# MVSR ENGINEERING COLLEGE
(An Autonomous Institution)

## MASTER OF TECHNOLOGY

## ACADEMIC REGULATIONS , SCHEME OF INSTRUCTION & SYLLABI (R-25)


## COMPUTER SCIENCE & ENGINEERING
(I, II, III & IV Semesters)

## ACADEMIC YEAR 2025-26

(Sponsored by Matrusri Education Society, Estd.1980

ISO 9001:2015

nirf 2020 Rank band 251-300

ACCREDITED BY NAAC NATIONAL ASSESSMENT AND ACCREDITATION COUNCIL

NBA Accredited Courses Civil,CSE,ECE, EEE,Mech & IT

R-25

# Rules and Regulations for M.E. /M.Tech Programs

# MVSR Engineering College

**Nadergul, Hyderabad – 501510**

**(An Autonomous Institution)**

**Accredited by NAAC & NBA Program**

**2025**

# College Profile

MVSR Engineering College is established in 1981 and affiliated to Osmania University. Currently, the college has B.E programs in Civil, CSE, ECE, EEE, IT, Mechanical and Automobile Engineering, PG programs in Civil Engineering, CSE, ECE and Mechanical besides MBA. College is recognized by Osmania University as a Centre for pursuing research leading to the award of Ph.D. Degree in the Disciplines of CSE, ECE and Mechanical Engineering. In all about a 1000 students take admission every year. The college is one of the earliest of the private Engineering colleges in the state. Since inception, the college has ensured an excellent and exemplary academic standard which has helped the college to be one of the topmost and most sought after college in the state.

**Vision:**

- To Impart technical education of the highest standards, producing technically competent confident and socially responsible engineers.

**Mission:**

- To impart adequate fundamental knowledge, technical and soft skills to students.
- To make learning process exciting, stimulating and joyful.
- To create a climate conducive to excellent teaching - learning Process.
- To bring out creativity in students.
- To contribute to advancement of engineering & technology.
- To make positive contribution to meet societal needs.

# MVSR Engineering College

**Hyderabad**

## Quality Policy

To provide quality education in engineering

through continual upgradation of

Teaching - learning process,

Human resources and

Infrastructure

so as to produce competent and committed professionals.

Date: 01.06.2010

Place: Hyderabad

PRINCIPAL

# Rules and Regulations

## M.E. /M.Tech. Programs (Full-Time)

***(Applicable to the students admitted from the Academic Year 2025-2026 onwards)***

## 1. INTRODUCTION:

**1.1** Provision of these rules and regulations shall come into force with effect from the academic year 2025-2026 and shall be applicable to all the M.E / M.Tech. courses offered by the Institute

**1.2** All the rules and regulations, herein after specified shall be read as a whole for the purpose of interpretation.

## 2. GENERAL:

**2.1** This document gives the general regulations applicable to all M.E. /M.Tech programs. Specific requirements for a particular M.E / M.Tech program are specified in regulations for that program.

**2.2** Any condition arising in the PG program and not covered in this manual shall be referred to the PG committee, which may refer it to the academic committee / Council of the institute.

## 3. M.E /M.TECH PROGRAMS:

The M.E. / M.Tech programs are offered in the following specializations by the respective departments of the Institute.

| **Department** | **Program** | **Course/ Specialization (s)** | **Minimum eligibility criteria** |
|---|---|---|---|
| Civil Engineering | M.E | Structural Engineering | B.E / B.Tech in Civil Engineering |
| Computer Science and Engineering | M.Tech | Computer Science and Engineering | B.E./B.Tech in CSE / IT and Allied Branches |
| Electronics and Communication Engineering | M.E | Embedded systems and VLSI Design | B.E/ B.Tech in Electronics and Communication Engineering |
| Mechanical Engineering | M.E. | CAD/ CAM | B.E. / B.Tech in Mechanical Engineering |

### 3.1 ELIGIBILITY FOR ADMISSION*

An applicant for admission into the M.E. / M.Tech. Program shall have one of the following qualifications:

**3.1.1** A Bachelor's degree in Engineering/Technology as mentioned against each specialization in the table 1 above, which is equivalent to the Bachelor's degree in Engineering / Technology of Osmania University.

**3.1.2** AMIE Degree or similar qualification recognized by the UPSC as equivalent to B.E / B.Tech.

**3.1.3** The candidates will be admitted strictly in accordance with the merit secured at the Entrance Examination conducted by the Government of Telangana, keeping in view of the rules in force regarding the reservations of seats to various categories of candidates.

*** Subject to review from time to time as per the directives of competent authority.**

### 3.2 HOW TO APPLY

A candidate seeking admission into the M.E./M.Tech. Program shall apply in the prescribed form as per the notification issued by Convener, PGECET (on behalf of TSCHE) every academic year.

### 3.3 ADMISSION

a) Admissions to Category ‘A’ will be filled by the Convener, PGECET appointed by TSCHE after conducting the counseling for admission to PG programs.
b) Admissions to category ‘B’ will be filled by the institute as per the norms from time to time.

**The following documents are to be submitted at the time of admission**

1. X and XII Std. Marks statement
2. Mark Sheets of all semesters/ years wise / consolidated of the qualifying degree examination, up to pre-final/ final year as applicable if result awaited.
3. Qualifying Degree / Provisional Certificate (If degree completed)
4. Transfer/Migration/College Leaving Certificate obtained from the Institute last studied (If already received)
5. Valid GATE Score Card (If available)
6. Community Certificate (only for SC/ST categories).
7. Nativity Certificate (for Jammu & Kashmir, Ladakh and North Eastern States)

## 4. COURSE STRUCTURE

**4.1** The duration of M.E. / M.Tech. (Full – Time) Programme is 4 semesters. The total period of study for the purpose of drawing the scholarship amount (if eligible) shall not exceed 24 months. Each semester shall have 16 weeks of instruction.

**4.2** The total course for an M.E. / M.Tech degree program will typically consist of the following components:

| | |
|---|---|
| a. | Program Core Courses |
| b. | Program Elective courses |
| c. | Mandatory courses |
| d. | Audit courses |
| e. | Open Electives |
| f. | Mini project |
| g. | Laboratory |
| h. | Internship |
| i. | Major Project |

**M.E./M.Tech. Four Semester Program Scheme of Instruction and Evaluation**

| S.No. | Course Name | Contact hours per week | | | Scheme of Examination | | Credits |
|---|---|---|---|---|---|---|---|
| | | L | T | P | CIE | SEE | |
| | **SEMESTER-I** | | | | | | |
| 1. | Core-I | 3 | | | 30 | 70 | 3 |
| 2. | Core-II | 3 | | | 30 | 70 | 3 |
| 3. | Programme Elective-I | 3 | | | 30 | 70 | 3 |
| 4. | Programme Elective-II | 3 | | | 30 | 70 | 3 |
| 5. | Research Methodology and IPR | 3 | | | 30 | 70 | 3 |
| 6. | Audit Course-I | 2 | 1 | | 30 | 70 | 0 |
| 7. | Laboratory-I | 0 | | 3 | 50 | - | 1.5 |
| 8. | Laboratory-II/Seminar-I | 0 | | 3 | 50 | - | 1.5 |
| | TOTAL | **17** | **1** | **6** | **280** | **420** | **18** |
| | **SEMESTER-II** | | | | | | |
| 1. | Core-III | 3 | | | 30 | 70 | 3 |
| 2. | Core-IV | 3 | | | 30 | 70 | 3 |
| 3. | Programme Elective-III | 3 | | | 30 | 70 | 3 |
| 4. | Programme Elective-IV | 3 | | | 30 | 70 | 3 |
| 5. | Audit Course-II | 2 | 1 | | 30 | 70 | 0 |
| 6. | Mini Project with seminar | | | 6 | 50 | | 3 |
| 7. | Laboratory-III | | | 3 | 50 | - | 1.5 |
| 8. | Laboratory-IV/Seminar-II | | | 3 | 50 | - | 1.5 |
| | TOTAL | **14** | **1** | **12** | **300** | **350** | **18** |
| | **SEMESTER-III** | | | | | | |
| 1. | Programme Elective-V | 3 | | | 30 | 70 | 3 |
| 2. | Open Elective | 3 | | | 30 | 70 | 3 |
| 3. | Major Project-I | | | 20 | 100 | | 10 |
| | TOTAL | **6** | | **20** | **160** | **140** | **16** |
| | **SEMESTER-IV** | | | | | | |
| 1. | Major Project-II | | | 32 | | 200 | 16 |
| | **GRAND TOTAL** | | | | | | **68** |

CIE: Continuous Internal Evaluation SEE: Semester End Examination

| **Audit Courses – I& II** | **Open Electives** |
|---|---|
| 1.English for Research Paper Writing | 1.Business Analysis |
| 2.Disaster Management | 2.Industrial Safety |
| 3.Sanskrit for Technical Knowledge | 3. Operation Research |
| 4.Value Education | 4.Cost Management of Engineering Projects |
| 5.Constitution of India | 5. Composite Materials |
| 6.Pedagogy Studies | 6. Waste to Energy |
| 7.Stress Management by Yoga | |
| 8.Personality Development through Life Enlightenment Skills | |

## 5. PROGRAM FEE AND SCHOLARSHIP

**5.1** Course fee will be informed at the time of admission. Each student shall pay the course fee and other fees as specified at the beginning of the academic year.

**5.2** Eligible students joining with GATE rank will be given scholarship as per the norms. (See appendix III)

## 6. PROGRAM REQUIREMENTS

**6.1** The degree of M.E./M.Tech. will be conferred on a candidate who has (a) pursued a regular course of study of not less than three semesters of course work as prescribed hereunder and has passed all examinations in the subjects as prescribed in the Scheme of Examination, and (b) submitted and successfully defended his/her Major Project at the end of the fourth semesters (Regular programme) as prescribed in the Scheme of Instruction and Evaluation.

**6.2** A regular course of study for eligibility to appear in any subject, for which an examination will be conducted at the end of the semester shall mean putting in an attendance of not less than 75% in each of the subject registered during that semester.

**6.3** However, in special cases and for sufficient causes shown, the competent authority may condone the deficiency of not exceeding 10% attendance for ill-health when an application is made for such a condonation supported by a medical certificate issued by an authorized medical officer and approved by the Institute. Absence not exceeding two weeks, for activities like N.S.S., Inter University Competitions and debates will be condoned if the candidate is sponsored by the institute for such activities.

**6.4** If a candidate fails to secure the minimum of 65% attendance required in any subject, then he/she shall not be eligible to appear for the Semester End Examination at the end of the semester in the subject. He/she shall be required to pursue a regular course of study in the subject again before appearing for the Semester End Examination (SEE) in that subject.

**6.5** If a candidate fails to maintain a minimum of 40% attendance in at least three of the Theory subjects registered independently (excluding Seminar and Laboratory courses) in the first semester following the admission, he/she shall forfeit his/her seat in the course and the admission automatically stands cancelled.

**6.6** The course requirements will be as per AICTE Model Curriculum for PG courses in Engineering / Technology, January2018.

**6.7** A student, on being admitted to the M.E / M.Tech. Programme will be assigned to a faculty Adviser / PG Coordinator. With the approval of the Faculty Adviser / PG Coordinator, the students shall draw up a study plan to satisfy all the requirements, keeping in view the area of specialization and then register for the courses.

**6.8** A student shall not be allowed to register for more than two subjects along with the Major Project-II.

**6.9** The registration process should be completed within one week from the date of admission for the I-semester and within one week from the date of commencement of classes for subsequent semesters. For the benefit of those who are unsuccessful in the main examination or for those who wish to reappear in a subject(s), a make – up examination will be conducted. A candidate must register for the main examination at the end of the semester. Failure to register for the main examination makes the candidate ineligible to register for the make-up examination.

**6.10** In the event, the make-up examination results are not declared before commencement of new semester, the candidates may be provisionally permitted to register for the subject(s) / Major Project-I and continuation depends on the declared result.

**6.11** A student is permitted for registration to Semester-III courses, if there are not more than three subjects as backlog from the previous semesters (Backlog for this purpose shall mean Theory courses/ Lab courses / Seminar). Moreover, the student is permitted for registration to Major Project-I, if he/she has completed the requirements of Mini Project. However, if this criteria is not satisfied in case of any student, he/she will be permitted for registration to Major Project-I in the subsequent even semester and for Major Project-II in the next odd Semester. A student without any backlogs will only be permitted to submit the Major Project. Major Project can be carried out at any recognized Institution/ R&D Organization with the approval of the Head of the Department and Head of the Organization.

**6.12** In the first fortnight of the third semester of Full-Time Programme a student shall seek a faculty member of the college who will be willing to be his/her supervisor for the Major Project and register for it, failing which, the Head of the Department shall assign Supervisor. The student may, in addition, can also have an External Supervisor from the organization to which he / she is attached as a Co-supervisor with the approval of Head of the Department concerned.

**6.13** A student shall submit five copies of the Major Project prepared in the standard prescribed format and approved by his / her supervisor on or before the date indicated in the almanac. The format specifications are given in Appendix. Detailed Guidelines on documentation of Major Project work will be issued separately.

**6.14** For such of those candidates who have not completed the course to an extent of maximum of 2 subjects and/or the Major Project within the stipulated period, an additional period of one year in continuation may be given to complete the same by the competent authority on application duly recommended by the concerned Head of Department.

**6.15** The maximum duration for completing all the requirements for obtaining the M.E./M.Tech Programme shall be N+2 (Where '**N**' stand for the normal or minimum duration prescribed for completion of the programme), which is four years from the date of admission.

## 7. EXAMINATION

**7.1** All examinations shall be held by the Institute at such place and on such dates as may be notified.

**7.2** Applications for permission to appear in SEE shall be made only through registration process on payment of the prescribed examination fee.

**7.3** When a candidate's application is found in order and he/she is found eligible to appear in the Semester End Examination (SEE), the Examination branch, shall furnish him/her with a Hall Ticket for the Semester End Examination (SEE) and this Hall ticket shall have to be produced by the candidate before he/she is admitted into the examination hall.

**7.4** A candidate is not entitled to claim refund of the whole or part of the examination fee nor for the reservation of the same for a subsequent examination (s) if he / she fails to present himself / herself for the Semester End Examination for any reason.

**7.5** A student shall appear for the Semester End Examination at the end of each semester only in the subjects registered at the beginning of the semester.

**7.6** A candidate will be permitted to apply for revaluation / recounting in any of the subjects appeared by paying the prescribed fee within five working days from the date of declaration of results.

**7.7** A candidate will be permitted to appear for the make-up examination, which shall be conducted within one and half month from the declaration of the results of the main examination, in the subject(s) failed in the main examination. A candidate shall apply for the make-up examination in the specified format by paying the prescribed fee as per the notification issued by the examination branch. Without appearing in main examination, a candidate foregoes his/her chance to appear in make-up examination.

**7.8** A candidate who is unsuccessful at both the main and make-up examination or has not appeared at these Examinations in [subject(s)] shall register for the subject (s) again and pass these core / elective course (s) as the case may be, irrespective of whether the syllabus remained same or revised. Further, the candidate who had undergone a regular course of study and secured a minimum of 75% attendance for eligibility to appear at the Semester End Examination can register for that course and appear for the SEE directly. The Continuous Internal Evaluation (CIE) marks earned earlier can be improved if the candidate wishes by appearing in the CIE. If the subject in which the candidate has failed is an elective, a new elective may be chosen if required. If a core course (subject) has been dropped in the curriculum, then the core course (subject) to be taken in place of the core course in which the candidate has failed will be specified by the Faculty Adviser / Course Coordinator in consultation with the Head of the department.

**7.9** The distribution of Marks/Grades for the Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE) areas detailed in the Scheme of instruction and Evaluation in table 2.

**7.10** The SEE question paper will contain two parts, Part-A and Part-B. Part- A is for 10 Marks consisting 5 questions one from each unit, student should attempt all questions and each question carries 02 Marks. Part-B carries 50 marks with five questions (each Question carries 10 marks) covering all the five units with internal choice. Questions in part-B may have subdivision.

In theory subject, a candidate shall score i) 40% marks in Semester End Exam and ii) 40% of marks in Continuous Internal Evaluation and Semester End Exam (CIE+SEE) together, in a particular Course, to be declared as 'PASS' in that Course.

In Practical course, a candidate shall score i) 50% marks in Semester End Exam and ii) 50% of marks in Continuous Internal Evaluation and Semester End Exam (CIE+SEE) together, in a particular subject, to be declared as 'PASS' in that subject.

**7.11** In CIE, out of **40 marks, 30 marks** are to be awarded on the basis of 2 class tests (taking average of both tests). Performance of both the tests will be taken into account. Remaining 10 marks are to be awarded based on assignments / seminars / quizzes etc.

**7.12** A minimum of 50% of students or 4 (four) number of students (whichever is the least) must have registered to offer a Program Elective or Open Elective.

**7.13** Laboratory Courses and Seminar listed in the **Scheme of Instructions and Evaluation** are Departmental requirements only. However, the candidate has to complete the same by securing Minimum qualifying marks.

**7.14** For Laboratory courses, out of 50 marks, 30 marks are to be awarded by the faculty concerned. The remaining 20 marks are to be awarded based on the performance of the individual student in Viva-Voce / Quiz etc.

**7.15** Each student is allotted a Mentor/Faculty member to complete Mini Project. Seminar has to be presented on completion of the Mini Project. Out of 50 marks, 30 marks are to be awarded by the mentor and 10 marks are to be awarded by each of the two examiners.

**7.16** During Semester III of Regular Programme, student is expected to present Seminar on Major Project topic covering progress of problem of Major Project topic.

**7.17** The evaluation of Major Project-I consists of 100 marks, of which 50 marks are to be awarded by supervisor and 50 marks to be awarded by internal Viva-Voce committee comprising Chairperson/Head of the Department and two Internal Faculty Members or one internal faculty and one external examiner as examiners. Each internal examiner willaward20marks and Chairperson will award 10marks.

**7.18** During Semester IV of regular programme, the candidate will continue his/her Major Project work on the same topic and complete it by the end of semester. The candidate should examine his/her Major Project work checked for plagiarism by the software provided by the institute. The candidate can submit his/her Major Project, when the similarity index is less than 30%.

**7.19** A student who has successfully completed all the programme requirements, is eligible to submit the Major Project.

**7.20** Students who fail to submit their Major Project and complete the examination formalities at the end of fourth semester (as per the almanac notified) need to re-register for their Major Project work in the following semester (in no case later than the N+2 from the date of admission), where '**N**' stands for the normal or minimum duration prescribed for completion of the programme. They will have to pay the prescribed fee for re-registration of Major Project work every semester till the completion of their Major Project work.

## 8. MAJOR PROJECT WORK AND EVALUATION PROCESS:

Every candidate shall be required to submit thesis or Major Project after selecting a topic approved by the Project Review Committee.

**8.1** Project Review Committee (PRC) shall be constituted by the Principal, Chairman BOS which consists of HOD as chair, PG Coordinator as Supervisor and Senior Faculty members of the Department.

1. Registration of Project work: A candidate is permitted to register for the project work in Third Semester.

2. The candidate has to submit his project proposal in consultation with his projects supervisor, the title, objective and plan of action of his/her project work to the PRC for its approval. Only after obtaining the approval of PRC the student can initiate the Project work.

3. If a candidate wishes to change his supervisor or topic of the project be can do so with approval of PRC. However, the PRC shall examine whether the change of topic/ supervisor leads to a major change of his initial plans of project proposal, If so, his date of registration for the project work start from the date of change of supervisor or topic as the case may be.

4. At the end of the III Semester, the project work progress is to be evaluated for 100 marks by the PRC Committee.

5. A candidate can submit project thesis only after successful completion of all theory and practical courses without any active backlogs and approval of PRC not earlier then 40 weeks from the date of registration of project work. For the approval of PRC the candidate shall submit the draft copy of the thesis to the Head of the Department and shall make an oral presentation before the PRC.

6. Three copies of the Project thesis certified by the supervisor shall be submitted to the concerned Head of the Department.

7. The external examiner for the final Viva-Voce examination shall be selected by the Dean (Examinations) along with Dean (Academics) of MVSREC and for this the Head of the concerned Department shall submit a panel of 5 examiners, who are eminent in that field with the help of the concerned guide.

8. Final Viva-Voce examination shall be conducted by a Board consisting of the External Examiner, Head of the Department, Supervisor and Project Coordinator.

**8.2** The candidate who has passed all the courses and Departmental requirements has to present the Major Project-II to the internal Viva-Voce Committee. The Major Project shall be scrutinized and evaluated by the Viva-Voce committee consisting of the Head of the Department, Internal Examiners and Supervisor of the candidate. The Head of the department is the Chairperson of the Viva-Voce Committee and Department PG coordinator/ project coordinator is the Convener. The Viva-Voce will be conducted as per the Almanac and will normally be twice in an academic year.

