allocation of marks depend on the weightage of the topic.

ILLUSTRATIVE PATTERN OF QUESTION PAPER

Q. 1 (A)..... based on Unit 1

OR

(B)..... based on Unit 1.

Q.2. (A)..... based on Unit 2

OR

(B)..... based on Unit 2

(A) based on Unit 3

OR

(B)..... based on Unit 3

(A)..... based on Unit 4

OR

(B)..... based on Unit 4

(A)..... based on Unit 5

OR

Q.5 (B)..... based on Unit 5

57. Questions shall assess knowledge, application of knowledge, and the ability to synthesize knowledge. The paper setter shall ensure that questions covering all skills and all units are set. She/he shall also mandatorily submit a detailed scheme of evaluation along with the question paper. Questions shall be of three categories of difficulty level – low difficulty, average difficulty and high difficulty.

58. The duration of written examination shall be 3 hours. Students shall be provided a single answer sheet of 16 pages.

Continuous Evaluation

59. A continuous assessment system in semester system (also known as internalassessment/comprehensive assessment) is spread through the duration of course and is done by the teacher teaching the course or by the department.

60. The continuous assessment provides a feedback on teaching learning process. The feedback after being analyzed is passed on to the concerned student for implementation and subsequent improvement. As a part of continuous evaluation, the learners shall be evaluated on a continuous basis by the Department to ensure that student learning takes place in a graded manner.

61. Continuous evaluation components should be designed in such a way that the faculty can monitor the student learning & development and intervene wherever required. The faculty must share the outcome of each continuous evaluation component with the students, soon after the evaluation, and guide the students for betterment.

62. Individual faculty member shall have the flexibility to design the continuous evaluation components in a manner so as to give a balanced assessment of student capabilities across Knowledge, Skills & Attitude (KSA) dimensions based on variety of assessment tools.

Suggested Components for Continuous Evaluation

63. Suggested components for Continuous Evaluation (CE) are:-

(a) Case Study / Case let / Situation Analysis – (Group Activity or Individual Activity)

(b) Class Test

(c) Open Book Test

(d) Field Visit / Study tour and report of the same

(e) Small Group Project & Internal Viva-Voce

(f) Learning Diary

(g) Scrap Book

(h) Group Discussion

(i) Role Play / Story Telling

(j) Individual Term Paper / Thematic Presentation

(k) Written Home Assignment

(l) Industry Analysis – (Group Activity or Individual Activity)

(m) Literature Review / Book Review

(n) Model Development / Simulation Exercises – (Group Activity or Individual Activity)

(o) In-depth Viva

(p) Quiz

(q) Student Driven Activities

® News-paper reading

64. There shall be a minimum of three continuous evaluation components per full credit course as well as for each half credit course. The faculty shall announce in advance the units based on which each continuous evaluation shall be conducted. The Department shall however have the liberty to conduct additional components (beyond three). However the total outcomeshall be scaled down to 40 / 60 marks for full credit and 60 / 40 for half credit courses respectively. Marks for the continuous evaluation must be communicated by the Department to the Exam Department of the University as per the schedule declared by the University. Detailed record of the Continuous Evaluation shall be maintained by the Department. The same shall be made available to the University, on demand.

65. At the end of Continuous Evaluation (out of 40 / 60 marks) the student may get an opportunity to improve the marks if he / she gets less than (30% / 25%) of marks

66. Safeguards for Credibility of Continuous Evaluation: The following practices are encouraged to enhance transparency and authenticity of continuous evaluation:-

(a) Involving faculty members from other department

(b) Setting multiple question paper sets and choosing the final question paper in a random manner.

(c) One of the internal faculty members (other than the course teacher) acting as jury during activity based evaluations.

(d) Involvement of Industry personnel in evaluating projects / field based assignments.

(e) Involvement of alumni in evaluating presentations, role plays, etc.

(f) 100% moderation of answer sheets, in exceptional cases.

Summer Internship Project

67. At the end of Sixth Semester each student shall undertake a Summer Internship Project (SIP) for 8 /10 weeks. It is mandatory for the student to seek advance written approval from the faculty guide and the Dean of the School about the topic and organization before commencing the SIP. The SIP may or may not have a Functional Focus, i.e. the student may take up a SIP in his/her intended area of specialization or in any other functional area of management. Ideally the SIP should exhibit a cross-functional orientation. The student shall submit a written structured report based on work done during this period on the basis of suggested guidelines and research methodology. SIP may be a research project – based on primary/ secondary data or may be an operational assignment involving working by the student on a given task/assignment/project/ etc. in an organization / industry. It is expected that the SIP shall sensitize the students to the demands of the workplace. The learning outcomes and utility to the organization must be specifically highlighted. The report should be well documented and supported by:-

(a) Introduction/ Executive Summary.

(b) Objectives of the Training.

(c) Company/ Organization profile (including Organization Chart)

(d) Research Methodology (Statement of Problem, Hypothesis (if any), Research Design.

(e) Technical prospective, Data Interpretation &Technology used by Industry.

(f) Relevant activity charts, tables, graphs, diagrams, etc.

(g) Suggestions & Recommendations

(h) Conclusions

(i) References in appropriate referencing styles. (APA, MLA, Harvard, Chicago Style etc.)

(j) Appendix (Questionnaire, Data Sheets etc.)

68. It should reflect the nature and quantum of work undertaken by the student. The report must reflect 8/10 weeks of work and justify the same.

69. The student shall submit TWO hard copies & one soft copy (CD) of the project report before 10th September in Semester VII. One hard copy is to be returned to the student by the Department after the External Viva-Voce. The Department shall conduct an internal viva- voce for evaluation of the SIP for 60 marks. The Panel shall comprise of the Internal Faculty Guide & One additional faculty nominated by the Dean.

