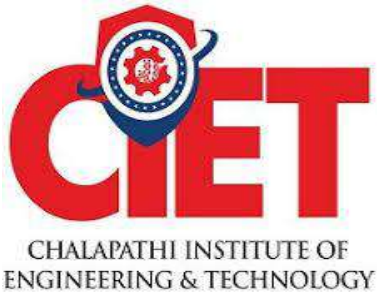
# CHALAPATHI INSTITUTE OF ENGINEERING & TECHNOLOGY

**(Accredited by NBA, NAAC with 'A' grade, Approved AICTE & Affiliated to ANU)**
**(An ISO 9001-2015 Certified Institution)**
**Chalapathi Nagar, LAM, Guntur-522 034, Andhra Pradesh, INDIA**




# (Autonomous)

## Department of Computer Science and Engineering

**4-Year B.Tech**
**R-24 Regulations**
**Semester System**

**With effect from 2024 – 2025**
**(from the batch admitted in the year 2024)**

# About the College

Chalapathi Institute of Engineering and Technology always plays pivot role about the welfare and the indispensible requirements of Engineering aspirants with a cutting edge vision. Sri Y.V.Anjaneyulu, Chairman of Chalapathi Educational Society established Chalapathi Institute of Engineering & Technology, Lam in Guntur. It is strategically situated between Guntur city and Amaravathi.

The Campus is situated in 20 acres covered with gorgeous green environment offering pleasant quality education and research. The college is placed in an independent and voluminous buildings constructed as per the norms and specifications of AICTE, New Delhi.

The burning object of the college is to provide well equipped infrastructure like Laboratories, spacious seminar halls, separate hostels for both boys and girls, canteen, Play ground having good ambience, language labs etc. This makes the students to concentrate on academic learning which provides quality education with ethics in holistic environment.

The college is affiliated to Acharya Nagarjuna University and recognized by AICTE, New Delhi. It offers four year B.Tech courses in CE, CSE, CSE-AI, CSE-AIML, CSE-DS, CSIT, CSE-CS, ECE& EEE and M.Tech courses in CSE and VLSI & ESD.

**COLLEGE VISION**

To emerge as an Institute of Excellence for Engineering and Technology and provide quality education, entrepreneurial and research opportunities to the students in catering the needs of society.

**COLLEGE MISSION**

To be a student centric institute imbibing experiential, innovative and lifelong learning skills with academic rigor.
To produce graduates who are knowledgeable, innovative and empathetic.
To inculcate entrepreneurial attitude and values amongst Learners.

**QUALITY POLICY**

Chalapathi Institute of Engineering and Technology is committed to achieve appropriate standards and excellence of teaching, research and consultancy by ensuring creative environment with challenging and entrepreneurial opportunities.

# Academic Regulations (R24) for B.Tech (Regular/Honors)

(Effective for the students admitted into I year from the Academic Year **2024-25** onwards)

1. **Award of the Degree**
   (a) Award of the B.Tech. Degree / B.Tech. Degree with a Minor if he/she fulfils the following:
      (i) Pursues a course of study for not less than four academic years and not more than eight academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would in addition to the maximum period permitted for graduation (Eight years).
      (ii) Registers for160 credits and secures all 160 credits.

   (b) **Award of B.Tech. degree with Honors** if he/she fulfils the following:
      (i) Student secures additional 15 credits fulfilling all the requisites of a B.Tech. Program i.e., 160 credits.
      (ii) Registering for Honors is optional.
      (iii) Honors are to be completed simultaneously with B.Tech. programme.

2. Students, who fail to fulfil all the academic requirements for the award of the degree within eight academic years from the year of their admission, shall forfeit their seat in B.Tech. Course and their admission stands cancelled. This clause shall be read alongwithclause1 a) i).

3. **Admissions**
   Admission to the B.Tech Program shall be made subject to the eligibility, qualifications and specialization prescribed by the A.P. State Government/University from time to time. Admissions shall be made either based on the merit rank obtained by the student in the common entrance examination conducted by the A.P. Government/University or any other order of merit approved by the A.P. Government/University, subject to reservations as prescribed by the Government/University from time to time.

4. **Program related terms**
   ***Credit:*** A unit by which the course work is measured. It determines the number of hours of instruction required per week. One credit is equivalent to one hour of teaching (Lecture/Tutorial) or two hours of practical work/fieldwork per week.

   **Credit Definition:**

| | |
|---|---|
| 1Hr. Lecture(L)per week | 1credit |
| 1Hr. Tutorial (T)per week | 1credit |
| 1Hr.Practical(P)per week | 0.5credit |
| 2Hrs.Practical(Lab)per week | 1credit |

***a) Academic Year:*** Two consecutive (one odd + one even) semesters constitute one academic year.

***b) Choice Based Credit System (CBCS):*** The CBCS provides a choice for students to select from the prescribed courses.

**5. Semester/Credits:**

i) A semester comprises 90 working days and an academic year is divided into two semesters.

ii) The summer term is for eight weeks during summer vacation. Internship / apprenticeship/work-based vocational education and training can be carried out during the summer term, especially by students who wish to exit after two semesters or four semesters of study.

iii) Regular courses may also be completed well in advance through MOOCs satisfying prerequisites.

**6. Structure of the Undergraduate Programme**

All courses offered for the undergraduate program (B.Tech.) are broadly classified as follows:

| S.No. | Category | Breakup of Credits (Total160) | Percentage of total credits | AICTE Recommendation (%) |
|---|---|---|---|---|
| 1. | Humanities and Social Science including Management (HM) | 13 | 8 % | 8 –9% |
| 2. | Basic Sciences(BS) | 20 | 13 % | 12 -16% |
| 3. | Engineering Sciences(ES) | 23.5 | 14% | 10– 18% |
| 4. | Professional Core(PC) | 54.5 | 34 % | 30– 36% |
| 5. | Electives – Professional (PE) & Open (OE); Domain Specific Skill Enhancement Courses (SEC) | 33 | 21 % | 19 -23% |
| 6. | Internships & Project work (PR) | 16 | 10 % | 8 –11% |
| 7. | Mandatory Courses(MC) | Non-credit | Non-credit | - |

**7. Course Classification:**

All subjects/courses offered for the undergraduate programme in Engineering & Technology (B.Tech. degree programmes) are broadly classified as follows:

| S.No. | Broad Course Classification | Course Category | Description |
|---|---|---|---|
| 1. | Foundation Courses | Foundation courses | Includes Mathematics, Physics and Chemistry; fundamental engineering courses; humanities, social sciences and management courses |
| 2. | Core Courses | Professional Core Courses (PC) | Includes subjects related to the discipline / parent department / branch of engineering |
| 3. | Elective Courses | Professional Elective Courses(PE) | Includes elective subjects related to the parent discipline/department/branch of Engineering |
| | | Open Elective Courses (OE) | Elective subjects which include inter disciplinary subjects or subjects in an area outside the parent discipline /department /branch of Engineering |
| | | Domain specific skill enhancement courses(SEC) | Inter disciplinary /job-oriented /domain courses which are relevant to the industry |
| 4. | Project & Internships | Project | B.Tech. Project or Major Project |
| | | Internships | Summer Internships–Community based and Industry Internships; Industry oriented Full Semester Internship |
| 5. | Audit Courses | Mandatory non-credit courses | Covering subjects of developing desired attitude among the learners |

## 8. Programme Pattern

i. Total duration of the of B. Tech (Regular/Honors) Programme is four academic years.
ii. Each academic year of study is divided into two semesters.
iii. Minimum number of instruction days in each semester is 90days.
iv. There shall be mandatory student induction program for fresher's, with three-week duration before the commencement of first semester. Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations etc., are included as per the guidelines issued by AICTE.
v. Health/ wellness/ yoga/ sports and NSS /NSS /Scouts & Guides / Community service activities are made mandatory as credit courses for all the undergraduate students.
vi. Courses like Environmental Sciences, Indian Constitution, and Technical Paper Writing & IPR are offered as non-credit mandatory courses for all the undergraduate students.
vii. Design Thinking for Innovation & Tinkering Labs is made mandatory as credit courses for all the undergraduate students.
viii. Increased flexibility for students through an increase in the elective component of the curriculum, with 05 Professional Elective courses and 04 Open Elective courses.

ix. Professional Elective Courses, include the elective courses relevant to the chosen specialization /branch. Proper choice of professional elective courses can lead to students specializing in emerging areas within the chosen field of study.

x. A total of 04 Open Electives are offered in the curriculum. A student can complete the requirement for B.Tech. Degree with a Minor within the 160 credits by opting for the courses offered through various verticals/tracks under Open Electives.

xi. While choosing the electives, students shall ensure that they do not opt for the courses with syllabus contents similar to courses already pursued.

xii. A pool of inter disciplinary/job-oriented/domain skill courses which are relevant to the industry are integrated into the curriculum of all disciplines. There shall be 05 skill-oriented courses offered during III to VII semesters. Among the five skill courses, four courses shall focus on the basic and advanced skills related to the domain/interdisciplinary courses and the other shall be a soft skills course.

xiii. Students shall undergo mandatory summer internships, for a minimum of eight weeks duration at the end of second and third year of the programme. The internship at the end of second year shall be community oriented and industry internship at the end of third year.

xiv. There shall also be mandatory full internship in the final semester of the programme along with the project work.

xv. Undergraduate degree with Honors is introduced by the University for the students having good academic record.

xvi. Each college shall take measures to implement Virtual Labs (https://www.vlab.co.in) which provide remote access to labs in various disciplines of Engineering and will help student in learning basic and advanced concept through remote experimentation. Student shall be made to work on virtual lab experiments during the regular labs.

xvii. Each college shall assign a faculty advisor/mentor after admission to a group of students from same department to provide guidance in courses registration /career growth/ placements/opportunities for higher studies/GATE/ other competitive exams etc.

xviii. Preferably 25% of course work for the theory courses in every semester shall be conducted in the blended mode of learning.

## 9. Evaluation Process

The performance of a student in each semester shall be evaluated subject wise with a maximum of 100 marks for theory and 100 marks for practical subject. Summer Internships shall be evaluated for 100 marks, Full Internship &Project work in final semester shall be evaluated for 200 marks, and mandatory courses with no credits shall be evaluated for 30 mid semester marks.

A student has to secure not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the mid semester and end examination marks taken together for the theory, practical, design, drawing subject or project etc. Incase of a mandatory course, he/she should secure 40%of the total marks.

**Theory Courses**

| Assessment Method | Marks |
|---|---|
| Continuous Internal Assessment | 30 |
| Semester End Examination | 70 |
| **Total** | **100** |

i) For theory subject, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End-Examination.
ii) For practical subject, the distribution shall be 30 marks for Internal Evaluation and70 marks for the End-Examination.
iii) If any course contains two different branch subjects, the syllabus shall be written in two parts with 3 units each (Part-A and Part-B) and external examination question paper shall beset with two parts each for35 marks.
iv) If any subject is having both theory and practical components, they will be evaluated separately as theory subject and practical subject. However, they will be given same subject code with an extension of 'T' for theory subject and 'P' for practical subject.

**a) Continuous Internal Evaluation**

i) For theory subjects, during the semester, there shall be two midterm examinations. Each midterm examination shall be evaluated for 30 marks of which 10 marks for objective paper (20 minute's duration), 15 marks for subjective paper (90 minutes duration) and 5 marks for assignment.
ii) Objective paper shall contain for 05 short answer questions with 2 marks each or maximum of 20 bits for 10 marks. Subjective paper shall contain 3 either or type questions (totally six questions from 1to 6) of which student has to answer one from each either-or type of questions. Each question carries10 marks. The marks obtained in the subjective paper are condensed to 15 marks.

**Note:**

- The objective paper shall be prepared in line with the quality of competitive examinations questions.
- The subjective paper shall contain 3 either or type questions of equal weightage of 10marks. Any fraction shall be rounded off to the next higher mark.
- The objective paper shall be conducted by the respective institution on the day of subjective paper test.
- Assignments shall be in the form of problems, mini projects, design problems, slip tests, quizzes etc. depending on the course content. It should be continuous assessment throughout the semester and the average marks shall be considered.

iii) If the student is absent for the mid semester examination, no re-exam shall be conducted and mid semester marks for that examination shall be considered as zero.

iv) First midterm examination shall be conducted for I, II units of syllabus with one either or type question from each unit and third either or type question from both the units. The second midterm examination shall be conducted for III, IV and V units with one either or type question from each unit.

v) Final mid semester marks shall be arrived at by considering the marks secured by the student in both the mid examinations with 80% weightage given to the better midexam and 20%to the other.

**For Example:**

Marks obtained in first mid: 25
Marks obtained in second mid: 20
Final mid semester Marks: (25x0.8) + (20x0.2) =24

If the student is absent for any one midterm examination, the final mid semester marks shall be arrived at by considering 80% weightage to the marks secured by the student in the appeared examination and zero to the other. For Example:

Marks obtained in first mid: Absent
Marks obtained in second mid: 25
Final mid semester Marks :( 25x0.8) + (0x0.2) =20

**b) End Examination Evaluation:**

End examination of theory subjects shall have the following pattern:

i) There shall be 6 questions and all questions are compulsory.
ii) Question I shall contain10 compulsory short answer questions for a total of 20 marks such that each question carries 2 marks.
iii) There shall be 2 short answer questions from each unit.
a) In each of the questions from 2 to 6, there shall be either/or type questions of 10 marks each. Student shall answer any one of them.
iv) The questions from 2 to 6 shall be set by covering one unit of the syllabus for each question.

End examination of theory subjects consisting of two parts of different subjects, for Example: Basic Electrical & Electronics Engineering shall have the following pattern:

i) Question paper shall be in two parts viz. Part A and Part B with equal weightage of 35 marks each.
ii) In each part, question1shall contain 5 compulsory short answer questions for a total of 5 marks such that each question carries 1mark.
iii) In each part, questions from 2 to 4, there shall be either/or type questions of 10 marks each. Student shall answer any one of them.
iv) The questions from 2 to 4 shall be set by covering one unit of the syllabus for each question.

**Practical Courses**

| Assessment Method | Marks |
|---|---|
| Continuous Internal Assessment | 30 |
| Semester End Examination | 70 |
| **Total** | **100** |

b) For practical courses, there shall be a continuous evaluation during the semester for 30 sessional marks and end examination shall be for 70 marks.

c) Day-to-day work in the laboratory shall be evaluated for 15 marks by the concerned laboratory teacher based on the record/vivaand15marks for the internal test.

d) The end examination shall be evaluated for 70 marks, conducted by the concerned laboratory teacher and a senior expert in the subject from the same department.
   - Procedure:20 marks
   - Experimental work & Results: 30marks
   - Vivavoce:20 marks.

   In a practical subject consisting of two parts (Eg: Basic Electrical & Electronics Engineering Lab), the end examination shall be conducted for 70 marks as a single laboratory in 3 hours. Mid semester examination shall be evaluated as above for 30 marks in each part and final mid semester marks shall be arrived by considering the average of marks obtained in two parts.

e) For the subject having design and/or drawing, such as Engineering Drawing, the distribution of marks shall be 30 for mid semester evaluation and 70 for end examination.

| **Assessment Method** | **Marks** |
|---|---|
| Continuous Internal Assessment | 30 |
| Semester End Examination | 70 |
| **Total** | **100** |

   Day-to-day work shall be evaluated for 15 marks by the concerned subject teacher based on the reports/submissions prepared in the class. And there shall be two Midterm examinations in a semester for duration of 2 hours each for 15 marks with weightage of 80% to better mid marks and 20% for the other. The subjective paper shall contain 3 either or type questions of equal weightage of 5 marks. There shall be no objective paper in mid semester examination. The sum of day-to-day evaluation and the mid semester marks will be the final sessional marks for the subject.
   The end examination pattern for Engineering Graphics is same as theory subjects, shall consist of 6 questions and all questions are compulsory. Question I shall contain10 compulsory short answer questions for a total of 20 marks such that each question carries 2 marks. There shall be 2 short answer questions from each unit. In each of the questions from 2 to 6, there shall be either / or type questions of 10 marks each. Student shall answer any one of them. However, the end examination pattern for other subjects related to design/drawing, multiple branches, etc is mentioned along with the syllabus.

f) There shall be no external examination for mandatory courses with zero credits. However, attendance shall be considered while calculating aggregate attendance

and student shall be declared to have passed the mandatory course only when he/she secures 40% or more in the internal examinations. Incase, the student fails, are-Examination shall be conducted for failed candidates for 30 marks satisfying the conditions mentioned in item 1 & 2 of the regulations.

g) The laboratory records and mid semester test papers shall be preserved for a minimum of 3 years in the respective institutions as per the University norms and shall be produced to the Committees of the University as and when the same are asked for.

**10. Skill Oriented Courses**

i) There shall be five skill-oriented courses offered during III to VII semesters.

ii) Out of the five skill courses two shall be skill-oriented courses from the same domain. Of the remaining three skill courses, one shall be a softskill course and the remaining two shall be skill-advanced courses from the same domain/Interdisciplinary/Job oriented.

iii) The course shall carry 100 marks and shall be evaluated through continuous assessments during the semester for 30 sessional marks and end examination shall be for 70 marks. Day-to-day work in the class / laboratory shall be evaluated for 30 marks by the concerned teacher based on the regularity /assignments / viva/ mid semester test. The end examination similar to practical examination pattern shall be conducted by the concerned teacher and an expert in the subject nominated by the principal.

iv) The Head of the Department shall identify a faculty member as coordinator for the course. A committee consisting of the Head of the Department, coordinator and a senior Faculty member nominated by the Head of the Department shall monitor the evaluation process. The marks / grades shall be assigned to the students by the above committee based on their performance.

v) The student shall be given an option to choose either the skill courses being offered by the college or to choose a certificate course being offered by industries / Professional bodies or any other accredited bodies. If a student chooses to take a Certificate Course offered by external agencies, the credits shall be awarded to the student upon producing the Course Completion Certificate from the agency. A committee shall be formed at the level of the college to evaluate the grades / marks given for a course by external agencies and convert to the equivalent marks/grades.

vi) There commended courses offered by external agencies, conversions and appropriate grades/marks are to be approved by the University at the beginning of the semester. The principal of the respective college shall forward such proposals to the University for Approval.

vii) If a student prefers to take a certificate course offered by external agency, the department shall mark attendance of the student for the remaining courses in that semester excluding the skill course in all the calculations of mandatory attendance requirements up on producing a valid certificate as approved by the University.