**8.3** The Viva-Voce committee will give a comprehensive report indicating the adequacy or otherwise of the Major Project-II, If candidate's Major Project -II work is found inadequate by the Viva-Voce committee, he/she has to appear once again for the Viva – Voce examination. The candidate will have to revise the Major Project-II as per recommendations of the Viva-Voce committee. The Department shall arrange for the conduct of pre-submission Viva-Voce and submit the final copy within two weeks to the Examination branch for conduct of Viva-Voce in consultation with the concerned Head of the department.

**8.4** Within four weeks from the date of submission to the Exam branch, the external Viva-Voce examination shall be conducted. The external Viva-Voce Committee consists of the Head of the Department, External Examiner and Supervisor of the candidate. The evaluation of Major Project-II for maximum of 200 marks will be done as per the guidelines given below.

1) 70 Marks are allocated for quality of Major Project work covering
   I. Literature review
   II. Innovation/Originality
   III. Research Methodology adopted and
   IV. Relevance/Practical applications by supervisor.

2) 70 Marks are provided for Report writing/ Documentation

3) 30 Marks are allocated for quality and clarity of presentation of Major Project work.

4) 30 Marks are provided for candidate's performance in terms of his/her ability to defend the work, his/her ability to answer the queries raised during Viva-Voce examination and overall subject knowledge.

Total = (a+b+c+d= 200 Marks)

**8.5** The formats for pre submission Viva-Voce and final Viva are given in Annexure I & II respectively.

## 9. AWARD OF DEGREE

A candidate shall be deemed to have fully passed in the subjects he/she has registered during the semester, if he/she secures not less than the minimum marks prescribed below:

**Minimum Qualifying Marks**

| Course particulars | Exam | Minimum Marks / Grade |
|---|---|---|
| (i) Each Theory Course | (CIE+SEE) | **40% in SEE** |
| (ii) Each Laboratory Course<br>(iii) Each Seminar<br>(iv) Major Project-I<br>(v) Major Project-II | (CIE)<br>(CIE)<br>(CIE)<br>(SEE) | 50%-'D' Grade |

## 10. GRADING SYSTEM

Grades are awarded based on the combined marks secured in the Semester End Examination (SEE) (Maximum 70%) and Continuous Internal Evaluation (CIE) (Maximum 30%) as per the criteria stated in the following Table:

| Academic Performance | Letter Grade | Grade Points |
|---|---|---|
| 90%= Marks≤100% | A+ | 10 |
| 80% = Marks<90% | A | 9 |
| 70%= Marks<80% | B | 8 |
| 60% = Marks<70% | C | 7 |
| 50%= Marks<60% | D | 6 |
| 0%≤Marks <50% | F | 0 |

i) The Memorandum of marks of a candidate will reflect the grade secured by him / her as per the grading criteria described in the table above.
ii) There is no minimum marks criteria for the Continuous Internal Evaluation (CIE) for theory subject(s).
iii) A minimum Cumulative Grade Point Average (CGPA) of 5 is required for the award of Degree. The consolidated memorandum of marks will reflect the credits / grade scored in each subject.

**Semester Grade Point Average (SGPA) & Cumulative Grade Point Average (CGPA) Calculation:**

(a) A student is said to have earned credits if he / she secures letter grade 'D' and above

(b) $$\text{SGPA} = \frac{\sum [\text{Letter Grade Point} * \text{Credits}]}{\sum \text{Credits}}$$

SGPA is calculated up to second decimal point
SGPA is calculated only when all subjects in that semester are Cleared/ Passed

(c) $$\text{CGPA} = \frac{\sum [(\text{SGPA}) * (\text{Total Credits})]}{\sum (\text{Total Credits})}$$

CGPA at a given point of Semester is calculated up to second decimal point CGPA is calculated only when total credits earned are equal to total credits up to a Semester in which the candidate has last appeared for Semester End Examination

(d) Memorandum of Marks should indicate total number of credits and total number of credits earned up to a point of Semester

**10.1.** In case of hearing impaired, orthopedically handicapped and visually challenged candidates, 10% reduction in pass marks in each subject is admissible as per G.O. Ms.No.150, dated 31-08-2006.

**10.2.** A candidate desiring to have recounting / revaluation can apply for it as per the institute norms and notification of Exam branch.

**10.3.** A candidate can also obtain a photocopy of the corrected answer book of the theory subjects SEE only on payment of Rs.1000/- (Rupees One thousand only) for each subject as per the notification of Exam branch.

**10.4.** In order to qualify for a PG degree of the institute, a student

1. Must have completed all the credit requirements for the degree as prescribed from time to time
2. Must have obtained a CGPA of at least 5.00 at the end of the semester in which the student completes all the requirements (including Major Project) for the degree

## 11. AWARD OF GOLD MEDAL

A student securing highest CGPA in **single attempt** is eligible for award of Gold Medal.

## 12. TRANSITORY REGULATIONS

1. Whenever the schemes of Instruction and /or syllabi are changed for a course, candidates shall satisfy the unfulfilled requirements of passing the number of core subjects and electives choosing equivalent subject/s from the revised schemes, with the approval of the competent authority.

2. Whenever a course or scheme of instruction has changed in a particular semester/year, two more examinations immediately following thereafter shall be conducted according to the old syllabus/regulations provided the content in the course has changed more than 40%.

3. Candidates not appearing at the examinations or failing in them shall register/appear for the examination subsequently according to the changed syllabus / regulations.

## MALPRACTICE AND AWARD OF PUNISHMENT

**Regulations under Ordinance no. vii**

**Conduct of Examinations Part – V**

**Schedule on the Nature of Malpractice and Award of Punishment**
**"Examination"** in this context refers to all the papers taken by the candidate on the same hall-ticket.

| S.No. | Malpractice | Award of Maximum Punishment |
|---|---|---|
| 1. | Possession of the prohibited (written or printed) papers, books, notes during the examination period but which were not used. | Shall be debarred from appearing at the subsequent papers of the examination apart from cancelling the result of the examination in which he/she had indulged in malpractice. |
| 2. | Matter relevant to the examination being written on any part of the body or on the clothes worn, or in the instruments, wrappings, etc. | -do- |
| 3. | Attempting to take help from any prohibited papers, notes, written or printed matter, writings on the walls, furniture and attempting to take help from or giving help to other regarding answer to any question or questions of the examination paper. | -do- |
| 4. | Taking help from or consulting of prohibited written or printed material; consulting and/or taking help from or helping other examinee during the examination period inside the examination hall or outside it; with or without their consent, or helping other candidate to receive help from anyone else. | -do- |
| 5. | An examinee who attempts to disclose his/her identity to the paper valuer by writing his/her roll number at a place other than the place prescribed for it, or by writing his/her name or any coded message or an examinee who makes an appeal to the paper valuer in the answer book. | Cancelling the result of that paper |
| 6. | Writing such as invocation of God's name in any form. | To be ignored |
| 7. | Writing on the question paper or other papers; the answer to questions, rough work, etc., with no intention of passing it on to another examinee. | To be warned not to do so |

| | | |
|---|---|---|
| 8. | Using abusive and obscene language in the answer book. | Cancellation of the result of that paper |
| 9. | Examinee allowing or destroying prohibited material found in his possession or acting in any other manner with a view to destroy evidence. | Cancellation of the result of all examinations taken or proposed to be taken during that session and prohibiting his/her admission to or continuation in any course for a period of one year. |
| 10. | Refusing to obey instructions of the Chief Superintendent/Invigilator | Cancelling the result of that paper |
| 11. | Smuggling an answer book /additional answer book/ matter into or out of the examination hall. | Cancellation of the result of all examinations taken or proposed to be taken during that session and prohibiting his/her admission to or continuation in any course for a period of one year. |
| 12. | Inserting in or removing from the answer book/additional answer book of any sheet. | -do- |
| 13. | Substituting wholly or partly an answer book/additional answer book. | -do- |
| 14. | Impersonation even at a single examination. | To be dealt with as per law |
| 15. | Cases of examinees when conspiring to interchange in Roll Numbers. | Cancellation of the result of all examinations taken or proposed to be taken during that session and prohibiting their admission to any course for a period of one year. |
| 16. | Creation of disturbance or otherwise misbehaving in and around the examination hall during or before the examination. | Cancelling the results of all examinations taken or proposed to be taken during that session and prohibiting admission into or continuation in any course of study for a period of two years. |
| 17. | Guilty of assaulting/abusing intimidating any person connected with the examination work any time before, during or after the examination | Cancelling the result of all examinations taken or proposed to be taken during that session and the next session and prohibiting admission into or continuation in any course for a period of two years. |
| 18. | Punishments for malpractices not defined here would be recommended on the merits of the individual cases by the malpractices committee. | |

**APPENDIX I**
**Format of M.E./M.Tech. Major Project**

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**Department of CSE / MECH / CIVIL / ECE**

**MVSR Engineering College**

## CERTIFICATE

This is to certify that the Major Project work entitled <Title of the Project Work> submitted by < Mr. / Ms. Name of the student (Roll No.) >, a student of Department of < Name of the Department >, < Name of the College > in partial fulfillment of the requirements for the award of the degree of master of <Engineering/Technology> with <Name of the Specialization> as specialization is a record of the bonafide work carried out by < him / her > during the academic year <Academic year >.

Date of submission of thesis

Signature of the Supervisor                    Signature of Head of the Dept.

Seal

## DECLARATION

I declare that the work reported in the Major Project entitled < Title of M.E. / M. Tech. Thesis> is a record of the work done by me in the Department of <Name of the Department, Place/Organization>. No part of the thesis is copied from books / journals / internet and wherever referred, the same has been duly acknowledged in the text. The reported data are based on the Major Project work done entirely by me and not copied from any other source.

Signature of the Student

***Plagiarism Certificate***

This is to certify that the thesis entitled '**Title of the Major Project'** submitted by **Name of the candidate**, towards partial fulfillment of the requirements for the award of the **Master of Engineering/Technology** degree in Engineering with specialization in **Specialization Name** was analyzed for Plagiarism. The Similarity Index was found to be ------% which is less than 30% as per the Faculty of Engineering norms.

| **Originality Report** | | | |
|---|---|---|---|
| **17%** | **12%** | **10%** | **8%** |
| **Similar Index** | **Internet Sources** | **Publications** | **Student Papers** |

**(Signature of the Student)** **(Signature of the Supervisor)**

**(Signature of the Principal/Coordinator, Anti-Plagiarism Software)**

**Station: Hyderabad**
**Date:**

**Appendix II**

**Guidelines for preparing M.E./M.Tech. Major Project**

The Thesis must be presented on A-4 paper approximately 11 inches/9 inches or 27.9 cm/ 22cm and duly hard bound.

**I. General:**

1. The title of the thesis should be concise and clearly convey the work presented.
2. Lists of figures, tables, variables, symbols, acronyms etc., should be included, before the start of the first chapter.
3. The abstract should not be more than 500 words.
4. A declaration stating the originality of work / results should be appended.
5. Any work which amounts to plagiarism should be totally avoided.
6. The entire thesis should be free from grammatical and spelling mistakes.
7. The total number of pages of the thesis should not normally exceed 250.
8. Any downloaded matter of tables or equations, if used, should be rewritten, and the source mentioned.
9. The first Chapter should clearly reflect the importance and objectives of the thesis.
10. A brief literature review may be included in the first or second chapter.
11. The organization of the thesis may be mentioned in the first chapter.
12. The pages should be numbered starting from the first page of the first chapter.
13. The pages before the first chapter should be numbered in small Roman numerals.
14. The headings and sub-headings should be properly numbered chapter wise.
15. Extension work may be indicated in the conclusion.
16. Uniform font and size should be followed for the titles of all chapters.
17. Uniform Indent should be followed throughout the text of the thesis.
18. Similarly uniformly should be maintained for all headings and sub headings.
19. Subscripts and superscripts should be adopted properly.

**II. Formatting**

1. The text should be presented at one and a half spacing.
2. The font size of the main text should be uniformly12 points throughout the thesis.
3. Left justification or left and right justification can be used for main text.
4. The left margin should be 30 -40 mm and the right. Top and bottom margins should be 25to 30 mm.
5. The final Major Project copies should be hard bound in PURPLE colour rexin. The cover page should be gold embossed. On the spine of the Major Project the full name of the candidate and the year of submission should be gold embossed.

## III. References

1. The references should be numbered from the first chapter to the last chapter in ascending order and the corresponding number should be shown in square brackets wherever required.
2. The reference should be listed with details after the last chapter.
3. All the references listed should be referred in the main text.
4. The references could be technical papers of Journals, conferences, symposia, workshops and seminars, technical reports, manuals, textbooks and software.
5. The important contents of referred materials should be in the following order: Name (s) of the author (s), Title of the paper, publication title, year of publication, Vol, No., pp.

## IV. Appendices

1. Important programs, derivations, data and any other useful material may be shown in the appendices with proper numbering.
2. The appendices should be numbered in capital Roman numbers or capital letters from the first chapter to the last chapter in ascending order. (e.g. Appendix1 or Appendix A)
3. The appendices should be shown with details after the last chapter.
4. All the appendices should be referred in the main text.

## V. Equations

1. All the equations used in the thesis should be properly numbered chapter wise (eg.Eq,3.1or)
2. The equations shown should be clearly referred and identified as Eq. or eq. followed by equation number.
3. Repetition of equations should be avoided. If needed, it may be referred by its number.
4. Equations should never be mixed up with main text. It should be shown as separate object and 'Equation Editor' can be used.

## VI. Tables

1. The tables shown in the thesis should be clearly referred and explained and they should be numbered properly.
2. At the top of the table, it should be identified as table, followed by table number (ex.Table3.1)
3. The caption of the table should be written clearly, precisely and briefly at the same position.
4. A spacing of at least 3 points should be taken for the first line of each cell.
5. Table size should not cross the limits of the set page margins.
6. The font size should be less than or equal to the font size of main text.

## VII. Figures

1. The figures shown in the thesis should be clearly referred and explained. They should be numbered properly chapter wise.
2. At the bottom of the figure, it should be identified as fig. or figures, followed by figure number (ex. Fig3.1 orfigure3.1).
3. The caption of the figure should be written clearly, precisely and briefly at the same position.
4. All the graphs and flowcharts should be identified and presented the same way as figures.
5. All the figures and graphs should be drawn clearly, so that variables, units, markings and details are dissembled.
6. All the drawings, textboxes, images and details related to a particular figure should be grouped together.
7. The font size used should be less than or equal to the font size of main text.
8. The figure size should not exceed the set page margins.

**Appendix III**

**AICTE - Post Graduate (PG) Scholarship**

**1.0 Objectives of the Scheme:**

**1.1. AICTE:** In order to ensure development of technical education in India awards Post Graduate Scholarship of Rs.12,400/- per month to full-time GATE/GPAT qualified students admitted to AICTE approved post graduate programs in AICTE approved Institutions/ University Departments as per AICTE approved intake.

**1.2. Amount of Scholarship**: The Scholarship under the scheme is Rs.12,400/- per month per student.

**1.3. Duration:** a) The Scholarship is tenable for 24 months or for the duration of the course i.e. from the date of commencement of classes till the date of completion of the classes whichever is lower and is not extendable under any circumstances. b) Students of final years of dual degree integrated programmes would also be entitled to PG Scholarship from the 9th semester onwards in case they get a CGPA score of 8 or above (on a scale of 10 ) i.e. only for one year in final year.

**1.4. Eligibility for Scholarship**: Post Graduate Scholarship is entitled only to those students

i. Having a valid GATE/ GPAT score at the time of admission.

ii. Must be admitted as a full-time scholar.

iii. Students of final years of dual degree integrated programmes would also be entitled to PG Scholarship from the 9th semester onwards in case they get a CGPA score of 8 or above (on a scale of 10 ) i.e. only for one year in final year.

iv. Admitted in AICTE approved Institutions / University Departments & AICTE approved programs viz. Master of Engineering, Master of Technology, Master of Architecture and Master of Pharmacy.

v. Number of PG Scholarship is limited to the AICTE approved intake in the programme in that year. However in addition to the approved intake, AICTE will provide PG scholarship to the additional 10% candidates over and above the approved intake of that course from EWS category, if the university/ institute has admitted students from Economically Weaker Sections (EWSs) as per MHRD OM F.No.12-4/2019-U1 dated 17th January 2019.

**1.5 Other Entitlements**: Students are eligible for following leaves:

- Casual leave: 15 days in an academic year
- Medical leave: Maximum of one month (30 days) in an academic year
- Maternity leave : Candidates are eligible for maternity/ Paternity leave as per Govt. of India norms issued from time to time at full rates of scholarship etc. once during the tenure of their award. However maximum duration of scholarship will not be extended in any circumstances.

**Note:** All kinds of leaves should be approved at the level of the University/College/Institute. Prior approval of the University/Institution/College is mandatory for all types of leaves.

**1.6 Terms and Conditions**:

**I.** In case any student/scholar receives any financial assistance from any other organization during the tenure of course, with due permission of the university/institute, the scholar will not be entitled for the scholarship for the duration in which he/ she is availing such financial assistance and it shall be resumed on discontinuance of such external financial assistance. Further the period for which the scholar has received external financial assistance shall be deducted from the maximum duration of the scholarship.

**II.** Foreign students, sponsored candidates and candidates admitted in PG programs through management quota are not eligible for the Scholarship.

**III.** It will be obligatory for every post-graduate student to undertake 8 to 10 hours (per week) of work related to teaching and research activities as assigned to him /her by the Institute. This could include tutorials, laboratory classes, development and maintenance of laboratories, assistance in research and development activities undertaken by faculty members, maintenance and operation of Computers and other central facilities, assistance in library, etc.

**IV.** The Scholarship will be granted to the student on a monthly basis subject to the satisfactory academic performance and adherence to University/Institute norms/rules and regulations as applicable time to time, certified by the Head of the Institute and obligatory work as per point no (iii) above.

**V.** PG Scholarship is not admissible to passed out students taking 2nd time admission on the basis of re-qualifying GATE/GPAT exam who have already availed the scholarship from AICTE or any other centrally funded institution like – IITs, NITs and IIITs etc. vi) The amount of PG Scholarship is subject to change as per the notification issued by Ministry of Human Resource Development (MHRD), New Delhi (now Ministry of Education) from time to time, with the approval of the Executive Committee of the Council.

VI. The student shall be required to give an undertaking to the effect that he/she would not leave the course midway. In case any student leaves the course in midway or failed/ drop out in subsequent year, he/she will be required to refund the total PG Scholarship drawn at the time of leaving the course. For those scholars who left the course midway on or after 1st October 2020, the scholarship shall be stopped.

VII. The Scholarship may be discontinued at any time for any kind of misconduct by the student, like involving in the act of ragging, misbehavior etc. on the recommendations of the Head of Institution (HOI).

VIII. Salary grant or any other grant e.g. Contingencies, Library, Books etc, will not be admissible to the Institute/College/ University implementing this scheme in compliance with the instructions of Govt. of India, Ministry of Human Resource Development, Dept. of Higher Education, Technical Section – I conveyed vide letter No. F. No. 9-2/2007-TS.I dated 22nd July, 2008.

IX. The mode and procedure of payment of Scholarship to the students shall be governed by the policy decision of the AICTE as may be notified from time to time on its web-portal or through advertisement in leading English/Hindi newspapers.

X. Any belated claim preferred after one year of the completion of the program shall not be entertained.

XI. The AICTE may impose any other conditions as deemed necessary from time to time and the decision of the AICTE shall be final and binding upon the recipients i.e. University/Institute/College/Student who are under the ambit of the AICTE for receipt of PG Scholarship.

XII. In case any student/scholar avails the break during the scholarship period on medical ground with due permission of the university/institute, the scholarship will be discontinued from the month of such break and shall be resumed on rejoining the program for the remaining period of scholarship.

**Appendix IV**

**STUDENTS' CONDUCT AND DISCIPLINARY CODE**

It is the responsibility and duty of each and every student of the Institute to become acquainted with "Students Conduct and Disciplinary Code". It is presumed that every student from the date of his/her admission to the Institute has knowledge of this code. All students are required to strictly adhere to this code as a condition of their admission to the Institute and these rules would be binding on and enforceable against them or any one among them.

**Section 1: Responsibilities of the Students: It shall be the responsibility of the students**

i. To behave and conduct themselves in the Institute campus, hostels and premises in a dignified and courteous manner and show due respect to the authorities, employees and elders.

ii. To follow decent and formal dressing manners. Students should avoid clothing depicting illegal drugs, alcohol, profane language, racial, sexual and vulgar captions etc.

iii. To access all educational opportunities and benefits available at the Institute and make good use of them to prosper academically and develop scientific temper.

iv. To respect the laws of the country, human rights and to conduct in a responsible and dignified manner at all times.

v. To report any violation of this Code to the functionaries under this Code.

**Section 2: Behavior of the Students**

1. Groupism of any kind that would distort the harmony is not permitted.

2. Students are expected to spend their free time in the Library. They shall not loiter along the verandas or crowd in front of the offices or the campus roads. Students should refrain from sitting on places such as parapets, stairs, footpaths etc.