70. There shall be an external viva-voce for the SIP for 40 marks. The examiner's panel for the same shall include one external faculty member nominated by the University and one internal faculty member nominated by the Dean. The external viva-voce shall be conducted for 15 minutes at least per student.

71. The Internal & the External viva-voce shall evaluate the project based on:-

(a) Actual work undertaken by the student

(b) Student understands of the organization and business environment

(c) Outcome of the project

(d) Utility of the project to the organization

(e) Basic analytical capabilities

72. Copies of SIP report and records of evaluation shall be maintained by the Department for a period of 3 academic years.

Dissertation

73. In YearIII &IV the student shall work under the supervision of the Faculty and carry out a minor and major project work / dissertation and Technical Seminar and submit a structured report in TWO hard copies & one soft copy (CD). The student is required to conduct advanced multidisciplinary research on a topic or present a seminar report related to one (or more) of contemporary technical topics. The topic is chosen in consultation with the student'ssupervisor.

74. The student will prepare and present a detailed research proposal prior to starting the work. It is mandatory for the student to seek advance written approval from the faculty guide and the Dean / HOD of the School about the topic before commencing the dissertation/ Project work. A dissertation outlining the entire problem, including a survey of literature and the various results obtained along with their solutions is expected to be produced. The student must submit the completed dissertation and make an oral / Power point presentation of the same. Through the dissertation, the student is expected to furnish evidence of competence inunderstanding varied aspects of the theme/topic selected and a deep understanding of the specialty area. The completion of the dissertation / project shall be certified by the Faculty Guide & approved by the Dean of the School.

75. The student can undergo desk research or industrial research and can follow the guidelines mentioned in the SIP for preparation of their final hard copy.

Assessment & Grade Point Average

76. The performance of a student will be evaluated in terms of two indices, viz. a) Semester Grade Point Average (SGPA) which is the Grade Point Average for a semester b)

Cumulative Grade Point Average (CGPA) which is the Grade Point Average for all the completed semesters at any point in time.

77. **Semester Grade Point Average (SGPA)**. At the end of each semester, SGPA is calculated as the weighted average of GPI of all courses in the current semester in which the student has passed, the weights being the credit values of respective courses.

SGPA = Grade Points divided by the summation of Credits of all Courses.

$$\sum \{C * GPI\} \text{ SGPA } / \sum C \text{ for a semester}$$

Where GPI is the Grade and C is credit for the respective Course.

Cumulative Grade Point Average (CGPA): Cumulative Grade Point Average (CGPA) is the grade point average for all completed semesters. CGPA is calculated as the weighted average of all GPI of all courses in which the student has passed up to the current semester.

Cumulative Grade Point Average (CGPA) for the Entire Course

$$CGPA = \sum \{C * GPI\} / \sum C \text{ for all semesters taken together.}$$

Where GPI is the Grade and C is credit for the respective Course.

Assessment and Grade Point Average

(a) The system of evaluation will be as follows

(i) Each Continuous Evaluation / Assessment and ESE (ETE) will be evaluated in terms of marks. The marks for Continuous Assessment and ESE (ETE) will be added to convert into a grade and later a grade point average. There is no grade independently for CA or ESE (ETE).

(ii) Result of a student will be declared for each semester after the ESE (ETE) only.

(iii) The student will get a Grade Sheet with total grades earned and a Grade Point Average, after earning the minimum number of credits towards the completion of a UG and PG program.

Marks	Grade	Grade Point
80-100	O : Outstanding	10
70-79	A+ : Excellent	9
60-69	A : Very Good	8
55-59	B+ : Good	7
50-54	B : Above Average	6
45-49	C : Average	5
40-44	P : Pass	4
0-39	F : Fail	0
-	Ab : Absent	0

Guidelines for Open Elective

78. **Open Elective Course:** Open Elective course can be chosen from a pool of courses and are:

- Very specific or specialized or advanced to the discipline / subject of study
- Supportive to the discipline/ subject of study
- Providing an expended scope
- Enabling an exposure to some other discipline/subject/domain
- Nurturing candidate's proficiency/skill.

DETAILS OF TECHNICAL COURSES

79. School of Engineering & Technology offering the following courses.

S.No.	Course	Year of Starting
1	B.Tech. (Civil Engg.)	2012
3	B.Tech. (Mechanical Engg.)	2012
4	B.Tech. (Electrical Engg.)	2012
5	B.Tech. (Electronics & Communication Engg.)	2012
6	M.Tech. (Computer Engg.)	2012
7	M.Tech. (VLSI Design)	2012
8	M.Tech. (Power System)	2012
9	M.Tech. (Digital Communication)	2012
10	M.Tech. (Structural Engineering)	2012
11	M.Tech. (TrasportationEngg.)	2012
12	M.Tech. (Thermal Engineering)	2012
13	M.Tech. (Industrial Auto. & Control)	2012
14	M.Tech. (Product Design & Manufacturing)	2012
15	M.Tech. (Artificial Intelligence & Data science)	2020
16	Ph.D (in relevant Streams)	2012

ELIGIBILITY CRITERIA

80. Eligibility criteria for admitting in the following courses is given below.

S. No	Course	Eligibility
		• Pass in 10+2 with minimum 50% (45% for SC/ST/Non Creamy Layer OBC/SBC) • Marks in aggregate from CBSE/ equivalent board along with 45% (40% for