## 11. Massive Open Online Courses (MOOCs):

A Student has to pursue and complete one course compulsorily through MOOCs approved by the University. A student can pursue courses other than core through MOOCs and it is mandatory to complete one course successfully through MOOCs for awarding the degree. A student is not permitted to register and pursue core courses through MOOCs.

A student shall register for the course (Minimum of either 8 weeks or 12 weeks) offered through MOOCs with the approval of Head of the Department. The Head of the Department shall appoint one mentor to monitor the student's progression. The student needs to earn a certificate by passing the exam. The student shall be awarded the credits assigned in the curriculum only by submission of the certificate. Examination fee, if any, will be borne by the student.

Students who have qualified in the proctored examinations conducted through MOOCs platform can apply for credit transfer as specified and are exempted from appearing internal as well as external examination (for the specified equivalent credit course only) conducted by the university.

Necessary amendments in rules and regulations regarding adoption of MOOC courses would be proposed from time to time.

## 12. Credit Transfer Policy

Adoption of MOOCs is mandatory, to enable Blended model of teaching-learning as also envisaged in the NEP2020. As per University Grants Commission (Credit Frame work for Online Learning Courses through SWAYAM) Regulation, 2016, the University shall allow up to a maximum of 20% of the total courses being offered in a particular programme i.e., maximum of 32 credits through MOOCs platform.

i) The University shall offer credit mobility for MOOCs and give the equivalent credit weightage to the students for the credits earned through online learning courses.
ii) Student registration for the MOOCs shall be only through the respective department of the institution, it is mandatory for the student to share necessary information with the department.
iii) Credit transfer policy will be applicable to the Professional & Open Elective courses only.
iv) The concerned department shall identify the courses permitted for credit transfer.
v) The University / institution shall notify at the beginning of semester the list of the online learning courses eligible for credit transfer.
vi) The institution shall designate a faculty member as a Mentor for each course to guide the students from registration till completion of the credit course.
vii) The university shall ensure no overlap of MOOC exams with that of the university examination schedule. In case of delay in results, the university will re-issue the marks sheet for such students.
viii) Student pursuing courses under MOOCs shall acquire the required

credits only after successful completion of the course and submitting a certificate issued by the competent authority along with the percentage of marks and grades.

ix) The institution shall submit the following to the examination section of the university:
    a) List of students who have passed MOOC courses in the current semester along with the certificate of completion.
    b) Undertaking form filled by the students for credit transfer.

x) The universities shall resolve any issues that may arise in the implementation of this policy from time to time and shall review its credit transfer policy in the light of periodic changes brought by UGC, SWAYAM, NPTEL and state government.

**Note:** Students shall be permitted to register for MOOCs offered through online platforms approved by the University from time to time.

## 13. Academic Bank of Credits (ABC)

The University has implemented Academic Bank of Credits (ABC) to promote flexibility in curriculum as per NEP 2020 to

i. provideoptionofmobilityforlearnersacrosstheuniversitiesoftheirchoice
ii. provide option to gain the credits through MOOCs from approved digital platforms.
iii. Facilitate award of certificate / diploma / degree in line with the accumulated credits in ABC
iv. Execute Multiple Entry and Exit system with credit count, credit transfer and credit acceptance from students' account.

## 14. Mandatory Internships

**Summer Internships:** Two summer internships either onsite or virtual each with a minimum of 08 weeks duration, done at the end of second and third years, respectively are mandatory. It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Power projects, software MNCs or any industries in the areas of concerned specialization of the Undergraduate program. One of the two summer internships at the end of second year (Community Service Project) shall be society oriented and shall be completed in collaboration with government organizations / NGOs & others. The other internship at the end of third year is Industry Internship and shall be completed in collaboration with Industries. The student shall register for the internship as per course structure after commencement of academic year. The guidelines issued by the APSCHE / University shall be followed for carrying out and evaluation of Community Service Project and Industry Internship. Evaluation of the summer internships shall be through the departmental committee. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the departmental committee comprising of Head of the Department, supervisor of the internship and a senior faculty member of the department. A certificate of successful completion from industry shall be included in the report. The report and the oral presentation shall carry

50% weightage each. It shall be evaluated for 50 external marks. There shall be no internal marks for Summer Internship. A student shall secure minimum 40% of marks for successful completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the University.

**Full Semester Internship and Project work:** In the final semester, the student should mandatorily register and undergo internship (onsite/virtual) and in parallel he/she should work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship.

The project report shall be evaluated with an external examiner. The total marks for project work 200 marks and distribution shall be 60 marks for internal and 140 marks for external evaluation. The supervisor assesses the student for 30 marks (Report: 15marks, Seminar: 15 marks). At the end of the semester, all projects shall be show cased at the department for the benefit of all students and staff and the same is to be evaluated by the departmental Project Review Committee consisting of supervisor, a senior faculty and HOD for 30marks.The external evaluation of Project Work is a Viva-Voce Examination conducted in the presence of internal examiner and external examiner appointed by the University and is evaluated for 140 marks.

The college shall facilitate and monitor the student internship programs. Completion of internships is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such cases, the student shall repeat and complete the internship.

## 15. Guidelines for offering a Minor

To promote inter disciplinary knowledge among the students, the students admitted into B.Tech. in a major stream/branch are eligible to obtain degree in Minor in another stream.

i) The Minor program requires the completion of 12credits in Minor stream chosen.
ii) Two courses for 06 credits related to a Minor are to be pursued compulsorily for the minor degree, but maybe waived for students who have done similar/equivalent courses .If waived for a student, then the student must take an extra elective course in its place. It is recommended that students should complete the compulsory courses (or equivalents) before registering for the electives.
iii) Electives (minimum of 2 courses) to complete a total of 12 credits.

**Note:** A total of 4 (Four) Open Electives are offered in the curriculum. A student can complete the requirement for Minor by opting for the courses offered through various verticals / tracks under Open Electives.

## 16. Guidelines for offering Honors

The objective of introducing B.Tech. (Hons.) is to facilitate the students to choose additionally the specialized courses of their choice and build their competence in a specialized area in the UG level. The programme is a best choice for academically excellent students having good academic record and interest towards higher studies and research.

i) Honors is introduced in the curriculum of all B. Tech. programs offering a major degree and is applicable to all B. Tech (Regular and Lateral Entry) students admitted in Engineering &Technology.
ii) A student shall earn additional 15 credits for award of B.Tech. (Honors) degree from same branch / department / discipline registered for major degree. This is in addition to the credits essential for obtaining the Undergraduate degree in Major Discipline (i.e., 160 credits).
iii) A student is permitted to register for Honors in IV semester after the results of III Semester are declared and students may be allowed to take maximum two subjects per semester pertaining to the Honors from V Semester onwards.
iv) The concerned Principal of the college shall arrange separate class work and time table of the courses offered under Honors program.
v) Courses that are used to fulfil the student's primary major may not be double counted towards the Honors. Courses with content substantially equivalent to courses in the student's primary Major may not be counted towards the Honors.
vi) Students can complete the courses offered under Honors either in the college or in online platforms like SWAYAM with a minimum duration of 12 weeks for a 3-credit course and 8 weeks duration for a 2-credit course satisfying the criteria for credit mobility. If the courses under Honors are offered in conventional mode, then the teaching and evaluation procedure shall be similar to regular B.Tech courses.
vii) The attendance for the registered courses under Honors and regular courses offered for Major degree in a semester are to be considered separately.
viii) A student shall maintain an attendance of 75% in all registered courses under Honors to be eligible for attending semester end examinations.
ix) A student registered for Honors shall pass in all subjects that constitute the requirement for the Honors degree program. No class / division (i.e., second class, first class and distinction, etc.) shall be awarded for Honors degree programme.
x) If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into open or core electives; they will remain extra. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.
xi) The Honors will be mentioned in the degree certificate as Bachelor of Technology (Honors) in XYZ. For example, B.Tech. (Honors) in Mechanical Engineering

**Enrolment into Honors:**

i) Students of a Department / Discipline are eligible to opt for Honors program offered by the same Department / Discipline
ii) The enrolment of student into Honors is based on the CGPA obtained in the major degree program. CGPA shall be taken upto III semester incase of regular

entry students and only III semester in case of lateral entry students. Students having 7.0 CGPA without any backlog subjects will be permitted to register for Honors.

iii) If a student is detained due to lack of attendance either in Major or in Honors, registration shall be cancelled.

iv) Transfer of credits from Honors to regular B.Tech degree and vice-versa shall not be permitted.

v) Honors are to be completed simultaneously with a Major degree program.

**Registration for Honors**:

i) Theeligibleandinterestedstudentsshallapplythroughthe HeadoftheDepartment (HOD) of his/her parent department. The whole process should becompletedwithinoneweekbeforethestartofeverysemester.Selectedstudentsshallbepermitted to register the courses under Honors.

ii) The selected students shall submit their willingness to the principal throughhis/herparentdepartmentofferingHonors.Theparentdepartmentshallmaintainthe record of student pursuing the Honors.

iii) ThestudentsenrolledintheHonorscourseswillbemonitoredcontinuously.Anadvisor/mentor from parent department shall be assigned to a group of students to monitor the progress.

iv) ThereisnofeeforregistrationofsubjectsforHonorsprogramofferedinofflineatthere spective institutions.

**17. Attendance Requirements:**

i) A student shall be eligible to appear for the University external examinations if he/she acquires a minimum of 40% attendance in each subject and 75% of attendance in aggregate of all the subjects. b) Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.

ii) Shortage of Attendance below 65% in aggregate shall in NOCASE be condoned.

iii) A stipulated fee shall be payable towards condonation of shortage of attendance to the University.

iv) Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration shall stand cancelled.

v) A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester. They may seek readmission for that semester from the date of commencement of class work.

vi) If any candidate fulfils the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

vii) If the learning is carried out in blended mode (both offline & online), then the total attendance of the student shall be calculated considering the offline and online attendance of the student.

viii) For induction programme attendance shall be maintained as per AICTE norms.

## 18. Promotion Rules:

The following academic requirements must be satisfied in addition to the attendance requirements mentioned in section 16.

i) A student shall be promoted from first year to second year if he/she fulfils the minimum attendance requirement as per university norms.

ii) A student will be promoted from II to III year if he/she fulfils the academic requirement of securing 40% of the credits (any ***decimal*** fraction should be ***rounded off*** to ***lower*** digit) up to in the subjects that have been studied up to III semester.

iii) A student shall be promoted from III year to IV year if he/she fulfils the academic requirements of securing 40% of the credits (any ***decimal*** fraction should be ***rounded off*** to ***lower*** digit) in the subjects that have been studied up to V semester. And in case a student is detained for want of credits for a particular academic year by ii) & iii) above, the student may make up the credits through supplementary examinations and only after securing the required credits he/she shall be permitted to join in the V semester or VII semester respectively as the case may be.

iv) When a student is detained due to lack of credits / shortage of attendance he / she may be re-admitted when the semester is offered after fulfillment of academic regulations. In such case, he/she shall be in the academic regulations into which he/she is readmitted.

## 19. Grading:

As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades and corresponding percentage of marks shall be followed:

After each course is evaluated for 100 marks, the marks obtained in each course will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

**Structure of Grading of Academic Performance**

| Range in which the marks in the subject fall | Grade | Grade points Assigned |
|---|---|---|
| 90 &above | S(Superior) | 10 |
| 80-89 | A(Excellent) | 9 |
| 70-79 | B(VeryGood) | 8 |
| 60-69 | C(Good) | 7 |
| 50- 59 | D(Average) | 6 |
| 40-49 | E(Pass) | 5 |
| < 40 | F (Fail) | 0 |
| Absent | Ab(Absent) | 0 |

i) A student obtaining Grade 'F' or Grade 'Ab' in a subject shall be considered failed and will be required to reappear for that subject when it is offered the next supplementary examination.

ii) For non-credit audit courses, "Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA/Percentage.

Computation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student,i.e.,

$$SGPA = \Sigma(C_i \times G_i)/\Sigma C_i$$

Where, $C_i$ is the number of credits of the $i^{th}$ subject and $G_i$ is the grade point scored by the student in the $i^{th}$ course.

The Cumulative Grade Point Average (CGPA) will be computed in the same manner considering all the courses undergone by a student overall the semesters of a program, i.e.,

$$CGPA = \Sigma(C_i \times S_i)/\Sigma C_i$$

Where "$S_i$"is the SGPA of the $i^{th}$ semester and $C_i$ is the total number of credits upto that semester.

Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts. While computing the SGPA the subjects in which the student is awarded Zero grade points will also be included.

Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale.
Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by the letters S,A, B, C, D and F.

**Award of Class:**

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree, he/she shall be placed in one of the following four classes:

| Class Awarded | CGPA Secured |
|---|---|
| First Class with Distinction | ≥ 7.5 |
| First Class | ≥6.5<7.5 |
| Second Class | ≥ 5.5 <6.5 |
| Pass Class | ≥ 5.0 <5.5 |

**CGPA to Percentage conversion Formula– (CGPA– 0.5) x10**

## 20. With–holding of Results

If the candidate has any dues not paid to the university or if any case of indiscipline or malpractice is pending against him / her, the result of the candidate shall be withheld in such cases.

## 21. Multiple Entry/ Exit Option

**(a) Exit Policy:**

The students can choose to exit the four-year programme at the end of first/ second/ third year.

i) **UG Certificate in (Field of study/discipline)** - Programme duration: First year (first two semesters) of the undergraduate programme, 40 credits followed by an additional exit 10-credit bridge course(s) lasting two months, including at least 6-credit job-specific internship/ apprenticeship that would help the candidates acquire job-ready competencies required to enter the workforce.

ii) **UG Diploma (in Field of study/discipline) -** Programme duration: First two years (first four semesters) of the undergraduate programme, 80 credits followed by an additional exit 10-credit bridge course(s) lasting two months, including at least 6-creditjob-specific internship/ apprenticeship that would help the candidates acquire job-ready competencies required to enter the workforce.

iii) **Bachelor of Science (in Field of study/ discipline)** i.e., **B.Sc. Engineering in (Field of study/ discipline)**-Programme duration: First three years (first six semesters) of the undergraduate programme, 120 credits.

**(b) Entry Policy:**

Modalitieson multiple entry by the student into the B.Tech. Programme will be provided in due course of time.

**Note:** The Universities shall resolve any issues that may arise in the implementation of Multiple Entry and Exit policies from time to time and shall review the policies in the light of periodic changes brought by UGC, AICTE and State government.

## 22. Gap Year Concept:

Gap year concept for Student Entrepreneur in Residence is introduced and outstanding students who wish to pursue entrepreneurship / become entrepreneur are allowed to take a break of one year at any time after II year to pursue full-time entrepreneur ship programme/ to establish startups. This period may be extended to two years at the most and these two years would not be counted for the time for the maximum time for graduation. The principal of the respective college shall forward such proposals submitted by the students to the University. An evaluation committee constituted by the University shall evaluate the proposal submitted by the student and the committee shall decide whether to permit the student(s) to avail the Gap Year or not

## 23. Transitory Regulations

Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfillment of academic regulations. Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone the course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, subject to Section 2 and they will follow the academic regulations into which they are readmitted.

Candidates who are permitted to avail Gap Year shall be eligible for re-joining in to the succeeding year of their B. Tech from the date of commencement of class work, subject to Section **2** and they will follow the academic regulations into which they are readmitted.

## 24. Minimum Instruction Days for a Semester:

The minimum instruction days including exams for each semester shall be 90days.

## 25. Medium of Instruction:

The medium of instruction of the entire B.Tech undergraduate programme in Engineering & Technology (including examinations and project reports) will be in English only.

## 26. Student Transfers:

Student transfers shall be as per the guidelines issued by the Government of Andhra Pradesh and the Universities from time to time.

## 27. General Instructions:

i. The academic regulations should be read as a whole for purpose of any interpretation.
ii. Malpractices rules-nature and punishments are appended.
iii. Where the words “he”, “him”, “his”, occur in the regulations, they also include “she”, “her”, “hers”, respectively.
iv. The Universities may change or amend the academic regulations or syllabi at anytime and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the Universities.
v. The Universities should train its faculty members time to time to provide experiential education to the students.
vi. The Universities are suggested to form industry consortium for various disciplines of engineering and explore the possibility of including their skilling programs as credit courses.
vii. The Universities should collaborate with Industries / Govt. Institutions in establishing Centers of Excellence (CoEs) in potential areas with exponential growth.
viii. In the case of any doubt or ambiguity in the interpretation of the guidelines given, the decision of the Vice-Chancellor / Head of the institution is final.

# ACADEMIC REGULATIONS (R24)
# FOR B.TECH. (LATERAL ENTRY SCHEME)

*(Effective for the students getting admitted into II year through Lateral Entry Scheme from the Academic Year 2025-2026onwards)*

1. **Award of the Degree**
   (a) Award of the B.Tech. Degree / B.Tech. Degree with a Minor if he / she fulfils the following:
      (i) Pursues a course of study for not less than three academic years and not more than six academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would in addition to the maximum period permitted for graduation (Six years).
      (ii) Registers for120creditsandsecuresall120credits.

   (b) **Award of B.Tech. degree with Honors** if he / she fulfils the following:
      (i) Student secures additional 15 credits fulfilling all the requisites of a B.Tech. program i.e., 120 credits.
      (ii) Registering for Honors is optional.
      (iii) Honors are to be completed simultaneously with B.Tech. programme.

2. Students, who fail to fulfil the requirement for the award of the degree within six consecutive academic years from the year of admission, shall for feit their seat.

3. **Minimum Academic Requirements**
   The following academic requirements have to be satisfied in addition to the requirements mentioned in item no.**2**
   i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he secures not less than 35% of marks in the end examination and a minimum of 40%of marks in the sum total of the mid semester evaluation and end examination taken together.

   ii. A student shall be promoted from III year to IV year if he/she fulfils the academic requirements of securing 40% of the credits (any decimal fraction should be rounded off to lower digit) in the subjects that have been studied up to V semester.