3. Possession or consumption of narcotic drugs and other intoxicating substances are strictly prohibited in the campus and hostels.

4. Silence shall be maintained in the premises of the Institute.

5. Students are not permitted to use mobile phones in the class room, library, computer Centre, examination halls, etc.

6. Students shall refrain from all activities considered as ragging which is a criminal offence.

7. Students are prohibited from indulging in anti-institutional, anti-national, antisocial, communal, immoral or political expressions and activities within the campus and hostels.

8. Politically based students' and other organizations or outfits are not allowed in the campus. Students are strictly prohibited from organizing, attending or participating in any activity or agitation sponsored by politically based organizations.

9. Students shall not deface, disfigure, damage or destroy or cause any loss in any manner to all the public, private or Institute properties.

10. Without specific permission of the authorities, students shall not bring outsiders to the Institute or hostels.

11. No one shall bring, distribute or circulate unauthorized notices, pamphlets, leaflets etc., within the campus or hostels.

12. The possession, distribution or exhibition of any item by any means which is per se obscene is prohibited within the campus or on any property owned/ managed by the Institute.

13. No student shall collect money either by request or by coercion from others within the campus or hostels.

14. The Institute being a place of learning and an exclusive academic zone, nobody shall respond to any call for any form of strike, procession or agitation including slogan shouting, dharna, gherao, burning of effigy or indulge in anything which may harm the peaceful atmosphere of the Institution and shall eschew from violence in the campus and hostels and even outside.

15. Possession or usage of weapons, explosives or anything that causes injury/ damage to the life and limb or body of any human being or property is prohibited.

16. Use of motorized vehicles within the Institute premises is strictly prohibited.

17. Students shall only use the waste bins for dispensing waste materials within the campus including classrooms, hostels, offices, canteen and messes.

18. Any conduct which leads to lowering of the esteem of the Institute is prohibited.

19. Any tours / visits by group of students without prior approval from the Institute is strictly not permitted and will be viewed seriously.

**Section 3: Disciplinary Sanctions:**

1. Any student exhibiting prohibited behavior mentioned in this Code shall, depending upon the gravity of the misconduct or depending on its recurrence, be subjected to any of the following disciplinary sanctions.

2. Any student who is persistently insubordinate, who is repeatedly or willfully mischievous, who is guilty of fraud, in the opinion of the competent authority, is likely to have an unwholesome influence on his/ her fellow students, will be removed from the rolls.

**I. Minor Sanctions**

i. Warning or Reprimand: This is the least sanction envisaged in this Code. The student engaged in any prohibited behavior will be issued a warning letter.

ii. Tendering Apology: The student engaged in any prohibited behavior may be asked to tender an apology for his/her act and undertaking that he/she shall not indulge in such or any of the prohibited behavior in future.

## II. Major Sanctions

i. Debarring from Examinations: A student/group of students may be debarred from writing all/any/some of the examinations, which forms part of the academic program for which he/she/they has/ have joined.

ii. Suspension: A student may be suspended from the Institute for violation of any of the provisions of this Code. The period of suspension and conditions, if any, shall be clearly indicated in the communication addressed to the student. The student shall lose his/her attendance for the suspended period.

iii. Restitution: Restitution implies reimbursement in terms of money and/or services to compensate for personal injury or loss, damage/disfiguration to property of the Institute or any property kept in the premises of the Institute in any manner. The students/group of students may be asked to compensate for the loss that has been caused to any person or property of the Institute or any property kept in the premises of the Institute due to the act of vandalism perpetrated by the students. The students/group of students shall also be liable to put in their service to restore any loss or damage caused to any property and thereby bringing it to its original form if it is possible.

iv. Forfeiture: Caution deposit of any student engaged in any prohibited behavior shall be forfeited.

v. Expulsion: This is the extreme form of disciplinary action and shall be resorted to only in cases where stringent action is warranted. Expulsion is the permanent dismissal of a student from the Institute. Such a student will not be eligible for readmission to any of the courses of this Institute.

## Section 4: Functionaries under the Code

i) **Heads of the Departments/ Faculty Advisors/Chief Warden/ Wardens of Hostels:** As the persons in charge of the Departments, the respective functionaries of all Teaching Departments shall have the power and duty to take immediate action to curb any prohibitory behavior as envisaged under this code.

As these functionaries cannot single handedly manage all the issues, they can assign part of the work to the teachers and the teachers of all the departments have the responsibility to inform any incident of prohibited behavior to the Heads of the Departments so that any serious issue can be settled before the same goes out of control. The Head of the Departments shall have the power to impose minor sanctions envisaged under section 3(I) of this Code.

They can also recommend imposition of major sanctions as envisaged under Section 3(II) of this Code to the Director. The Head of the Departments/ Faculty Advisors while taking any action as envisaged in the code shall do so in an impartial manner and see to it that the sanction imposed/proposed is commensurate with the gravity of the prohibited behavior. Any lapse on the part of a teacher/ Warden to report any instance of violence and misconduct on the part of the students shall be reported to the Director by the respective Head of the Departments/Chief Warden.

The Wardens of Hostels shall be responsible for maintaining strict discipline and decorum in the hostel. He/she shall specifically see to it that the inmates of the hostel do not involve themselves in violation of any clause under Section 2 of this Code.

ii) **Deans:** Any authority of the Institute with delegated powers shall have the power to visit/inspect any premises, buildings or any property of the Institute when there is a genuine doubt that any act of prohibited behavior is taking place and can take any lawful actions to curb such behavior. The HODs/ Faculty Advisors/Chief Warden/ Wardens of Hostels shall report to the Dean (Students) any instances of prohibited behavior, who in turn shall bring it to the notice of the Director. The Dean (Students) shall forward the recommendations from the HODs/ Chief Warden to impose a major sanction under Section 3(II) of this Code to the Director after noting his observations. The Dean (Students) can also suo moto recommend action against any student/students indulging in prohibited behavior which is brought to his/ her notice.

iii) **Principal:** The Principal shall be the ultimate authority in imposing major sanctions as envisaged under Section 3(II) against the students for acts of prohibited behavior. The Principal can also entertain any appeal from any student/students aggrieved by the action of any authority of the Institute under or subordinate to the Principal and decide the case on merit.

**Section 5**: **Right to Appeal:**

The student/students aggrieved by the action of any authority of the Institute under or subordinate to the Principal can appeal to the Principal.

**Section 6: Assistance from Law Enforcement Agencies:**

The Deans/ HoD shall have the power and duty to call the Police immediately with the concurrence of the Principal when there is a threat of Law and Order situation in the Campus and also when there is a genuine apprehension that any incident of rioting, vandalism or any other act prohibited by law is likely to take place. The Deans/ HoDs/ Chief Warden shall in such a case give a detailed report to the Principal. The Principal/ Deans/ HoDs/ Chief Warden can also arrange for video recording of the entire situation and take requisite actions through police and other concerned. Authorities

**Section 7: Grievance Redressal Committee**

The Institute will also set up “Grievance Redressal Committee” where the students can air their grievances. The Committee shall consist of the Deans/ HoDs/ Chief Warden and also members of the Parent-Teacher Association. Till these committees are constituted, ad-hoc committees shall be formed by the Director.

**Section 8: Undertaking by the Students**

The students joining any academic program of the Institute will have to give an undertaking to the effect that he/she will comply with the provisions envisaged in this Code in letter and spirit and even if it is not given them as well, will be bound by the provisions of this Code.

## Section 9: Opportunity for Hearing

No order other than the order suspending or warning a student shall be passed without giving an opportunity of hearing to the Student/ Students.

## Section 10: Ultimate Authority

For all disciplinary matters related to students, the Principal shall be the ultimate authority as provided herein.

## Section 11: Amendments to the Code

The administrative council of the Institute shall have the power to amend any of the provisions in this Code. The amendments shall be brought to the notice of the students and faculty of the Institute through notice put on the institute website, notice boards of the institute or through emails.

# Scheme of Instruction, Examination

(With effect from the academic year 2025-2026)

/

## M.Tech. I to IV Semesters

## of

## Two Year Post Graduate Degree Programme

## in

## Computer Science & Engineering

**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**
**MVSR ENGINEERING COLLEGE (A)**
NADERGUL, HYDERABAD-501510
(Sponsored by Matrusri Education Society, Estd.1980)
Approved by AICTE & Affiliated to Osmania University, Estd.1981
ISO 9001:2015 Certified Institution, Accredited by NAAC
website: www.mvsrec.edu.in

**2025-2027**

**R25**

# DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

# MVSR ENGINEERING COLLEGE

(An Autonomous Institution)

**Two Year Degree Programme**

**in**

**M.TECH COMPUTER SCIENCE & ENGINEERING**

**Academic Year: 2025-26**

**Structure of Post Engineering program:**

| S.No | Course Work – Subject Area | Credits/ Semester | | | | R 25 Credits | R 21 Credits |
|---|---|---|---|---|---|---|---|
| | | I | II | III | IV | | |
| 1 | Professional Subjects –Core (PC) | 10 | 10 | - | - | **20** | **15** |
| 2 | Professional Subject-Electives (PE) | 6 | 7 | - | - | **13** | **17** |
| 3 | Open Subjects – Electives (OE) | - | 3 | - | - | **3** | **3** |
| 4 | Project Work, Seminar and/or Internships (PW) | 1 | 2 | 10 | **16** | **29** | **30** |
| 5 | Mandatory Courses (MC) | 3 | - | - | - | **3** | **3** |
| 6 | Audit Course (AC-1) (Non-Credit) | - | - | AC | - | **0** | **0** |
| | **TOTAL** | 20 | 22 | 10 | **16** | **68** | **68** |
| | **Contact Hours/ Week** | 22 | 25 | 23 | **32** | **102** | **102** |

**R25**

## SCHEME OF INSTRUCTION & EXAMINATION
## M. Tech. (Computer Science and Engineering) I – Semester

| S. No. | Course Type/Code | Course Name | Scheme of Instruction Contact Hrs/ week | | | | Scheme of Examination | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P/D | Total | CIE | SEE | Duration of SEE (Hrs.) | |
| **Theory Courses** | | | | | | | | | | |
| 1 | P25PC001CS | Mathematical Foundations of Computer Science | 3 | - | - | 3 | 40 | 60 | 3 | 3 |
| 2 | P25PC002CS | Advanced Data Structures | 3 | - | - | 3 | 40 | 60 | 3 | 3 |
| 3 | P25PC003CS | Advanced Databases | 3 | - | - | 3 | 40 | 60 | 3 | 3 |
| 4 | P25PEXXXCS | Professional Elective–I | 3 | - | - | 3 | 40 | 60 | 3 | 3 |
| 5 | P25PEXXXCS | Professional Elective–II | 3 | - | - | 3 | 40 | 60 | 3 | 3 |
| 6 | P25MC001MC | Research methodology & IPR | 3 | - | - | 3 | 40 | 60 | 3 | 3 |
| **Practical/ Laboratory Courses** | | | | | | | | | | |
| 7 | P25PC181CS | Laboratory–I (Core) Advanced Data Structured Lab | - | - | 2 | 2 | 25 | 50 | 3 | 1 |
| 8 | P25PS181CS | Seminar | - | - | 2 | 2 | 25 | - | 3 | 1 |
| | | **Total** | **18** | **-** | **04** | **22** | **290** | **410** | **-** | **20** |

**PC**: Program Core **PE:** Professional Elective **OE**: Open Elective
**AD**: Audit Course **MC**: Mandatory Course **HS**: Humanities and social science

**L**: Lecture **T**: Tutorial **P**: Practical **D**: Drawing
**CIE:** Continuous Internal Evaluation **SEE:** Semester End Examination (Univ. Exam)

## Note:

1. Each contact hour is a Clock Hour.
2. The practical class can be of two and half hour (clock hours) duration as per the requirement of a Particular laboratory.
3. *If the Mandatory Course is offered in I-Semester, the Open Elective course should be offered in II-semester. If Open Elective course is offered in I-Semester, then the Mandatory Course should be Offered in II-semester.
4. **Open Elective Subject is not offered to the students of CSE and IT Department.

**R25**

## SCHEME OF INSTRUCTION & EXAMINATION
## M. Tech. (Computer Science and Engineering) II–Semester

| S. No. | Course Type/Code | Course Name | Scheme of Instruction Contact Hrs/ week | | | | Scheme of Examination | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P/D | Total | CIE | SEE | Duration of SEE (Hrs.) | |
| **Theory Courses** | | | | | | | | | | |
| 1 | P25PC004CS | Soft Computing | 3 | - | - | 3 | 40 | 60 | 3 | 3 |
| 2 | P25PC005CS | Distributed Cloud Computing | 3 | - | - | 3 | 40 | 60 | 3 | 3 |
| 3 | P25PC006CS | Cyber Security & Digital Forensics | 3 | - | - | 3 | 40 | 60 | 3 | 3 |
| 4 | P25PEXXXCS | Professional Elective–III | 3 | - | - | 3 | 40 | 60 | 3 | 3 |
| 5 | P25PEXXXCS | Professional Elective–IV | 3 | - | - | 3 | 40 | 60 | 3 | 3 |
| 6 | P25OEXXXX | Open Elective-I | 3 | - | - | 3 | 40 | 60 | 3 | 3 |
| **Practical/ Laboratory Courses** | | | | | | | | | | |
| 7 | P25PC281CS | Laboratory–II(core) Distributed Cloud Computing | - | - | 2 | 2 | 25 | 50 | 3 | 1 |
| 8 | P25PC282CS | Laboratory–III(Elective-III) | - | - | 2 | 2 | 25 | 50 | 3 | 1 |
| 9 | P25PM281CS | Mini Project | - | - | 4 | 4 | 50 | - | 3 | 2 |
| | | **Total** | **18** | **-** | **08** | **26** | **340** | **460** | **-** | **22** |

**PC**: Program Core **PE:** Professional Elective **OE**: Open Elective
**AD**: Audit Course **MC**: Mandatory Course **HS**: Humanities and social science

**L**:Lecture **T**:Tutorial **P**:Practical **D**:Drawing
**CIE:** Continuous Internal Evaluation **SEE:** Semester End Examination (Univ.Exam)

**Note:**

1. Each contact hour is a Clock Hour.
2. The practical class can be of two and half hour (clock hours) duration as per the requirement of a Particular laboratory.
3. **Open Elective Subject is not offered to the students of CSE and IT Department.
4. Internship is carried out during the summer break.

**R25**

# SCHEME OF INSTRUCTION & EXAMINATION
## M. Tech. (Computer Science and Engineering) III–Semester

| S. No. | Course Type/Code | Course Name | Scheme of Instruction Contact Hrs/ week | | | | Scheme of Examination | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P/D | Total | CIE | SEE | Duration of SEE (Hrs.) | |
| **Theory Courses** | | | | | | | | | | |
| 1 | P25PEXXXHS | Audit course-I | 3 | - | - | 3 | 40 | 60 | 3 | 0 |
| 2 | P25PW801CS | Major Project Phase–I | - | - | 20 | 20 | 100 | - | 3 | 10 |
| | | Total | **03** | **-** | **20** | **23** | **140** | **60** | **-** | **10** |

**PC**: Program Core **PE:** Professional Elective **OE**: Open Elective
**AD**: Audit Course **MC**: Mandatory Course **HS**: Humanities and social science

**L**:Lecture **T**:Tutorial **P**:Practical **D**:Drawing
**CIE:** Continuous Internal Evaluation **SEE:** Semester End Examination (Univ.Exam)

**R25**

## SCHEME OF INSTRUCTION & EXAMINATION
## M. Tech. (Computer Science and Engineering) IV – Semester

| S. No. | Course Type/Code | Course Name | Scheme of Instruction Contact Hrs/ week | | | | Scheme of Examination | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P/D | Total | CIE | SEE | Duration of SEE (Hrs.) | |
| **Theory Courses** | | | | | | | | | | |
| 1 | P25PW802CS | Major Project Phase – II (Dissertation) | - | - | 32 | 32 | - | 200 | 3 | 16 |
| | | Total | **-** | **-** | **32** | **32** | **-** | **200** | | **16** |

**PC**: Program Core  **PE:** Professional Elective  **OE**: Open Elective
**AD**: Audit Course  **MC**: Mandatory Course  **HS**: Humanities and social science

**L**:Lecture  **T**:Tutorial  **P**:Practical  **D**:Drawing
**CIE:** Continuous Internal Evaluation  **SEE:** Semester End Examination(Univ.Exam)

## Note:

1. Each contact hour is a Clock Hour
2. The practical class can be of two and half hour (clock hours) duration as per the requirement of a Particular laboratory.
3. **Open Elective Subject is not offered to the students of CSE and IT Department.
4. The students who are willing to register for MOOCs in the M. Tech (CSE) III – semester instead of Professional Electives – IV & V, should register for those of the courses, approved by the CBoS, OU and respective college MOOCs Coordinator. Those students are strictly not permitted to appear for either CIE or SEE of Professional Electives – IV & V if they abstain from attending the semester classwork. Further, for students willing to appear for both MOOCS and Professional Electives, they Should fulfill the minimum attendance criteria.

**Total number of credits entire PG program of 4 semesters is 68**
**(1st Sem to 4thsem – 20+22+10+16)**

## List Professional Core Subjects

| S. No | Course Code | Course Title |
|---|---|---|
| 1 | P25PC001CS | Mathematical Foundations of Computer Science |
| 2 | P25PC002CS | Advanced Data Structures |
| 3 | P25PC003CS | Advanced Databases |
| 4 | P25PC004CS | Soft Computing |
| 5 | P25PC005CS | Distributed Cloud Computing |
| 6 | P25PC006CS | Cyber Security & Digital Forensics |

## List of Professional Core Subjects based Laboratory Courses

| S. No. | Course Code | Course Title |
|---|---|---|
| 1 | P25PC181CS | Advanced Data Structures Lab |
| 2 | P25PC281CS | Distributed Cloud Computing Lab |

**Professional Elective Specialization Threads:**

| Threads/ Specialization | PE- I (Sem-I) | PE – II (Sem-I) | PE – III (Sem-II) With Lab | PE – IV (Sem-II) |
|---|---|---|---|---|
| **AI, ML & Data Science** | Image Processing and Computer Vision | Deep Learning | Natural Language Processing | AI for Robotics |
| **Networks & Cyber Security** | IoT & Applications | Secure Coding Principles | Advanced Wireless & Mobile Networks | Security & Privacy in Social Media |
| **Software & Web Development** | Web Engineering | UI/UX Design Fundamentals | Full Stack Development | Mobile App Development |
| **Emerging Technologies & Human Interaction** | Human Computer Interaction (HCI) | Virtual, Augmented, Mixed & Extended Reality | Blockchain Technology | Quantum Computing |

# List Professional Elective Subjects

| ELECTIVE I | | |
|---|---|---|
| **S.No.** | **Course Code** | **Course Title** |
| 1 | P25PE001CS | Image Processing and Computer Vision |
| 2 | P25PE002CS | IoT & Applications |
| 3 | P25PE003CS | Web Engineering |
| 4 | P25PE004CS | Human Computer Interaction (HCI) |

| ELECTIVE II | | |
|---|---|---|
| **S.No.** | **Course Code** | **Course Title** |
| 1 | P25PE005CS | Deep Learning |
| 2 | P25PE006CS | Secure Coding Principles |
| 3 | P25PE007CS | UI/UX Design Fundamentals |
| 4 | P25PE008CS | Virtual, Augmented, Mixed & Extended Reality |

| ELECTIVE III | | |
|---|---|---|
| **S.No.** | **Course Code** | **Course Title** |
| 1 | P25PE009CS | Natural Language Processing |
| 2 | P25PE010CS | Advanced Wireless & Mobile Networks |
| 3 | P25PE011CS | Full Stack Development |
| 4 | P25PE012CS | Blockchain Technology |

| ELECTIVE III (Laboratories) | | |
|---|---|---|
| **S.No.** | **Course Code** | **Course Title** |
| 1 | P25PE809CS | Natural Language Processing (NLP) Lab |
| 2 | P25PE810CS | Advanced Wireless & Mobile Networks Lab |
| 3 | P25PE811CS | Full Stack Development Lab |
| 4 | P25PE812CS | Blockchain Technology Lab |

| ELECTIVE IV | | |
|---|---|---|
| **S.No.** | **Course Code** | **Course Title** |
| 1 | P25PE013CS | AI for Robotics |
| 2 | P25PE014CS | Security & Privacy in Social Media |
| 3 | P25PE015CS | Mobile App Development |
| 4 | P25PE016CS | Quantum Computing |

## List of Mandatory Courses

| S. No. | Course Code | Course Title |
|---|---|---|
| 1 | P25MC001CS | Research Methodology &IPR |

## List of Open Electives

| S. No. | Course Code | Course Title |
|---|---|---|
| 1 | P5OE001CE | Cost Management of Engineering Projects |
| 2 | P25OE002CS** | Business Analytics |
| 3 | P25OE003EC | Basics of Embedded System Design |
| 4 | P25OE004EE | Waste to Energy |
| 5 | P25OE005ME | Industrial Safety |
| 6 | P25XXXXEC | Real time operating system for Embedded Application |
| 7 | P25XXXXEC | VLSI design from micro to nano technology |
| 8 | P25XXXXCS** | Fundamentals of ML |
| 9 | P25XXXXME | Operation Research |

**Note**:**Open Elective Subject is not offered to the students of CSE

## List of subjects of Audit Course

| S. No. | Course Code | Course Title |
|---|---|---|
| 1 | P25AD001HS | English for Academic and Research Writing |
| 2 | P25AD002HS | Disaster Management |
| 3 | P25AD003HS | Sanskrit for Technical Knowledge |
| 4 | P25AD004HS | Value Education |
| 5 | P25AD005HS | Constitution of India and Fundamental Rights |
| 6 | P25AD006HS | Pedagogy Studies |
| 7 | P25AD007HS | Stress Management by Yoga |
| 8 | P25AD008HS | Personality Development through life Enlightenment Skills |

| Course Code | Course Title | | | | | | Core/Elective |
|---|---|---|---|---|---|---|---|
| P25PC001CS | Mathematical Foundations of Computer Science | | | | | | Core |
| Prerequisite | Contact Hours per Week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| - | 3 | - | - | - | 40 | 60 | 3 |

**Course Objectives:**

The main objectives of this course are to

- Understand the basic concepts of logic, proof techniques, number theory and their applications in computer science.
- Introduce the fundamental principles of counting, and recurrence relations.
- Understand the models of computation, including finite automata, pushdown automata, and Turing machines.
- Understand probability concepts, distributions, and key statistical measures.
- Gain a foundational understanding of Boolean algebra and Graph theory, and their significance in computer science.