1.	B. Tech	SC/ ST/OBC/SBC)marks ● Mathematics and Physics as Compulsory subjects and any one of Chemistry/ Computer Science/ IP/Biology/ Bio-technology. ***For Lateral Entry Criteria*** ● 3-Year diploma in relevant branch from state board of technical education/ recognized university/ B.Sc with mathematics as one of the subject/ equivalent qualification with a minimum of 50% marks (45% for SC/ST/OBC/SBC)
2.	M. Tech	● BE/ B.Tech/ equivalent in relevant discipline with 55 % marks or 6.25 CGPA on 10 points Scale (50% or 5.75 CGPA on 10 points scale for ST/SC/OBC/SBC) ● Candidate with MCA/ M. Sc (IT) will also be considered for M. Tech in computer Engineering.
3.	Ph. D	● A Master's degree in Engineering/Technology/Science of a recognized Indian University, or a degree approved by the Association of Indian Universities, or any other equivalent qualification in the relevant field. Not less than 55 % marks in aggregate or its equivalent grade B in the UGC 7-point scale. ● Provided that a relaxation of 5 % of marks (from 50% to 45%) shall be allowed for the candidates belonging to SC/ST/OBC (Non-Creamy layers) /Differently-abled category in the entrance examination conducted by the Universities. ● A relaxation of 5% of marks from 55 % to 50% or an equivalent relaxation of grade shall be allowed for candidates who had obtained their Master's degree prior to 19th September 1991. The eligibility of 55% (or an equivalent grade) and the relaxation shall be permissible on qualifying marks without including grace marks.

COMPONENT WISE MARKS DISTRIBUTION

81. Examination component and their marks distribution.

MARKS DISTRIBUTION				
S.No	**Exam Component**	**Theory (Th)**	**Practical (Pr)**	**Discp& TEP DTP/Practical**
		Max. Marks	**Max. Marks**	**Max. Marks**
A.	**Internal Evaluation (IE)**	40	60	50
	CIE-I	12	20	NA
	MSE	12	20	NA
	CIE-II	06	10	NA
	Attendance	10	10	NA
B.	**End Semester Exam (ESE)**	60	40	NA
	Total	**100**	**100**	**50**

IE – Attendance Marks both Theory & Practical Courses :

At the end of the semester, the marks for attendance (both for Theory & Practical) will be finalized by each course teacher/instructor/faculty on the basis of total attendance of his/her course as per the guideline indicated following table :

S. No	Total Attendance (TA in % Range)	Marks (Out of 10)
1	95% ≤ **TA**	10
2	90 % ≤ **TA**< 95%	09
3	85 % ≤ **TA**< 90%	08
4	80 % ≤ **TA**< 85%	07
5	70 % ≤ **TA**< 80%	06
6	60 % ≤ **TA**< 70%	05
7	50 % ≤ **TA**< 60%	04
8	40 % ≤ **TA**< 50%	03
9	30 % ≤ **TA**< 40%	02
10	20 % ≤ **TA**< 30%	01
11	**TA**< 20%	00

Minimum Passing Percentage Components

Minimum Passing Percentage				
S. No	Programme	IE	ESE	Total
1	B.Tech	35%	45%	50%
2	M. Tech	30%	40%	40%
3	Ph. D	-----	------	50%

It must be noted that at the end of each semester the marks of IE component stands fixed. They now remain unchanged and can't be improved upon. All the chances of improvement for IE will be given within the semester itself. Moreover the minimum passing percentage in IE component is optional.

If the student attains the minimum percentage in the ESE & Total Components of a particular course then that course will be considered as Clear and will be awarded the "PASS" status, if not the course attains "BACK" status. Additionally a course can be awarded "GPASS" Status if a student passes it by award of Grace marks.

Out of the total courses for which the student has registered in a particular semester, he/she will earn the credits for courses with status "PASS"/"GPASS" in that semester, irrespective of the grade obtained in them.

Moreover Discp& TEP Component credit will not be counted for promotion (neither in total nor in attained as it has no Pass/Back/G Pass Status.

Class Attendance & Debar Policy

Class Attendance and Debar Policy:

Class attendance and Marks for all courses of study will be taken from Department.

Apart from monthly communication for attendance, the tentative short attendance lists and final short attendance lists will be published by Chief Proctor.

The students have to maintain a minimum of 75% attendance, combining all courses / activities in his/her program of study.

If a student is unable to maintain so he/she will not be allowed to sit in the end semester examinations and has to repeat the semester.

For any medical issues / other participation consult department head/ department dean / proctor.

IE Improvement Policy:

As the IE component is fixed and cannot be improved in subsequent attempts, hence a chance will be given to the student who falls below the passing criterion, to improve each of the IE component (CIE/MSE).

After each head CIE/MSE a list will be published by COE office indicating Fail students in the respective component. The students will be asked (by COE office) to apply for improving IE.CIE/MSE – detailing the courses concerned. This includes absent students also.

Once the final list is published (by COE) office, the improvement CIE and MSE will be taken in test/exam mode only. These exams will be kept on Saturdays/off days only.

There will be a minimal fee - Rs 50 per subject per component (as improvement fee).

After improvement IE, the marks for IE are finalized and freeze for subsequent attempts.

Eligibility ESE

Eligibility for ESE (End Semester Examination)

he/she has filled the relevant examination form in stipulated time period.

If student satisfies the minimum attendance criterionIf student is not guilty of any act of indiscipline

Repeat Cases (Loss of an academic year)

A student has to repeat the semester if:

His/her attendance falls below the minimum attendance criterionHe/she is not promoted to next semester

Though the repeat student studies with his junior batch yet his maximum course durationdoes not changes.

End Semester Examination-Supplementary & Back:

End Semester Examination (ESE) will be held at the end of each semester. They can befurther categorized as Main ESE, Supplementary ESE and Back ESE.

Supplementary ESE will be introduced from session 2019-20 to facilitate the students. Barring the repeat students, all students who have a Back status for some or more courses oftheir main exam can appear in Supplementary ESE. (The process of Exam Form, admit cardetc remains same as in Main, Back ESE).

Supp ESE will generally be held on Saturdays, in the month of August/September during oddsemester and in the month of February/ March during even semester.

If a student still, after supplementary ESE, is unable to clear Backlogs will now come underBack Cycle, subject to promotion rule and maximum course duration.

Generally ESE Main & Back will be held during 15 Nov – 15 Dec (odd semester) and 15April 15 May (even semester) (considering no gap/break after odd semester).