   And in case if student is already detained for want of credits for particular academic year, the student may make up the credits through supplementary exams of the above exams before the commencement of IV year I semester class work of next year.

**4. Course Pattern**

i) The entire course of study is three academic years on semester pattern.

ii) A student eligible to appear for the end examination in a subject but absent at it or has failed in the end examination may appear for that subject at the next supplementary examination offered.

iii) When a student is detained due to lack of credits/shortage of attendance the student may be re-admitted when the semester is offered after fulfilment of academic regulations, the student shall be in the academic regulations into which he/she is readmitted.

5. Allot her regulations as applicable for B.Tech. Four-year degree course (Regular) will hold good for B. Tech. (Lateral

# B.TECH.-COURSE STRUCTURE–R24

**(Applicable from the academic year 2024-25 onwards)**

## INDUCTION PROGRAMME

| S.No. | Course Name | Category | L-T-P-C |
|---|---|---|---|
| 1 | Physical Activities -- Sports, Yoga and Meditation, Plantation | MC | 0-0-6-0 |
| 2 | Career Counseling | MC | 2-0-2-0 |
| 3 | Orientation to all branches—career options, tools, etc. | MC | 3-0-0-0 |
| 4 | Orientation on admitted Branch—corresponding labs, tools and platforms | EC | 2-0-3-0 |
| 5 | Proficiency Modules & Productivity Tools | ES | 2-1-2-0 |
| 6 | Assessment on basic aptitude and mathematical skills | MC | 2-0-3-0 |
| 7 | Remedial Training in Foundation Courses | MC | 2-1-2-0 |
| 8 | Human Values & Professional Ethics | MC | 3-0-0-0 |
| 9 | Communication Skills -- focus on Listening, Speaking, Reading, Writing skills | BS | 2-1-2-0 |
| 10 | Concepts of Programming | ES | 2-0-2-0 |

**B.Tech.–I Year I Semester (CSE & ECE)**

| S.No. | Category | S.Code | Title | L/D | T | P | Credits |
|---|---|---|---|---|---|---|---|
| 1 | BS&H | CSE/ECE/CAI/ CDS/CSM/CIT/CS C/EEE-111 | Linear Algebra & Calculus | 3 | 0 | 0 | 3 |
| 2 | BS&H | CSE/ECE-112 | Engineering Physics | 3 | 0 | 0 | 3 |
| 3 | Engineering Science | CSE/ECE-113 | Basic Civil & Mechanical Engineering | 3 | 0 | 0 | 3 |
| 4 | BS&H | CSE/ECE-114 | Communicative English | 2 | 0 | 0 | 2 |
| 5 | Engineering Science | CSE/ECE/CAI/ CDS/CSM/CIT/CS C/EEE-115 | Introduction to Programming | 3 | 0 | 0 | 3 |
| 6 | BS&H | CSE/ECE-151 | Engineering Physics Lab | 0 | 0 | 2 | 1 |
| 7 | BS&H | CSE/ECE-152 | Communicative English Lab | 0 | 0 | 2 | 1 |
| 8 | Engineering Science | CSE/ECE/CAI/ CDS/CSM/CIT/CS C/EEE-153 | Computer Programming Lab | 0 | 0 | 3 | 1.5 |
| 9 | Engineering Science | CSE/ECE-154 | Engineering Workshop | 0 | 0 | 3 | 1.5 |
| 10 | BS&H | CSE/ECE-155 | Health and wellness, Yoga and sports | - | - | 1 | 0.5 |
| **Total** | | | | **14** | **00** | **11** | **19.5** |

**B.Tech.–I Year II Semester (CSE & ECE)**

| S.No. | Category | S.Code | Title | L/D | T | P | Credits |
|---|---|---|---|---|---|---|---|
| 1 | BS & H | CSE/ECE/CAI/ CDS/CSM/CIT/ CSC/EEE-121 | Differential Equations & Vector Calculus | 3 | 0 | 0 | 3 |
| 2 | BS&H | CSE/ECE-122 | Engineering Chemistry | 3 | 0 | 0 | 3 |
| 3 | Engineering Science | CSE/ECE-123 | Basic Electrical and Electronics Engineering | 3 | 0 | 0 | 3 |
| 4 | Engineering Science | CSE/ECE-124 | Engineering Graphics | 1 | 0 | 4 | 3 |
| 5 | Professional Core | CSE/ECE-125 | Python Programming(CSE-125) Electronic Devices and Circuits(ECE-125) | 3 | 0 | 0 | 3 |
| 6 | BS&H | CSE/ECE-161 | Engineering Chemistry Lab | 0 | 0 | 2 | 1 |
| 7 | Engineering Science | CSE/ECE-162 | Electrical and Electronics Engineering Workshop | 0 | 0 | 3 | 1.5 |
| 8 | Professional Core | CSE/ECE-163 | Python Programming Lab (CSE-164) Electronic Devices and Circuits Lab (ECE-164) | 0 | 0 | 3 | 1.5 |
| 9 | Engineering Science | CSE/ECE-164 | IT Workshop | 0 | 0 | 2 | 1 |
| 10 | BS&H | CSE/ECE-165 | NSS/NCC/Scouts & Guides/Community Service | - | - | 1 | 0.5 |
| **Total** | | | | **13** | **0** | **15** | **20.5** |

**B.Tech.–I Year I Semester**

| S.No. | Category | S.Code | Title | L/D | T | P | Credits |
|---|---|---|---|---|---|---|---|
| **1** | BS&H | CSE/ECE/CAI/ CDS/CSM/CIT/ CSC/EEE-111 | Linear Algebra & Calculus | 3 | 0 | 0 | 3 |
| 2 | BS&H | CAI/CDS/CIT/ CSC/CSM/EEE - 112 | Engineering Chemistry | 3 | 0 | 0 | 3 |
| 3 | Engineering Science | CAI/CDS/CIT/ CSC/CSM/EEE - 113 | Basic Electrical and Electronics Engineering | 3 | 0 | 0 | 3 |
| 4 | Engineering Science | CAI/CDS/CSM/ CIT/ CSC/EEE- 114 | Engineering Graphics | 1 | 0 | 4 | 3 |
| 5 | Engineering Science | CSE/ECE/CAI/ CDS/CSM/CIT/ CSC/EEE-115 | Introduction to Programming | 3 | 0 | 0 | 3 |
| 6 | BS&H | CAI/CDS/CIT/ CSC/CSM/EEE - 151 | Engineering Chemistry Lab | 0 | 0 | 2 | 1 |
| 7 | Engineering Science | CAI/CDS/CIT/ CSC/CSM/EEE - 152 | Electrical and Electronics Engineering Workshop | 0 | 0 | 3 | 1.5 |
| 8 | Engineering Science | CSE/ECE/CAI/ CDS/CSM/CIT/ CSC/EEE-153 | Computer Programming Lab | 0 | 0 | 3 | 1.5 |
| 9 | Engineering Science | CAI/CDS/CIT/ CSC/CSM/EEE - 154 | IT Workshop | 0 | 0 | 2 | 1 |
| 10 | BS&H | CAI/CDS/CIT/ CSC/CSM/EEE - 155 | NSS/NCC/Scouts & Guides/Community Service | - | - | 1 | 0.5 |
| **Total** | | | | **13** | **00** | **15** | **20.5** |

**B.Tech.–I Year II Semester**

| S.No. | Category | S.Code | Title | L/D | T | P | Credits |
|---|---|---|---|---|---|---|---|
| 1 | BS & H | CSE/ECE/CAI/ CDS/CSM/CIT/ CSC/EEE-121 | Differential Equations & Vector Calculus | 3 | 0 | 0 | 3 |
| 2 | BS&H | CAI/ CDS/CSM/CIT/ CSC/EEE-122 | Engineering Physics | 3 | 0 | 0 | 3 |
| 3 | Engineering Science | CAI/ CDS/CSM/CIT/ CSC/EEE-123 | Basic Civil & Mechanical Engineering | 3 | 0 | 0 | 3 |
| 4 | BS&H | CSE/ECE-124 | Communicative English | 2 | 0 | 0 | 2 |
| 5 | Professional Core | CSE/CAI/CDS/C SM/CIT/CSC-125 | Python Programming(CSE related branches) Network Work Theory (EEE-125) | 3 | 0 | 0 | 3 |
| 6 | BS&H | CSE/CAI/CDS/C SM/CIT/CSC-161 | Engineering Physics Lab | 0 | 0 | 2 | 1 |
| 7 | BS&H | CSE/CAI/CDS/C SM/CIT/CSC-162 | Communicative English Lab | 0 | 0 | 2 | 1 |
| 8 | Professional Core | CSE/CAI/CDS/C SM/CIT/CSC-163 | Python Programming Lab (CSE-163) NT Lab (EEE-163) | 0 | 0 | 3 | 1.5 |
| 9 | Engineering Science | CSE/CAI/CDS/C SM/CIT/CSC-164 | Engineering Workshop | 0 | 0 | 3 | 1.5 |
| 10 | BS&H | CSE/CAI/CDS/C SM/CIT/CSC-165 | Health and wellness, Yoga and sports | - | - | 1 | 0.5 |
| **Total** | | | | 14 | 0 | 11 | 19.5 |

## II Year I Semester (CSE)

| S.No. | Category | S.Code | Title | L | T | P | Credits |
|---|---|---|---|---|---|---|---|
| 1 | BS&H | CSE -211 | Mathematical Foundation for Computer Science | 3 | 0 | 0 | 3 |
| 2 | BS&H | CSE-212 | Universal human values | 2 | 0 | 0 | 2 |
| 3 | Engineering Science | CSE -213 | Digital Logic Design | 3 | 0 | 0 | 3 |
| 4 | BS&H/ Engineering Science | CSE-214 | Probability & Statistics | 3 | 0 | 0 | 3 |
| 5 | Professional Core | CSE -215 | Data Structures | 3 | 0 | 0 | 3 |
| 6 | Professional Core | CSE -216 | Object-Oriented Programming | 3 | 0 | 0 | 3 |
| 7 | Professional Core | CSE-251 | Data Structures Lab | 0 | 0 | 3 | 1.5 |
| 8 | Professional Core | CSE -252 | Object-Oriented Programming Lab | 0 | 0 | 3 | 1.5 |
| 9 | Skill Enhancement course | CSE -253 | SOC | 0 | 1 | 2 | 2 |
| 10 | Audit Course | CSE -217 | Environmental Science | 2 | 0 | 0 | - |
| | | | **Total** | 19 | **1** | **8** | **22** |

## II Year II Semester (CSE)

| S.No. | Category | S.Code | Title | L | T | P | Credits |
|---|---|---|---|---|---|---|---|
| 1 | Engineering Science | CSE -221 | Artificial Intelligence | 3 | 0 | 0 | 3 |
| 2 | Engineering Science | CSE -222 | Database Management Systems | 3 | 0 | 0 | 3 |
| 3 | Professional Core | CSE -223 | Computer Organization | 3 | 0 | 0 | 3 |
| 4 | Professional Core | CSE -224 | Design and Analysis of Algorithms | 3 | 0 | 0 | 3 |
| 5 | Professional Core | CSE -225 | Operating Systems | 3 | 0 | 0 | 3 |
| 6 | Professional Core | CSE -261 | Artificial Intelligence Lab | 0 | 0 | 3 | 1.5 |
| 7 | Professional Core | CSE -262 | Database Management Systems Lab | 0 | 0 | 3 | 1.5 |
| 8 | Skill Enhancement course | CSE -264 | SOC | 1 | 0 | 2 | 2 |
| 9 | BS&H | CSE -226 | Design Thinking & Innovation | 1 | 0 | 2 | 2 |
| | | | **Total** | **17** | **0** | **10** | **22** |

Mandatory Community Service Project Internship of 08 weeks duration during summer vacation

**CSE 111 LINEAR ALGEBRA & CALCULUS**

**Course Objectives:**

- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.
- To describe the role of multiple integrals in calculating areas and volumes.
- To solve system of linear equations through application of matrices & explain the role of Eigen values and Eigen vectors for orthogonal transformations.
- To impart knowledge of mean value theorems and series expansions.

**Course Outcomes:**

At the end of the course, the student will be able to
CO1: Develop and use of matrix algebra techniques that are needed by engineers for practical applications.
CO2: Utilize mean value theorems to real life problems their general applications.
CO3: Familiarize with functions of several variables which is useful in optimization.
CO4: Learn important tools of calculus in higher dimensions.
CO5: Familiarize with double and triple integrals of functions of several variables in two dimensions using Cartesian and polar coordinates

**UNIT I Matrices**

Rank of a matrix by echelon form, normal form. Inverse of non-singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Jacobi and Gauss Seidel Iteration Methods.

**UNIT II Eigenvalues, Eigen vectors and Orthogonal Transformation**

Eigenvalues, Eigenvectors and their properties, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

**UNITIII Calculus**

Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), Problems

**UNIT IV Partial differentiation and Applications (Multi variable calculus)**

Partial derivatives, total derivatives, chain rule, Taylor's and Maclaurin's series, expansion of functions of two variables, Jacobians, Functional dependence, maxima and minima of functions of two variables, method of Lagrange multipliers.

**UNITV Multiple Integrals (Multivariable Calculus)**

Double integrals, triple integrals, change of order of integration, change of variables to polar coordinates, Applications: Finding areas (by double integrals) and volumes (by triple integrals).

**Textbooks:**

1. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers,2017,44thEdition
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10thEdition.

**Reference Books:**

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, R.K. Jain and S.R.K.Iyengar,Alpha Science International Ltd., 20215th Edition(9th reprint).
3. Advanced Engineering Mathematics, Micheael Greenberg, Pearson publishers, 9thedition
4. Higher Engineering Mathematics, H.KD as ,Er.RajnishVerma, S.Chand Publications,2014, Third Edition (Reprint 2021)

**CSE 112 ENGINEERING PHYSICS**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Objectives:**

To bridge the gap between the Physics in school at 10+2level and UG level engineering courses by identifying the importance of the optical phenomenon like interference, diffraction etc, enlightening the principle of Laser, its characteristics, applications and concepts of quantum mechanics, introduce novel concepts of dielectric and magnetic materials, physics of semiconductors.

**Course Outcomes:**

CO1: Analyze the intensity variation of light due to polarization, interference and diffraction.

CO2: Familiarize with the basics of Lasers and their applications.

CO3: Summarize various types of polarization of dielectrics and classify the magnetic materials.

CO4: Explain fundamentals of quantum mechanics and apply it toone dimensional motion of particles.

CO5: Identify the type of semiconductor using Hall effect.

**UNIT I Wave Optics**

**12Hrs**

Interference: Introduction -Principle of superposition –Interference of light – Interference in thin films (Reflection Geometry) &applications- Color in thin films- Newton's Rings, Determination of wavelength and refractive index. Diffraction: Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to singles lit–Diffraction Grating–Grating Spectrum, Dispersive power and resolving power of Grating (Qualitative).

**UNITII LASERS and Fiber Optics**

**8Hrs**

Characteristics of LASER-Spontaneous and Stimulated Emissions-Principle of Lasing Action - Population Inversion – Pumping- Einstein's Coefficients- Components of Laser System-Working Principle of Ruby Laser-He-Ne Laser- Applications of Lasers

**Introduction to Optical Fibers-** Principle of Optical Fiber- Critical Angle- Acceptance Angle – Numerical Aperture-Classification of fibers based on Refractive Index Profile - Fiber Optic communication system-Applications of Optical fiber system.

**UNITIII Dielectric and Magnetic Materials**

**8Hrs**

**Dielectric Materials:** Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector – Relation between the electric vectors-Types of polarizations-Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative)-Lorentz internal field-Clausius-Mossotti equation - complex dielectric constant – Frequency dependence of polarization – dielectric loss.

**Magnetic Materials:** Introduction-Magnetic dipole moment-Magnetization-Magnetic susceptibility and permeability – Atomic origin of magnetism - Classification of magnetic materials: Dia, Para, Ferro, Anti-ferro & Ferrimagnetic materials-Domain concept of Ferromagnetism & Domain walls (Qualitative)-Hysteresis-soft and hard magnetic materials.

**UNITIV Quantum Mechanics** **10Hrs**

**Quantum Mechanics:** Dual nature of light–Introduction to matter waves-De-Broglie's hypothesis of matter waves –Properties of Matter waves -Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations–Particle in one-dimensional infinite potential well.

**UNITV Semiconductors**

**10Hrs**

Semiconductors: Formation of energy bands–Classification of crystalline solids Intrinsic semiconductors–Electricalconductivity–Fermilevel–Extrinsicsemiconductors–n-type semiconductor, p-type semiconductor- Dependence of Fermi energy on carrier concentrationandtemperature-Driftcurrentanddiffusioncurrent–Einstein'sequation–Hall effect and its applications-Solar Cell-Working, Characteristics and applications.

**Textbooks**

•A Textbook of Engineering Physics, Dr. D. Tirupathi Naidu and M. Veeranjaneyulu VGS Book Links 6thEdition, August2019.

•A Textbook of Engineering Physics, M. N. Avadhanulu, P. G. Kshirsagar & TVS Arun Murthy, S. Chand Publications, 11th Edition 2019.Engineering Physics - D.K. Bhattacharyaand Poonam Tandon, Oxford press (2015)3. Engineering Physics by P.K. Palanisamy Sci Tech publications.

**Reference Books:**

1.EngineeringPhysics-B.K. Pandey and S. Chaturvedi, CengageLearning2021.

2.EngineeringPhysics-Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.

3.Engineering Physics" - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press. 2010

4. Engineering Physics - M.R. Srinivasan, New Age international publishers (2009).

**Web Resources**: https://www.loc.gov/rr/scitech/selected-internet/physics.html

**CSE 113 BASIC CIVIL AND MECHANICAL ENGINEERING**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Objectives:**

- Get familiarized with the scope and importance of Civil Engineering and Introduce the preliminary concepts of surveying.
- Acquire preliminary knowledge on Transportation and water Resources Engineering.
- Introductiontobasiccivilengineeringmaterialsandconstructiontechniques.
- GetfamiliarizedwiththescopeandimportanceofMechanicalEngineeringin different sectors and industries.
- Provideanoverviewofdifferentthermalsystemsandmanufacturingprocessesandintroduce basics of robotics and its applications.