**Course Outcomes:**

After completing this course, the student will be able to:

- Formulate and prove mathematical statements using various proof techniques.
- Develop algorithms for solving problems involving counting and recurrence relations.
- Apply automata theory to design and implement language parsers.
- Compute and interpret statistical measures.
- Apply Boolean algebra and Graph theory to solve practical problems in computer science and engineering.

**UNIT - I**

**Logic and Proofs**: Propositional Logic, Applications of Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Rules of Inference, Introduction to Proofs.

**Number Theory:** Divisibility and Modular Arithmetic, Primes and Greatest Common Divisors, Solving Congruences, Applications of Congruences.

**UNIT - II**

**Counting**: Basics of counting- Pigeonhole Principle- Permutations and Combinations – Pascal's Identity-Vandermonde's Identity- Generalized Permutations and combinations.

**Recurrence Relations**: Recurrence Relations: Solving Recurrence Relations- Linear Homogeneous and Non-Homogeneous Recurrence relations.

**UNIT - Ill**

**Automata, Grammars and Languages:** Regular Languages and Finite Automata, Mealy and Moore Models, Context-Free Languages and Pushdown Automata, Turing Machines.

**UNIT - IV**

**Probability and Statistics:** Sample Spaces and Events, Conditional Probability and Bayes' Theorem, Random Variables and Probability Distributions, Binomial, Poisson, and Geometric Distributions, Expectation, Variance, and Moments. Law of Large Numbers and Central Limit Theorem, Markov Chains.

**UNIT - V**

**Boolean algebra**: Introduction, Boolean Functions, Representing Boolean Functions, Logic Gates, Minimization of Boolean Functions.

**Graph Theory:** Isomorphism, Planar graphs, Graph Coloring, Hamilton Circuits and Euler Cycles.

**Text Books:**

1. Kenneth H.Rosen – Discrete Mathematics and its Applications – 7$^{th}$ edition, Mc Graw – Hill.
2. John E.Hopcroft, Rajeev Motwani, Jeffery D Ulman, Introduction to Automata Theory Languages and Computation, Third edition, Pearson Education.
3. K. Trivedi. Probability and Statistics with Reliability, Queuing, and Computer Science Applications, Wiley.

**References:**


1. J.P.Trembly, R.Manohar, Discrete Mathematical Structure with Application to Computer Science, Mc Graw- Hill.
2. Theory of Computer Science- Automata languages and computation –Mishra and Chandrashekaran, Third edition, PHI.
3. Miller & Freund's, Probability and Statistics For Engineers, by Richard A. Johnson, Eight Edition, PHI.

| Course Code | CourseTitle | | | | | | | Core/Elective |
|---|---|---|---|---|---|---|---|---|
| P25PC002CS | Advanced Data Structures | | | | | | | Core |
| Prerequisite | Contact Hours per week | | | | CIE | SEE | | Credits |
| | L | T | D | P | | | | |
| Basic Data Structures, Time complexity, algorithms. Basic Computer Organization *(desirable)*: | 3 | - | - | - | 40 | 60 | | 3 |

**Course Objectives:**

- To provide an in-depth understanding of advanced data structures and their applications.
- To analyse and evaluate the time and space complexity of various data structures.
- To enable students to implement advanced data structures and apply them in real-world problems.
- To develop proficiency in using data structures for solving problems in software engineering, artificial intelligence, and system programming.
- To introduce persistent and cache-oblivious data structures for modern computing needs.

**Course Outcomes:**

Upon successful completion of this course, students will be able to:

- Demonstrate understanding of non-linear and hierarchical data structures and their operations.
- Apply suitable advanced data structures for modeling and solving complex computational problems.
- Analyse the performance of data structures using asymptotic notations.
- Implement and experiment with advanced data structures in high-level programming languages.
- Evaluate the trade-offs between different data structures in terms of complexity and real-world usage.

**UNIT - I**

**Trees and Balanced Trees:** AVL Trees, Red-Black Trees, Splay Trees, B-Trees, Tries and Suffix Trees, Huffman coding.

**UNIT – II**

**Graph Representations:** Adjacency List vs Matrix, Compressed Sparse Row (CSR) format, Disjoint Sets (Union-Find) with Path Compression, Graph Traversal algorithms, Topological sorting Pattern matching algorithms: Bruteforce, Boyer –Moore, Knuth Morris Pratt.

**UNIT – III**

**Shortest path algorithms:** Dijkstra’s, Warshall’s, Minimm Spanning tree: Prim’s and kruskal’s algorithms. Heaps and Priority Queues,

**UNIT – IV**

Hash Functions,Resolution techniques,Chaining,Open Addressing,Perfect Hashing, Cuckoo Hashing, Extendible Hashing, Skip list, operation on skip list.

**UNIT - V**

Bloom Filters, Range Trees, KD-Trees, Quadtrees, R-Trees ,Chinese Remainder Theorem, LU Decomposition.

**Textbooks:**


1. Thomas H. Cormen et al., *Introduction to Algorithms*, MIT Press**.**
2. Michael T. Goodrich, Roberto Tamassia**, *Algorithm Design: Foundations, Analysis, and Internet Examples*, Wiley.**
3. Mark Allen Weiss**, *Data Structures and Algorithm Analysis in C*++, Pearson.**
4. Peter Brass**, *Advanced Data Structures*, Cambridge University Press.**
5. D.S. Malik**, *Data Structures using C*++, Cengage Learning.**


**Reference Books**


1. S. Dasgupta, C. Papadimitriou, and U. Vazirani, *Algorithms*, McGraw Hill.
2. Sedgewick and Wayne, *Algorithms*, Addison-Wesley.

<table>
<tr><th>Course Code</th><th colspan="6">Course Title</th><th>Core/Elective</th></tr>
<tr><td>P25PC003CS</td><td colspan="6">ADVANCED DATABASES</td><td>Core</td></tr>
<tr><th rowspan="2">Prerequisite</th><th colspan="4">Contact Hoursper week</th><th rowspan="2">CIE</th><th rowspan="2">SEE</th><th rowspan="2">Credits</th></tr>
<tr><th>L</th><th>T</th><th>D</th><th>P</th></tr>
<tr><td>Basic Database Concepts, Operating Systems</td><td>3</td><td>-</td><td>-</td><td>-</td><td>40</td><td>60</td><td>3</td></tr>
</table>

**Course Objectives:**

- Understand the representation and querying mechanisms of complex data types including semi-structured, textual, spatial, and object-oriented data.
- Learn advanced query processing and optimization strategies in memory-resident and traditional database systems.
- Analyze and implement various architectures of modern database systems including centralized, distributed, parallel, and cloud-based systems.
- Explore parallel and distributed query and transaction processing with a focus on scalability, fault tolerance, and consistency.
- Apply advanced indexing techniques and performance tuning strategies in real-time, distributed, and high-volume data applications.

**Course Outcomes:**

After completion of the course the student is able to:

- **CO1**: Model and manage complex data types using formats like JSON, XML, RDF, and apply them to knowledge graphs and spatial databases.
- **CO2**: Implement efficient query processing techniques and optimize query execution using cost-based strategies and materialized views.
- **CO3**: Design and evaluate database architectures suitable for parallel, distributed, and cloud environments.
- **CO4**: Develop and analyze parallel and distributed algorithms for query and transaction processing ensuring consistency and availability.
- **CO5**: Employ indexing strategies like B-tree variants and Bloom filters, and tune performance for large-scale data-intensive applications.

**UNIT– I**

**Complex Data types:**

**Semi-structured Data** -Overview of Semi-structured Data Models, JSON,XML,RDF and Knowledge Graphs.

**Object Orientation** - Object-Relational Database Systems, Object-Relational Mapping.

**Textual Data** -Keyword Queries, Relevance Ranking, Measuring Retrieval Effectiveness, Keyword Querying on Structured Data and Knowledge Graphs.

**Spatial Data-** Representation of Geometric Information, Design Databases, Geographic Data, Spatial Queries

**UNIT– II**

**Query Processing:** Overview, Measures of Query Cost, Selection Operation, Sorting, join Operation, Other Operations, Evaluation of Expressions, ++Query processing in the memory
**Query Optimization:** Overview, Transformation of Relational Expressions, Estimating Statistics of Expression Results, Choice of Evaluation Plans, Materialized Views, Advanced topics in Query optimization

**UNIT– III**

**Database-System Architectures:** Centralized Database Systems, Server System Architectures, Parallel Systems, Distributed Systems, Transaction Processing in Parallel and Distributed Systems, Cloud-Based Services
**Parallel and Distributed Storage** :Data Partitioning, Dealing with Skew in Partitioning, Replication, Parallel Indexing, Parallel Key-Value Stores

**UNIT– IV**

**Parallel and Distributed Query Processing:** Parallel Sort, Parallel Join, Other Operations, Parallel Evaluation of Query Plans, Query Processing on Shared-Memory Architectures, Query Optimization for Parallel Execution, Parallel Processing of Streaming Data, Distributed Query Processing.
**Parallel and Distributed Transaction Processing:** Distributed Transactions, Commit Protocols, Concurrency Control in Distributed Databases, Replication, Extended Concurrency Control Protocols, Replication with Weak Degrees of Consistency, Coordinator Selection, Consensus in Distributed Systems.

**UNIT–V**

**Advanced Application Development:** Performance Tuning, Performance Benchmarks, Other Issues in Application Development, Standardization, Distributed Directory Systems.
**Advanced Indexing Techniques:** Bloom Filter, Indexing of Spatial Data, B-Tree Variants, Lock Structured storage.

**Text Books:**

1. Abraham Silberschatz, Henry F Korth, S Sudarshan, Database System Concepts, McGraw Hill International Edition, 7th Edition, 2019.
2. Data base Internals Alex Petrov O’RElley, 1st Edition
3. ElmasriNavathe, Somayajulu, Gupta, Fundamentals of Database Systems, Pearson Education, 4th Edition, 2006.

**Suggested Readings:**

1. CJ Date, A Kannan, S Swamynathan, An Introduction to Database Systems, Pearson Education, 8thEdition, 2006 Raghu Ramakrishnan, and Johannes Gehrke, Database Management Systems, McGraw-Hill International Edition, 3rd Edition, 2002.

| Course Code | Course Title | | | | | | | Core/Elective |
|---|---|---|---|---|---|---|---|---|
| P25MC001ME | Research Methodology and IPR | | | | | | | Mandatory Course |
| Prerequisite | Contact Hoursper week | | | | CIE | SEE | | Credits |
| | L | T | D | P | | | | |
| - | 3 | - | - | - | 40 | 60 | | 3 |

**Course Objectives:**

- Motivate to choose research as career
- Formulate the research problem, prepare the research design
- Identify various sources for literature review and data collection report writing
- Equip with good methods to analyse the collected data
- Know about IPR copyrights

**Course Outcomes:**
After completion of the course the student is able to:

- Define research problem, review and asses the quality of literature from various sources
- Improve the style and format of writing a report for technical paper/ Journal report, understand and develop various research designs
- Collect the data by various methods: observation, interview, questionnaires.
- Analyse problem by statistical techniques: ANOVA, F-test, Chi-square
- Understand apply for patent and copyrights

**UNIT– I**
**Research Methodology:** Objectives and Motivation of Research, Types of Research, research approaches, Significance of Research, Research Methods Verses Methodology, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India, Benefits to the society in general. Defining the Research Problem: Selection of Research Problem, Necessity of Defining the Problem

**UNIT– II**
**Literature Survey and Report writing:** Importance and purpose of Literature Survey, Sources of Information, Assessment of Quality of Journals and Articles, Need of Review, Guidelines for Review, Record of Research Review.
**Report writing:** Meaning of interpretation, layout of research report, Types of reports, Mechanism of writing a report. **Research Proposal Preparation:** Writing a Research Proposal and Research Report, Writing Research Grant Proposal.

**UNIT– III**
**Research Design:** Meaning of Research Design, Need of Research Design, Feature of a Good Design, Important Concepts Related to Research Design, Different Research Designs, Basic Principles of Experimental Design, Developing a Research Plan, Steps in sample design, types of sample designs.

**UNIT– IV**

**Data Collection and Analysis:** Methods of data collection, Data organization, Methods of data grouping, Diagrammatic representation of data, Graphic representation of data. Importance of Parametric, nonparametric test, testing of variance of two normal populations, use of Chi-square, ANOVA, F-test, z-test

**UNIT–V**

**Intellectual Property Rights:** Meaning, Nature, Classification and protection of Intellectual Property, The main forms of Intellectual Property, Concept of Patent, Patent document, Invention protection, Granting of patent, Rights of a patent, Licensing, Transfer of technology.

**Suggested Readings:**


1. C.R Kothari, Research Methodology, Methods & Technique‖; New Age International Publishers, 2004
2. R.Ganesan,ResearchMethodologyforEngineers‖,MJPPublishers,2011
3. Y.P. Agarwal, Statistical Methods: Concepts, Application and Computation,Sterling Publications Pvt. Ltd., New Delhi, 2004
4. G.B. Reddy, Intellectual Property Rights and the Law 5th Ed. 2005 Gogia LawAgency
5. AjitParulekar and Sarita D"Souza, Indian Patents Law – Legal & Business Implications, Macmillan India Ltd, 2006.

| Course Code | Course Title | | | | | | Core/Elective |
|---|---|---|---|---|---|---|---|
| P25PC181CS | Advanced Data Structures Lab | | | | | | Core |
| Prerequisite | Contact Hours per week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| Basic Data Structures, Time complexity, algorithms. | - | - | - | 2 | 25 | 50 | 1 |

**Course Objectives:**

- To provide hands-on experience in implementing advanced data structures.
- To strengthen the understanding of abstract data types through practical coding.
- To develop the ability to choose appropriate data structures for solving real-world problems.
- To evaluate the time and space complexity of implemented data structures.
- To enhance problem-solving and debugging skills in algorithm design and data structure manipulation.

**Course Outcomes:**

Upon successful completion of this course, students will be able to:

- Demonstrate understanding of non-linear and hierarchical data structures and their operations.
- Apply suitable advanced data structures for modeling and solving complex computational problems.
- Analyze the performance of data structures using asymptotic notations.
- Implement and experiment with advanced data structures in high-level programming languages.
- Evaluate the trade-offs between different data structures in terms of complexity and real-world usage.

**Laboratory Experiments (Practical):**

1. Implementation of Stacks and Queues using Linked list
2. Implementation of Huffman coding.
3. Implementation of AVL Trees with insertion and deletion.
4. Implementation of Brute force, Boyer –Moore, Knuth Morris Pratt
5. Implementation of Dijkstra’s, Warshall’s algorithms.
6. Implementation of Prim’s and kruskal’s algorithms.
7. Implementing Perfect Hashing and Cuckoo Hashing.
8. Bloom Filter implementation and its evaluation.
9. Implementation of LU Decomposition

**Recommended Textbooks**

1. **Thomas H. Cormen et al.,** ***Introduction to Algorithms*****, MIT Press**.
2. **Mark Allen Weiss**, *Data Structures and Algorithm Analysis in C++*, Pearson.
3. **Michael T. Goodrich, Roberto Tamassia**, *Algorithm Design: Foundations, Analysis, and Internet Examples*, Wiley.
4. **Peter Brass**, *Advanced Data Structures*, Cambridge University Press.
5. **D.S. Malik**, *Data Structures using C++*, Cengage Learning

| Course Code | Course Title | | | | | | Core/Elective |
|---|---|---|---|---|---|---|---|
| **P25PS181CS** | **Seminar** | | | | | | **Core** |
| **Prerequisite** | **Contact Hours per week** | | | | **CIE** | **SEE** | **CreditsS** |
| | **L** | **T** | **D** | **P** | | | |
| Basic Data Structures, Time complexity, algorithms. | **-** | **-** | **-** | **2** | **25** | **-** | **1** |

**Course Objectives:**

- Enable students to undertake systematic independent study on state-of-the-art topics in their area of specialization.
- Develop skills in literature survey, technical analysis, and logical organization of material.
- Train students in technical writing and preparation of professional presentations.
- Enhance oral communication and discussion abilities in technical forums.
- Encourage critical thinking and constructive participation in peer seminars

**Course Outcomes:**

Upon successful completion of this course, students will be able to:

- Identify and study current research topics relevant to their specialization.
- Conduct a comprehensive literature survey and analyze existing work.
- Prepare a well-structured technical report with proper references.
- Deliver professional oral presentations using OHP/PC/Multimedia aids.
- Engage in technical discussions and defend their ideas effectively.

**Guidelines**

1. Seminar topics shall be chosen by students in consultation with faculty members.
2. Each student must:
    a. Submit a **one-page synopsis** of the seminar at least two days prior to the presentation (for display/record).
    b. Deliver a **20-minute presentation** followed by **10 minutes of discussion**.
    c. Submit a **typed seminar report** with references and slides within one week after presentation.
3. Seminars will be scheduled from the **3rd week to the last week** of the semester. Changes in schedule are to be discouraged.

**Evaluation Scheme**

Evaluation will be based on:

**Presentation Skills**

1. **Technical Content & Literature Survey**
2. **Seminar Report & References**
3. **Participation in Discussion / Question Handling**
4. Evaluation is to be done by a **committee of at least 2 faculty members**.
5. The **average of two presentations** may be considered for awarding marks.

| Course Code | Course Title | | | | | | Core/Elective |
| --- | --- | --- | --- | --- | --- | --- | --- |
| P25PC004CS | SOFT COMPUTING | | | | | | Core |
| Prerequisite | Contact Hoursper week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| MFCS, algorithms, and programming in Python or MATLAB | 3 | - | - | - | 40 | 60 | 3 |

**Course Objectives:**

- Understand the fundamentals and evolution of soft computing paradigms in contrast to traditional AI.
- Learn and analyze various models of **artificial neural networks**, including supervised and unsupervised learning techniques.
- Explore fuzzy logic concepts and apply fuzzy inference systems to decision-making problems.
- Understand and apply genetic algorithms to solve optimization and machine learning problems.
- Integrate neural networks, fuzzy logic, and genetic algorithms for solving complex, real-world problems.

**Course Outcomes:**

After completion of the course the student is able to:

- **CO1**: Differentiate between hard and soft computing approaches and describe the role of computational intelligence.
- **CO2**: Design and implement supervised and unsupervised neural network models for pattern recognition and classification.
- **CO3**: Apply fuzzy logic concepts in modelling and reasoning under uncertainty.
- **CO4**: Develop and utilize genetic algorithms for solving optimization problems in machine learning.
- **CO5**: Combine soft computing techniques to build hybrid intelligent systems for real-world applications.

**UNIT – I**

**Introduction: Evolution of Computing:** Soft Computing Constituents, From Conventional AI to Computational Intelligence, Hard vs Soft computing.

**UNIT – II**

**Artificial Neural Networks:** Fundamental concepts, Evolution of neural networks, Basic models of artificial neural network, Important terminologies of ANNs. McCulloch-Pitts neuron, linear separability, Hebb network.