The ESE Theory will be held in two sessions (9-12 and 12:30-3:30).

The student will be given 15-20 days duration to fill the exam form with normal fee, furtherwith late fee etc., the last date being 10-15 days prior to last teaching day.

If some student accidently forgot and wishes to fill after last date, he has to give the application for same, otherwise a undertaking stating that he will not sit in the exams.

A minimum two day window may open just before the last teaching day to give chance tosuch students, based on the decisions of a committee.

In no case the exam form will be filled on the day of commencement of theory exam or later.

****

POORNIMA UNIVERSITY								
School of Computer Science and Engineering								
Name of Program: M. Tech. Computer Science and Engineering, Batch: 2021-23								
Teaching Scheme for Year – I, Semester- I _____								
Course Code	Course Name	Teaching Scheme (Hrs per Week)			Marks Distribution			Credits
		Lecture (L)	Tutorials (T)	Practical (P)	IE	ESE	Total	
A.	University Core Courses							
A.1	Theory							
	-	-	-	-	-	-	-	-
A.2	Practical							
	-	-	-	-	-	-	-	-
B.	Department Core Courses							
B.1	Theory							
MCECCE1101	Advanced Topics in Algorithms	4	-	-	40	60	100	4
MCECCE1102	Advanced Data Structure	4	-	-	40	60	100	4
B.2	Practical							
MCECCE1201	R Programming Lab-I	-	-	2	60	40	100	1
C.	Department Elective: Any Two							
MCEECE1111	Linear Algebra and Optimization	4	-	-	40	60	100	4
MCEECE1112	Parallel and Distributed Computing							
MCEECE1113	Distributed Operating Systems							
MCEECE1121	R Language	4	-	-	40	60	100	4
MCEECE1122	Stochastic Models							
MCEECE1123	Data Mining & Data Warehousing							
MCEECE1124	Embedded Systems							
D.	Open Elective: Anyone							
	Nil	-	-	-	-	-	-	-
E.	Humanities and Social Sciences including Management courses OR Ability Enhancement Compulsory Course (AECC)							
MCECHM1202	Soft Skills-I	-	-	2	60	40	100	1
F.	Skill Enhancement Courses (SEC) OR Project work, Seminar and Internship in Industry or Elsewhere							
MCECCE1401	Seminar-I	-	-	2	60	40	100	1
G.	Social Outreach, Discipline, TEP, VAC& Extra Curricular Activities							
MCECCE1601	Discipline and Talent Enrichment Programme-I	-	-	2	50	-	50	1
	Total	16		8				20
	Total Teaching Hours	24						

Syllabus – First Semester

Code: MCECCE1101	Advanced Topics in Algorithms	4 Credits [LTP: 4-0-0]

COURSE OUTCOME

After successful completion of this course the student would be able

- To analyze to various algorithms according to the space and time complexity.
- To understand basic parallel algorithms and their working.
- To understand basic geometric algorithms and their working
- To understand graph algorithm and their application in solving networking problems.
- To understanding approximation algorithms and their applications.

A. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Complexity and Advanced data structures**	07
2.	**Parallel algorithms**	08
3.	**Geometric algorithms**	08
4.	**Graph algorithms**	07
5.	**Approximation algorithms**	07

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Complexity and Advanced data structures**
	• Introduction of Unit • Complexity and Asymptotic Notations • Operations on Binary Search Tree • Weight Balanced Trees (Huffman Trees), • Statics and Interval Tree Applications • Conclusion of Unit
2.	**Parallel algorithms**
	• Introduction of Unit • Basic techniques for sorting, • Searching and Merging, • List ranking in PRAMs and Interconnection networks • Conclusion of Unit
3.	**Geometric algorithms**
	• Introduction of Unit • Point location, • Convex hulls • Voronoi diagrams, • Arrangements • Conclusion of Unit
4.	**Graph algorithms**
	• Introduction of Unit • Isomorphism Components, Algorithms for Connectness, • Finding all Spanning Trees in a Weighted Graph,Cut-sets.

	• Cut-Vertices Planer and Dual graphs,Spanning Trees • Strongly Connected Components and Aritculation Point. • Single source shortest path and all pair shortest path algorithms. • Min-Cut Max- Flow theorem of Network Flows. • Ford-Fulkerson Max Flow Algorithms. • Conclusion of Unit
5.	**Approximation algorithms**
	• Introduction of Unit • Use of Linear programming • Primal dual • Local search heuristic • Conclusion of Unit

C. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Introduction to Algorithms	Cormen	Fourth Edition	Prentice Hall of India
2.	The Design and Analysis of Computer Algorithms	Aho A.V.,Hopcrptt J.E. and Ullman J.D.	Fourth Edition	Pearson Education.
Reference Book				
1.	Data Structure and Algorithms, Horowitz and Sahni			
2.	Baase-Computer Algorithms,pearson Education			
3.	Fundamentals of Data Structures Galgotia Book Source			

Code: MCECCE1102 **Advanced Data Structure** **4 Credits [LTP: 4-0-0]**

COURSE OVERVIEW AND OBJECTIVES:

This course introduces to students with a number of highly efficient algorithms and data structures for fundamental computational problems across a variety of areas. Course provides an understanding for implementation and complexity analysis of fundamental algorithms such as parallel and distributed algorithms, max flow, discrete Fourier transform.

COURSE OUTCOME

The student would be able

CO01102.1 To create various kind of multi-way search tree, AVL tree, Splay tree.

CO01102.2 To understand basic probability theory with random variables.

CO01102.3 To analyze convex hull problems and gift-wrapping algorithms.

C001102.4 To design Ford-Fulkerson Algorithm to obtain the solution of Graph based problems.

CO01102.5 Understanding of Parallel and Distributed algorithms.