**Course Outcomes:**

**On completion of the course, the student should be able to:**

CO1: Understand the importance of Civil Engineering and various concepts of surveying
CO2: Understand the importance of Transportation, Water Resources Engineering and Conveyance Structures
CO3: Understand the basic characteristics of Civil Engineering Materials and attain knowledge on prefabricated technology.
CO4: Understand the different manufacturing processes.
CO5: Describe the basics of robotics and its applications.

**UNIT I**

**Basics of Civil Engineering:** Role of Civil Engineers in Society- Various Disciplines of Civil Engineering- Structural Engineering- Geo-technical Engineering- Transportation Engineering- Hydraulics and Water Resources Engineering – Environmental Engineering-Scope of each discipline- Building Construction and Planning- Construction Materials-Cement - Aggregate - Bricks- Cement concrete- Steel. Introduction to Prefabricated construction Techniques.

**UNIT II**

**Surveying:** Objectives of Surveying- Horizontal Measurements- Angular Measurements- Introduction to Bearings Leveling instruments used for leveling -Simple problems on leveling and bearings- Contour mapping.

**UNIT III**

**Transportation Engineering** Importance of Transportation in Nation's economic development-Types of Highway Pavements- Flexible Pavements and Rigid Pavements - Simple Differences. Basics of Harbor, Tunnel, Airport, and Railway Engineering.

**Water Resources and Environmental Engineering:** Introduction, Sources of water- Quality of water- Specifications- Introduction to Hydrology–Rainwater Harvesting-Water Storage and Conveyance Structures (Simple introduction to Dams and Reservoirs)

**UNIT IV**

**Introduction to Mechanical Engineering:** Role of Mechanical Engineering in Industries and Society- Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.

**Manufacturing Processes:** Principles of Casting, Forming, joining processes, Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing.

**UNIT V**

**Thermal Engineering** – IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles.

**Powerplants**–Working principle of Steam, Diesel, Hydro, Nuclear power plants.

Introduction to Robotics -Joints & links, configurations, and applications of robotics.

(Note: The subject covers only the basic principles of Civil and Mechanical Engineering systems. The evaluation shall be intended to test only the fundamentals of the subject.)

**Textbooks:**

1. Basic Civil Engineering, M.S. Palanisamy, Tata McGraw Hill publications (India)Pvt .Ltd. Fourth Edition.
2. Internal Combustion Engines by V. Ganesan, By Tata McGraw Hill publications (India)Pvt. Ltd.
3. An introduction to Mechanical Egg by Jonathan Wicker and Kemper Lewis, Cengage learning India Pvt. Ltd.

**Reference Books:**

1.Surveying, Vol-I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers 2019. Fifth Edition.

2.Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers, Delhi. 2016

3.Highway Engineering, S.K. Khanna, C. E. G. Justoand Veeraraghavan, Nem chandand Brothers Publications 2019. 10th Edition.

4.G.S hanmugam and M.S. Palanisamy, Basic Civil and the Mechanical Engineering, Tata McGraw Hill publications (India) Pvt. Ltd.

5.3Dprinting&AdditiveManufacturingTechnology-L. Jyothish Kumar, Pulak M Pandey, Springer publications

6.Appuu Kuttan KK, Robotics, I.K.International Publishing House Pvt.Ltd. Volume-I

**CSE 114 COMMUNICATIVE ENGLISH**

| L | T | P | C |
|---|---|---|---|
| 2 | 0 | 0 | 2 |

**Course Objectives:**

The main objective of introducing this course, Communicative English, is to facilitate effective listening, Reading, Speaking and Writing skills among the students. It enhances the same in their comprehending abilities, oral presentations, reporting useful information and providing knowledge of grammatical structures and vocabulary. This course helps the students to make them effective in speaking and writing skills and to make them industry ready.

**Course Outcomes:**

CO1: Understand the context, topic, and pieces of specific information from social or Transactional dialogues.
CO2: Apply grammatical structures to formulate sentences and correct word forms.
CO3: Analyze discourse markers to speak clearly on a specific topic in informal discussions.
CO4: Evaluate reading / listening texts and to write summaries based on global comprehension of these texts.
CO5: Create a coherent paragraph, essay and resume.

**UNIT I**

**Lesson: HUMAN VALUES: Gift of Magi (Short Story)**

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.
Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.
Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information.
Writing: Mechanics of Writing: Capitalization, Spellings, Punctuation-Parts of Sentences.
Grammar: Parts of Speech, Basic Sentence Structures-forming questions
Vocabulary: Synonyms, Antonyms. One Word Substitutes

**UNIT II**

**Lesson: NATURE: The Brook by Alfred Tennyson (Poem)**

Listening: Answering a series of questions about main ideas and supporting ideas after listening to audiotexts.
Speaking: Discussion in pairs/small groups on specific topics followed by short structure talks.
Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
Writing: Structure of a paragraph-Paragraph writing (specific topics)
Grammar: Articles and Prepositions
Vocabulary: Idioms

**UNITIII**

**Lesson: BIOGRAPHY: Elon Musk**

Listening: Listening for global comprehension and summarizing what is listened to.
Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed
Reading: Reading a text in detail by making basic inferences-recognizing and interpreting specific context clues; strategies to use text clues for comprehension.
Writing: Summarizing, Note -making & Note Taking Grammar: Tenses, subject-verb agreement Vocabulary: Clauses & Phrases

**UNITIV**

**Lesson: INSPIRATION: The Toys of Peace by Saki**

Listening: Making predictions while listening to conversations/transactional dialogues without video; listening with video.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.

Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.

Writing: Letter Writing, Resumes Grammar: Active &Passive Voice Vocabulary: Words often confused

**UNITV**

**Lesson: MOTIVATION: The Power of Intrapersonal Communication (An Essay)**

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.

Speaking: Formaloralpresentationsontopicsfromacademiccontexts

Reading: Reading comprehension.

Writing: Writing structured essays on specific topics. Grammar: Direct & Indirect speech, Correction of the errors Vocabulary: Technical Jargons

**Textbooks:**

- Path finder: Communicative English for Under graduate Students,1st Edition, Orient Black Swan, 2023 (Units 1,2 & 3)
- Empowering with Language by Cengage Publications, 2023 (Units4&5)

**Reference Books:**

1. Dubey, Sham Ji &Co. English for Engineers, VikasPublishers,2020
2. Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge, 2014.
3. Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge University Press, 2019.
4. Lewis, Norman. Word Power Made Easy-The Complete Hand book for Building a Superior Vocabulary. Anchor, 2014.

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**CSE 115 INTRODUCTION TO PROGRAMMING**

**Course Objectives:**

- To introduce students to the fundamentals of computer programming.
- To provide hands-on experience with coding and debugging.
- To foster logical thinking and problem-solving skills using programming.
- To familiarize students with programming on data types, control structures, functions and arrays.
- To encourage collaborative learning and teamwork in coding projects.

**Course Outcomes:**

**A student after completion of the course will be able to**

- Understand basics of computers, the concept of algorithm and problem-solving analysis.
- Understand the concepts of control structures, branching and looping statements.
- Apply the concepts of arrays in solving complex problems.
- Develop programs on modular programming using functions and strings.
- Develop an ability to debug and optimize the code and solve real time problem statements.

**UNIT- I**

**Introduction to Computer Problem Solving**: Programs and Algorithms, Computer Problem Solving Requirements, Phases of Problem-Solving, Problem-Solving Strategies, Top-Down Approach, Algorithm Designing. Introduction to Flowchart and Pseudo code.

**UNIT- II**

**Introduction to C Programming:** Introduction, Structure of a C Program. Comments, Keywords, Identifiers, Data Types, Variables, Constants, Input/output Statements, Operators, Type Conversion, Control Flow, Relational Expressions.

**Conditional Branching Statements:** if, if-else, if-else—if, switch.

**Basic Loop Structures:** while dowhile loops, for loop, nested loops.

**Jumping Statements**: Break, Continue and goto statements.

**UNIT- III**

**Arrays:** Introduction, Operations on Arrays, Arrays as Function Arguments, Two Dimensional Arrays, Multidimensional Arrays.

**Functions:** Declaration, Function Definition, Function Call, Categories of Functions, Passing Parameters to Functions, Scope of Variables, Variable Storage Classes. Recursion.

**UNIT- IV**

**Pointers:** Concept of a Pointer, Declaring and Initializing Pointer Variables, Pointer Expressions and Address Arithmetic, Null Pointers, Generic Pointers, Pointers as Function Arguments, Pointers and Arrays, Pointer to Pointer, Dynamic Memory Allocation, Dangling Pointer, Command Line Arguments.

**Strings:** String Fundamentals, String Processing with and without Library Functions, Pointers and Strings.

**UNIT- V**

**Structures:** Structures, Unions, Bit Fields: Introduction, Nested Structures, Arrays of Structures, Structures and Functions, Self-Referential Structures, Unions, Enumerated Data Type —Enum variables, Using Typedef keyword, Bit Fields.

**Files:** Introduction to Files, Using Files in C, Reading from Text Files, Writing to Text Files, Random File Access.

**Textbooks:**

1."The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice-Hall, 1988

2.Schaum's Outline of Programming with C, Byron S Gottfried, McGraw-Hill Education, 1996

**Reference Books:**

1.A Structured Programming Approach Using C, Forouzan, Gilberg, Cengage.

2.How to solve it by Computer, R. G. Dromey, and Pearson Education.

3.Programming In C A-Practia1 Approach. Ajay Mittal, Pearson

4.Computing fundamentals and C Programming, Balagurusamy, E., McGrawHillEducation, 2008

5.Programming in C, Rema Theraja, Oxford, 2016, 2nd edition

6.C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE, 3rd edition.

**CSE 151** **ENGINEERING PHYSICS LAB**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**LIST OF EXPERIMENTS**

**Course Objectives:**
To study the concepts of optical phenomenon like interference, diffraction etc., recognize the importance of energy gap in the study of conductivity and Hall effect in semiconductors and study the parameters and applications of lasers by conducting experiments.

**Course Outcomes: The students will be able to**
CO1: Operate optical instruments like travelling microscope and spectrometer.
CO2: Estimate the wave lengths of different colors by using diffraction grating.
CO3: Plot the intensity of the magnetic field of circular coil carrying current with distance.
CO4: Evaluate the stopping potential using Photocell–I-V Characteristic curves
CO5: Calculate the wavelength of a given Laser.
CO6: Identify the type of semiconductor using Hall effect.

1. Determination of Radius of curvature of a given Plano Convex Lens by Newton's Rings.
2. Determination of wave lengths of different Spectral lines in Mercury Spectrum Using Diffraction Grating in Normal Incidence Configuration.
3. Determination of wavelength of Laser light by using Diffraction Grating
4. Photocell–I-V Characteristic curves and determination of Stopping Potential.
5. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method.
6. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.
7. Determination of temperature coefficients of a thermistor.
8. Determination of acceleration due to gravity and Radius of Gyration by using compound pendulum.
9. Determination of rigidity modulus of the material of the given wire using Tensional pendulum.
10. Determination of Young's modulus for the given material of wooden scale by non-uniform bending (or double cantilever) method.
11. Determination of Frequency of A.C. Supply using Sono Meter
12. Determination of Numerical Aperture and Acceptance Angle using Optical Fiber.

**References**:
A Textbook of Practical Physics-S. Balasubramanian, M.N. Srinivasan, S. Chand Publishers, 2017.

**Web Resources:**
www.vlab.co.inhttps://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype

**CSE 152** **COMMUNICATIVE ENGLISH LAB**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Course Objectives:**

The main objective of introducing this course, Communicative English Laboratory, is to expose students to a variety of self-instructional, learner-friendly modes of language learning. The students will be trained in basic communication skills and prepared to face job interviews.

**Course Outcomes:**

- **CO1:** Understand the different aspects of English language proficiency with emphasis on LSRW skills.
- **CO2:** Apply communication skills through various language-learning activities.
- **CO3:** Analyze English speech sounds, stress, rhythm, intonation, and syllable division for better listening and speaking comprehension.
- **CO4:** Evaluate and exhibit professionalism in participating in debates and group discussions.
- **CO5:** Create effective course objectives.

**List of Topics:**

1. Vowels & Consonants
2. Neutralization / Accent Rules
3. Communication Skills & JAM
4. Role Play or Conversational Practice
5. E-mail Writing
6. Resume Writing, Cover Letter, SOP
7. Group Discussions – Methods & Practice
8. Debates – Methods & Practice
9. PPT Presentations / Poster Presentation
10. Interview Skills

**Suggested Software:**

- K-VAN SOLUTIONS
- Walden Infotech
- Young India Films

**Reference Books:**

1. Raman Meenakshi, Sangeeta Sharma. Technical Communication. Oxford Press, 2018.
2. Taylor Grant: English Conversation Practice, Tata McGraw-Hill Education India, 2016.
3. Hewing's, Martin. Cambridge Academic English (B2). CUP, 2012.
4. J. Sethi & P. V. Dhamija. A Course in Phonetics and Spoken English (2nd Ed), Kindle, 2013.

**CSE 153** **ENGINEERING WORKSHOP**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 3 | 1.5 |

**Course Objectives:**

To familiarize students with woodworking, sheet metal operations, fitting, electrical house wiring skills, and basic repairs of two-wheeler vehicles.

**Course Outcomes:**

- **CO1:** Identify workshop tools and their operational capabilities.
- **CO2:** Practice manufacturing components using workshop trades, including fitting, carpentry, foundry, and welding.
- **CO3:** Apply fitting operations in various applications.
- **CO4:** Apply basic electrical engineering knowledge for house wiring practice.

**SYLLABUS**

1. **Demonstration:**
   Safety practices and precautions to be observed in the workshop.
2. **Woodworking:**
   Familiarity with different types of wood and tools used in woodworking, and making the following joints:
   a) Half–Lap joint
   b) Mortise and Tenon joint
   c) Corner Dovetail joint or Bridle joint
3. **Sheet Metal Working:**
   Familiarity with different types of tools used in sheet metal working and development of the following sheet metal jobs from GI sheets:
   a) Tapered tray
   b) Conical funnel
   c) Elbow pipe
4. **Fitting:**
   Familiarity with different types of tools used in fitting and performing the following fitting exercises:
   a) V-fit
   b) Dovetail fit
   c) Semi-circular fit
5. **Electrical Wiring:**
   Familiarity with different types of basic electrical circuits and making the following connections:
   a) Parallel and series
   b) Two-way switch
   c) Godown lighting
   d) Tube light
   e) Three-phase motor

**Textbooks:**

1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published, 2019.
   Workshop Processes, Practices, and Materials, Bruce J. Black, Routledge Publishers, 5th Edn. 2015.
2. A Course in Workshop Technology Vol I & II, B. S. Raghuwanshi, Dhanpath Rai & Co., 2015 & 2017.

**Reference Books:**

1. Elements of Workshop Technology, Vol. I, S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai, 2007, 14th edition.
2. Workshop Practice, H. S. Bawa, Tata-McGraw Hill, 2004.
3. Wiring Estimating, Costing and Contracting, Soni P. M. & Upadhyay P. A., Atul Prakashan, 2021-22.

**CSE 154** **COMPUTER PROGRAMMING LAB**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 3 | 1.5 |

## LIST OF EXPERIMENTS

**Course Objectives:** The course aims to give students hands – on experience and train them on the concepts of the C- programming language.

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

1. Implement and execute the programs written in C language on Windows and Linux OS.
2. Apply conditional and iterative statements to solve real time scenarios in C.
3. Develop C programs which utilize memory efficiently through arrays and strings.
4. Develop programs to demonstrate the applications through user defined datatypes.
5. Construct programs using structures, unions, and files.

**WEEK-1**

**Objective:**

- Getting familiar with the programming environment on the computer and writing the first program.
- Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.

1a) Exposure to Dev C++, Turbo C, gcc and other Online Editors etc.

1b) Writing Simple Programs using printf(), scanf().

1c) Developing the algorithms/flowcharts for the following sample programs

i) Sum and Average of 3 numbers.

ii) Conversion of Fahrenheit to Celsius and vice versa.

iii) Simple interest Calculation.

**WEEK-2**

**Objective:** Learn how to define variables with the desired datatype, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.

i) Finding the square root of a given number.

ii) Finding compound interest.

iii) Area of a triangle using heron's formulae.

iv) Distance travelled by an object.

**WEEK-3**

**Objective:** Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works.

i) Evaluate the following expressions.

a. A+B*C+(D*E) + F*G

b. A/B*C-B+A*D/3

c. A+++B---A

d. J= (i++) + (++i)

ii) Find the maximum of three numbers using conditional operator.

iii) Take marks of 5 subjects in integers, and find the total, average in float.

**WEEK 4**

**Objective:** Explore the full scope of different variants of "if construct" namely if-else, nest-

else, if-else if*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for "if construct".
i) Write a C program to find the Max and Min of four numbers using if-else.
ii) Write a C program to generate electricity bill.
iii) Find the roots of the quadratic equation.
iv)Write a C program to simulate a calculator using switch case.
v)Write a C program to find the given year is a leap year or not.

**WEEK 5**
**Objective:** Explore the full scope of iterative constructs namely while loop, do-while loop and for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.
i) Find the factorial of given number using any loop.
ii) Find the given number is a prime or not.
iii) Compute sine and cos series.
iv) Checking a number palindrome
v) Construct a pyramid of numbers.

**WEEK 6**
**Objective:** Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.
i) Find the min and max of a 1-D integer array.
ii) Perform linear search on1D array.
iii) The reverse of a 1D integer array.
iv) Find 2's complement of the given binary number.
v) Eliminate duplicate elements in an array.

**WEEK 7**
**Objective:** Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.
i) Addition of two matrices.
ii) Multiplication two matrices.
iii) Sort array elements using bubble sort.
iv) Concatenate two strings without built-in functions.
v) Reverse a string using built-in and without built-in string functions.

**WEEK 8**
**Objective:** Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C
i) Write a C program to find the sum of a 1D array using malloc().
ii) Write a C program to find the total, average of n students using structures.
iii) Enter n students data using calloc() and display failed students list.
iv) Read student name and marks from the command line and display the student details along with the total.

v) Write a C program to implement realloc()

**WEEK 9**

Objective: Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures

i) Demonstrate the differences between structures and unions using a C program.

ii) Write a C program to shift/rotate using bitfields.