**Supervised Learning Neural Networks:** Perceptron networks, Adaptive linear neuron (Adaline), Multiple Adaptive linear neuron (Madaline), Back propagation network

**UNIT – III**

**Unsupervised Learning Neural Networks:** Kohonen self-organizing networks, Adaptive resonance theory.

**Associate Memory Networks:** Bidirectional associative memory network, Hopfield networks.

**UNIT – 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.

**UNIT – V**

**Genetic algorithms:** Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning: Simple genetic algorithm, General genetic algorithm, Classification of genetic algorithm, Machine Learning Approach to Knowledge Acquisition

**Text Books:**

1. S.N. Sivanandam & S.N. Deepa, "Principles of soft computing", Wiley publications, 2nd Edition, 2011.
2. LiMin Fu, "Neural Networks in Computer Intelligence", McGraw-Hill edition, 1994.

**Suggested Readings:**

1. S. Rajasekaran& G.A.Vijayalakshmipai, "Neural Networks, Fuzzy logic & Genetic Algorithms, Synthesis &Applications", PHI publication, 2008.
2. K.L.Du& M.N.S Swamy, "Neural Networks in a Soft Computing Framework", Springer International edition, 2008.
3. Goldberg, David E., "Genetic Algorithms in Search, Optimization and Machine Learning", Addison Wesley, New Delhi, 2008.

**Online Resources:**

1. https://onlinecourses.nptel.ac.in/noc22_cs54/preview
2. https://onlinecourses.nptel.ac.in/noc25_ma54/preview

| Course Code | Course Title | | | | | | Core/Elective |
|---|---|---|---|---|---|---|---|
| **P25PC005CS** | **Distributed Systems and Cloud Computing** | | | | | | **Core** |
| **Prerequisite** | **Contact Hours per week** | | | | **CIE** | **SEE** | **Credits** |
| | **L** | **T** | **D** | **P** | | | |
| Operating Systems, Computer Networks, Data Structures & Algorithms, DBMS, and Programming skills | **3** | **-** | **-** | | **40** | **60** | **3** |

**Course Objectives:**

- Understand the foundational principles and architecture of distributed systems and cloud computing.
- Analyze various infrastructure and storage mechanisms in cloud environments, including database technologies and naming synchronization.
- Explore consistency, replication, and fault tolerance techniques in distributed systems.
- Examine distributed file systems, web-based systems, and service-oriented architectures.
- Develop cloud applications using modern cloud platforms, focusing on security, scalability, and data processing.

**Course Outcomes:**

After completing this course, the student will be able to:

- Describe the core concepts and architecture of distributed systems and cloud computing.
- Analyze different infrastructure and storage solutions, including CDN, NoSQL data stores, and synchronization techniques.
- Implement consistency and replication protocols, fault tolerance mechanisms, and consensus algorithms in distributed systems.
- Evaluate the design and implementation of distributed file systems, web services, and service-oriented architectures.
- Develop secure and scalable cloud applications using platforms like AWS, Hadoop, and implementing necessary security measures

**UNIT-I**

**Introduction:** Introduction to distributed systems and cloud computing, Design goals – Transparency Issues of distributed systems and cloud computing, , Cloud Deployment Models,
**Cloud Delivery Models:** SaaS, PaaS, IaaS.
System Architectures, Middleware, Cloud Computing architectures, End-to-end system design. Threads, Virtualization and types, Code Migration. Remote procedure call, Remote Method Invocation, Multicast Communication

**UNIT-II**

**Infrastructure And Storage Mechanism:** CDN,The CAP Theorem, NoSQL data stores, Distributed hash tables. Table -based (Google BigTable), key-based (Amazon Dynamo), and Cassandra.

**Storage in the Cloud:** Google, Hadoop file system., Load Balancer, SLA Monitor, Hypervisor.

**Naming and Synchronization:** Naming, DNS, Resolution Techniques, Clock Synchronization, Logical Clocks, Election Algorithms, Mutual Exclusion Algorithms.

**UNIT-III**

**Consistency and Replication:** Introduction, Data-Centric Consistency Models, Client-Centric Consistency Models, Replica Management, and Consistency Protocols.

**Fault Tolerance:** Introduction to Fault Tolerance, Failure models, Replicated services and quorum consensus, Reliable Client- Server Communication, Reliable Group Communication, 2PC and 3PC.

**Distributed Object-Based Systems:** CORBA, DCOM, GLOBE -Architecture, Comparison

**UNIT-IV**

**File Systems:** Introduction, Goals, Distributed file systems :SUN-NFS, AFS. CODA, Cloud file systems : Google/Hadoop file system, Examples,

**Web-Based Systems**: TheApache Web Server, Web Server Clusters, Communication, HTTP Fundamentals, Web services and REST. Example: Amazon S3. The JAX-RS API ,REST. Web sockets. Vert.x: Node.js for Java, SOAP, Service-Oriented Architectures,

**UNIT-V**

**Cloud Application Development:** Amazon Web Services:Ec2 Cloud Application, How to install Hadoop in Eclipse on Windows system, Apache Hadoop Amazon Elastic, Batch cloud computing: Map-Reduce: Example, Scaling, Programming Model, Mapreduce.net and Hadoop. Domain-specific languages for cloud data processing: Pig and Hive.

**Applications in the cloud:** Google App Engine(GAE) Amazon Web Services(AWS)

**Suggested Readings:**


1. Kai Hwang, Geoffrey C. Fox, Jack J. Dongarra, “Distributed and Cloud Computing from Parallel Processing to the Internet of Things”, Elsevier, 2012.
2. Dominic Duggan , Enterprise Software Architecture and Design ,
3. Cloud Computing - Sandeep Bhowmik, Cambridge University Press, 2017.
4. Enterprise Cloud Computing - Technology, Architecture, Applications, Gautam Shroff, Cambridge University Press, 2016.
5. Distributed Computing, Sunita Mahajan and Seema Shah, Oxford University
6. Andrew S. Tanenbaum and Maarten Van Steen, Distributed Systems, PHI 2nd Edition, 2009.3
7. Distributed Computing, Fundamentals, Simulations and Advanced topics, 2nd Edition, HagitAttiyaand Jennifer Welch, Wiley India
8. Distributed Systems: Concepts and Design, G. Coulouris, J. Dollimore, and T. Kindberg.

**Reference Books:**

1. Toby Velte, Anthony Velte, Robert C. Elsenpeter, ―Cloud Computing, A PracticalApproach‖, Tata McGraw-Hill Edition, 2010.
2. Rittinghouse, John W., and James F. Ransome, "Cloud Computing: Implementation,Management, And Security", CRC Press, 2017.
3. R. Hill,L. Hirsch,P.Lake,S.Moshiri, Guide to Cloud Computing,Principles andPractice‖, Springer, 2013
4. R. Buyya, J. Borberg, A. Goscinski, Cloud Computing-Principles and Paradigms, Wiley,2013.
5. Distributed Operating Systems by P. K. Sinha, PHI
6. Distributed Systems: Principles and Paradigms, Taunenbaum
7. Java Network Programming & Distributed Computing by David Reilly, Michael Reill

| Course Code | Course Title | | | | | | Core/Elective |
|---|---|---|---|---|---|---|---|
| **P25PC006CS** | **CYBER SECURITY AND DIGITAL FORENSICS** | | | | | | Core |
| **Prerequisite** | **Contact Hoursper week** | | | | **CIE** | **SEE** | **Credits** |
| | **L** | **T** | **D** | **P** | | | |
| Basic knowledge of Operating Systems and Computer Networks | **3** | - | - | - | **40** | **60** | **3** |

**Course Objectives:**

- To understand the nature and classifications of cybercrimes, attackers, and motivation.
- To study legal frameworks, including the Indian IT Act and global cyber law practices.
- To introduce core digital forensics principles, evidence handling, and investigative processes.
- To apply tools and techniques in network, email, mobile, and cloud forensics.
- To develop hands-on skills for digital evidence acquisition, preservation, and analysis

**Course Outcomes:**

After completion of the course the student is able to:

- **CO1**: Describe various cybercrimes, attack methods, and associated legal frameworks.
- **CO2**: Apply foundational concepts of digital forensics in handling and preserving evidence.
- **CO3**: Conduct forensic investigations on computer, network, and mobile systems using appropriate tools.
- **CO4**: Analyze cyber incidents and reconstruct events using forensic processes.
- **CO5**: Evaluate legal and ethical issues surrounding cybercrime investigations and digital evidence.

**Unit I:**

**Introduction to Cybercrime and Attack Vectors**

Definition and classification of cybercrime, cybercriminal profiles, attack motivations. Indian and global perspectives on cybercrime. Key threats: social engineering, cyberstalking, botnets, cloud abuse. Overview of the Indian IT Act 2000 and 2008 amendment.

**Unit II:**

**Cyber Law and Legal Frameworks**

Legal frameworks for cybercrime: the Indian legal landscape, digital signatures, cybercrime and punishment, cyber law challenges in India. Student-specific challenges and legal responsibilities. International cyber law standards and comparative study.

**Unit III:**
**Fundamentals of Digital Forensics**
Digital forensics principles and process, types of digital evidence, digital forensics lifecycle. Chain of custody, data acquisition and validation. Tools for imaging, preservation, and verification. Forensic readiness and handling forensic workstations.

**Unit IV:**
**Network, Email and Web Forensics**
Network forensics: intrusion detection, log analysis, network sniffing. Email forensics: tracking headers, content reconstruction. Web forensics: artifacts, cache, and log file analysis. Use of open-source tools: Wireshark, Snort, Autopsy, and Browser History Examiner.

**Unit V:**
**Mobile and Cloud Forensics**
Mobile forensics: data extraction techniques, tools, and formats. Forensic handling of smartphones and SIM cards. Cloud forensics: challenges in multi-tenant environments, log acquisition. Recent trends and case laws in electronic evidence seizure and presentation in court.

**Textbooks**


1. Nina Godbole, Sunil Belapure, *Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives*, Wiley India.
2. John Sammons, *The Basics of Digital Forensics*, Elsevier.
3. John Vacca, *Computer Forensics: Computer Crime Scene Investigation*, Laxmi Publications.


**References**


1. Kevin Mandia & Chris Prosise, *Incident Response and Computer Forensics*, Tata McGraw Hill.
2. Brian Carrier, *File System Forensic Analysis*, Pearson Education.
3. Cory Altheide & Harlan Carvey, *Digital Forensics with Open Source Tools*, Elsevier.
4. Marjie T. Britz, *Computer Forensics and Cyber Crime: An Introduction*, Pearson.


**Online Resources**

1. https://www.cs.nmt.edu/~df/lectures.html
2. https://www.cyberforensics.in/
3. https://www.ncdrc.res.in/

| Course Code | Course Title | Core / Elective |
|---|---|---|
| **P25PC281CS** | **Distributed Systems and Cloud Computing Lab** | **Core** |

| Prerequisite | Contact Hours per Week | | | | CIE | SEE | Credits |
|---|---|---|---|---|---|---|---|
| | L | T | D | P | | | |
| Operating Systems, Computer Networks, DSA, DBMS, Programming | - | - | - | 2 | 25 | 50 | 1 |

**Course Objectives**

- Understanding Remote Communication and virtualization concepts
- To understand multithreading concepts using sockets
- To understand transaction management protocols
- Understanding Name Resolution techniques.
- To learn about integrating different Databases with cloud
- To use Map, reduce model for distributed processing
- To understand how to deploy web application using node JS

**Course Outcomes**

After completing this course, the student will be able to

- Implement RMI and instance creation accessing using virtualization.
- Develop programs that communicate data between two hosts and FTP
- Implement 2PC and DNS
- Implement Map, reduce model for distributed processing
- Integrate different Databases with cloud and Application development.

**List of Experiments to be performed:**

1. Create an instance and connect an access using Virtualization
2. Implement RMI (remote Method Invocation)
3. Implementation of Chat Server
4. Implementation FTP Client and Server
5. Implement 2PC(Two Phase Commit Protocol)
6. Implementation of DNS Domain Name Server
7. Integrating MySQL database services from Cloud
8. Implementing CASANDRA (CRUD operations)
9. Implement a word count application which counts the number of occurrences of each word in a large collection of documents Using Map Reduce model.
10. Deploying Web Page on cloud using Node JS

| Course Code | Course Title | | | | | | | Core/Elective |
|---|---|---|---|---|---|---|---|---|
| **P25PM281CS** | **Mini Project** | | | | | | | **Core** |
| **Prerequisite** | **Contact Hours per week** | | | | **CIE** | **SEE** | | **Credits** |
| | **L** | **T** | **D** | **P** | | | | |
| Basic Data Structures, algorithms, Programming | **-** | **-** | **-** | **2** | **25** | **-** | | **1** |

**Course Objectives:**

- Expose students to research-oriented problem solving in their specialization.
- Enable students to apply theoretical knowledge to practical/industrial problems.
- Develop competence in research methodology, experimental/numerical modeling, and analysis.
- Enhance technical documentation and presentation skills.
- Provide an opportunity for innovative and original contributions.

**Course Outcomes:**

Upon successful completion of this course, students will be able to:

- Identify and define research problems of academic/industrial relevance.
- Conduct literature review and adopt appropriate research/experimental methodologies.
- Design, implement, and analyze mathematical, numerical, or experimental models.
- Interpret results systematically and draw valid conclusions.
- Prepare well-structured technical reports and deliver effective presentations.

**Guidelines**

1. Mini project shall be carried out in **II Semester** under the supervision of a faculty member.
2. Students should typically work **3–4 weeks on literature survey/preparation** and **12 weeks on active project work**.
3. Projects must be **relevant to the discipline or industry** and allow demonstration of competence in research techniques.
4. The project topic should be selected such that it demonstrates the student's **competence in research techniques, problem-solving ability, and innovation** in the chosen area of Computer Science & Engineering.
5. The project should preferably have **academic, research, or industry relevance**.

6. Each student must present their work for assessment at the end of the semester with a project report.
   The report should include:
   a. Research objectives and problem statement
   b. Background and literature review
   c. Methodology/techniques used
   d. Results, analysis, and discussion
   e. Conclusions and references

**Evaluation Scheme**

1. Problem formulation & objectives
2. Literature survey & methodology
3. Implementation & results analysis
4. Report quality (documentation & references)
5. Presentation & viva

| Course Code | Course Title | | | | | | Core/Elective |
|---|---|---|---|---|---|---|---|
| P25PW801CS | Major Project Phase–I | | | | | | Core |
| Prerequisite | Contact Hours per week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| - | - | - | - | 20 | 100 | - | 10 |

**Course Outcomes:**

Upon successful completion of this course, students will be able to:

- Exposed To Self-learning various topics.
- Learn to survey the literature such as books, journals and contact resource persons for the selected topic research.
- Learn To Write Technical Reports.
- Develop Oral and Written Communication Skills To Present.
- Defend their work in front of technically qualified audience

**Guidelines**

1. The Project work will preferably be a problem with research potential and should involve scientific research, design, generation/collection and analysis data, determining solution and must preferably bring out the individual contribution.
2. Seminar should be based on the area in which the candidate has undertaken the dissertation work.
3. The CIE shall include reviews and the preparation of report consisting of a detailed problem statement and a literature review.
4. The Preliminary Results (if available) of the problem may also be discussed in the report.
5. The work has to be presented in front of the committee consists of Chairperson-BoS, Osmania University Head, Supervisor Project coordinator from the respective Department of the Institute.

**The candidate has to be in regular contact with his supervisor and the topic of dissertation must be mutually decided by the guide and student.**

| Course Code | Course Title | | | | | | Core/Elective |
|---|---|---|---|---|---|---|---|
| P25PW802CS | Major Project Phase–2 (Dissertation) | | | | | | Core |
| Prerequisite | Contact Hours per week | | | | CIE | SE E | Credits |
| | L | T | D | P | | | |
| - | - | - | - | 32 | 200 | - | 16 |

**Course Outcomes**: At the end of this course, students will be able to:

- Use different experimental techniques and will be able to use different software/computational/analytical tools.
- Design and develop an experimental setup/equipment/test rig.
- Conduct tests on existing setups/ equipment's and draw logical conclusions from the results after analyzing them
- Either work in a research environment or in an industrial environment.
- Conversant with technical report writing and will be able to present and convince heir topic of study to the engineering community

**Guidelines**

1. It is a continuation of Major Project Phase- I started in semester-III.
2. The student has to submit the report in prescribed format and also present a seminar.
3. The dissertation should be presented in standard format as provided by the department.
4. The candidate has to prepare a detailed project report consisting of introduction of the problem, problem statement, literature review, objectives of the work, methodology (experimental set up or numerical details as the case maybe)of solution and results and discussion.
5. The report must bring out the conclusions of the work and future scope for the study. The work has to be presented in front of the examiners panel consisting of an approved external examiner and Chairperson BoS& Head, Osmania University and Supervisor from the Institute.
6. The candidate has to be in regular contact with his / her Supervisor/ CoSupervisor

| Course Code | Course Title | | | | | | Core/ Elective |
|---|---|---|---|---|---|---|---|
| P25PE004CS | Human Computer Interaction | | | | | | Core |
| Prerequisite | Contact Hours per week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| Computer GraphicsGUI, Programming | 3 | - | - | - | 40 | 60 | 3 |

**Course Objectives:**

- Understand the fundamentals of interaction design, usability, and user experience.
- Explore cognitive, social, and emotional factors that affect user interaction.
- Learn different interface types and methods for data collection and analysis.
- Understand requirement discovery, prototyping, and practical interaction design processes.
- Acquire skills in evaluating interaction designs through various methods.

**Course Outcomes**: On completion of this course, the student will be able to-

- Identify good design practices and explain conceptual models, interaction types, and design paradigms.
- Analyze the impact of cognition, social engagement, and emotions on user experience and interface design.
- Apply appropriate interface designs and conduct basic data gathering and analysis for user-centered design.
- Develop personas, use cases, and prototypes to design interactive systems effectively.
- Conduct usability testing, inspections, and analytics to assess and improve interaction designs.

**UNIT-I**

**Interaction Design:** Introduction, Good and Poor Design, what is Interaction Design, The User Experience, Understanding Users Accessibility and Inclusiveness, Usability and User Experience Goals

**Process of Interaction Design:** Introduction, What is Involved in Interaction Design, Practical Issues

**Conceptualizing Interaction:** Introduction, Conceptualizing Interaction, Conceptual Models, Interface Metaphors, Interaction Types, Paradigms, Visions, Theories, Models, and Frameworks

**UNIT-II**

**Cognitive Aspects:** Introduction, what is Cognition, Cognitive Frameworks

**Social Interaction:** Introduction, Being Social, Face-to-Face Conversations, Remote Conversations, Co-presence, Social Engagement

**Emotional Interaction:** Introduction, Emotions and the User Experience, Expressive Interfaces and Emotional Design, Annoying Interfaces, Affective Computing and Emotional AI, Persuasive Technologies and Behavioral Anthropomorphism Change.

**UNIT-III**

**Interfaces:** Introduction, Interface Types, Natural User Interfaces and Beyond, Which Interface

**Data Gathering:** Introduction, Five Key Issues , Data Recording, Interviews, Questionnaires, Observation, Choosing and Combining Techniques

**Data Analysis, Interpretation, and Presentation: Introduction**, Quantitative and Qualitative, Basic Quantitative Analysis, Basic Qualitative Analysis, Kind of Analytic Framework to Use, Tools to Support Data Analysis, Interpreting and Presenting the Findings

**UNIT-IV**

**Discovering Requirements:** Introduction, Data Gathering for Requirements, Bringing Requirements to Life: Personas and Scenarios, Capturing Interaction with Use Cases **Design, Prototyping, and Construction:** Introduction, Prototyping, Conceptual Design, Concrete Design, Generating Prototypes, Construction

**Interaction Design in Practice:** Introduction, AgileUX, Design Patterns, Open-Source Resources, Tools for Interaction Design.

**UNIT-V**

**Introducing Evaluation:** Introduction, Types of Evaluation, Evaluation Case Studies, Case Studies, Other Issues to Consider in Evaluation

**Evaluation Studies: From Controlled to Natural Settings:** Introduction, Usability Testing, Conducting Experiments, Field Studies

**Evaluation: Inspections, Analytics, and Models:** Introduction, Inspections: Heuristic Evaluation and Walk-Throughs, Analytics and A/B Testing, Predictive Models.

**Suggested Readings:**


1. Helen Sharp, Jennifer Preece, Yvonne Rogers Interaction Design: Beyond Human Computer Interaction wiley Publishing 5th Edition 2019
2. Jenifer Tidwell, Charles Brewer, Aynne Valencia, Designing Interfaces, O‘REllIEY 3rd Edition 2020
3. Alan Cooper, Robert Reimann, David Cronin, Christopher Noessel, About Face: The Essentials of Interaction Design Wiley, 4th Edition 2014
4. Elizabeth Goodman, Mike Kuniavsky, Observing the User Experience, Elsevier 2ndEdition 2012
5. Jesmond Allen, James Chudley, Smashing UX Design, Wiley ,1st Edition 2012

| Course Code | Course Title | | | | | | Core/ Elective |
|---|---|---|---|---|---|---|---|
| P25PE001CS | Digital Image Processing and Computer Vision | | | | | | Core |
| Prerequisite | Contact Hours per week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| Linear algebra, calculus, signal processing basics, data structures, and programming | 3 | - | - | - | 40 | 60 | 3 |

**Course Objectives:**

- Understand image acquisition and representation.
- Apply enhancement and filtering techniques.
- Perform segmentation, edge detection, and morphology.
- Learn image compression methods.
- Explore object recognition, 3D vision, and watermarking.