A. OUTLINE OF COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Advanced Data Structures	12
2.	Randomized Algorithms	7
3.	Geometric Algorithms	8
4.	Graph And Approximation Algorithms	8
5.	Parallel And Distributed Algorithms	7

B. DETAILED SYLLABUS

Unit	Contents
1.	**ADVANCED DATA STRUCTURES** Binary Search Tree, AVL Trees, Multi-Way Search Tree, (2-4) Trees, Red-Black Trees, Splay Trees, persistence Trees.
2.	**RANDOMIZED ALGORITHMS** Basic Probability Theory, Independent Events, Random variables and Expectation, Hat Check Problem, Job Hiring Problem using Indicator Random Variable, Birthday Paradox, Las Vegas and Monte Carlo Algorithms.
3.	**GEOMETRIC ALGORITHMS** One Dimensional Range Searching, Quad trees, K-D Trees, Convex Hulls and Gift-Wrapping Algorithm, Graham Scan Algorithm.
4.	**GRAPH AND APPROXIMATION ALGORITHMS** Matching and Flows, Residual Capacity and Augmenting Paths, Ford-Fulkerson Algorithm, Edmonds-Karp Algorithm, Bipartite Matching. Approximation algorithms: Introduction to Approximation Algorithm, Vertex Cover Algorithm, Clustering, TSP Problem, Local Search Heuristics.
5.	**PARALLEL AND DISTRIBUTED ALGORITHMS** Introduction, PRAM Model, ER, CR, EW and CW Models, Parallel Search Algorithm, ER Broadcast Algorithm, Semi group Algorithms and Accelerated Cascading, Recursive Doubling, Parallel Prefix, Sorting Network, Bitonic Sort, Merging and Shearsort.

C. **RECOMMENDED STUDY MATERIAL**

S. No	Title of the Book	Author
1.	Randomized Algorithms, Cambridge University Press	Motwani and Raghavan
2.	Computational Geometry, Springer Verlag	Preparata and Shamos

3.	Data Structures and Algorithms: 1, Searching and Sorting, Springer Verlag	Mehlhorn
4.	Combinatorial Optimization, Princeton University Press	Papadimitrou and Steiglitz

Important Web Links:

1- https://www.udemy.com/course/introduction-to-data-structures
2- https://www.coursera.org/learn/advanced-data-structures
3- https://www.geeksforgeeks.org/data-structures-and-algorithms-online-courses-free-and-paid/
4- https://www.onlinetraining.in/course/c-data-structures/
5- courses.csail.mit.edu/6.851/spring12/lectures

Code: MCECCE1201 **R PROGRAMMING LAB** **4 Credits [LTP: 4-0-0]**

A. List of Programs

Part A	
	1. Install and configure R, set working directory. 2. Install Packages and calling installed packages 3. R studio environment and functionalities of R studio 4. Implement basic R operations (data input, missing values, importing data into R using different formats : xlsx, CSV, Text files) 5. Use R as a calculator 6. Explore various functionalities of dataframes. 7. Create data set using data frames, list and tables. 8. Create the contingency table for the given raw data. 9. Create the interactive user input code line in r using readline ( ) function. 10. Create the contingency table for the given vector format data. 11. Convert the contingency table to original format of the given data. 12. Analyse and give interpretation of summary statistics for the given data. 13. Calculate mean, median and mode for the grouped data and compare the results for the given data. 14. Analyse the given data for non-parametric tests and give the interpretations. 15. Use R for test the given data order to compare the effectiveness of two sources of nitrogen, namely ammonium chloride (NH4Cl) and urea, on grain yield of Coarse cereal, an experiment was conducted. The results on the grain yield of Coarse Cereal (kg/plot) under the two treatments are given below. H4Cl : 13.4, 10.9, 11.2, 11.8, 14.0, 15.3, 14.2, 12.6, 17.0, 16.2, 16.5, 15.7. rea : 12.0, 11.7, 10.7, 11.2, 14.8, 14.4, 13.9, 13.7, 16.9, 16.0, 15.6, 16.0. ssess which source of nitrogen is better for Coarse Cereal.
Part B	
	16. Before an increasing in exercise duty on tea, 800 persons out of a sample of 1000 persons were found to be tea drinkers. After an increasing in duty, 800 people were tea drinkers in a sample of 1200 people. Using SE of a proportion, state whether there is a significant decrease in consumption of tea after the increase in the exercise duty. 17. Use R for test the given data A health status survey in a few villages revealed that the normal serum protein value of children in that locality is 7.0 g/100ml. A group of 16 children who received high protein food for a period of six months had serum protein values shown below. Can we consider that the mean serum protein level of those who were fed on high protein diet is different from that of the general population? S.No. (Child No.) 1 2 3 4 5 6 7 8 Protein level (g%) 7.10 7.70 8.20 7.56 7.05 7.08 7.21 7.25 S.No. (Child No.) 9 10 11 12 13 14 15 16 Protein level (g%) 7.36 6.59 6.85 7.90 7.27 6.56 7.93 8.56

18. Students were selected to training. Their performance was noted by giving a test and the marks recorded out of 50. They were given effective 6 months training and again they were given a test and marks were recorded out of 50.

Students	1	2	3	4	5	6	7	8	9	10
Before training	25	20	35	15	42	28	26	44	35	48
After training	26	20	34	13	43	40	29	41	36	46

By applying the t-test can it be concluded that the students have benefited by the training?

19. 100 individuals of a particular race were tested with an intelligence test and classified into two classes. Another group of 120 individuals belong to another race were administered the same intelligence test and classified into the same two classes. The following are the observed frequencies of the two races:

Race	Intelligence		
Intelligent	Non-intelligent	Total	
Race I	42	58	100
Race II	55	65	120
Total	97	123	220

Test whether the intelligence is anything to do with the race.

20. Obtain the correlation coefficient between the heights of father(X) and of the son (Y) from the following data

X	65	66	67	68	69	70	71	72
Y	67	68	65	68	72	72	69	71

And also test its significance. Using R functions.