**WEEK 10**

**Objective:** Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration

i) Write a C function to calculate NCR value.

ii) Write a C function to find the length of a string.

iii) Write a C function to transpose of a matrix.

**WEEK 11**

**Objective:** Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions.

i) Write a recursive function to generate Fibonacci series.

ii) Write a recursive function to find the lcm of two numbers.

iii) Write a recursive function to find the factorial of a number.

**WEEK 12**

**Objective:** Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers

i) Write a C program to swap two numbers using call by reference.

ii) Demonstrate Dangling pointer problem using a C program.

**WEEK13**

**Objective:** To understand data files and file handling with various file I/O functions. Explore the differences between text and binary files.

i) Write a C program to write and read text into a file.

ii) Write a C program to write and read text into a binary file using fread() and fwrite().

iii) Find no. of lines, words and characters in a file

**Textbooks:**

1. Ajay Mittal, Programming in C: A practical approach, Pearson.

2. Byron Gottfried, Schaum' s Outline of Programming with C, McGraw Hill

**Reference Books:**

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PrenticeHall of India

2. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

**CSE155 HEALTH AND WELLNESS, YOGA AND SPORTS**

| L | T | P | C |
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**Course Objectives:**
The main objective of introducing this course is to help students maintain mental and physical wellness by balancing emotions in their lives. It primarily enhances the essential traits required for personality development.

**Course Outcomes:**
After completion of the course, the student will be able to:

- **CO1:** Understand the importance of yoga and sports for physical fitness and sound health.
- **CO2:** Demonstrate an understanding of health-related fitness components.
- **CO3:** Compare and contrast various activities that help enhance their health.
- **CO4:** Assess current personal fitness levels.
- **CO5:** Develop a positive personality.

**UNIT I**

**Concept of Health and Fitness:**
Nutrition and balanced diet, basic concept of immunity, relationship between diet and fitness, globalization and its impact on health, Body Mass Index (BMI) for all age groups.

**Activities:**

1. Organizing health awareness programs in the community.
2. Preparation of health profiles.
3. Preparation of a chart for a balanced diet for all age groups.

**UNIT II**

**Concept of Yoga:**
Need for and importance of yoga, origin and history of yoga in the Indian context, classification of yoga, physiological effects of Asanas, Pranayama and meditation, stress management through yoga, mental health, and yoga practice.

**Activities:**

- Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar.

**UNIT III**

**Concept of Sports and Fitness:**
Importance, fitness components, history of sports, ancient and modern Olympics, Asian Games, and Commonwealth Games.

**Activities:**

1. Participation in one major game and one individual sport (e.g., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table Tennis, Cricket, etc.).
2. Practicing general and specific warm-up, aerobics.
3. Practicing cardiorespiratory fitness, treadmill, run tests, 9-minute walk, skipping, and running.
4.

**Reference Books:**

a. Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edition, Jones & Bartlett Learning,

2022.
b. T.K.V. Desikachar. The Heart of Yoga: Developing a Personal Practice.
c. Archie J. Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993.
d. Wiseman, John Lofty. SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere, Third Edition, William Morrow Paperbacks, 2014.
e. The Sports Rules Book, Human Kinetics with Thomas Hanlon, 3rd Edition, Human Kinetics, Inc., 2014.

**General Guidelines:**

1. Institutes must assign slots in the timetable for Health/Sports/Yoga activities.
2. Institutes must provide fields/facilities and offer a minimum of five choices of games/sports.
3. Institutes are required to provide sports instructors or yoga teachers to mentor the students.

**Evaluation Guidelines:**

a. Evaluated for a total of 100 marks.
b. A student can select 6 activities of their choice, with a minimum of 1 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totaling 90 marks.
c. A student shall be evaluated by the concerned teacher for 10 marks through a viva voce.

## CSE 121 DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Objectives:**

- To enable students to understand the fundamental concepts of chemistry and provide them with the knowledge to address industrial problems and find solutions.
- To familiarize students with engineering chemistry and its applications, developing analytical thinking abilities and skills for sustainable development.
- To strengthen basic concepts of bonding models, advanced engineering materials, and applications of electrochemistry, batteries, and polymers.
- To introduce instrumental methods and their applications.
- To impart a scientific approach and familiarize students with the applications of chemistry in the field of technology.

**Course Outcomes:**

At the end of the course, the student will be able to:

- **CO1:** Solve differential equations related to various engineering fields.
- **CO2:** Identify solution methods for partial differential equations that model physical processes.
- **CO3:** Interpret the physical meaning of different operators such as gradient, curl, and divergence.
- **CO4:** Estimate the work done against a field, circulation, and flux using vector calculus.

**UNIT I: Differential Equations of First Order and First Degree**

Linear differential equations – Bernoulli's equations – Exact equations and equations reducible to exact form.

**Applications:**

Orthogonal trajectories (Cartesian and polar form), Newton's Law of Cooling, Law of Natural Growth and Decay.

**UNIT II: Linear Differential Equations of Higher Order**

Definitions of homogeneous and non-homogeneous equations, complementary function, general solution, and particular integrals of types $e^{ax}$, $\sin ax \cos ax$, $x^k$, $e^{ax}v$, $x^k v$,

**Application:**

Wronskian, Method of Variation of Parameters, Equations reducible to linear ODEs with constant coefficients, Cauchy-Euler equation, Legendre's equation.

**UNIT III: Partial Differential Equations**

Introduction and formation of partial differential equations by elimination of arbitrary constants and arbitrary functions. Solutions of First-order linear equations using Lagrange's method, homogeneous linear partial differential equations with constant coefficients.

**UNIT IV: Vector Differentiation**

Scalar and vector point functions, vector operator Del, Del applied to scalar point functions – Gradient, Directional Derivative; Del applied to vector point functions – Divergence and Curl. Solenoidal, Irrotational Vector, Scalar Potential Functions, Vector Identities.

**UNIT V: Vector Integration**

Line integral (circulation and work done), surface integral, volume integral.

**Theorems (without proof):** Green's Theorem in the plane. Stokes' Theorem. Divergence Theorem.
**Applications:** Related problems.

**Textbooks:**

1. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, 2017, 44th Edition.
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

**Reference Books:**

1. Thomas Calculus, George B. Thomas, Maurice D. Weir, and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, Dennis G. Zill and Warren S. Wright, Jones and Bartlett, 2018.
3. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021, 5th Edition (9th reprint).
4. Higher Engineering Mathematics, B. V. Ramana, McGraw Hill Education, 201.

**CSE 122** **ENGINEERING CHEMISTRY**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Objectives:**

1. To enable students to understand the fundamental concepts of chemistry.
2. To provide students with knowledge of industrial problems and their solutions.
3. To familiarize students with engineering chemistry and its applications, while developing analytical thinking abilities and skills for sustainable development.
4. To strengthen the basic concepts of bonding models, advanced engineering materials, and applications of electrochemistry, batteries, and polymers.
5. To introduce instrumental methods and their applications.
6. To impart a scientific approach and familiarize students with the applications of chemistry in the field of technology.

**Course Outcomes:**

At the end of the course, the student will be able to:

- **CO1:** Explain the preparation, properties, and applications of thermoplastics, thermosetting plastics, elastomers, and conducting polymers.
- **CO2:** Compare the materials of construction for batteries and electrochemical sensors.
- **CO3:** Summarize the fundamentals of bonding models and molecular orbital energy diagrams for molecules.
- **CO4:** Explain the principles of spectrometry and summarize the concepts of instrumental methods.
- **CO5:** Apply the principles of band diagrams to the application of conductors and semiconductors, and the synthesis of nanomaterials.

**UNIT I: Polymer Chemistry**

**Introduction to Polymers:** Functionality of monomers, chain growth and step-growth polymerization, coordination polymerization with specific examples, and mechanisms of polymer formation.

**Plastics:** Thermoplastics and thermosetting plastics – preparation, properties, and applications of PVC, Teflon, Bakelite, and Nylon-6,6.

**Elastomers:** Buna-S, Buna-N – preparation, properties, and applications.

**Conducting Polymers:** Polyacetylene, polyaniline – mechanism of conduction and applications.

**Bio-Degradable Polymers:** Poly Glycolic Acid (PGA), Poly Lactic Acid (PLA).

**UNIT II: Electrochemistry and Applications**

**Electrochemical Cell:** Nernst equation, cell potential calculations, and numerical problems.

**Potentiometry:** Potentiometric titrations (redox titrations).

**Conductivity:** Concept of conductivity, conductivity cell, and conductometric titrations (acid-base titrations).

**Electrochemical Sensors:** Potentiometric sensors with examples.

**Battery Technology:** Primary cells – Zinc-air battery. Secondary cells – Lithium-ion batteries (working principles and cell reactions). Fuel cells – Hydrogen-oxygen fuel cell (working principles).

**UNIT III: Structure and Bonding Models**

**Valence Bond Theory:** Hybridization and types of hybridizations.

**Molecular Orbital Theory:** Bonding in homo- and heteronuclear diatomic molecules. Energy level diagrams of H2, B2, O2, CO, and NO. π-molecular orbitals of butadiene and benzene, calculation of bond order.

**UNIT IV: Instrumental Methods and Applications**

**Electromagnetic Spectrum:** Absorption of radiation and Beer-Lambert's law.

**UV-Visible Spectroscopy:** Electronic transitions and instrumentation.

**IR Spectroscopy:** Fundamental modes, selection rules, and instrumentation.

**Chromatography:** Basic principles, classification, HPLC (principles, instrumentation, and applications).

**UNIT V: Modern Engineering Materials**

**Semiconductors:** Introduction, basic concepts, and applications.

**Superconductors:** Introduction, basic concepts, and applications.

**Supercapacitors:** Introduction, basic concepts, classification, and applications.

**Nanomaterials:** Introduction, classification, properties, and applications of fullerenes, carbon nanotubes, graphene, and nanoparticles.

**Textbooks:**

1. Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013.
2. Peter Atkins, Julio de Paula, and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.
3. Prasanta Rath, S. Aruna Kumari, Engineering Chemistry, CENGAGE Learning.
4. Shikha Agarwal, Engineering Chemistry Fundamentals and Applications, Cambridge, 2nd Edition.

**Reference Books:**

1. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
2. J.D. Lee, Concise Inorganic Chemistry, 5th Edition, Wiley Publications, Feb. 2008.
3. Fred W. Billmayer Jr, Textbook of Polymer Science, 3rd Edition.
4. Dr. S.S. Dara and Dr. S.S. Umare, A Textbook of Engineering Chemistry, S. Chand Publication, 2022.

**CSE 123 BASIC ELECTRICAL & ELECTRONICS ENGINEERING**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Objectives**

To expose to the field of electrical & electronics engineering, laws and principles of electrical/ electronic engineering and to acquire fundamental knowledge in the relevant field. To teach the fundamentals of semiconductor devices and its applications**.**

**Course Outcomes:** After the completion of the course students will be able to
CO1. Apply mathematical tools and fundamental concepts to derive various equations related to electrical circuits.
CO2. Describe fundamental laws, operating principles of motors/generators, MC / MI instruments
CO3. Demonstrate the working of electrical machines, measuring instruments and power generation stations.
CO4. Calculate electrical load and electricity bill of residential and commercial buildings.
CO5. Describe the fundamentals of semiconductor devices and its applications.

**UNIT I DC & AC Circuits**
**DC Circuits:** Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Simple numerical problems.
**AC Circuits:** A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Power factor (Simple Numerical problems).

**UNIT II Machines and Measuring Instruments**
**Machines:** Construction, principle and operation of (i) DC Machines (ii) Single Phase Transformer, (iii) Three Phase Induction Motor and Applications of electrical machines.
**Measuring Instruments:** Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments.

**UNIT III Energy Resources, Electricity Bill & Safety Measures**
**Energy Resources:** Concept of Conventional and non-conventional energy resources; Layout and operation of Conventional Power Generation systems: Thermal and Nuclear.
**Electricity bill:** Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

**UNIT IV SEMICONDUCTOR DEVICES**
**Introduction** - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier.

**UNIT V BASIC ELECTRONIC CIRCUITS AND INSTRUMENTTAION**

**Rectifiers and power supplies**: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. **Amplifiers**: Block diagram of Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response. Electronic Instrumentation: Block diagram of an electronic instrumentation system.

**Textbooks:**


1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition
4. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
5. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009


**Reference Books:**


1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019, Fourth Edition
2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020
3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017
4. Basic Electrical and Electronics Engineering, S. K. Bhatacharya, Person Publications, 2018, Second Edition.
5. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.
6. Santiram Kal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.
7. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009


**Web Resources:**

1. https://nptel.ac.in/courses/108105053
2. https://nptel.ac.in/courses/108108076

**CSE 124** **ENGINEERING GRAPHICS**

| L | T | P | C |
|---|---|---|---|
| 1 | 0 | 4 | 3 |

**Course Outcomes:**

- **CO1:** Understand the principles of engineering drawing, including engineering curves, scales, orthographic, and isometric projections.
- **CO2:** Draw and interpret orthographic projections of points, lines, planes, and solids in front, top, and side views.
- **CO3:** Understand and draw projections of solids in various positions in the first quadrant.
- **CO4:** Explain the principles behind the development of surfaces.
- **CO5:** Prepare isometric and perspective sections of simple solids.

**UNIT I: Introduction**

**Lines, Lettering, and Dimensioning:** Geometrical constructions and constructing regular polygons using general methods.

**Curves:** Construction of ellipse, parabola, and hyperbola using general methods. Cycloids, involutes, normal, and tangents to curves.

**UNIT II: Orthographic Projections**

**Reference Planes:** Importance of reference lines or planes, projections of a point situated in any one of the four quadrants.

**Projections of Straight Lines:** Straight lines parallel to both reference planes, Straight lines perpendicular to one reference plane and parallel to the other, Straight lines inclined to one reference plane and parallel to the other., Straight lines inclined to both reference planes.

**Projections of Planes:** Regular planes perpendicular to both reference planes., Regular planes parallel to one reference plane and inclined to the other, Planes inclined to both reference planes.

**UNIT III: Projections of Solids**

**Types of Solids:** Polyhedra and solids of revolution.

**Projections of Solids:** Solids with the axis perpendicular to the horizontal plane. Solids with the axis perpendicular to the vertical plane. Solids with the axis parallel to both reference planes. Solids with the axis inclined to one reference plane and parallel to the other.

**UNIT IV: Sections and Development of Solids**

**Sections of Solids:** Perpendicular and inclined section planes. Sectional views and true shapes of sections. Sections of solids in simple positions.

**Development of Surfaces:** Methods of development: Parallel line and radial line development. Development of a cube, prism, cylinder, pyramid, and cone.

**UNIT V: Conversion of Views**

Conversion of isometric views to orthographic views. Conversion of orthographic views to isometric views.

**Textbook:**

1. N.D. Bhatt, Engineering Drawing, Charotar Publishing House, 2016.

**Reference Books:**

1. K.L. Narayana and P. Kannaiah, Engineering Drawing, Tata McGraw Hill, 2013.
2. M.B. Shah and B.C. Rana, Engineering Drawing, Pearson Education Inc., 2009.
3. Dhananjay Jolhe, Engineering Drawing with an Introduction to AutoCAD, Tata McGraw Hill, 2017.

**CSE 125** **PYTHON PROGRAMMING**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Objectives:**

- Understand structure and data types of python script.
- Implement iterations and functions in python.
- Implement modules and data structures using mutable & immutable objects.
- Understand object-oriented concepts on real world scenarios.
- Understand packages for statistics and gaming.

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

- Understand program structure python REPL shell environment.
- Implement iterators and functions for data processing.
- Implement different modules and objects to organize data.
- Implement different data structures and their functionalities.
- Understand Object oriented concepts and handle different errors through exceptions.

**UNIT I**

**Introduction:** History of Python, Features of Python, Applications, Python Using the REPL (Shell), Running Python Scripts, Variables, Assignment forms, Keywords, Input-Output, Indentation.

**Operators and Type Conversion:** Data Types: Numeric, Booleans, Sequence, Strings, Operators, Type conversions, Expressions.

**UNIT II**

**Control Flow:** Control Flow- if, if-elif-else, for, while, break, continue, pass.

**Functions:** Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables, Anonymous Functions, Lambdas, map, reduce and filter.

**UNIT III**

**Modules:** Creating modules, import statement, from Import statement, name space, builtin modules- os, random, math, json, request, date, RegEx, itertools.

**Packages:** Introduction to PIP, installing packages using PIP.

**Exploring Data Science Libraries:** NumPy, Pandas, Matplotlib

**UNIT IV**

**Strings & Data Structures:** String, String Formatting, List, String and List Slicing, Tuple, Sets, Frozen Sets, Dictionaries, Comprehensions, Built-in methods of all sequences.

**Object Oriented Programming OOP in Python:** Classes, 'self-variable', Methods, Constructor, Inheritance, Polymorphism, and Data Abstraction.

**UNIT V**

**Files:** Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules.

**Errors and Exceptions:** Syntax Errors, Exceptions, Exception Handlers, Raising Exceptions, User defined Exceptions

**Textbooks:**

1. Python Programming: Using Problem Solving Approach by Reema Theraja, Oxford publications.
2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson.

**Reference Books:**

1. Fundamentals of Python by Kenneth H Lambert, Cengage
2. Learning Python, Mark Lutz, Orielly.
3. Python Programming by Ashok N Kamathane, McGrawhill

**CSE 161** **ENGINEERING CHEMISTRY LAB**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Course Outcomes (COs)**

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

- **CO1**: Determine the cell constant and conductance of solutions.
- **CO2**: Prepare advanced polymer materials like Bakelite.
- **CO3**: Measure the strength of an acid present in secondary batteries.
- **CO4**: Analyze the IR spectra of some organic compounds.
- **CO5**: Calculate the strength of acid in a Pb-Acid battery.