**Course Outcomes**: On completion of this course, the student will be able to-

- Classify Image representations.
- Apply Image transformation methods.
- Implement image processing algorithms.
- Design face detection and recognition algorithms.
- Recover the information, knowledge about the objects in the scene.

**Unit-I**

**Image Fundamentals and Acquisition**

Image models: intensity, color, range, Image formation: image shape, sampling, quantization
Image acquisition: cameras, sensors, scanners,Digital image representation and storage.

**Unit-II**

**Image Enhancement in Spatial Domain**

Gray-level transformations: contrast stretching, log, negative, Histogram processing: equalization, specification, Multi-image operations: addition, subtraction, averaging, Spatial filtering: templates, convolution, window operations, Smoothing techniques: mean, median, Gaussian, directional smoothing.

**Unit-III**

**Segmentation and Edge Detection**

Segmentation concepts and region operations, Edge detection:Gradient operators (Sobel, Prewitt, Roberts), Compass operators (Kirsch, Robinson), Laplacian & second-order detection, Crack edge detection, edge following. Thresholding methods, Region growing, splitting & merging

**Unit-IV**

**Morphological Image Processing and Compression**

Morphological operations: erosion, dilation, opening, closing, Morphological transformations: skeletonization, thinning, thickening, Area-based operations, Image compression: Types and requirements (lossless vs lossy) , Statistical compression (Huffman, run-length), Spatial compression, Contour coding, Quantization methods

**Unit-V**

**Advanced Topics in Image Analysis**

Representation and description of objects, Object recognition techniques, 3D vision and geometry: stereo, depth maps, Digital watermarking, Texture analysis: statistical, structural, spectral approaches, Applications: medical imaging, biometrics, satellite imaging, AI-based vision

**Text Books:**


1. D. A. Forsyth, J. Ponce, Computer Vision: A Modern Approach, PHI Learning, 2009.
2. Milan Soanka, Vaclav Hlavac and Roger Boyle, Digital Image Processing and Computer Vision,Cengage Learning, 2014
3. R.C. Gonzalez and R.E. Woods, Digital Image Processing, Pearson Education, 2007

| Course Code | Course Title | | | | | | Core/ Elective |
|---|---|---|---|---|---|---|---|
| **P25PE002CS** | **Internet of Things & Applications** | | | | | | **Core** |
| **Prerequisite** | **Contact Hours per week** | | | | **CIE** | **SEE** | **Credits** |
| | **L** | **T** | **D** | **P** | | | |
| **PPS using C, BE & Sensors, Microprocessor& Microcontroller, DBMS** | **3** | **-** | **-** | **-** | **40** | **60** | **3** |

**Course Objectives:**

- Understand the principles of energy transformation and control systems.
- Gain foundational knowledge of embedded systems and Arduino programming.
- Explore IoT architecture, protocols, and cloud computing fundamentals.
- Learn to utilize IoT-ready development boards for network and cloud integration.
- Develop IoT web applications using Python and Flask, and study various IoT case applications.

**Course Outcomes**:

On completion of this course, the student will be able to-

- Justify IoT's role in enabling technologies
- Suggest components of an IoT Architecture for various application sectors
- Work with Arduino based IoT applications
- Develop Python based IoT solutions using Raspberry Pi
- Define requirements for IoT projects based on problem scenario

**UNIT-I**

**Basics of Energy Transformation**: Transducers, Types of Transducers.
**IoT Sensing and Actuation**: Introduction, Sensors, Sensor Characteristics, Sensorial Deviations, Sensing Types, Sensing Considerations, Actuators, Actuator Types, Actuator Characteristics, Taxonomy, Working Principles and Characteristics.
**Parameters Control Systems**: Introduction, Classification and Applications
**Embedded Systems:** Introduction, Characteristics, Architecture, Applications, Advantages & Disadvantages. Arduino: Introduction, UNO, IDE, Program Structure, Interfacing Sensors & Actuators (using Serial, PWM, i2C)

**UNIT-II**

**Introduction to IoT:** IoT Definition, IoT Characteristics, IoT Applications, Key Components of IoT System Things/Device, Gateway, Cloud/Server, Analytics, User Interface, Architecture of IoT.
**IoT Challenges**: Design Challenges, Security Challenges.

**Associated IoT technologies**: Cloud Computing: Introduction, Virtualization, Cloud Models, Service-Level Agreement in Cloud Computing, Sensor-Cloud: Sensors-as-a-Service. Cloud Service Models, Read/Write Communication APIs,Fog & Edge Computing Fundamentals.

**UNIT-III**

**Programming with Arduino Uno:** ARDUINO UNO board Block diagram, Sketch Structure, Data types & Built in Constants, Operators: Arithmetic, Bitwise, Compound, Comparison, and Boolean, Control statements and Loops, Functions and library functions, LED Blinking using Arduino, Serial Communication Functions.

**UNIT-IV**

**IoT related protocols**: HTTP, MQTT, CoAP, 6LowPAN, RPL, IPV6, WiFi, Bluetooth, ZigBee, LoRaWAN.

**IoT ready Arduino products**: NodeMCU and ESP32 development boards, Accessing Sensor-data & Actuators over Local Network and Cloud.

**Exemplary Device:** Raspberry Pi, About the Board, Linux on Raspberry Pi, Motivation for using Python for IoT, Programing Raspberry Pi with Python.

**UNIT-V**

**IoT Case Studies And Future Trends:**

Developing IoT Web Applications, Python Web Application Framework - Flask.

*Case Studies* IoT Analytics – Introduction, Smart City-Smart Lighting, Smart Parking Environment, Agricultural IoT, Vehicular IoT , Healthcare IoT.

**Text Book:**


1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle,"From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", Academic Press
2. Sudip Misra, Anandarup Mukherjee, Arijit Roy, "Introduction to IoT", Cambridge University Press 2021.
3. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on Approach)"


**Reference Books:**


1. Adrian McEwen, "Designing the Internet of Things", Wiley Publishers
2. Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill
3. Cuno Pfister, "Getting Started with the Internet of Things", O' Reilly Media
4. Jeeva Jose, "Internet of Things", Khanna Publishing House


**e-Resources:**

1. Introduction to internet of things, IIT Kharagpur, Prof. Sudip Misra - https://nptel.ac.in/courses/106105166

| Course Code | Course Title | | | | | | Core/Elective |
|---|---|---|---|---|---|---|---|
| **P25PE003CS** | **Web Engineering** | | | | | | **Elective** |
| **Prerequisite** | Contact Hours per Week | | | | CIE | SEE | Credits |
| Strong knowledge of Java, DBMS, Internet Basics,OS Concepts, Basic Web Technologies. | L | T | D | P | | | |
| | - | - | - | **2** | **40** | **60** | **3** |

**Course Objectives:**

- Introduce the principles, processes, and methodologies of Web Engineering.
- Understand requirements elicitation, modeling, and analysis for web-based systems.
- Familiarize students with web application design, architecture, and usability principles.
- Provide knowledge of web development technologies, frameworks, and security aspects.
- Enable students to test, deploy, and maintain web applications ensuring quality and scalability.

**Course Outcomes:**

After completing this course, the student will be able to:

- Explain the fundamentals, challenges, and engineering approaches to web application development.
- Analyze and document requirements for effective web applications.
- Design architectures, navigation models, and user interfaces with usability and accessibility in mind.
- Apply modern web technologies, frameworks, and security mechanisms in development.
- Evaluate, test, deploy, and maintain web applications considering performance and reliability.

**UNIT I**

Introduction to Web Engineering,Evolution of the Web and Web Applications,
Web Engineering vs Web Development,Characteristics of Web Applications,Challenges in Web Application Development (Usability, Security, Scalability, Performance),
Web Engineering Process Models (Waterfall, Incremental, Agile, Web-Specific Models)

**UNIT II**

Requirements Engineering for Web Applications,Requirements Elicitation and Analysis,Functional vs Non-Functional Requirements,Modeling Requirements: Use Cases, Scenarios, Storyboards,Information Architecture and Content Management Systems.

**UNIT III**

Web Application Design,Web Application Architectures: Client-Server, 3-Tier, MVC, SOA, Microservices,Navigation Design and Workflow Modeling,User Interface (UI) Design and User Experience (UX) Principles,Responsive Design and Web Accessibility Guidelines (WCAG),Design Patterns for Web Applications.

**UNIT IV**
Web Application Development & Technologies,Overview of Web Technologies: HTML5, CSS3, JavaScript, XML/JSON,Client-Side vs Server-Side Development Concepts
Frameworks and Middleware: Servlets/JSP, PHP, Node.js, Django (conceptual overview)
Web Services: REST, SOAP, APIs,Security in Web Applications: Authentication, Authorization, HTTPS, OWASP Top 10,

**UNIT V**
Testing, Deployment, and Maintenance,Web ApplicationTesting,Functional,Usability, Performance, Security, Tools for Web Testing: Selenium, JUnit, Postman (overview),Deployment Models: On-premises, Cloud, Containerization (Docker basics),
Maintenance and Evolution of Web Applications,Emerging Trends: Progressive Web Apps (PWA), WebAssembly, AI-enabled Web Applications.

**Textbooks:**

1. Roger S. Pressman, David Lowe – Web Engineering: A Practitioner's Approach, McGraw-Hill, 2008.
2. Gustavo Rossi, Oscar Pastor, Daniel Schwabe, Luis Olsina (Eds.) – Web Engineering: Principles and Techniques, Springer, 2007.

**References:**

1. Leon Shklar, Richard Rosen – Web Application Architecture: Principles, Protocols and Practices, Wiley.
2. Kogent Learning Solutions – Web Technologies: HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Dreamtech Press.
3. Florian Daniel, Maristella Matera – Engineering Web Applications, Springer.
4. Soumen Chakrabarti – Mining the Web: Discovering Knowledge from Hypertext Data, Morgan Kaufmann.

| Course Code | Course Title | | | | | | Core/Elective |
|---|---|---|---|---|---|---|---|
| **P25PE005CS** | **DEEP LEARNING** | | | | | | Elective |
| **Prerequisite** | **Contact Hours per week** | | | | **CIE** | **SEE** | **Credits** |
| | **L** | **T** | **D** | **P** | | | |
| **Linear algebra, Probability, Machine learning** | **3** | **-** | **-** | **-** | **40** | **60** | **3** |

**Course Objectives:**

- To understand the complexity, architecture, and limitations of deep learning algorithms.
- To learn and apply training techniques such as gradient descent, regularization, and optimization methods in neural networks.
- To design and implement deep learning models using convolutional and recurrent neural networks.
- To analyze the applications of deep learning in computer vision including image classification, segmentation, and captioning.
- To explore and implement deep learning techniques for natural language processing tasks such as sentiment analysis, NER, and dialogue systems.

**Course Outcomes:**

After completion of the course the student is able to:

- **CO1**: Implement and optimize deep neural networks using techniques like back propagation, ReLU, and dropout.
- **CO2:** Apply convolutional and recurrent neural networks (LSTM, GRU) to image and sequence data effectively.
- **CO3:** Use deep learning models in real-world computer vision tasks like object detection and image generation.
- **CO4:** Represent and process textual data using word embeddings such as Word2Vec, CBOW, and GloVe.
- **CO5:** Build deep learning models for NLP applications including sentiment analysis, sentence classification, and dialogue generation.

**UNIT – I**

Introduction: Feed forward Neural networks, Gradient descent and the back propagation algorithm, Unit saturation, the vanishing gradient problem, and ways to mitigate it. RelU Heuristics for avoiding bad local minima, Heuristics for faster training, Nestors accelerated gradient descent, Regularization, Dropout

**UNIT - II**

Convolutional Neural Networks: Architectures, convolution/pooling layers, Recurrent Neural Networks: LSTM, GRU, Encoder Decoder architectures. Deep Unsupervised Learning: Auto encoders, Variational Auto-encoders, Adversarial Generative Networks, Auto-encoder and DBM Attention and memory models, Dynamic Memory Models

**UNIT - III**

Applications of Deep Learning to Computer Vision: Image segmentation, object detection, automatic image captioning, Image generation with Generative adversarial networks, video to text with LSTM models, Attention Models for computer vision tasks

**UNIT - IV**

Applications of Deep Learning to NLP: Introduction to NLP and Vector Space Model of Semantics, Word Vector Representations: Continuous Skip-Gram Model, Continuous Bag-of-Wordsmodel (CBOW), Glove, Evaluations and Applications in word similarity

**UNIT - V**

Analogy reasoning: 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

**Text Books:**


1. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press.
2. The Elements of Statistical Learning by T. Hastie, R. Tibshirani, and J. Friedman, Springer.
3. Probabilistic Graphical Models. Koller, and N. Friedman, MIT Press.


**References**:


1. Bishop, C, M., Pattern Recognition and Machine Learning, Springer, 2006.
2. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
3. Golub, G.,H., and Van Loan,C.,F., Matrix Computations, JHU Press,2013.
4. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004

| Course Code | Course Title | | | | | | Core/Elective |
|---|---|---|---|---|---|---|---|
| P25PE006CS | Secure Coding Principles | | | | | | Elective |
| Prerequisite | Contact Hours per week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| Programming, Cryptography, Software Engineering, OS, DBMS | 3 | - | - | - | 40 | 60 | 3 |

**Course Objectives:**

- To introduce students to fundamental concepts of security, including threats, vulnerabilities, exploits, and various attack mechanisms that compromise software systems.
- To understand the secure software development lifecycle (S-SDLC) and apply best practices in designing, developing, and maintaining secure applications.
- To equip students with threat modelling techniques, risk assessment methods, and secure coding practices for mitigating application-level vulnerabilities.
- To develop the ability to identify and prevent common database and web-specific security issues such as SQL injection, XSS, race conditions, and file handling exploits.
- To train students in secure testing methodologies, enabling them to design and execute security test plans for detecting and resolving security flaws in software systems.

**Course Outcomes:**

After successful completion of this course, the student will be able to:

- **CO1:** Explain the fundamental concepts of software security, malware, and attack vectors, and distinguish between different types of vulnerabilities.
- **CO2:** Apply secure software development practices throughout the software development lifecycle, ensuring security by design, default, and deployment.
- **CO3:** Construct threat models, identify potential risks, and implement secure coding techniques to mitigate application-level security threats.
- **CO4:** Analyze and implement countermeasures for database and web security vulnerabilities such as SQL injection, XSS, and race conditions.
- **CO5:** Develop and execute security testing strategies, including test plans for web and file-based applications, to ensure robust and secure software deployment.

**UNIT – I**

**Introduction:** Security, CIATriad, Viruses, Trojans, and Worms in a Nutshell, Security Concepts exploit, threat, vulnerability, risk, attack.

**Malware Terminology:** Rootkits, Trapdoors, Botnets, Key loggers, Honey pots. Active and Passive Security Attacks. IP Spoofing, Teardrop, DoS, DDoS ,XSS, SQL injection, Man in middle Attack, Format String attack. Types of Security Vulnerabilities-buffer over flows, Invalidated input, race conditions, access-control problems, weakness in authentication, authorization, or cryptographic practices. Access Control Problems.

**UNIT– II**

**Need for secure systems:** Proactive Security development process, Secure Software Development Cycle (S-SDLC), Security issues while writing SRS, Design phase security, Development Phase, Test Phase, Maintenance Phase, Writing Secure Code – Best Practices SD3 (Secure by design, default and deployment), Security principles and Secure Product Development Timeline.

**UNIT – III**

**Threat modeling process and its benefits:** Identifying the Threats by Using Attack Trees, Risk Mitigation Techniques and Security Best Practices. Security techniques, authentication, authorization

**Secure Coding Techniques:** Protection against DoS attacks, Application Failure Attacks, CPU Starvation Attacks.

**Security Issues in C Language:** String Handling, Avoiding Integer Over flows and Underflows and Type Conversion Issues- Memory Management Issues,Code Injection Attacks.

**UNIT – IV**

**Database and Web-specific issues:** SQL Injection Techniques and Remedies, Race conditions, Time of Check, Time of Use and its protection mechanisms. Validating Input and Inter process Communication, Securing Signal Handlers and File Operations. XSS scripting attack and its types – Persistent and Non persistent attack XSS Countermeasures and Bypassing the XSS Filters.

**UNIT –V**

**Testing Secure Applications:** Security code overview, secure software installation. The Role of the Security Tester, Building the Security Test Plan. Testing HTTP-Based Applications, Testing File-Based Applications

**Suggested Reading:**


1. Michael Howard and David LeBlanc, Writing Secure Code‖, Microsoft Press, 2nd Edition, 2004.
2. Secure Coding: Principles and Practices. Authors: Mark G. Graff and Kenneth R. Van Wyk
3. Jason Deckard, ―Buffer Overflow Attacks: Detect, Exploit, Prevent―, Syngress,1st Edition, 2005.
4. Frank Swiderski and Window Snyder, ―Threat Modeling‖, Microsoft Professional, 1st Edition, 2004.

| Course Code | Course Title | | | | | | Core/Elective |
|---|---|---|---|---|---|---|---|
| P25PE007CS | UI/UX Design | | | | | | Elective |
| Prerequisite | Contact Hours per week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| - | 3 | - | - | - | 40 | 60 | 3 |

**Course Objectives:**

The main objectives of this course are to

- To understand the fundamentals and stages of design thinking.
- To analyze user needs using research and analysis tools.
- To design effective and aesthetic user interfaces.
- To develop engaging and user-friendly experiences.
- To create and test prototypes for usability and improvement.

**Course Outcomes:**

After completing this course, the student will be able to:

- Explain design thinking concept.
- Interpret user requirements.
- Select appropriate visual design for given problem.
- Create interactions using design tool.
- Create innovative design prototype for given applications.

**UNIT-I**

Design Thinking Fundamentals: Introduction to Design thinking – Concept, Purpose, 5 stages of design thinking – Empathize, Define, Ideate, Prototype, Test. Introduction to User Interface / User Experience, (UI/UX) – Definition of Design with respect to digital, media, User Interface, User experience, Difference, between UI and UX. History of UX. Need of UI and UX

**UNIT-II**

User Requirements and its Analysis- Introduction to research and analysis tool (freeware) such as FigJam. User requirements – Definition, Types of user research - Qualitative research, Quantitative research. Tools to collect user requirements – personal observation, interviews, questionnaire, User/ Expert reviews. User requirement analysis - Understanding target audience and client requirements, Competitive analysis, Affinity mapping, Defining User Personal

**UNIT-III**

User Interface Design- Storyboarding, User journey mapping, Gestalt principles of design - Aesthetics in UI design - Using Light, Color and Contrast Effectively in UI Design. Introduction to any freeware design tool such as Figma. Visual Communication Design - effective visual communication for graphical user interface

**UNIT-IV**
User Experience Design Tool - Introduction to User Experience design, UX design open source tool such as – Figma features – Navigations, interactions, Buttons Creating library, Gamification, micro-animation, Creating visual identity of the project – design system, design theme.

**UNIT-V**
Prototyping and Testing- Introduction to Wireframing - Purpose of wireframing, Types – low fidelity, medium fidelity, high fidelity. Basics of sketching, Creating low fidelity wireframes, medium fidelity and high fidelity in Figma. Basic considerations in wireframing – device, size, behavior, interaction. Elements used in wireframing – visual design, high fidelity elements. Prototyping and Testing.

**Text Books:**


1. Jesse James Garrett, The Elements of User Experience: User-Centered Design for the Web and Beyond, New Riders Publishing, 201 West 103 Street, Indianapolis, IN 46290 800-545- 5914 ISBN:978-0-321-68368-7
2. Falk Uebernickel, Li Jiang, Walter Brenner, Britta Pukall, Therese Naef, Design Thinking: The Handbook, World Scientific Publishing Co Pte Ltd, No.16, South West Boag Road T. Nagar, Chennai 600017, INDIA ISBN-10: 9811203504 ISBN-13: 978-9811203503.
3. Fabio Staiano, Designing and Prototyping Interfaces with Figma, Packt Publishing Ltd, Grosvenor House, 11 St Paul's Square, Birmingham, B3 1RB ISBN-10: 180056418X ISBN-13: 978-1800564183.
4. Kilian Langenfeld, Design Thinking for Beginners, Personal Growth Hackers ISBN-10: 3967160629 ISBN-13: 978-3967160628.

| Course Code | Course Title | | | | | | Core/Elective |
|---|---|---|---|---|---|---|---|
| **P25PE008CS** | **Virtual, Augmented, Mixed & Extended Reality** | | | | | | Elective |
| **Prerequisite** | **Contact Hoursper week** | | | | **CIE** | **SEE** | **Credits** |
| | **L** | **T** | **D** | **P** | | | |
| Programming, Web Technologies, ML, Computer Vision | **3** | **-** | **-** | **-** | **40** | **60** | **3** |

**Course Objectives:**

- To introduce the fundamentals, history, and requirements of Virtual Reality and Virtual Environments.
- To study VR software technologies and 3D interaction techniques
- To learn principles of designing and evaluating 3D user interfaces.
- To explore Augmented Reality concepts, hardware, and software.
- To understand Mixed Reality, Extended Reality, and their challenges.