21. Consider the inbuilt data set cars.
22. Find Correlation between possible variables and pairwise correlation
23. Find regression line between appropriate variables
24. Display the summary statistics and comment on the results

Code: MCEECE1111	Linear Algebra and Optimization	4 Credit [4-0-0]

COURSE OVERVIEW AND OBJECTIVES:

COURSE OUTCOME

D. OUTLINE OF COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Vector Space	12
2.	Linear Transformation	7
3.	Eigen Space	8
4.	Optimization	8
5.	Analysis of Newton's Method	7

E. DETAILED SYLLABUS

Unit	Contents
1.	Vector Spaces: Vector Spaces, Subspaces- Definition and Examples, Linear independence of vectors, Bases and dimension, Linear Span, Field-Definition, Vector space in Rn: System of linear equations, row space, Column space and null space. Four fundamental spaces, relation between rank and nullity, consistency theorem, basis from a spanning set and independent set.
2.	Linear transformations: General linear transformation, Matrix of transformation, Kernel and range, properties, Isomorphism, change of basis, invariant subspace, Linear functional. Inner Product: Real and complex inner product spaces, properties of inner product, length and distance, Cauchy-Schwarz inequality, Orthogonality, Orthogonal complement, Orthonormal bases, Gram Schmidt orthogonalisation
3.	EigenSpace: Properties of Eigen values and Eigen vectors , Eigen values, Eigen vectors, minimal polynomial, Diagonalization, Orthogonal diagonalization, Jordan canonical form Matrix Factorization: LU decomposition, QR Decomposition and singular value decomposition
4.	Optimization: Conditions for local minimization-One dimensional Search methods:Golden search method, Fibonacci method, Newton's Method, Secant Method, Remarks on Line Search Gradient-based methods-introduction, the method of steepest descent, analysis of Gradient Methods, Convergence, Convergence Rate.
5.	Analysis of Newton's Method, Levenberg-Marquardt Modification, Newton's Method for Nonlinear Least-Squares. Conjugate direction method, Conjugate Direction Algorithm, Conjugate Gradient Algorithm for Non-Quadratic Quasi Newton method.

F. RECOMMENDED STUDY MATERIAL

S. No	Title of the Book	Author
1.	Linear Algebra and It's Applications, 4th edition, Cengage Learning, 2006.	Gilbert Strang
2.	Introduction to Applied Linear Algebra: Vectors, Matrices, and Least Squares, Cambridge University Press, 2018	Stephen Boyd, Lieven Vandenberghe
3.	Linear Algebra with applications, 4th edition, McGraw-Hill, 2002	W. Keith Nicholson

4.	Topics in Linear Algebra, Wiley Eastern, 1975.	I.N Herstein
5.	Linear Algebra : A Geometric Approach, Prentice-Hall of India, 2000.	S.Kumaresan
6.	Schaum's outline of linear algebra, 3rd Ed., Mc Graw Hill Edn., 2017	Seymour Lipschutz, Marc Lipson

Code: MCEECE1112	**Parallel & Distributed Computing**	**4 Credits [LTP: 4-0-0]**

COURSE OUTCOME

The student would be able

CO01104.1.1 To provide hardware and software issues in modern distributed systems.

CO01104.1.2 Analyze the Communication system provided in the Distributed System.

CO01104.1.3 To distinguish between the concepts of distributed architecture, naming, synchronization, consistency and replication, fault tolerance, security.

CO01104.1.4 Understand client server communication & group communication.

CO01104.1.5 Study a case study of distributed file system (SUN, CODA).

A. OUTLINE OF COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Introduction To Distributed Operating Systems	10
2.	Communication In Distributed Systems	08
3.	Synchronization In Distributed Systems	06
4.	Processes And Processors In Distributed Systems	09
5.	Distributed File Systems	09

B. DETAILED SYLLABUS

Unit	Contents
1.	**INTRODUCTION TO PARALLEL AND DISTRIBUTED SYSTEMS** Goals, hardware concepts, software concepts, client server model.
2.	**COMMUNICATION & PROCESSES** Communication, layered protocols, remote procedure call, objective invocation, message & stream-oriented communication, processes, threads, clients, servers; naming entities, mobile and unreferenced entities
3.	**CLOCK SYNCHRONIZATION** Algorithms, transaction; consistency and replication, data-centric & client-centric models, protocols.
4.	**FAULT TOLERANCE & SECURITY** Process resilience, reliable client-server & group Communication, commit, recovery, security, channels, access, security control.
5.	**DISTRIBUTED OBJECT-BASED SYSTEMS** explanation and comparison, distributed file systems (SUN, CODA) and comparison; distributed document-based system and coordination-based systems, multimedia systems, Parallel Programming Languages and Algorithms.

C. RECOMMENDED STUDY MATERIAL

S.No	Title of the Book	Author
1.	Distributed Systems Principals and Paradigms, Pearson Edu	Andrew S. Tanenbaum, marten van steen
2.	Distributed Systems Concepts and Design" Pearson Edu.	George Coulouris, Jean Dollimore, Tim Kindber
3.	An Introduction to Distributed & Parallel Computing, PHI.	Joel M. Crichlow
4.	Introduction to parallel Processing, PHI	M. Sasikumar, Dinesh Shikhare P Ravi Prakash
5.	Distributed Operating System, TMH	Andrew S. Tanenbaum
Important Web Links:		
1. https://www.geeksforgeeks.org/difference-between-network-os-and-distributed-os/ 2. https://nptel.ac.in/courses/106/106/106106107/ 3. https://www.nptel.ac.in/courses/106/106/106106168/ 4. https://www.ics.uci.edu/~cs230/lectures/DistributedOSintro.pdf 5. https://link.springer.com/chapter/10.1007/3-540-52609-9_73		

C. RECOMMENDED STUDY MATERIAL

Code: MCEECE1113 **Distributed Operating System** **4 Credits [LTP: 4-0-0]**

COURSE OVERVIEW AND OBJECTIVES:

This course provides an understanding of hardware and software issues in modern distributed systems. It will enhance the knowledge in distributed architecture, naming, synchronization, consistency and replication, fault tolerance, security, and distributed file systems. To analyze the current popular distributed systems such as peer-to-peer (P2P) systems will also be analyzed.