**List of Experiments**

1. Determination of temporary and permanent hardness of water using standard EDTA solution.
2. Measurement of 10Dq by spectrophotometric method.
3. Conductometric titration of a strong acid vs. strong base.
4. Conductometric titration of a weak acid vs. strong base.
5. Determination of cell constant and conductance of solutions.
6. Potentiometry: Determination of redox potentials and EMFs.
7. Determination of the strength of an acid in a Pb-Acid battery.
8. Preparation of Bakelite.
9. Verify Lambert-Beer's law.
10. Wavelength measurement of a sample through UV-Visible spectroscopy.
11. Identification of simple organic compounds using IR spectroscopy.
12. Preparation of nanomaterials by the precipitation method.
13. Estimation of ferrous iron by dichrometry.
14. Determination of alkalinity of a sample containing Na2CO3and NaOH.
15. Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).
16. Determination of Mn2 using standard oxalic acid solution.

**Note**: At least **10 experiments** must be completed for assessment in a semester.

**Reference**

- **"Vogel's Quantitative Chemical Analysis (6th Edition)"**
  Pearson Publications by J. Mendham, R.C. Denney, J.D. Barnes, and B. Sivasankar.

**CSE 162 ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 3 | 1.5 |

**Course Objectives:**

- To impart knowledge on the fundamental laws of electrical circuits, functions of electrical machines and energy calculations. To impart knowledge on the principles of digital electronics and fundamentals of electron devices & its applications.

**Course Outcomes:**

After competition of this course, the student will be able to
**CO1.** Measure voltage, current, power and energy in an electrical circuit.
**CO2.** Wiring of simple circuits.
**CO3.** Identify the cut sections of the machines
**CO4**. Understand the fundamentals of semiconductor devices and its applications.
**CO5.** Explain the operation of a digital circuit.
**Activities:**

1. Familiarization of commonly used Electrical & Electronic Workshop Tools: Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.
   - Provide some exercises so that hardware tools and instruments are learned to be used by the students.
2. Familiarization of Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.
   - Provide some exercises so that measuring instruments are learned to be used by the students.
3. Components:
   - Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, colour coding package, symbol, cost etc.
   - Testing of components like Resistor, Capacitor, Diode, Transistor, ICs etc. - Compare values of components like resistors, inductors, capacitors etc with the measured values by using instruments

**List of experiments:**

1. Verification of KCL and KVL
2. Wiring of a simple circuit for controlling a lamp
3. Familiarity with different types of connections: (1) series (2) Parallel (3) Series and Parallel (4) Two way switch
4. Measurement of Voltage, current, Power and energy in a single phase circuit (Energy Meter)
5. Demonstration of cut sections of machines: DC Machines and ac Machines
6. Measurement of Earth Resistance using Megger
7. Calculation of Electrical Energy for Domestic Premises
8. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
9. Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
10. Implementation of half wave and full wave rectifiers
11. Plot Input & Output characteristics of BJT in CE and CB configurations

12. Frequency response of CE amplifier.
13. Simulation of RC coupled amplifier with the design supplied
14. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs.
15. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs.

Tools / Equipment Required: DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices.

**Reference Books:**

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition
4. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, PearsonEducation, 2021.
5. R. P. Jain, Modern Digital Electronics, 4$^{th}$ Edition, Tata Mc Graw Hill, 2009
6. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version,Pearson Education,2009.

**CSE 163** **PYTHON PROGRAMMING LAB**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 3 | 1.5 |

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

- Understand the working environment of Python and its program structure.
- Implement conditional and iterative statements.
- Create custom modules and functions to handle different operations.
- Implement Object oriented concepts through real time scenarios and handle errors.

**Week-1**

i)Write a python script to read using input() and display using print() functions.
ii)Write a python script to make use of all conversion functions.

**Week-2**

i)Write a python script to take five subject marks and print the grade for the student.
ii)Write the python script to print whether the roots are equal, distinct or complex for given coefficients a, b and c for quadratic equation.

**Week-3**

i)Write a program to take input as integer N and check whether N is Pronic Number or not. (Product of two consecutive numbers is pronic N(N+1): Eg 110 = 10*11)
ii)Write a python script to take input as amount in rupees R and find out the least number of notes N that can be possible to store in a Wallet.(Hint Notes: 2000,500,200,100,50,20,10) Eg: R=2589, N=5
iii)Write a program to check whether given number N is N-Series(Disarium) number or not. (Eg. 135 is N-Series Number because 11 +32 +53 = 135 and some others are 89, 175, 518 etc).

**Week-4**

i)Write a python script to print the different shapes (Half Pyramid, Inverted Half Pyramid, Hallow Inverted Half Pyramid etc… ) using *.
ii)Using Recursion, Write a program to take input as vehicle Number N and check whether N is Fancy number or not. (Folding of digits of number should be 9)

**Week-5**

i)Create a module named “CIET” and create functions addStudent, removeStudent, searchStudent. Access the above module using import statement.
ii)Write a python script using lambdas, to take input as String, and sort the string SS in descending/ascending order according to their frequency of its occurrences of characters. (Eg.S='missisippi', SS=ispm)

**Week-6**

i)Write a python script to take input as number N, and find out the largest number L , that can be formed with N.Eg. N=679, P={679,697,769,796,967,976}, L = 976.
ii)Write a python script to take input as list, L and print output as largest number L and total combinations C for given N digit number formed by the combination of L.(Eg. L=[1,2,1,4], N=3, L=421,C=12).

**Week-7**

i)Write a python script to take two string S1 and S2 and perform all the string operations.
ii) Write a python script to take input as multi-line string and find the sum of all numbers in that string using re module. (Eg. S=”he11o they are 40students in97 room of 4th line”, Sum= 151)

**Week-8**

i)Using Python OOPS, create a class, constructor, method, __str__ and __repr__ for:
a) Employee
b) Student.

**Week-9**

i)Write a python program to implement Exception Handling Techniques.
ii)Create a user defined Exception named “Validate” and raise the exception "Person is not eligible to vote".

**Week-10**

i)Using NumPy, implement different matrix operations in python.
ii)Using pandas, read the data from any text files.

**CSE 164** **IT Workshop**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Course Objectives**

- To introduce the internal parts of a computer, peripherals, I/O ports, and connecting cables.
- To demonstrate configuring the system as a dual boot with both Windows and other operating systems.
- To teach basic command-line interface commands on Linux.
- To teach the usage of the Internet for productivity and self-paced life-long learning.
- To introduce compression, multimedia, antivirus tools, and office tools such as word processors, spreadsheets, and presentation tools.

**Course Outcomes**

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

- Perform hardware troubleshooting.
- Understand hardware components and their interdependencies.
- Safeguard computer systems from viruses/worms.
- Prepare documents and presentations.
- Perform calculations using spreadsheets.

**PC Hardware & Software Installation**

1. **Task 1:** Identify the peripherals of a computer, Components in a CPU and its Functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.
2. **Task 2:** Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.
3. **Task 3:** Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.
4. **Task 4:** Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva
5. **Task 5:** Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva .

**Internet & World Wide Web**

**Task1:** Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

**Task 2:** Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

**Task 3:** Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.
**Task 4:** Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

**LaTeX and WORD**
**Task 1 –** Word Orientation: The mentor needs to give an overview of La TeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of La TeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using La TeXand word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.
**Task 2:** Using La TeX and Word to create a project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both La TeX and Word.
**Task 3:** Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.
**Task 4:** Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

**EXCEL**

**Excel Orientation**: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, Overview of toolbars, Saving excel files, Using help and resources.
**Task 1:** Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, Auto fill, Formatting Text
**Task 2:** Calculating GPA -. Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function,
**Task 3:** Split cells, Freeze panes, Group and outline, Sorting, Boolean and logical operators, Conditional formatting

**POWERPOINT**
**Task 1:** Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.
**Task 2:** Interactive Presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.
**Task 3**: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides

**AI Tools – ChatGPT**

**Task 1:** Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them. Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"

**Task 2:** Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

**Task 3:** Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are. Ex:Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

**Explore – GitHub**

**Task 1:** Students should understand GITHUB and should possess accounts in it.

**Task 2:** Students should explore different repositories available in GITHUB and student should create his/ her own simple repositories.

**Task 3:** Students should take simple experiments /presentations and upload them in their GITHUB account.

**Task 4:** Students should understand how GITHUB Enterprise Cloud is used and also explore the GIT and GIT HUB resources.

**Reference Books**

1. Comdex Information Technology Course Toolkit, Vikas Gupta, WILEY Dreamtech, 2003.
2. The Complete Computer Upgrade and Repair Book, Cheryl A. Schmidt, WILEY Dreamtech, 2013, 3rd Edition.
3. Introduction to Information Technology, ITL Education Solutions Limited, Pearson Education, 2012, 2nd Edition.
4. PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft).
5. LaTeX Companion, Leslie Lamport, PHI/Pearson.
6. IT Essentials PC Hardware and Software Companion Guide, David Anfins and Ken Quamme, CISCO Press, Pearson Education, 3rd Edition.
7. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan, CISCO Press, Pearson Education, 3rd Edition.
8. GitHub Quick Start Tutorials.

**CSE 165 NSS/NCC/SCOUTS & GUIDES /COMMUNITY SERVICE**

| L | T | P | C |
|---|---|---|---|
| - | - | 1 | 0.5 |

**Course Objectives**

The objective of introducing this course is to impart discipline, character, fraternity, teamwork, social consciousness among the students, and engage them in selfless service.

**Course Outcomes (COs)**

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

- **CO1**: Understand the importance of discipline, character, and the service motto.
- **CO2**: Solve societal issues by applying acquired knowledge, facts, and techniques.
- **CO3**: Explore human relationships by analyzing social problems.
- **CO4**: Determine to extend their help for fellow beings and the downtrodden.
- **CO5**: Develop leadership skills and civic responsibilities.

**UNIT I: Orientation**

**General Orientation** on NSS/NCC/Scouts & Guides/Community Service activities, and career guidance.

**Activities**:

1. Conducting ice-breaking sessions to discuss expectations from the course, personal talents, and skills.
2. Conducting orientation programs for students, including future plans, activities, and releasing a road map.
3. Displaying success stories, motivational biopics, and award-winning movies on societal issues.
4. Conducting talent shows such as singing patriotic songs, painting, or any other contribution.

**UNIT II: Nature & Care**

**Activities**:

1. Best out of waste competition.
2. Poster and sign-making competition to spread environmental awareness.
3. Recycling and environmental pollution article writing competition.
4. Organizing a Zero-Waste Day.
5. Digital environmental awareness activity via various social media platforms.
6. Virtual demonstration of different eco-friendly approaches for sustainable living.
7. Writing a summary of any book related to environmental issues.

**UNIT III: Community Service**

**Activities**:

1. Conducting a one-day special camp in a village by contacting village/area leaders.Survey the village, identify problems, and help solve them via media, authorities, experts, etc.
2. Conducting awareness programs on health-related issues such as general health, mental health, spiritual health, and HIV/AIDS.
3. Conducting consumer awareness programs and explaining various legal provisions.
4. Women empowerment programs addressing sexual abuse, adolescent health, and population education.
5. Organizing other programs in collaboration with local charities, NGOs, etc.

**Reference Books**

1. Nirmalya Kumar Sinha & Surajit Majumder, *A Textbook of National Service Scheme, Vol. I*, Vidya Kutir Publication, 2021 (ISBN: 978-81-952368-8-6).
2. *Red Book - National Cadet Corps: Standing Instructions Vol. I & II*, Directorate General of NCC, Ministry of Defence, New Delhi.
3. Davis, M.L., & Cornwell, D.A., *Introduction to Environmental Engineering*, McGraw Hill, New York, 4/e, 2008.
4. Masters, G.M., Joseph, K., & Nagendran, R., *Introduction to Environmental Engineering and Science*, Pearson Education, New Delhi, 2/e, 2007.
5. Ram Ahuja, *Social Problems in India*, Rawat Publications, New Delhi.

**General Guidelines**

1. Institutes must assign slots in the timetable for the activities.
2. Institutes are required to provide instructors to mentor the students.

**Evaluation Guidelines**

- The course is evaluated for a total of **100 marks**.
- A student can select **6 activities** of their choice, with a minimum of **one activity per unit**. Each activity will be evaluated by the concerned teacher for **15 marks**, totaling **90 marks**.
- A viva voce will be conducted by the concerned teacher for **10 marks** on the subject.

**II Year I Semester**

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## MATHEMATICAL FOUNDATION FOR COMPUTER SCIENCE
**(Common to CAI/CSM/CSE/CDS/CIT/CSC)**

**Course Objectives:**

- To introduce the students to the topics and techniques of discrete methods and combinatorial reasoning.
- To introduce a wide variety of applications. The algorithmic approach to the solution of problems is fundamental in discrete mathematics, and this approach reinforces the close ties between this discipline and the area of computer science.

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

1. Build skills in solving mathematical problems (L3)
2. Comprehend mathematical principles and logic (L4)
3. Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software (L6)
4. Manipulate and analyze data numerically and/or graphically using appropriate Software(L3)
5. How to communicate effectively mathematical ideas/results verbally or in writing (L1)

**UNIT–I: Mathematical Logic: (10Hours)**

Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof, Predicate Calculus: Predicates, Predicative Logic, Statement Functions.

**UNIT-II: Set Theory: (9 Hours)**

Sets: Operations on Sets, Principle of Inclusion-Exclusion, Relations: Properties, Operations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering, Hasse Diagrams, Functions: Bijective, Composition, Inverse, Permutation, and Recursive Functions, Lattice and its Properties.

**UNIT-III: Combinatorics and Recurrence Relations: (8 Hours)**

Basis of Counting, Permutations, Permutations with Repetitions, Circular and Restricted Permutations, Combinations, Restricted Combinations, Binomial and Multinomial Coefficients and Theorems.

**Recurrence Relations:**

Generating Functions, Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions.

**UNIT-IV: Graph Theory: ( 8 Hours)**

Basic Concepts, Graph Theory and its Applications, Subgraphs, Graph Representations: Adjacency and Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs,

**Unit-V: Multi Graphs (9 Hours )**

Multigraphs, Bipartite and Planar Graphs, Euler's Theorem, Graph Colouring and Covering, Chromatic Number, Spanning Trees, Prim's and Kruskal's Algorithms, BFS and DFS Spanning Trees.

**TEXT BOOKS:**

1. Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.

**REFERENCE BOOKS:**

1. Discrete Mathematics for Computer Scientists and Mathematicians, J. L.Mott, A. Kandel and T. P. Baker, 2nd Edition, Prentice Hall of India.
2. Discrete Mathematical Structures, Bernand Kolman, Robert C. Busby and Sharon Cutler Ross, PHI.
3. Discrete Mathematics, S. K. Chakraborthy and B.K. Sarkar, Oxford, 2011.
4. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K.H. Rosen, 7th Edition, Tata McGraw Hill.

**II Year I Semester**

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## UNIVERSAL HUMAN VALUES

**(Common to CAI/CSM/CSE/CDS/CIT/CSC/ECE/EEE)**

**Course Objectives:**

- To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

**Course Outcomes:**

- Define the terms like Natural Acceptance, Happiness and Prosperity (L1, L2)
- Identify one's self, and one's surroundings (family, society nature) (L1, L2)
- Apply what they have learnt to their own self in different day-to-day settings in real life (L3)
- Relate human values with human relationship and human society. (L4)
- Justify the need for universal human values and harmonious existence (L5)
- Develop as socially and ecologically responsible engineers (L3, L6)

**Course Topics**

The course has 28 lectures and 14 tutorials in 5 modules. The lectures and tutorials are of 1-hour duration. Tutorial sessions are to be used to explore and practice what has been proposed during the lecture sessions.

The Teacher's Manual provides the outline for lectures as well as practice sessions. The teacher is expected to present the issues to be discussed as propositions and encourage the students to have a dialogue.

**UNIT I** Introduction to Value Education (6 lectures and 3 tutorials for practicesession)

Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)

Lecture 2: Understanding Value Education

Tutorial 1: Practice Session PS1 Sharing about Oneself

Lecture 3: self-exploration as the Process for Value Education
Lecture4: Continuous Happiness and Prosperity – the Basic Human Aspirations
Tutorial 2: Practice Session PS2 Exploring Human Consciousness
Lecture 5: Happiness and Prosperity – Current Scenario
Lecture 6: Method to Fulfill the Basic Human Aspirations
Tutorial 3: Practice Session PS3 Exploring Natural Acceptance

**UNIT II** Harmony in the Human Being (6 lectures and 3 tutorials for practice session)
Lecture 7: Understanding Human being as the Co-existence of the self and the body.
Lecture 8: Distinguishing between the Needs of the self and the body
Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body.
Lecture 9: The body as an Instrument of the self
Lecture 10: Understanding Harmony in the self
Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self
Lecture 11: Harmony of the self with the body
Lecture 12: Programme to ensure self-regulation and Health
Tutorial 6: Practice Session PS6 Exploring Harmony of self with the body

**UNIT III** Harmony in the Family and Society (6 lectures and 3 tutorials for practice session)
Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction
Lecture 14: 'Trust' – the Foundational Value in Relationship
Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust
Lecture 15: 'Respect' – as the Right Evaluation
Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect
Lecture 16: Other Feelings, Justice in Human-to-Human Relationship
Lecture 17: Understanding Harmony in the Society
Lecture 18: Vision for the Universal Human Order
Tutorial 9: Practice Session PS9 Exploring Systems to fulfil Human Goal

**UNIT IV** Harmony in the Nature/Existence (4 lectures and 2 tutorials for practicesession)
Lecture 19: Understanding Harmony in the Nature
Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature
Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature
Lecture 21: Realizing Existence as Co-existence at All Levels
Lecture 22: The Holistic Perception of Harmony in Existence
Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence.