**Course Outcomes:**

After completion of the course the student is able to:

- Explain the evolution, components, and benefits of Virtual Reality.
- Demonstrate the use of VR toolkits and apply 3D interaction techniques.
- Design and evaluate 3D user interfaces for immersive applications.
- Compare AR hardware/software and create simple AR applications.
- Differentiate VR, AR, MR, and XR and analyze their challenges and features.

**UNIT – I**

**Virtual Reality and Virtual Environment:** The historical development of VR –Scientific landmarks Computer Graphics, Real-time Computer Graphics, Flight Simulation, Virtual environments, Requirements of VR, Benefits of Virtual reality.

**3D User Interface Input Hardware:** Input device characteristics, Desktop input devices, Tracking devices, 3D Mice, Special Purpose Input Devices, Direct Human Input, Home-Brewed Input Devices, Choosing Input devices for 3D interfaces.

**UNIT – II**

**Software Technologies:** VR Environment –VR Database, Tessellated Data, LODs, Cullers and Occluders, Lights and Cameras, Scripts, VR toolkits, Available software in the market.

**3D Interaction Techniques:** 3D Manipulation tasks, Manipulation techniques and Input devices, Interaction Techniques for 3D Manipulation.

**UNIT -III**

**Designing and Developing 3D User Interfaces:** Strategies for Designing and Developing Guidelines and Evaluation.

**Virtual Reality Applications:** Engineering, Architecture, Education, Medicine, Entertainment, Science, Training

**UNIT -IV**

**What Is Augmented Reality -** Defining augmented reality, history of augmented reality, applications of augmented reality.

**Augmented Reality Hardware** – Displays – Audio Displays, Haptic Displays, Visual Displays, Other sensory displays, Visual Perception, Requirements and Characteristics, Spatial Display Model.

**Augmented Reality Software -** Introduction, Major Software Components for Augmented Reality Systems, Software used to Create Content for the Augmented Reality Application.

**UNIT -V**

**Beyond A. R. - Mixed Reality :** Augmented and Mixed Reality, Taxonomy, technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality, wireless displays in educational augmented reality applications, mobile projection interfaces, marker-less tracking for augmented reality, enhancing interactivity in AR environments, evaluating AR systems.

**Text Book(s):**


1. C. Burdea & Philippe Coiffet, "Virtual Reality Technology", Second Edition, Gregory, John Wiley & Sons, Inc.,2008
2. Jason Jerald. 2015. The VR Book: Human-Centred Design for Virtual Reality. Association for Computing, Machinery and Morgan & Claypool, New York, NY, USA.
3. Allan Fowler-AR Game Development, 1st Edition, A press Publications, 2018, ISBN 978- 1484236178 2.
4. Augmented Reality: Principles & Practice by Schmalstieg / Hollerer, Pearson Education India; First edition (12 October 2016),ISBN-10: 9332578494

**Suggested Reference(s):**


1. Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016
2. Understanding Virtual Reality: Interface, Application and Design, William R Sherman and Alan B Craig, (The Morgan Kaufmann Series in Computer Graphics)". Morgan Kaufmann Publishers, San Francisco, CA, 2002
3. Developing Virtual Reality Applications: Foundations of Effective Design, Alan B Craig, William R Sherman and Jeffrey D Will, Morgan Kaufmann, 2009.Designing for Mixed Reality, Kharis O'Connell Published by O'Reilly Media, Inc., 2016, ISBN: 9781491962381


**Suggested MOOC(s)/Value Added Course(s):**

1. https://learn.microsoft.com/en-us/windows/mixed-reality/
2. https://learn.microsoft.com/en-us/archive/msdn-magazine/2016/november/hololens-introduction-to-the-hololens
3. https://www.coursera.org/learn/ar

| Course Code | Course Title | | | | | | Core/Elective |
|---|---|---|---|---|---|---|---|
| **P25PE010CS** | **Advanced Wireless and Mobile Networks** | | | | | | **Elective** |
| **Prerequisite** | **Contact Hours per week** | | | | **CIE** | **SEE** | **Credits** |
| | **L** | **T** | **D** | **P** | | | |
| Computer Networks, Wireless Communication, Mobile Computing Concepts Mathematics (probability, basic linear algebra). | **3** | **-** | **-** | **-** | **40** | **60** | **3** |

**Course Objectives:**
The course aims to:
- Provide a detailed understanding of wireless and mobile communication principles and architectures.
- Examine protocols, technologies, and performance metrics in wireless and mobile networks.
- Analyze advanced topics such as mobile IP, handoff mechanisms, QoS, and mobility management.
- Explore emerging wireless technologies including 5G, IoT, VANETs, and wireless sensor networks.
- Enable students to critically evaluate and design wireless communication systems.

**Course Outcomes:**
Upon successful completion of this course, students will be able to:
- **CO1**: Explain wireless transmission fundamentals and cellular concepts.
- **CO2**: Analyze MAC protocols, routing strategies, and mobility models in mobile networks.
- **CO3**: Evaluate the functioning of mobile IP, handoff strategies, and QoS mechanisms.
- **CO4**: Investigate the design and application of wireless sensor networks, VANETs, and 5G systems.
- **CO5**: Apply knowledge to solve problems and design solutions for real-world wireless systems.

**Unit I**
**Wireless Transmission and Cellular Concepts:** Principles of Wireless Transmission: Path Loss, Fading, Interference, Frequency Reuse, Channel Assignment Strategies, GSM Architecture and Protocol Stack, GPRS and EDGE – Architecture and Services, OFDM, CDMA, and TDMA techniques.

**Unit II**
**Medium Access and Wireless LANs:** MAC Protocols for Wireless Networks: Aloha, CSMA/CA, MACA, MACAW, IEEE 802.11 Architecture, Protocols, and QoS Support, Bluetooth, Wi-Fi Standards (802.11 a/b/g/n/ac/ax), Hidden Terminal and Exposed Terminal Problems, Wireless PAN and MAN technologies

**Unit III**

**Mobile IP and Transport Protocols:** Mobile IP, IPv6 Mobility Support, Route Optimization, Tunneling, and Triangular Routing, Handoff Strategies – Hard and Soft Handoff, Wireless TCP, Indirect TCP, Snooping TCP, Mobility Models – Random Walk, Gauss-Markov, Manhattan.

**Unit IV**

**Routing and Quality of Service in Mobile Networks:** Ad-Hoc and Sensor Network Routing Protocols: AODV, DSR, OLSR, TORA, QoS Metrics and Challenges in Wireless Networks, Resource Allocation and Call Admission Control, Cross-Layer Design Approaches, Security Issues in Wireless and Mobile Networks.

**Unit V**

**Emerging Wireless Technologies:** Wireless Sensor Networks (WSNs): Architecture, Protocols, and Applications, Vehicular Ad Hoc Networks (VANETs): Characteristics, Applications, Routing,4G and 5G Architectures and Protocols, Mobile Cloud Computing and Mobile Edge Computing, Internet of Things (IoT) and LPWANs (LoRa, NB-IoT).

**Recommended Textbooks:**


1. Jochen Schiller, *Mobile Communications*, Pearson Education.
2. Kaveh Pahlavan and Prashant Krishnamurthy, *Principles of Wireless Networks*, Prentice Hall.


**Reference Books:**


1. Theodore S. Rappaport, *Wireless Communications: Principles and Practice*, Pearson.
2. C. Siva Ram Murthy and B. S. Manoj, *Ad Hoc Wireless Networks: Architectures and Protocols*, Pearson.
3. Vijay Garg, *Wireless Communications and Networking*, Morgan Kaufmann.

<table>
<tr><th>Course code</th><th colspan="6">Course Title</th><th>Core/Elective</th></tr>
<tr><td>P25PE012CS</td><td colspan="6">BLOCKCHAIN TECHNOLOGY</td><td>ELECTIVE</td></tr>
<tr><td rowspan="2">Prerequisite</td><td colspan="4">Contact Hours per week</td><td rowspan="2">CIE</td><td rowspan="2">SEE</td><td rowspan="2">Credits</td></tr>
<tr><td>L</td><td>T</td><td>D</td><td>P</td></tr>
<tr><td>NIL</td><td>3</td><td>0</td><td>0</td><td>0</td><td>40</td><td>60</td><td>3</td></tr>
</table>

**Course Objectives:**

- To introduce the principles and concepts of blockchain technology
- To familiarize the basics of crypto currencies and bitcoin
- To inject the concept of Ethereum blockchain and its applications
- To reveal the characteristics and example platforms of private and consortium blockchains
- To discuss the current limitations, challenges and applications of blockchain

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

- Understand the fundamentals of blockchain principles, architecture and its components
- Familiarize about crypto currencies and bitcoin
- Analyze and implement basic applications of blockchain through Ethereum
- Compare and understand the activities of public, private and consortium blockchain
- Understand the challenges, applications and limitations of blockchain and able to work with blockchain tools

**UNIT-I**

**Fundamentals of blockchain:** Introduction, Origin of Blockchain, components of blockchain, block in a blockchain, blockchain layers, pros and cons of blockchain, decentralization and distribution, types of blockchain, consensus protocol

**UNIT-II**

**Cryptocurrency basics:** Introduction, Bitcoin and cryptocurrency, cryptocurrency basics, Types of cryptocurrencies. public blockchain, blockchain layers, popular public blockchains

**UNIT-III**

**Solidity Programming:** Introduction, solc compiler, Deployment steps, Data types, variables, constants,
Immutable, Visibility, payable, if-else statements, while-for loops, Arrays, Mapping, constructors, View
and Pure functions, Error Handling, try-catch

**UNIT-IV**

**Ethereum blockchain:** Introduction, Ethereum components, How mining works in Ethereum, Merkle Patricia Tree, Architecture of Ethereum, Workflow of Ethereum, Comparison of bitcoin and Ethereum

Smart contracts: Introduction, characteristics, types of smart contracts

**UNIT-V**

**Private blockchain:** Key characteristics of private blockchain, Need of private blockchain, private blockchain examples, E-commerce site example, smart contract in private environment

**Consortium blockchain:** Key characteristics of Consortium blockchain, Need of consortium blockchain, Hyperledger platform

**Case Studies:** Installing and launching an Ethereum blockchain in a test network, Using of Ethereum wallets: MetaMask, Writing and deploying a simple contract through Remix IDE

**Textbook:**

1. "Blockchain Technology" by Chandramouli Subramanian, Asha A George, Abhilash K A, Meena Karthikeyan,Universities Press

**Suggested Reading:**

1. Blockchain Technology:Concepts and Applications by Kumar Saurabh,Ashutosh Saxena, WILEY
2. Mastering Blockchain-Distributed ledger technology, decentralization, and smart contracts explained, Second Edition, by Imran Bashir, Packt Publishing

**E-Resources:**

1. https://developer.ibm.com/technologies/blockchain/
2. https://solidity-by-example.org/
3. https://ethereum.org/en/
4. https://www.hyperledger.org/projects/fabric
5. NPTEL courses:
    a. Blockchain and its Applications
    b. Blockchain Architecture Design and Use Cases

| Course code | Course Title | | | | | | Core/Elective |
|---|---|---|---|---|---|---|---|
| **P25PE011CS** | **Full Stack Development** | | | | | | **ELECTIVE** |
| **Prerequisite** | **Contact Hours per week** | | | | **CIE** | **SEE** | **Credits** |
| | **L** | **T** | **D** | **P** | | | |
| Programming knowledge, Java | **3** | **0** | **0** | **0** | **40** | **60** | **3** |

**Course Objectives:**

- Understand the fundamentals of web technologies and develop static pages using HTML, CSS, and responsive design.
- Gain knowledge of JavaScript syntax, DOM manipulation, events, and XML for structured data.
- Learn to build interactive front-end applications using React components, state, hooks, and routing.
- Acquire skills to develop server-side applications using Node.js and Express with RESTful services and authentication.
- Understand MongoDB concepts, apply Mongoose for schema management, and integrate full-stack applications with basic deployment.

**Course Outcomes:**

Upon completion of the course, students will be able to

- Design responsive web pages using HTML5, CSS3, and layout techniques.
- Apply JavaScript and ES6 features to manipulate DOM, handle events, and validate forms.
- Develop single-page applications in React using components, state, hooks, and navigation.
- Build RESTful APIs with Node.js and Express and implement basic authentication.
- Perform CRUD operations in MongoDB and integrate MERN stack components into a functional application.

**Unit I**

A Brief Introduction to Internet, The World Wide Web, Web Browsers, Web Servers, Uniform Resource Locators, MIME, HTTP.

**HTML:** Structure of HTML document, headings, paragraphs, links, lists, tables, forms, Multimedia elements (images, audio, video). **CSS Fundamentals:** CSS basics: selectors, properties, colors, fonts, margins, padding, borders. Layout techniques: box model, flexbox, grid. Responsive design basics (media queries).

**Unit II**

**JavaScript:** Overview, Object Orientation and JavaScript, Syntactic Characteristics, Primitives, Operators, Expressions, Input and Output, Control Statements, Objects Creation and modification, Arrays, Functions, Constructors, Pattern Matching.

DOM manipulation: selecting, modifying elements. Events: handling clicks, form validation.

ES6 basics: let/const, arrow functions, template literals.

**XML:** Introduction to XML, Syntax, XML document structure, XML Schemas, Display in raw XML documents, XML Processors.

**Unit III**

**React JS:** Introduction to React, JSX, components, Props and state, event handling, Lists and keys, conditional rendering, Forms and controlled components, State management: local state, lifting state, Context API; Hooks: useState, useEffect, useReducer, custom hooks, React Router (SPA routing), forms & validation, controlled/uncontrolled components

**Unit IV**

**Node JS:** Node.js fundamentals (event loop, modules, streams), project structure and environment management, Creating a simple server, Express: routing, middleware, request/response lifecycle, Authentication & Authorization: sessions, JWTs, OAuth basics

**Unit V**

**MongoDB:** MongoDB basics: collections, documents, CRUD operations. Indexes, Mongoose for schema definition and validation. Connecting Express app with MongoDB, Mongoose ODM: schemas, models, validation, hooks, population, Integrating React front-end with Express + MongoDB backend.

**Build & deployment:** webpack production builds, environment variables, Docker basics, Github basics.

**Suggested Books:**


1. Robert W.Sebesta: Programming the World Wide Web, Pearson Education,
2. *Pro MERN Stack* : Full Stack Web App Development with MERN— Vasan Subramanian, Apress
3. MASTERING HTML, CSS & Java Script Web Publishing, by Laura Lemay, Rafe Colburn, Jennifer Kyrnin
4. Beginning MERN Stack Development, by Greg Lim

| Course Code | Course Title | | | | | | Core/Elective |
|---|---|---|---|---|---|---|---|
| **P25PE009CS** | **Natural Language Processing** | | | | | | Elective |
| **Prerequisite** | **Contact Hoursper week** | | | | **CIE** | **SEE** | **Credits** |
| | **L** | **T** | **D** | **P** | | | |
| Python Programming, Data Structures, Probability and statistics, Machine Learning | **3** | **-** | **-** | **-** | **40** | **60** | **3** |

**Course Objectives:**

- To understand how computers process and analyze human language using Python.
- To learn how to clean, tag, and prepare raw text data for analysis.
- To study different ways to represent text like TF-IDF and word embeddings.
- To explore machine learning and deep learning methods for classifying text.
- To apply NLP techniques in real-world tasks like sentiment analysis, translation, and speech recognition.

**Course Outcomes:**

After completion of the course the student is able to:

- Use Python to process and analyze text data.
- Pre-process raw text using tokenization, tagging, and formatting.
- Represent text using vectorization methods like TF-IDF and Word2Vec.
- Build and test machine learning and deep learning models for text classification.
- Create NLP-based applications like chatbots, translators, and recommender systems.

**UNIT - I**

**Language Processing and Python:** Computing with Language: Texts and Words, Texts as Lists of Words, Computing with Language: Simple Statistics, Making Decisions and Taking Control, Automatic Natural Language Understanding. Accessing Text Corpora and Lexical Resources: Accessing Text Corpora, Conditional Frequency Distributions, Lexical Resources, WordNet.

**UNIT–II**

**Processing Raw Text:** Accessing Text from the Web and from Disk, Strings: Text Processing at the Lowest Level, Text Processing with Unicode, Regular Expressions for Detecting Word Patterns, Useful Applications of Regular Expressions, Normalizing Text, Regular Expressions for Tokenizing Text, Segmentation, Formatting: From Lists to Strings. Categorizing and Tagging Words: Using a Tagger, Tagged Corpora, Mapping Words to Properties Using Python Dictionaries, Automatic Tagging, N-Gram Tagging, Transformation based Tagging.

**UNIT – III**

**Text Representation:** Vector Space Models Basic Vectorization Approaches, One-Hot Encoding Bag of Words, Bag of N-Grams, TF-IDF, Distributed Representations, Word Embedding, Going Beyond Words, Distributed Representations.

**UNIT - IV**

**Learning to Classify Text:** Supervised Classification, Evaluation, Naive Bayes Classifiers Deep Learning for NLP: Introduction to Deep Learning, Convolutional Neural Networks, Recurrent Neural Networks, Classifying Text with Deep Learning.

**UNIT-V**

**NLP applications:** Topic modeling, Sentiment analysis, Word sense disambiguation, Speech recognition and speech to text, Text to speech, Language detection and translation, Recommender systems, Question-Answering Systems, social media.

**Text Books:**


1. Sowmya Vajjala, Bodhisattwa Majumder, Anuj Gupta & Harshit Surana "Practical Natural Language Processing: A Comprehensive Guide to Building Real world NLP Systems", O"Reilly Media, Inc., 1st Edition, 2020.
2. Steven Bird, Ewan Klein, and Edward Lope ,"Natural Language Processing with Python", O"Reily, 2009
3. Akshay Kulkarni, AdarshaShivananda ,"Natural Language Processing Recipes: Unlocking Text Data with Machine Learning and Deep Learning using Python", Apress, 2019


**Suggested Readings:**


1. Allen James, Natural Language Understanding, Benjamin/Cumming,1995.
2. Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.


**Online Resources:**

1. https://nptel.ac.in/courses/106101007/
2. https://home.cs.colorado.edu/~martin/slp.html
3. https://web.stanford.edu/~jurafsky/slp3/

| Course code | Course Title | | | | | | Core/Elective |
|---|---|---|---|---|---|---|---|
| **P25PE811CS** | **Full Stack Development Lab** | | | | | | **ELECTIVE** |
| **Prerequisite** | **Contact Hours per week** | | | | **CIE** | **SEE** | **Credits** |
| | **L** | **T** | **D** | **P** | | | |
| Programming knowledge, Java | **-** | **-** | **-** | **2** | **25** | **50** | **1** |

**Course Objectives:**

- To provide hands-on experience in developing static and dynamic web pages using HTML, CSS, and JavaScript.
- To enable students to build interactive front-end applications using React.
- To implement server-side applications with Node.js and Express.
- To perform CRUD operations on MongoDB and connect it with Node.js.
- To integrate front-end and back-end into a complete MERN application.

**Course Outcomes:**

After successful completion of the lab, students will be able to:

- Design and implement responsive web pages using HTML and CSS.
- Apply JavaScript and DOM manipulation to create interactive client-side applications.
- Develop front-end applications using React with state, props, forms, and routing.
- Build RESTful APIs with Node.js and Express and connect them with MongoDB.
- Integrate all MERN stack components to develop and deploy a complete web application.

**HTML & CSS**

1. Create a personal portfolio website using HTML and CSS.
2. Design a responsive web page using Flexbox and Grid layouts.
3. Develop a form with validation using HTML5 attributes and CSS styling.

**JavaScript & DOM**

1. Implement a simple calculator using JavaScript.
2. Create a dynamic to-do list with add/remove functionality using DOM.
3. Develop a form validation script using JavaScript events.

**React**

1. Build a React app with functional components and props (e.g., student list).
2. Implement state and event handling in React (e.g., counter app).
3. Create a React form with validation and controlled components.
4. Use React Router to develop navigation between multiple pages.

**Node.js & Express**

1. Develop a simple REST API using Express with CRUD operations.
2. Implement user authentication (registration & login) using sessions or JWT.

**MongoDB**

1. Perform CRUD operations in MongoDB using Mongoose.
2. Create a schema with validation and demonstrate queries (find, update, delete).

**MERN Integration**

1. Develop a mini MERN project (e.g., Student Management System / Blog App / To-Do Application) integrating React, Node.js, Express, and MongoDB.