COURSE OUTCOME

The student would be able

CO01103.3.1 To understand the concepts of hardware and software in modern distributed systems.

CO01103.3.2 Analyze the Communication system provided in the Distributed System.

CO01103.3.3 To distinguish between the concepts of distributed architecture, naming, synchronization, consistency and replication, fault tolerance, security.

CO01103.3.4 Understand the concept of thread and differentiate between various system models.

CO01103.3.5 Understand and memorize the concepts of Distributed File System.

A. OUTLINE OF COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Introduction To Distributed Operating Systems	10
2.	Communication In Distributed Systems	08
3.	Synchronization In Distributed Systems	07
4.	Processes And Processors In Distributed Systems	07
5.	Distributed File Systems	10

B. DETAILED SYLLABUS

Unit	Contents
1.	**INTRODUCTION TO DISTRIBUTED OPERATING SYSTEMS** Distributed operating system, Goals, Hardware Concepts: bus-based multiprocessors, switched multiprocessors, bus-based multi computers, switched multi computers, Software Concepts: network operating systems. true distributed systems, multiprocessor time sharing systems, Design, Issues:transparency,flexibility,reliability,performance,scalability.
2.	**COMMUNICATION IN DISTRIBUTED SYSTEMS** Layered Protocols: the physical layer ,the data link layer, the network layer, the transport layer, the session layer, the presentation layer, the application layer, Asynchronous Transfer Mode Networks :definition, ATM physical layer, ATM layer, ATM adaption layer, ATM switching, The Client-Server Model: client and servers, addressing, blocked vs non-blocking primitives, buffered vs unbuffered primitives, reliable vs unreliable primitives, Remote Procedure Call: basic RPC operation, parameter passing, dynamic binding, RPC semantics in the presence of failures, Implementation issues, Group Communication: design issues, group communication in ISIS.
3.	**SYNCHRONIZATION IN DISTRIBUTED SYSTEMS** Clock Synchronization: logical clocks, physical clocks, clock synchronization algorithm, Mutual Exclusion: centralized algorithm, distributed algorithm, token ring algorithm, comparison of three algorithms, Election Algorithms: bully algorithm, ring algorithm, Atomic Transactions: introduction, transaction model, implementation, concurrency control, Deadlocks in Distributed Systems distributed deadlock detection, distributed deadlock prevention.
4.	**PROCESSES AND PROCESSORS IN DISTRIBUTED SYSTEMS** Threads: introduction, thread usage, design issues for thread packages, implementing a thread package, thread and

	RPC, System Models: the workstation model, using idle workstations, processor pool model, hybrid model, Processor Allocation: allocation model, design issue for processor allocation algorithms, Scheduling in Distributed Systems.
5.	**DISTRIBUTED FILE SYSTEMS** Distributed File System Design: file service interface, directory server interface, semantic of file sharing, Distributed File System Implementation: file usage, system structure, caching, replication, sun network file system, Trends in Distributed File Systems: new hardware, scalability, wide area networking, mobile users, fault tolerance, multimedia.

C. RECOMMENDED STUDY MATERIAL

S.No	Title of the Book	Author
1.	Distributed Operating Systems	A.S. Tanenbaum, Pearson Education
2.	Distributed Systems: Concepts and Design	G. Coulouris, J. Dollimore and T. King Berg., Addison Wesley
3.	Advanced Concepts in Operating Systems	M. Singhal and N. G. Shivaratri, TMH

Important Web Links:

1. https://www.geeksforgeeks.org/difference-between-network-os-and-distributed-os/ 2. https://nptel.ac.in/courses/106/106/106106107/
3. https://www.nptel.ac.in/courses/106/106/106106168/
4. https://www.ics.uci.edu/~cs230/lectures/DistributedOSintro.pdf 5. https://link.springer.com/chapter/10.1007/3-540-52609-9_73

Code: MCEECE 1124	**Embedded System**	**4 Credits [LTP: 4-0-0]**

COURSE OVERVIEW AND OBJECTIVES

The objective of this course is to introduce the importance & concept of basic functions and structure of embedded systems in order to achieve applications goal. This subject also deals with development software of embedded system. At the end of course work student is expected to present various concepts of Embedded Systems and the methodology to implement these concepts.

COURSE OUTCOME
The student will be able to:

CO02103.3.1 Understand about the basic terminologies of Embedded System.
CO02103.3.2 Differentiate between various types of Processor and Architecture.
CO02103.3.3 Analyze various types of buses and its configurations.
CO02103.3.4 Analyze various design patterns of Embedded System using data flow and control flow graphs.
CO02103.3.5 Study about Embedded System Accelerators.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	Embedded Computing Requirements	07
2	Embedded Processors	10
3	Embedded Computing Platform	09
4	Embedded Software Analysis and Design	10
5	Embedded System Accelerators	06

B. DETAILED SYLLABUS

Unit	Contents
1.	**Embedded Computing Requirements**: Characteristics and applications of embedded systems; Components of Embedded Systems; challenges in Embedded System Design and design process; Formalism for system design.
2.	**Embedded Processors**: RISC vs. CISC architectures; ARM processor – processor architecture and memory organization, instruction set, data operations and flow control; SHARC processor – memory organization, data operations and flow control, parallelism within instructions; Input and output devices, supervisor mode, exception and traps; Memory system, pipelining and superscalar execution.
3.	**Embedded Computing Platform**: CPU Bus – Bus protocols, DMA, system bus configurations, ARM bus; Timers and counters, A/D and D/A converters, Keyboards, LEDs, displays and touchscreens; Design examples.
4.	**Embedded Software Analysis and Design:** Software design pattern for Embedded Systems; Model programs – data flow graphs and control/data flow graphs; Assembly and linking; Compilation techniques; Analysis and optimization of execution time, energy, power and program size.
5.	**Embedded System Accelerators**: Processor accelerators, accelerated system design