**UNIT V** Implications of the Holistic Understanding – a Look at Professional Ethics (6 lectures and 3 tutorials for practice session)
Lecture 23: Natural Acceptance of Human Values
Lecture 24: Definitiveness of (Ethical) Human Conduct
Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct
Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order
Lecture 26: Competence in Professional Ethics
Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education
Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies
Lecture 28: Strategies for Transition towards Value-based Life and Profession
Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

Practice Sessions for UNIT I – Introduction to Value Education
PS1 Sharing about Oneself
PS2 Exploring Human Consciousness
PS3 Exploring Natural Acceptance

Practice Sessions for UNIT II – Harmony in the Human Being
PS4 Exploring the difference of Needs of self and body
PS5 Exploring Sources of Imagination in the self
PS6 Exploring Harmony of self with the body

Practice Sessions for UNIT III – Harmony in the Family and Society
PS7 Exploring the Feeling of Trust
PS8 Exploring the Feeling of Respect
PS9 Exploring Systems to fulfil Human Goal

Practice Sessions for UNIT IV – Harmony in the Nature (Existence)
PS10 Exploring the Four Orders of Nature
PS11 Exploring Co-existence in Existence

Practice Sessions for UNIT V – Implications of the Holistic Understanding – a Look at Professional Ethics
PS12 Exploring Ethical Human Conduct
PS13 Exploring Humanistic Models in Education
PS14 Exploring Steps of Transition towards Universal Human Order

**READINGS:**

**Textbook and Teachers Manual**

a. The Textbook

R R Gaur, R Asthana, G P Bagaria, *A Foundation Course in Human Values and Professional Ethics*, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

b. The Teacher's Manual

R R Gaur, R Asthana, G P Bagaria,*Teachers' Manual for A Foundation Course in Human Values and Professional Ethics*, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

**Reference Books**

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj – PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

**Mode of Conduct:**

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.

Tutorial hours are to be used for practice sessions.

While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration.

Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included.

The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.
It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses. This course is to be taught by faculty from every teaching department, not exclusively by any one department.
Teacher preparation with a minimum exposure to at least one 8-day Faculty Development Program on Universal Human Values is deemed essential.

**Online Resources:**

1. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf
2. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf
3. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf
4. https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-S2%20Respect%20July%2023.pdf
5. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf
6. https://fdp-si.aicte-india.org/download/FDPTeachingMaterial/3-days%20FDP-SI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-S2A%20Und%20Nature-Existence.pdf
7. https://fdp-si.aicte-india.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%2023-25%20Ethics%20v1.pdf
8. https://www.studocu.com/in/document/kiet-group-of-institutions/universal-human-values/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385
9. https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

**II Year I Semester**

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## DIGITAL LOGIC DESIGN
**(Common to CSE/CSC/CIT)**

**Course Objectives:**

1. Understand number systems and perform conversions between them.
2. Analyze and minimize Boolean functions using K-maps and logic identities.
3. Design combinational and sequential logic circuits.
4. Explore programmable logic devices such as ROM, PLA, and PAL.
5. Understand basics of digital computing systems and arithmetic circuits.

**Course Outcomes:**

1. Convert between various number systems including binary, octal, hexadecimal, and BCD.
2. Minimize Boolean expressions using Karnaugh maps and implement using logic gates.
3. Design combinational circuits such as multiplexers, encoders, decoders, and arithmetic units.
4. Construct sequential logic circuits including flip-flops, counters, and registers.
5. Understand and implement programmable logic and the basics of digital computer systems.

**UNIT I: Introduction to Digital Design** **8 Hours**

What is Digital Design?, Specification and Implementation of Digital Systems, Structured Design Approaches (Trial-and-Error, CAD tools), Binary, Octal, Hexadecimal, BCD, and Number System Conversions, Digital Logic Characterization: Fan-in/Fan-out, Noise Margins, Switching Times

**UNIT II: Boolean Algebra and Logic Gates** **10 Hours**

Basic Logic Gates: AND, OR, NOT, NAND, NOR, XOR, Boolean Laws and DeMorgan's Theorems, Canonical SOP/POS Forms, Karnaugh Maps 2, 3, 4 variables, Minimization of Expressions and Implementation using Gates, Multiple Output Two-Level Gate Networks

**UNIT III: Combinational Logic Design** **9 Hours**

Design of Adders, Subtractors, Multipliers, Multiplexers, Demultiplexers, Encoders, Decoders, Seven Segment Display, Priority Encoders, Comparators, HDL Modelling of Combinational Circuits, Realization Using PROM, PAL, and PLA

**UNIT IV: Sequential Logic Design** **8 Hours**

Flip-Flops: SR, D, T, JK; Master-Slave and Edge Triggered, Flip-Flop Conversions, State Diagrams and State Tables, Counters: Ripple, Synchronous, Ring, Johnson, Registers and Shift Registers, Applications: Clock Division, Sequence Detectors

**UNIT V: Programmable Logic & Digital Computing** **10 Hours**

Introduction to Programmable Logic Device, ROM, PLA, PAL Design and Applications Arithmetic Circuits: Adders, Subtractors, Multipliers, Memory Organization: RAM, ROM, Basic Structure of Digital Computers.

**Text Books**

1. Digital Design, 5/e, M. Morris Mano, Michael D. Ciletti, Pearson Education.
2. Fundamentals of Logic Design, 5/e, Roth, Cengage Learning.

**Reference Books**

1. Digital Logic and Computer Design, M. Morris Mano, PEA.
2. Digital Logic Design, Leach, Malvino, Saha, TMH.

**II Year I Semester**

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## PROBABILITY AND STATISTICS

**(Common to CAI/CSM/CSE/CDS/CIT/CSC)**

**Course Objectives:**

- To familiarize the students with the foundations of probability and statistical methods
- To impart probability concepts and statistical methods in various applications Engineering

**Course Outcomes:** Upon successful completion of this course, the student should be able to

1. Classify the concepts of data science and its importance (L2)
2. Interpret the association of characteristics and through correlation and regression tools (L4)
3. Apply discrete and continuous probability distributions (L3)
4. Design the components of a classical hypothesis test (L6)
5. Infer the statistical inferential methods based on small and large sampling tests (L4)

**Unit – I: Descriptive statistics and methods for data science: (9 Hours)**

Data science – Statistics Introduction – Population vs Sample –Collection of data – primary and secondary data – Type of variable: dependent and independent Categorical and Continuous variables – Data visualization – Measures of Central tendency – Measures of Variability – Skewness – Kurtosis.

**UNIT – II: Correlation and Regression: (10 Hours)**

Correlation – Correlation coefficient – Rank correlation. Linear Regression: Straight line – Multiple Linear Regression - Regression coefficients and properties – Curvilinear Regression: Parabola – Exponential – Power curves.

**UNIT – III: Probability and Distributions: (9 Hours)**

Probability– Conditional probability and Baye's theorem – Random variables – Discrete and Continuous random variables – Distribution functions – Probability mass function, Probability density function and Cumulative distribution functions – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions.

**UNIT – IV: Sampling Theory: (8 Hours)**

Introduction – Population and Samples – Sampling distribution of Means and Variance (definition only) – Point and Interval estimations – Maximum error of estimate – Centrallimit theorem (without proof) – Estimation using $\chi^2$, t, and F-distributions.

**UNIT – V: Tests of Hypothesis: (9 Hours)**

Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One tail and two-tail tests – Test of significance for large samples and Small Samples: Single and difference means – Single and two proportions – Student's t- test, F-test, $\chi^2$ -test.

**Text Books:**


1) **Miller and Freund's**, Probability and Statistics for Engineers,7/e, Pearson, 2008.

2) **S. C. Gupta and V.K. Kapoor**, Fundamentals of Mathematical Statistics, 11/e,Sultan Chand & Sons Publications, 2012.


**Reference Books:**


1) **Shron L. Myers, Keying Ye, Ronald E Walpole,** Probability and StatisticsEngineers and the Scientists,8th Edition, Pearson 2007.
2) **Jay l. Devore,** Probability and Statistics for Engineering and the Sciences, 8th Edition,Cengage.
3) **Sheldon M. Ross**, Introduction to probability and statistics Engineers and theScientists, 4th Edition, Academic Foundation, 2011.
4) **Johannes Ledolter and Robert V. Hogg**, Applied statistics for Engineers andPhysical Scientists, 3rd Edition, Pearson, 2010.

**II Year I Semester**

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## DATA STRUCTURES
**(Common to CAI/CSM/CSE/CDS/CIT/CSC)**

**Course Objectives:**

The main objectives of the course is to

- To provide the knowledge of basic data structures and their implementations.
- To understand importance of data structures in context of writing efficient programs.
- To develop skills to apply appropriate data structures in problem solving

**Course Outcomes:**

At the end of the course, Student will be able to

- Ability to choose appropriate data structures to represent data items in real world
- Ability to analyze the time and space complexities of Algorithms
- Implement and know the application of algorithms for sorting and sorting
- Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in
- Graphs

**UNIT I (8 Hours)**

**Introduction to Linear Data Structures:** Definition and importance of linear data structures Overview of time and space complexity, Notations and Analysis.

**Searching Techniques:** Linear & Binary Search, Sorting Techniques: Bubble sort, Selection sort, Insertion Sort, Merge Sort Quick Sort.

**UNIT II (10 hours)**

**Stacks:** Introduction to stacks: properties and operations, implementing stacks using arrays,Applications of stacks in expression evaluation.

**Queues:** Introduction to queues: properties and operations, implementing queues using arrays, Applications of queues

**UNIT III (8 Hours )**

Linked Lists: Singly linked lists: representation and operations, doubly linked lists and circular linked lists, Comparing arrays and linked lists, Applications of linked lists.

**UNIT IV (10 hours )**

**Trees:** Introduction to Trees, Binary Search Tree – Insertion, Deletion & Traversal, AVL Trees-Insertion, Deletion, RED-BLACK TREEES, BFS, DFS,

**UNIT V (10 Hours )**

Hashing: Brief introduction to hashing and hash functions, Collision resolution techniques: chaining and open addressing, Hash tables: basic implementation and operations.

**Textbooks:**

1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Silicon Press, 2008

**Reference Books:**

1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft
3. Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein
5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms" by Robert Sedgewick

**II Year I Semester**

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## OBJECT-ORIENTED PROGRAMMING
**(Common to CAI/CSM/CSE/CDS/CIT/CSC)**

**Course Objectives:**

The learning objectives of this course are to:

- Identify Java language components and how they work together in applications
- Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
- Learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
- Understand how to design applications with threads in Java
- Understand how to use Java APIs for program development

**Course Outcomes:**

Understanding the principles of data abstraction, inheritance and polymorphism

Apply the principles of virtual functions and polymorphism

Analyzing the handling formatted I/O and unformatted.

Evaluate the I/O Introduces exception handling.

**UNIT I: Object Oriented Programming: (10 Hours)**

Basic concepts, Principles, Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.
**Data Types**, Variables, and Operators :Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final.
**Control Statements**: Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

**UNIT II: Classes and Objects: (9 Hours)**

Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this.
**Methods:** Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

**UNIT III: Arrays: (10 Hours)**

Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three- dimensional Arrays, Arrays as Vectors.

**Inheritance:** Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.

**Interfaces:** Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

**UNIT IV: Packages and Java Library: (8 Hours)**

Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto-unboxing.

**Exception Handling:** Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions.

**Java I/O and File:** Java I/O API, standard I/O streams, types, Byte streams, Character streams, Scanner class, Files in Java (Text Book 2)

**UNIT V: String Handling in Java: (8 Hours)**

Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Comparison, Modifying, Searching; Class String Buffer.

**Multithreaded Programming:** Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread-Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads. (Text Book 3)

**Text Books:**

1. JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
2. Joy with JAVA, Fundamentals of Object Oriented Programming, DebasisSamanta, MonalisaSarma, Cambridge, 2023.
3. JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

**References Books:**

1. The complete Reference Java, 11thedition, Herbert Schildt,TMH
2. Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

**Online Resources:**

1. https://nptel.ac.in/courses/106/105/106105191/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_shared/overview

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**II Year I Semester**

## DATA STRUCTURES LAB
**(Common to CAI/CSM/CSE/CDS/CIT/CSC)**

**Course Objectives:**

The course aims to strengthen the ability of the students to identify and apply the suitable data structure for the given real-world problem. It enables them to gain knowledge in practical applications of data structures.

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

CO1: Explain the role of linear data structures in organizing and accessing data efficiently in Algorithms.

CO2: Design, implement, and apply linked lists for dynamic data storage, demonstrating Understanding of memory allocation.

CO3: Develop programs using stacks to handle recursive algorithms, manage program states, and Solve related problems.

CO4: Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in Graphs and distinguish between deques and priority queues and apply them appropriately to Solve data management challenges.

CO5: Recognize scenarios where hashing is advantageous, and design hash-based solutions for Specific problems.

**List of Experiments:**

**Exercise 1: Array Manipulation**

i) Write a program to reverse an array.
ii) C Programs to implement the Searching Techniques – Linear & Binary Search
iii) C Programs to implement Sorting Techniques – Bubble, Selection and Insertion Sort

**Exercise 2: Stack Operations**

i) Implement a stack using arrays and linked lists.
ii) Write a program to evaluate a postfix expression using a stack.
iii) Implement a program to check for balanced parentheses using a stack

**Exercise 3:**
**Queue Operations**

i) Implement a queue using arrays and linked lists.
ii) Develop a program to simulate a simple printer queue system.
Iii) Solve problems involving circular queues.

**Exercise 4:**
**Stack and Queue Applications**

i) Use a stack to evaluate an infix expression and convert it to postfix.
ii) Create a program to determine whether a given string is a palindrome or not.
iii) Implement a stack or queue to perform comparison and check for symmetry

**Exercise 5:**
**Linked List Implementation**
i) Implement a singly linked list and perform insertion and deletion operations.
ii) Develop a program to reverse a linked list iteratively and recursively.
Iii) Solve problems involving linked list traversal and manipulation.

**Exercise 6:**
**Double Linked List Implementation**
i)Implement a doubly linked list and perform various operations to understand its properties and Applications.
ii) Implement a circular linked list and perform insertion, deletion, and traversal.

**Exercise 7:**
. **Linked List Applications**
i) Create a program to detect and remove duplicates from a linked list.
ii) Implement a linked list to represent polynomials and perform addition.
iii) Implement a double-ended queue (deque) with essential operations

**Exercise 8: Binary Search Tree**
i) Implementing a BST using Linked List.
ii) Traversing of BST.

**Exercise 9: Hashing**
i) Implement a hash table with collision resolution techniques.
ii) Write a program to implement a simple cache using hashing.

**Textbooks:**
1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Silicon Press, 2008

**Reference Books:**
1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft
3. Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein
5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms by Robert Sedgewick

**II Year I Semester**

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## OBJECT-ORIENTED PROGRAMMING LAB
**(Common to CAI/CSM/CSE/CDS/CIT/CSC)**

**Course Objectives:**

The aim of this course is to

- Practice object oriented programming in the Java programming language
- Implement Classes, Objects, Methods, Inheritance, Exception, RuntimePolymorphism, User defined Exception handling mechanism
- Illustrate inheritance, Exception handling mechanism, JDBC connectivity
- Construct Threads, Event Handling, implement packages, Java FX GUI

**Experiments covering the Topics:**

- Object Oriented Programming fundamentals- data types, control structures
- Classes, methods, objects, Inheritance, polymorphism,
- Exception handling, Threads, Packages, Interfaces
- Files, I/O streams.

**Sample Experiments:**

**Exercise – 1**:

a) Write a JAVA program to display default value of all primitive data type of JAVA

b) Write a java program that display the roots of a quadratic equation $ax^2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.

**Exercise - 2**

a) Write a JAVA program to search for an element in a given list of elements using binary search mechanism.

b) Write a JAVA program to sort for an element in a given list of elements using bubble sort

c) Write a JAVA program using String Buffer to delete, remove character.

**Exercise - 3**

a) Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method.

b) Write a JAVA program implement method overloading.

c) Write a JAVA program to implement constructor.

d) Write a JAVA program to implement constructor overloading.

**Exercise - 4**

a) Write a JAVA program to implement Single Inheritance

b) Write a JAVA program to implement multi level Inheritance

c) Write a JAVA program for abstract class to find areas of different shapes

**Exercise - 5**

a) Write a JAVA program give example for "super" keyword.

b) Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?

c) Write a JAVA program that implements Runtime polymorphism

**Exercise - 6**

a) Write a JAVA program that describes exception handling mechanism

b) Write a JAVA program Illustrating Multiple catch clauses

- Write a JAVA program for creation of Java Built-in Exceptions
- Write a JAVA program for creation of User Defined Exception

**Exercise - 7**

a) Write a JAVA program that creates threads by extending Thread class. First thread display "Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third display "Welcome" every 3 seconds, (Repeat the same by implementing Runnable)

**b)** Write a program illustrating **is Alive** and **join ()**

c) Write a Program illustrating Daemon Threads.

d) Write a JAVA program Producer Consumer Problem

**Exercise – 8**

1. Write a JAVA program that import and use the user defined packages

**II Year I Semester**

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## ENVIRONMENTAL SCIENCE

**(Common to CAI/CSM/CSE/CDS/CIT/CSC/ECE/EEE)**

Course Objectives:

- To make the students to get awareness on environment
- To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life
- To save earth from the inventions by the engineers.

**Course Outcomes:**

- Grasp multidisciplinary nature of environmental studies and various renewable and non-renewable resources.
- Understand flow and bio-geo-chemical cycles and ecological pyramids.
- Understand various causes of pollution and solid waste management and related preventive measures.
- About the rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation.
- Casus of population explosion, value education and welfare programmes.

### UNIT–I

Multidisciplinary Nature Of Environmental Studies: – Definition, Scope and Importance – Need for Public Awareness.

Natural Resources: Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems–Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies– Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.–Energy resources:

### UNIT–II

Ecosystems: Concept to fan ecosystem.–Structure and function of an ecosystem–Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids–Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.
b. Grassl and ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity And Its Conservation: Introduction Definition: genetic, species and ecosystem

diversity–Bio-geographical classification of India–Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts– Endangered and endemic species of India –Conservation of biodiversity:In-situand Ex-situ conservation of biodiversity.

**UNIT–III**

Environmental Pollution: Definition, Cause, effects and control measures of:

a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

**UNIT–IV**

Social Issues and the Environment: From Unsustainable to Sustainable development– Urban problems related to energy – Water conservation, rain water harvesting, watershed management –Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions–Climate change, global warming, acidrain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wastel and reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act–Wild life Protection Act–Forest Conservation Act–Issues involved in enforcement of environment allegislation–Public awareness.

**UNIT–V**

Human Population And The Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education–HIV/AIDS–Women and Child Welfare–Role of information Technology in Environment and human health–Case studies. Field Work: Visit to a local area to document environmental assets River/ forest grassland/ hill/ mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds–river, hills lopes,etc..