**Suggested Books:**


1. Robert W.Sebesta: Programming the World Wide Web, Pearson Education,
2. *Pro MERN Stack* : Full Stack Web App Development with MERN— Vasan Subramanian, Apress
3. MASTERING HTML, CSS & Java Script Web Publishing, by Laura Lemay, Rafe Colburn, Jennifer Kyrnin
4. Beginning MERN Stack Development, by Greg Lim

<table>
<tr><th colspan="1">Course Code</th><th colspan="6">Course Title</th><th>Core/Elective</th></tr>
<tr><td>P25PE810CS</td><td colspan="6">Advanced Wireless and Mobile Networks Lab</td><td>Elective</td></tr>
<tr><td rowspan="3">Prerequisites:<br>Computer Networks, Wireless Communication, Mobile Computing, Mathematics</td><td colspan="4">Contact Hours per week</td><td rowspan="2">CIE</td><td rowspan="2">SEE</td><td rowspan="2">Credits</td></tr>
<tr><td>L</td><td>T</td><td>D</td><td>P</td></tr>
<tr><td>-</td><td>-</td><td>-</td><td>2</td><td>25</td><td>50</td><td>3</td></tr>
</table>

**Course Objectives:**

- To provide practical knowledge of wireless and mobile network standards.
- To familiarize students with wireless modules like Wi-Fi, Bluetooth, LoRa, GSM, and X-Bee.
- To train students in configuring routing protocols using simulation tools.
- To develop skills in simulating MANETs and Wireless Sensor Networks.
- To apply MATLAB and other simulators for analyzing wireless communication techniques.

**Course Outcomes:**

Upon successful completion of this course, students will be able to:

- **CO1:** Simulate and implement wireless LAN, PAN, and WAN using standard modules.
- **CO2:** Configure and test OSPF and EIGRP protocols in simulated environments**.**
- **CO3:** Build and evaluate MANETs and WSNs using hardware and simulators**.**
- **CO4:** Demonstrate message transfer using GSM and LoRa modules.
- **CO5:** Apply simulation tools to study line coding and wireless communication.

**List of Experiments:**

1. Simulate a Simple Local Area Network Using 802.11 standard ( Use Arduino/Raspberry Pi)
2. Create a Personal Area Network using Blue tooth Modules
3. Build a Simple Network using 802.16 standard (Use X-Bee Module)
4. Build a Simple LoRa Network which can send a message over a long distance(50 KM to 100 KM)
5. Build a Wireless Wide Area Network using LoRa WAN Module
6. Basic OSPF configuration using GNS3 tool
7. Basic EIGRP Configuration using GNS3 tool
8. Simulate the line coding techniques using MATLAB Simulink.
9. Simulate a MANET using Raspberry Pi board
10. Develop a Wireless Sensor Network using open source simulators or emulators like Cupcarbon/GNS3 simulator
11. Develop a program to Send and Receive a Message using GSM Module (Ex: SIM990A)

**Text Books:**

1. Wireless communications--principles and practice Pearson 2nd edition T. S. Rappaport
2. Mobile Communications , Jochen Schiller, Second Edition, Pearson Education 2012

**Online Resources:**

1. https://ict.iitk.ac.in/courses/wireless-ad-hoc-and-sensor-networks
2. https://vlab.amrita.edu/?sub=78&brch=256

<table>
<tr><th>Course code</th><th colspan="4">Course Title</th><th colspan="2"></th><th>Core/Elective</th></tr>
<tr><td>P25PE812CS</td><td colspan="6">BLOCKCHAIN TECHNOLOGIES LAB</td><td>Elective</td></tr>
<tr><td rowspan="2">Prerequisite</td><td colspan="4">Contact Hours per week</td><td rowspan="2">CIE</td><td rowspan="2">SEE</td><td rowspan="2">Credits</td></tr>
<tr><td>L</td><td>T</td><td>D</td><td>P</td></tr>
<tr><td>HTML, CSS, JS, Any OOP language</td><td>0</td><td>0</td><td>0</td><td>2</td><td>25</td><td>50</td><td>1</td></tr>
</table>

**Course Objectives:**
- To analyze different cryptographic tools
- To explore online crypto wallets and perform transactions
- To learn solidity programming concepts
- To workout with various public and private Blockchain frameworks and tools
- To build a Decentralized applications in a blockchain test networks

**Course Outcomes:**
At the end of the course students will be able to
- Analyze different cryptographic tools
- Perform transactions through online crypto wallets
- Build and deploy Solidity programs
- Design smart contracts for blockchain test networks
- Practice Decentralized Applications in public and private blockchain test networks

**Week - 1: Basic Cryptographic tools**
Generating ciphertexts from plaintexts, digital signatures through public and private keys, Hash functions,
Showing a live blockchain demo

**Week - 2: Working with MetaMask, Rabby wallets and block explorers**
Installing MetaMask, Rabby wallets creating wallet addresses, sending & receiving ethers in a test networks, examining wallets in block explorers (etherscan, blockstream, coinmarketcap)

**Week - 3: Practicing Solidity Programming**
Installing Remix IDE, Writing and deploying basic solidity programs

**Week - 4: Practicing Solidity Programming**
Solidity programs on arrays, Strings, mappings and functions

**Week - 5: Practicing Solidity Programming**
Solidity programs on constructors, if-else, loops, error handling, try-catch

**Week - 6: Neo Blockchain**
Installing and setting up Neo Blockchain test network and performing Neo transactions

**Week - 7: Ganache-CLI Ethereum blockchain**
Installing Ganache-CLI in VSCode IDE, launching local Ethereum blockchain network and deploying a smart contract

**Week - 8: Building and Deploying an E-Voting Application**
Building a Decentralized Application by designing a front end user interface through html,css,node js and writing a smart contract for E-Voting to interact with backend Ganache-CLI / Truffle Tool

**Week - 9: Building and Deploying a Banking Application**
Building a Decentralized Application by designing a front end user interface through html,css,node js and writing a smart contract for Banking Operations to interact with backend Ganache-CLI / Truffle Tool

**Week - 10: HardHat Blockchain Tool**
Installing HardHat Tool and viewing blockchain Accounts in HardHat and deploying a smart contract

**Week - 11: Hyperledger Fabric Explorer**
Installing Hyperledger fabric explorer and setting up and launch a fabric network

**Week - 12: Hyperledger Fabric Composer**
Installing Hyperledger Fabric composer tool, launch fabric network and run an asset application

| Course Code | Course Title | | | | | | Core/Elective |
|---|---|---|---|---|---|---|---|
| P25PE809CS | Natural Language Programming Lab | | | | | | Core |
| Prerequisite | Contact Hours per Week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| - | 3 | - | - | - | 40 | 60 | 3 |

**Course Objectives:**

The Students will be able to

- Discuss the current and likely future performance of several NLP applications.
- Describe briefly a fundamental technique for processing language for several subtasks, such as morphological processing.
- Implement parsing, word sense disambiguation and etc.
- Understand how these techniques draw on and relate to other areas of computer science.
- Understand the basic principles of designing and running an NLP experiment.

**Course Outcomes:**

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

- Student will be able to implement LSI,NER.
- Student will be able to implement TD-IDF method and Ngram models
- Develop a Part of speech tagger.
- Student can able classify the text based on part of speech tagger.
- Student can able to implement several NLP applications.

1. a. Write a python program to perform tokenization by word and sentence using nltk.

   b. Write a python program to eliminate stopwords using nltk.

   c. Write a python program to perform stemming using nltk.

2. a. Write a python program to perform Parts of Speech tagging using nltk.

   b. Write a python program to perform lemmatization using nltk.

3. a. Write a python program for chunking using nltk.

   b. Write a python program to perform Named Entity Recognition using nltk.

4. a. Write a python program to find Term Frequency and Inverse Document Frequency (TF-IDF).

   b. Write a python program for CYK parsing (CockeYounger-Kasami Parsing) or Chart Parsing.

5. a. Write a python program to find all unigrams, bigrams and trigrams present in the given corpus.

   b. Write a python program to find the probability of the given statement “This is my cat” by taking the an example corpus into consideration.

6. Use the Stanford named Entity recognizer to extract entities from the documents. Use it Programmatically and output for each document which named entities it contains and of which type.

7. Choose any corpus available on the internet freely. For the corpus, for each document, count how many times each stop word occurs and find out which are the most frequently occurring stop words. Further, calculate the term frequency and inverse document frequency as The motivation behind this is basically to find out how important a document is to a given query. For e.g.: If the query is say: “The brown crow”. “The” is less important. “Brown” and “crow” are relatively more important. Since “the” is a more common word, its tf will be high. Hence we multiply it by idf, by knowing how common it is to reduce its weight.

8. Write the python code to perform sentiment analysis using NLP.

9. Write the python code to develop Spam Filter using NLP.

10. Write the python code to detect Fake News using NLP.

| Course code | Course Title | | | | | | Core/Elective |
|---|---|---|---|---|---|---|---|
| P25PE013CS | AI for Robotics | | | | | | Elective |
| Prerequisite | Contact Hours per week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| Basic knowledge of robotics, AI/ML concepts, and programming (Python/C++) | 3 | 0 | 0 | 0 | 40 | 60 | 3 |

**Course Objectives:**

- Understand the fundamentals of robotics, robot architecture, and ROS setup.
- Apply AI techniques for object recognition using neural networks and supervised learning.
- Explore robot learning and speech recognition capabilities.
- Implement robot navigation, path planning, and obstacle avoidance strategies.
- Integrate artificial personality, emotion modeling, and conversational AI in robots.

**Course Outcomes:**

Upon completion of the course, students will be able to

- Set up and configure robots with hardware, software, and ROS.
- Develop AI models for object recognition using neural networks.
- Enable robots to learn autonomously and understand speech commands.
- Design navigation and obstacle avoidance systems using SLAM and decision-making.
- Create robots with artificial personality, emotion modeling, and interactive chat capabilities

**UNIT – I**

Foundation for Robotics and AI, the robot architecture, ROS, Setting up the software and hardware for the construction of the robot

**UNIT – II**

A systems engineering-based approach to robotics Object Recognition Using Neural Networks and Supervised Learning

**UNIT – III**

Techniques that allow the robot to learn for itself Teaching the Robot to Listen, Robot speech recognition

**UNIT – IV**

Robot navigation including SLAM. Putting Things Away for obstacle avoidance, path planning, decision trees

**UNIT – V**

Giving the Robot an Artificial Personality, the Robot Emotion Engine, the Human Emotion Model, and integrating personality rules into a chat bot-based conversation engine. The future of AI and robotics

**Text books:**

1. Francis X. Govers, “Artificial Intelligence for Robotics - Build intelligent robots that perform human tasks using AI techniques”, Packt Publishing, 2018
2. Danny Staple, “Learn Robotics Programming: Build and control AI-enabled autonomous robots using the Raspberry Pi and Python”, Packt Publishing, 2021.

**Suggested Readings:**

1. Nikleia Eteokleous, Efi Nisiforou, ”Designing, Constructing and Programming Robots for Learning”, IGI Global Publishing, 2021

**Online Resources:**

1. https://www.classcentral.com/course/udacity-artificial-intelligence-for-robotics-319
2. https://nptel.ac.in/courses/107106090

| Course code | Course Title | | | | | | Core/Elective |
|---|---|---|---|---|---|---|---|
| P25PE015CS | Mobile Application Development | | | | | | ELECTIVE |
| Prerequisite | Contact Hours per week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| NIL | 3 | 0 | 0 | 0 | 40 | 60 | 3 |

**Course Objectives:**

- To understand the Android operating system, its framework, and activity lifecycle.
- To learn the concepts of fragments and Android application components for modular app development.
- To design user interfaces using layouts, widgets, and to implement communication through intents and broadcasts.
- To explore internet connectivity, cloud integration, and state management in Android applications.
- To acquire knowledge of structured data storage using SQLite, Room persistence, and Firebase realtime database.

**Course Outcomes:**

Upon completion of the course, students will be able to

- Create and manage Android apps and handle activity lifecycle.
- Implement fragments and manage app resources effectively.
- Build interactive UIs and handle activity communication.
- Connect apps to internet resources and preserve state.
- Store and manage data using Room, SQLite, and Firebase.

**UNIT-I**

Introduction to Android Operating System: Android OS and Features – Android development framework; Installing and running applications on Android Studio, Creating AVDs, Types of Android application; Creating Activities, Activity Life Cycle, Activity states, monitoring state changes

**UNIT-II**

**Fragments** – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, Introducing the Fragment Manager, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and activities, Fragments Without User Interfaces

**Android application components** – Android Manifest file, externalizing recourses like Simple Values, Drawables, Layouts, Menus, etc,

**UNIT-III**

**Building User Interfaces:** Fundamental Android UI design, Android User Interface Fundamentals, Layouts – Linear, Relative, Grid and Table Layouts, The Android Widget Toolbox, Working with Lists and Grids, Introducing Data Binding, Creating New Views

**Intents and Broadcasts**: Using intents to launch Activities, Types of Intents, Passing data to Intents, Getting results from Activities, Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters

**UNIT-IV**

**Using Internet Resources:** Connecting to the Internet, Connecting, Downloading, and Parsing Internet Resources, Using the Download Manager, Best Practices for Downloading Data Without Draining the Battery, An Introduction to Internet Services and Cloud Computing.

**Files, Saving State:** Saving Files, States, and Preferences, Saving and Restoring Activity and Fragment Instance State Using the Lifecycle Handlers, Retaining Instance State with Headless Fragments and View Models. Creating and Saving Shared Preferences, Retrieving Shared Preferences, Building a Preference UI

**UNIT-V**

Introducing Structured Data Storage in Android, **Storing Data Using the Room Persistence Library:** Creating Database, performing interactions, **SQLite database:** creating and opening a database, creating tables, inserting retrieving and deleting data

**Firebase Realtime Database:** Adding Firebase to Your App, Defining a Firebase Database and Defining Access Rules, Adding, Modifying, Deleting, and Querying Data from a Firebase Realtime Database

**Text book:**


1. Professional Android, Fourth Edition, Reto Meier, Ian Lake, Wiley India, (Wrox)


**Suggested Reading:**


1. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning Reference(s):
2. Beginning Android Application Development, Wei-Meng Lee, Wiley India (Wrox)
3. Android Application Development, Black Book, Pradeep Kothari, Dreamtech Press
4. Android Programming: Pushing the Limits, Erik Hellman, Wiley Publications


**Suggested MOOCs/Value Added Course(s):**

1. https://developer.android.com/courses

| Course Code | Course Title | | | | | | | Core/Elective |
|---|---|---|---|---|---|---|---|---|
| P25PE016CS | Quantum Computing | | | | | | | Elective |
| Prerequisite | Contact Hours per week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| Linear Algebra, Probability Theory, Algorithms & Complexity, Discrete Mathematics, Basic Programming Skills (Qiskit) | 3 | - | - | - | 40 | 60 | 3 |

**Course Objectives:**

The course aims to:

- Introduce the fundamental principles of quantum mechanics as they apply to computing.
- Develop an understanding of quantum computation models, quantum gates, and circuits.
- Explore key quantum algorithms and their impact on classical computing paradigms.
- Study quantum complexity theory and cryptography.
- Examine the challenges in building scalable quantum computers and applications in various domains.

**Course Outcomes:**

Upon successful completion of this course, students will be able to:

- **CO1:** Understand the mathematical framework of quantum mechanics and its relevance to computation.
- **CO2:** Describe quantum bits (qubits), superposition, entanglement, and quantum gates.
- **CO3:** Analyze and implement basic quantum algorithms such as Deutsch-Jozsa, Grover's, and Shor's algorithm.
- **CO4:** Compare classical and quantum complexity classes and understand the implications for cryptography.
- **CO5:** Evaluate current quantum computing platforms and their limitations and potentials.

**Unit I**

**Foundations of Quantum Mechanics:** Linear Algebra Refresher: Vectors, Hilbert Spaces, Dirac Notation, Postulates of Quantum Mechanics, Qubits and Quantum States,Quantum Measurement and No-Cloning Theorem , Quantum Entanglement and Tensor Products.

**Unit II**

**Quantum Gates and Circuits:** Single Qubit Gates: X, Y, Z, H, Phase, T, Multi-Qubit Gates: CNOT, Toffoli, SWAP, Quantum Circuit Model and Universality, Circuit Equivalence and Decomposition, Reversible Computing and Circuit Complexity.

**Unit III: Quantum Algorithms:** Deutsch and Deutsch-Jozsa Algorithms, Simon's Algorithm Grover's Search Algorithm, Quantum Fourier Transform (QFT), Shor's Factoring Algorithm.

**Unit IV**

**Quantum Complexity and Error Correction:** Classical vs Quantum Complexity Classes: P, NP, BQP, Quantum Parallelism and Speedup, Basics of Quantum Error Correction: Bit-flip, Phase-flip Codes, Shor Code, Surface Codes (introductory), Decoherence and Fault Tolerance.

**Unit V**

**Quantum Cryptography and Applications:** Quantum Key Distribution (QKD): BB84, E91, Quantum Teleportation and Superdense Coding, Applications in Optimization, Simulation, and AI, Quantum Programming Platforms (Qiskit, Cirq, QuTiP – overview), Challenges in Scalable Quantum Computers.

**Recommended Textbooks:**


1. Michael A. Nielsen and Isaac L. Chuang, *Quantum Computation and Quantum Information*, Cambridge University Press.
2. Phillip Kaye, Raymond Laflamme, and Michele Mosca, *An Introduction to Quantum Computing*, Oxford University Press.


**Reference Books and Resources:**


1. Mermin, *Quantum Computer Science: An Introduction*, Cambridge University Press
2. Scott Aaronson, *Quantum Computing Since Democritus*, Cambridge
3. IBM Qiskit Documentation
4. MIT OCW: Quantum Computation

| Course Code | Course Title | | | | | | Core/Elective |
|---|---|---|---|---|---|---|---|
| **P25PE014CS** | **Security and Privacy in Social Media** | | | | | | Core |
| **Prerequisite** | **Contact Hoursper week** | | | | **CIE** | **SEE** | **Credits** |
| | **L** | **T** | **D** | **P** | | | |
| CN, OS, Cyber Security | **3** | **-** | **-** | **-** | **40** | **60** | **3** |

**Course Objectives:**

- Understand and analyze the fundamental principles of security and privacy in online social media networks.
- Identify and evaluate common security threats and vulnerabilities in social media platforms.
- Develop strategies to protect personal data and maintain user privacy in online social interactions.
- Explore the legal, ethical, and social implications of privacy breaches in social media networks.
- Implement practical techniques and tools for enhancing security and privacy in online social media environments.

**Course Outcomes:**

After completion of the course the student is able to:

- Understand and analyze social media content using foundational techniques like BoW and TF-IDF.
- Apply network analysis concepts to examine the structure and dynamics of social media networks.
- Identify and address various security threats in social media, including identity theft and misinformation.
- Evaluate privacy concerns and implement measures to protect user data on social media platforms.
- Analyze real-world social media platforms through comprehensive case studies to understand their unique features and challenges.

**UNIT-I**

Social Media - Introduction; Social Media - User vs Developer's Perspective, Data Collection APIs;
Social Media Content Analysis - BoW Model, TF-IDF

**UNIT-II**

Network Analysis - Node Centrality Measures, Degree Distribution, Average Path Length, Clustering
Coefficient, Power Law; Synthetic Networks - Random Graphs, Preferential Attachment Model.

**UNIT-III**

Security Issues in Social Media - Overview; Review of Machine Learning; Identity Theft – Profile Cloning, Social Phishing; Fake, Compromised, Sybil accounts and their behavior; Spamming; Rumour or Misinformation; Cyberbullying; Collective Misbehaviors.

**UNIT-IV**

Privacy Issues in Social Media - Overview; Privacy Settings; PII Leakage, Identity vs Attribute. Disclosure Attacks; Inference Attacks; De-anonymization Attacks; Privacy Metrics - k-anonymity, l-diversity; Personalization vs Privacy, Differential Privacy.

**UNIT-V**

Social Media Case Studies - Facebook, Twitter, Instagram, YouTube, LinkedIn, StackOverflow, GitHub, Quora, SnapChat, Reddit, FourSquare, Yelp.

**Text Book(s):**


1. Zafarani, Reza, Mohammad Ali Abbasi, and Huan Liu. Social media mining: an introduction. Cambridge University Press


**Suggested Reference(s):**


1. Bonzanini Marco. Mastering Social Media Mining. Packt Publishing
2. Mikhail Klassen, Matthew A. Russell. Mining the Social Web, O'Reilly Media
3. Privacy and Security in Online Social Media (PSOSM), Prof. Ponnurangam Kumaraguru, IIITH, https://cdn.iiit.ac.in/cdn/precog.iiit.ac.in/teaching/psosmonnptel/2023/
4. NOC:Privacy and Security in Online Social Media, IIIT Hyderabad, Prof. Ponnurangam Kumaraguru, https://nptel.ac.in/courses/106106146


**Suggested MOOC(s)/Value Added Course(s):**

1. Privacy and Security in Online Social Media, Prof. Ponnurangam Kumaraguru, IIIT Hyderabad,
2. https://onlinecourses.nptel.ac.in/noc23_cs13/preview