C. RECOMMENDED STUDY MATERIAL:

S.No	Title of the Book	Author
1.	Computer as Components	Wayne Wolf published by Elsevier Inc
2.	An Introduction to Geographical Information System	Andrew S. Loss published by Elsevier Inc
3.	Embedded System Design	Steve Heath published by Elsevier Inc
4.	Embedded System design: A unified hardware/software Introduction	by Frank Vahid & Tony Givagi published b John Wiley & Sons Inc

Important Web Links:

1. https://nptel.ac.in/courses/108/102/108102045
2. https://swayam.gov.in/nd1_noc20_cs15/preview
3. https://www.youtube.com/playlist?list=PLrjkTql3jnm-lZMoUb1xMCp0HgxvJ7ocx
4. http://www.nptelvideos.in/2012/11/embedded-systems.html
5. https://www.youtube.com/watch?v=TP1_F3IVjBc

Code: MCEECE 1121	**R Language**	**4 Credits [LTP: 4-0-0]**

COURSE OVERVIEW AND OBJECTIVES:

COURSE OUTCOME

The student would be able

1. Analyse data and find relative patterns to predict outcomes
2. Analyse continuous data in varying scenarios
3. Perform Confirmatory Data analysis
4. Able to solve Machine learning and Data science problem
5. Able to develop projects to solve real time problems

Demonstrate expert knowledge in outcome predictions

A. OUTLINE OF COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Introduction to R	10
2.	Data with R	08
3.	Data Analysis with R	06
4.	Machine Learning with R	09
5.	Documentation	09

B. DETAILED SYLLABUS

Unit	Contents
1.	Introduction to R: R Installation Guide and Installing R Packages; Basic data types and data structures in R; Reading, writing, manipulating and visualizing data in R
2.	Reading and getting data into R, Vectors and assignment, Logical and Index vectors, Generating regular sequences, Missing values, Ordered and Unordered Factors, The function tapply() and ragged arrays, Ordered factors, Reading data from files.
3.	**Exploring and cleaning data for analysis**, Data organization, Arrays and Matrices, Basics of Arrays in R, Matrix operations, Advanced Matrix operations, Additional Matrix facilities, Lists and Data frames.
4.	**Mapping models to Machine Learning**, Evaluating and Validating models, Probability distributions in R, **Statistical models in R**, Building linear models, Generalized linear models, Nonlinear least squares and maximum likelihood models.
5.	**Documentation**, Graphical analysis, plot() function, Displayingmultivariate data, Using graphics parameters, Matrix plots, Exporting graphs, ggplot package.

C. RECOMMENDED STUDY MATERIAL

S.No	Title of the Book	Author
1.	Mastering Machine Learning with R, Packt Publishing	Cory Lesmeister
2.	Machine Learning with R, Springer	Abhijit Ghatak
3.	Machine Learning, MIT Press	Kevin Murphy
4.	Practical Data Science with R, Manning Publications. 2014	Nina Zumel, John Mount
5.	Practical DataScience Cookbook, Packt Publishing Limited, 2014	Tony Ojeda, Sean Patrick Murphy, Benjarnin Bengfort. Abhijit Dasgupta

Code: MCECHM1202	**Soft Skills-I**	**1 Credit [LTP: 2-0-0]**

COURSE OUTCOME

The student would be able to:

CO01206.1 Effectively communicate through verbal/oral communication and improve the listening skills

CO01206.2 To develop and nurture the soft skills of the students through individual and group activities.

CO01206.3 To expose students to right attitudinal and behavioral aspects and to build the same through activities

CO01206.4 To make the engineering students aware of the importance, the role and the content of soft skills through instruction, knowledge acquisition, demonstration and practice.

CO01206.5 To encourage the all round development of students by focusing on soft skills.

A. DETAILED SYLLABUS

Unit	Unit Details
1	Personality Enhancement Self-Awareness, Self Esteem & Confidence , Attitude Branding Yourself: Assertiveness and Confidence, The Corporate Fit-Dressing and Grooming, Corporate Dressing – Dress for Success, Etiquette: Social etiquette, business etiquette – civic sense – social norms
2	Effective Management Skills Time & Stress Management: Act in time on commitment Planning & Prioritizing, Emotional Intelligence: Managing Emotions
3	Art of Communication Interview Skills: Fluency & Expression, Group Discussions: Structured & Unstructured, Presentations: Voice, Body Language, Content and Visual Aids, Audience Management
4	Interpersonal Skills The Team Concept& Elements of Teamwork, Stages of Team Formation, & an Effective Team, Essential Building Blocks of Effective Teams Leadership Skills: style andtraits
5	Written & Oral Communication Writing Skills: Picture perception & Story Making, Storytelling, Extempore & Paper Presentations.

Code: MCEECE 1401	**SEMINAR-I**	**1 Credits [LTP: 2-0-0]**

A. DETAILED SYLLABUS

Unit	Contents
	Students will be grouped in two to three, will have to decide final thesis area, download research papers from IEEE, ACM, Elsevier, Springer etc. Summarizing paper – Reading abstracts and finding ideas, conclusion, Advantages of Their approach, the drawbacks of the papers. Generalize results from a research paper to related research problems. Comparing the approach - Identify weaknesses and strengths in recent research articles in the subject. Practice sessions on how to read, analyze and summarize research papers. Students in group will have to deliver seminar, prepare a report and a review paper based on analysis.