**Text books:**

1. Text book of Environmental Studies for Undergraduate Courses ErachBharucha for University Grants Commission, Universities Press.
2. Palaniswamy,"Environmental Studies", Pearson education

**Reference Books:**

1. Deeksha Dave and E.SaiBabaReddy, "Text book of Environmental Science", CengagePublications.
2. M.AnjiReddy,"Text book of Environmental Sciences andTechnology",BS Publication.
3. J.P.Sharma, Comprehensive Environmental studies, Laxmi publications.
4. J.GlynnHenry and GaryW.Heinke,"Environmental Sciences and Engineering", Prentice Hall of India Private limited
5. G.R.Chatwal,"A Text Book of Environmental Studies "Himalaya Publishing House
6. Gilbert M.Masters and WendellP.Ela,"Introduction to Environmental Engineering and Science, Prentice Hall of India Private limited.

**II Year II Semester**

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## ARTIFICIAL INTELLIGENCE
**(Common to CAI/CSM/CSE/CIT)**

**Pre-requisite:**

1. Knowledge in Computer Programming.
2. A course on "Mathematical Foundations of Computer Science".
3. Background in linear algebra, data structures and algorithms, and probability.

**Course Objectives:**

1. The student should be made to study the concepts of Artificial Intelligence.
2. The student should be made to learn the methods of solving problems using Artificial Intelligence.
3. The student should be made to introduce the concepts of Expert Systems.
4. To understand the applications of AI, namely game playing, theorem proving, and machine learning.
5. To learn different knowledge representation techniques

**UNIT – I (8 Hours )**

**Introduction:** AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

**UNIT – II (9 Hours)**

**Searching-** Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A* ,AO* Algorithms, Problem reduction, Game Playing-Adversial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions.

**UNIT – III (10 Hours )**

**Representation of Knowledge:** Knowledge representation issues, predicate logic- logic programming, semantic nets- frames and inheritance, constraint propagation, representing knowledge using rules, rules based deduction systems. Reasoning under uncertainty, review of probability, Bayes' probabilistic interferences and dempstershafer theory.

**UNIT – IV(9 Hours)**

**Logic concepts:** First order logic. Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution, Learning from observation Inductive learning, Decision trees, Explanation based learning, Statistical Learning methods, Reinforcement Learning.

**UNIT – V (9 Hours)**

**Expert Systems:** Architecture of expert systems, Roles of expert systems – Knowledge Acquisition Meta knowledge Heuristics. Typical expert systems – MYCIN, DART, XCON: Expert systems shells.

**Textbooks:**

1. S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach",Second Edition, Pearson Education.
2. Kevin Night and Elaine Rich, Nair B., "Artificial Intelligence (SIE)", Mc Graw Hill

**Reference Books:**

1. David Poole, Alan Mackworth, Randy Goebel,"Computational Intelligence: a logical approach", Oxford University Press.
2. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, Pearson Education.
3. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers.
4. Artificial Intelligence, Saroj Kaushik, CENGAGE Learning.

**Online Learning Resources:**

1. https://ai.google/
2. https://swayam.gov.in/nd1_noc19_me71/preview

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## DATABASE MANAGEMENT SYSTEMS
**(Common to CAI/CSM/CSE/CDS/CIT/CSC)**

**Course Objectives:**

The main objectives of the course is to

- Introduce database management systems and to give a good formal foundation on the relational model of data and usage of Relational Algebra
- Introduce the concepts of basic SQL as a universal Database language
- Demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
- Provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

**Course Outcomes:**

- Understand the basic concepts of database management systems
- Apply SQL to find solutions to a broad range of queries
- Apply normalization techniques to improve database design
- Analyze a given database application scenario to use ER model for conceptual design of the database

**UNIT I: Introduction: (10 Hours )**

Database system, Characteristics (Database Vs File System), Database Users, Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

**Entity Relationship Model:** Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.

**Unit II: Relational Model: (9 Hours)**

Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance, Relational Algebra, Relational Calculus. BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update).

**UNIT III: SQL: (9 Hours )**

Basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.

**UNIT IV: Schema Refinement (Normalization): (10 Hours)**

Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency Lossless join and dependency preserving decomposition, (1NF, 2NF and 3 NF), concept of surrogate key, Boyce-Codd normal form(BCNF), MVD, Fourth normal form(4NF), Fifth Normal Form (5NF).

**UNIT V:Transaction Concept: (9 hours)**

Transaction State, ACID properties, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, lock based, time stamp based, optimistic, concurrency protocols, Deadlocks, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.

**Introduction to Indexing Techniques:** B+ Trees, operations on B+Trees, Hash Based Indexing:

**Text Books:**

1. Database Management Systems, 3rd edition, Raghurama Krishnan, Johannes Gehrke, TMH (For Chapters 2, 3, 4)
2. Database System Concepts,5th edition, Silberschatz, Korth, Sudarsan,TMH (For Chapter 1 and Chapter 5)

**Reference Books:**

1. Introduction to Database Systems, 8thedition, C J Date, Pearson.
2. Database Management System, 6th edition, RamezElmasri, Shamkant B. Navathe, Pearson
3. Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

**Web-Resources:**

1. https://nptel.ac.in/courses/106/105/106105175/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012758066672820224 56_shared/overview

**II Year II Semester**

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## COMPUTER ORGANIZATIONS
**(Common to CSE/CIT/CSC)**

**COURSE OBJECTIVES:**
To expose the students to the following:
1. How Computer Systems work & the basic principles
2. Instruction Level Architecture and Instruction Execution
3. The current state of art in memory system design
4. How I/O devices are accessed and its principles.
5. To provide the knowledge on Instruction Level Parallelism

**Course Outcomes :**

- Able to understand the basic components and the design of CPU, ALU and Control Unit.
- Ability to understand memory hierarchy and its impact on computer cost/performance
- Ability to understand the advantage of instruction level parallelism and pipelining for high performance Processor design
- Ability to understand the instruction set, instruction formats and addressing modes

**UNIT I (8 Hours )**
Basic Functional units of Computers: Functional units, basic Operational concepts, Bus structures. Software, Performance, Multiprocessors, Multicomputer.
Data Representation: Signed number representation, fixed and floating point Representations. Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms. Error detection and correction codes.

**UNIT II (9 Hours )**
Register Transfer Language and Micro Operations: RTL- Registers, Register transfers, Bus and memory transfers. Micro operations: Arithmetic, Logic, and Shift micro operations, Arithmetic logic shift unit. Basic Computer Organization and Design: Computer Registers, Computer instructions, Instruction cycle. Instruction codes, Timing and Control, Types of Instructions: Memory Reference Instructions, Input – Output and Interrupt.

**UNIT III (10 Hours)**
Central Processing Unit organization: General Register Organization, Stack organization, Instruction formats, addressing modes, Data Transfer and Manipulation, Program Control, CISC and RISC processors Control unit design: Design approaches, Control memory, Address sequencing, micro program example, design of CU. Micro Programmed Control.

**UNIT IV (Hours)**
Memory Organization: Semiconductor Memory Technologies, Memory hierarchy, Interleaving, Main Memory-RAM and ROM chips, Address map, Associative memory-Hardware organization. Match logic. Cache memory-size vs. block size, Mapping functions-Associate, Direct, Set Associative mapping. Replacement algorithms, write policies. Auxiliary memoryMagnetic tapes etc

**UNIT V (9 Hours)**
Input –Output Organization: Peripheral devices, Input-output subsystems, I/O device interface, I/O Processor, I/O transfers–Program controlled, Interrupt driven, and DMA, interrupts and exceptions. I/O device interfaces – SCII, USB Pipelining and Vector Processing:

**TEXT BOOKS:**

1. Computer Organization – Carl Hamacher, Zvonks Vranesic, SafeaZaky, Vth Edition, McGraw Hill.
2. Computer Systems Architecture – M.Moris Mano, IIIrd Edition, Pearson/PHI

**REFERENCE BOOKS:**

1. "Computer Architecture and Organization", 3rd Edition by John P. Hayes,WCB/McGraw- Hill
2. "Computer Organization and Architecture: Designing for Performance", 10th Edition by i. William Stallings, Pearson Education.
3. "Computer System Design and Architecture", 2nd Edition by Vincent P. Heuring and Harry ii. F. Jordan, Pearson Education.

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## DESIGN & ANALYSIS OF ALGORITHMS
**(Common to CSE/CIT/CSC)**

**Course Objectives:**

- To analyze the asymptotic performance of algorithms
- Ability to choose appropriate algorithm design techniques for solving problems
- To design and implement various programming paradigms and its complexity
- To analyze the problems using shortest path algorithms.

**Course Outcomes :**

- Ability to analyze the performance of algorithms.
- Ability to choose appropriate algorithm design techniques for solving problems Understand how the choice of data structures and the algorithm design methods impact the performance of programs.
- Identify problems using algorithm design methods such as the greedy method, divide and conquer, dynamic programming, backtracking and branch and bound
- Understand the differences between tractable and intractable problems and P & NP classes.

**UNIT- I (8 Hours )**
**Introduction: Algorithm Design paradigms –** motivation, concept of algorithmic efficiency, run time analysis of algorithms, Asymptotic Notations.
**Divide and Conquer:** Structure of divide and conquer, Binary Search, Merge sort, Quick sort, Strassen Matrix Multiplication; Analysis of divide and conquer run time recurrence relations.

**UNIT- II (10 Hours)**
**Greedy Method:** Overview, Knapsack problem, Job sequencing with deadlines, Minimum Spanning Tree (Prim's and Kruskal's algorithms), Single source shortest path Algorithms (Dijkstra's Algorithm, Bellman-Ford algorithm).

**UNIT- III (8 Hours )**
**Dynamic Programming:** Overview, difference between dynamic programming and DAC, difference between dynamic programming and Greedy Method. All-pair Shortest path, Matrix-chain multiplication, Traveling Salesman Problem, longest Common sequence.

**UNIT- IV (8 Hours)**
**Back tracking:** Overview, N-queen problem, sum of subsets, Graph Coloring, Hamiltonian Cycle and Knapsack problem.

**UNIT- V (10 Hours )**
**Branch and Bound:** 0/1 Knapsack problem using LIFO branch and bound, FIFO branch and bound, Travelling Salesman Problem.
**Computational Complexity:** Complexity measures, Polynomial Vs Non- polynomial time complexity; NP-hard and NP-complete classes, examples.

**Text Books:**

**1**.E. Horowitz, S. Sahni and S.Rajsekran, "Fundamentals of Computer Algorithms", Galgotia Publication.
2. Design & Analysis of Algorithms, S. Sridhar, Oxford
3. Design & Analysis of Algorithms, Sharma, Khanna Publishing House, N.Delhi

**Reference Books:**

**1**.T. H. Cormen, Leiserson, Rivest and Stein, "Introduction of Computer Algorithm", PHI.
2.Sara Basse, A.V. Gelder, "Computer Algorithms", Addison Wesley.
3. E.Sreenivasa Reddy,"Design and Analysis of Algorithms", Sci-Tech Public

**II Year II Semester**

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## OPERATING SYSTEMS

**(Common to CAI/CSM/CSE/CDS/CIT/CSC)**

**Course Objectives:**

The main objectives of the course is to make student

- Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection.
- Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
- Illustrate different conditions for deadlock and their possible solutions.

**Course Outcomes :**

- Understand the structure and functionalities of operating systems.
- Apply various concepts to solve problems related to process synchronization, deadlocks and make an effective report
- Apply different algorithms of CPU scheduling, Page replacement and disk scheduling.
- Analyze process, memory and storage management strategies.

**UNIT – I (10 Hours )**

**Operating Systems Overview**: Introduction, Operating system functions, Operating systems operations, Computing environments, Free and Open-Source Operating Systems

**System Structures:** Operating System Services, User and Operating-System Interface, system calls, Types of System Calls, system programs, Operating system Design and Implementation, Operating system structure, Building and Booting an Operating System, Operating system debugging

**UNIT – II ( 9 Hours )**

**Processes:** Process Concept, Process scheduling, Operations on processes, Inter-process communication.

**Threads and Concurrency**: Multithreading models, Thread libraries, threading issues. CPU Scheduling: Basic concepts, scheduling criteria, Scheduling algorithms, Multiple processor scheduling.

**UNIT – III (9 Hours)**

**Synchronization Tools:** The Critical Section Problem, Peterson's Solution, Mutex Locks, Semaphores, Monitors, Classic problems of Synchronization.

**Deadlocks**: system Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from Deadlock.

**UNIT – IV (10 Hours )**

**Memory-Management Strategies:** Introduction, Contiguous memory allocation, Paging, Structure of the Page Table, Swapping.

**Virtual Memory Management:** Introduction, Demand paging, Copy-on-write, Page replacement, Allocation of frames, Thrashing

Storage Management: Overview of Mass Storage Structure, HDD Scheduling.

**UNIT – V (9 Hours )**

**File System**: **File System Interface:** File concept, Access methods, Directory Structure; File system Implementation: File-system structure, File-system Operations, Directory implementation, Allocation method, Free space management; File-System Internals: File-System Mounting, Partitions and Mounting, File Sharing.

**Protection:** Goals of protection, Principles of protection, Protection Rings, Domain of Protection, Access matrix.

**Text Books:**

1. Operating System Concepts, Silberschatz A, Galvin P B, Gagne G, 10th Edition, Wiley, 2018.
2. Modern Operating Systems, Tanenbaum A S, 4th Edition, Pearson , 2016

**Reference Books:**

1. Operating Systems -Internals and Design Principles, Stallings W, 9th edition, Pearson, 2018
2. Operating Systems: A Concept Based Approach, D.M Dhamdhere, 3rd Edition, McGraw- Hill, 2013

**Online Learning Resources:**

1. https://nptel.ac.in/courses/106/106/106106144/
2. http://peterindia.net/OperatingSystems.html

**II Year II Semester**

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## ARTIFICIAL INTELLIGENCE LAB

**(Common to CAI/CSM/CSE/CIT)**

**LIST OF EXPERIMENTS**

1. Write a program to implement Vacuum Cleaner Agent.
2. Write a program to implement BFS, DFS.
3. Write a program to implement 8-Puzzle problem using A* algorithm.
4. Write a program to implement n queens problem.
5. Write a program to implement MIN-MAX algorithm.
6. Write a program to represent simple fact for a statement.
7. Write a program to represent a graph and apply BFS on it.
8. Write a program for backward and forward reasoning.
9. Write a program containing facts related to following predicatesLocation (city, state)
   Stays (person, city)
   Display: (i) list of persons, state and city (ii) Given person, find the state in which he isstaying.
10. Write a program that answers about family members and relationships. Include predicates & clauses which define sister, brother, father, mother, Grandchild,grandfather and uncle. The program should be able to answer question such as following.
    a. Father (X, bob)
    b. Grandson (X, Y)
    c. Uncle (bill, Sue)
    d. Mother (marry, X)
11. write a program to implement an inductive learning algorithm for decision trees.

**II Year II Semester**

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## DATABASE MANAGEMENT SYSTEMS LAB
**(Common to CAI/CSM/CSE/CDS/CIT/CSC)**

**Course Objectives:**

This Course will enable students to

- Populate and query a database using SQL DDL/DML Commands
- Declare and enforce integrity constraints on a database
- Writing Queries using advanced concepts of SQL
- Programming PL/SQL including procedures, functions, cursors and triggers,

**Experiments covering the topics:**

- DDL, DML, DCL commands
- Queries, nested queries, built-in functions,
- PL/SQL programming- control structures
- Procedures, Functions, Cursors, Triggers,
- Database connectivity- ODBC/JDBC

**Sample Experiments:**

1. Creation, altering and droping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4. Queries using Conversion functions (to char, to number and to date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next day, add months, last day, months between, least, greatest, trunc, round, to char, to date)
5. 
    i. Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
    ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.

6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-APPLICATION ERROR.
8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
10. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
11. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers
12. Create a table and perform the search operation on table using indexing and non-indexing techniques.
13. Write a Java program that connects to a database using JDBC
14. Write a Java program to connect to a database using JDBC and insert values into it
15. Write a Java program to connect to a database using JDBC and delete values from it

**Text Books/Suggested Reading:**

1. Oracle: The Complete Reference by Oracle Press
2. Nilesh Shah, "Database Systems Using Oracle", PHI, 2007
3. Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007

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## DESIGN THINKING & INNOVATION

**Course Objectives:** The objectives of the course are to

- Bring awareness on innovative design and new product development.
- Explain the basics of design thinking.
- Familiarize the role of reverse engineering in product development.
- Train how to identify the needs of society and convert into demand.
- Introduce product planning and product development process.

### UNIT – I Introduction to Design Thinking

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

### UNIT - II Design Thinking Process

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development

**Activity:** Every student presents their idea in three minutes, every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

### UNIT - III Innovation

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity.

**Activity:** Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

### UNIT - IV Product Design

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies.

**Activity:** Importance of modeling, how to set specifications, Explaining their own product design.

## UNIT – V Design Thinking in Business Processes

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes.

**Activity:** How to market our own product, about maintenance, Reliability and plan for startup.

### Textbooks:


1. Tim Brown, Change by design, 1/e, Harper Bollins, 2009.
2. Idris Mootee, Design Thinking for Strategic Innovation, 1/e, Adams Media, 2014.


### Reference Books:


1. David Lee, Design Thinking in the Classroom, Ulysses press, 2018.
2. Shrrutin N Shetty, Design the Future, 1/e, Norton Press, 2018.
3. William lidwell, Kritinaholden, &Jill butter, Universal principles of design, 2/e, Rockport Publishers, 2010.
4. Chesbrough.H, The era of open innovation, 2003.


### Online Learning Resources:

- https://nptel.ac.in/courses/110/106/110106124/
- https://nptel.ac.in/courses/109/104/109104109/
- https://swayam.gov.in/nd1_noc19_mg60/preview
- https://onlinecourses.nptel.ac.in/noc22_de16/preview

### Course Outcomes:

| COs | Statements | Blooms Level |
|---|---|---|
| CO1 | Define the concepts related to design thinking. | L1 |
| CO2 | Explain the fundamentals of Design Thinking and innovation. | L2 |
| CO3 | Apply the design thinking techniques for solving problems in various sectors. | L3 |
| CO4 | Analyse to work in a multidisciplinary environment. | L4 |
| CO5 | Evaluate the value of creativity. | L5 |