



SANTHIRAM ENGINEERING COLLEGE :: NANDYAL **(AUTONOMOUS)**

Approved by A.I.C.T.E., New Delhi, Permanently Affiliated to JNT University, Ananthapuram
Accredited by NAAC with Grade-A, Accredited by NBA (ECE & CSE)
An ISO 9001:2015 Certified Institution, 2(f) & 12(B) recognition by UGC Act, 1956
NH-40, NANDYAL-518501 (Dist), A.P.

Learn - Grow - Empower

R-23

ACADEMIC REGULATIONS **COURSE STRUCTURE** **AND** **DETAILED SYLLABI**

B.TECH-CSE(05)

Regular Four Year UG Degree Course
(Applicable for the batches admitted from 2023-24)

&

Lateral Entry Three Year UG Degree Course
(Applicable for the batches admitted from 2024-25)



website: www.srecnandyal.edu.in

Academic Regulations (R23) for B. Tech (Regular-Full time)
(Effective for the students admitted into I year from the Academic Year 2023-24 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 for 163 credits and secures all 163 credits.
- (iii) A Student who secures highest percentage of marks in the batch of every department will be honoured with gold medal.
- (iv) A Student who secures second highest percentage of marks in the batch of every department will be honoured with silver medal.

(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., 163 credits.
- (ii) Registering for Honors is optional.
- (iii) Honors is 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 along with clause 1 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/field work per week.

Credit Definition:

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5 credit
4 weeks MOOCs course	1 credit

- 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 (Total 163)	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 parent discipline/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 interdisciplinary subjects or subjects in an area outside the parent discipline/ department/ branch of Engineering
		Domain specific skill enhancement courses (SEC)	interdisciplinary/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

- Total duration of the of B. Tech (Regular) Programme is four academic years.
- Each academic year of study is divided into two semesters.
- Minimum number of instruction days in each semester is 90 days.
- There shall be mandatory student induction program for fresher's, with a 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.
- Health/wellness/yoga/sports and NSS /NSS /Scouts & Guides / Community service activities are made mandatory as credit courses for all the under graduate students.
- Courses like Environmental Sciences, Indian Constitution, Technical Paper Writing & IPR are offered as non-credit mandatory courses for all the undergraduate students.
- Design Thinking for Innovation & Tinkering Labs are made mandatory as credit courses for all the undergraduate students.
- Increased flexibility for students through an increase in the elective component of the curriculum, with 05 Professional Elective courses and 04 Open Elective courses.
- 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.
- 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 163 credits by opting for the courses offered through various verticals/tracks under Open Electives.
- While choosing the electives, students shall ensure that they do not opt for the courses with syllabus contents similar to courses already pursued.
- A pool of interdisciplinary/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 Institution for the students having good academic record.
 - xvi. The Institution 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. The 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 50 marks, Full Internship & Project work in final semester shall be evaluated for 200 marks, 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. In case 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 and 70 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 be set with two parts each for 35 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 a separate subject code for theory subject and 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/short answer paper, 15 marks for subjective paper and 5 marks for assignment.
- ii) Objective paper shall contain maximum of 20 bits for 10 marks /Short answer paper shall contain for 05 short answer questions with 2 marks each and Subjective paper shall contain 3 either or type questions of which student has to answer one from each either-or type of questions. Each question carries 5 marks. Time duration for the midterm examination is 110 min.

Note:

- The Subjective with Short answer paper shall contain one mandatory question with 05 short answer questions with 2 marks each and 3 either or type questions (from 2 to 7) of equal weight age of 5 marks. Any fraction shall be rounded off to the next higher mark. Total marks for each midterm examination is 25 marks.
 - 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 average marks shall be considered. For Midterm-I average of 2 assignments and for Midterm-II average of 3 assignments are considered from the respective units of syllabus.
- 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% weight age given to the better mid exam and 20% to the other.

For Example:

Marks obtained in first mid: 25

Marks obtained in second mid: 20

Final mid semester Marks: $(25 \times 0.8) + (20 \times 0.2) = 24$

If the student is absent for any one midterm examination, the final mid semester marks shall be arrived at by considering 80% weight age 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: $(25 \times 0.8) + (0 \times 0.2) = 20$

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 contain 10 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.
- iv) 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.
- v) The question 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 weight age of 35 marks each.
- ii) In each part, question 1 shall contain 5 compulsory short answer questions for a total of 5 marks such that each question carries 1 mark.
- 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.
- v) **There shall be online evaluation for semester theory end examinations. The evaluation is completely online. A minimum of 50% of theory courses shall be sent for online external evaluation. Remaining courses evaluation shall be done by online internal evaluation.**

a) 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/viva and 15 marks for the internal test.
- d) The end examination shall be evaluated for 70 marks, conducted by the concerned laboratory teacher and an external examiner (expert in the subject from the same department) from the other college nominated by the principal from the panel of **Three** members submitted by the Head of the Department.
 - Procedure: 20 marks
 - Experimental work & Results: 30 marks
 - Viva voce: 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 / Engineering Graphics**, 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 weight age of 80% to better mid marks and 20% for the other. The subjective paper shall contain 3 either or type questions of equal weight age 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, shall consists of 5 questions, either/or type, of 14 marks each. There shall be no objective type questions in the end examination. 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. In case, the student fails, an examination shall be conducted for failed candidates for 30 marks satisfying the conditions mentioned in item 1 & 2 of the regulations.
- g) **The laboratory and mid semester** test papers shall be preserved for a minimum of 3 years in the respective institution as per the University norms and shall be produced to the Committees of the University as and when the same are asked for.
- h) **Semester End Examination answer scripts** will be preserved for one academic year (For example first year papers will be preserved up to second year second semester results declaration). However, the soft copy of all the Semester End Examinations answer scripts will be preserved permanently in the institution.

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 soft skill 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 external subject expert nominated by the principal from the panel of Three members submitted by the Head of the Departments. 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 an external subject expert nominated by the principal shall monitor the evaluation process. The marks/grades shall be assigned to the students by the above committee based on their performance.
- iv) The student shall be given an option to choose either the skill courses being offered by the institution 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.
- v) The recommended courses offered by external agencies, conversions and appropriate grades/marks are to be approved by the institution. The Head of the Department shall forward such proposals to the principal for approval.
 - vi) 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 upon producing a valid certificate as approved by the principal.

11. Massive Open Online Courses (MOOCs):

A Student has to pursue and complete TWO courses compulsorily through MOOCs approved by the institution. A student can pursue courses other than core through MOOCs and it is mandatory to complete two courses 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 Institution.

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 NEP 2020. As per University Grants Commission (Credit Framework for Online Learning Courses through SWAYAM) Regulation, 2016, the Institution 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 Institution shall offer credit mobility for MOOCs and give the equivalent credit weight age 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 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 Institution shall ensure no overlap of MOOC exams with that of the institution examination schedule. In case of delay in results, the Institution 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 respective Departments shall submit the following to the examination section of the Institution:
 - 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) *A MOOC course online assignment, programming assignment (if any) and proctor exam marks together taken as Final Marks (i.e.,100 marks) for that subject for credit transfer.*
- xi) The Institution 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 Institution from time to time.

13. Academic Bank of Credits (ABC)

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

- i. provide option of mobility for learners across the universities/institutions of their choice
- 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/Institution 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% weight age 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 Institution.

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: 15 marks, Seminar: 15 marks). At the end of the semester, all projects shall be showcased 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 30 marks. The external evaluation of Project Work is a Viva-Voce Examination conducted in the presence of internal examiner and external examiner appointed by the principal from the panel of Three members submitted by the Head of the Departments and is evaluated for 140 marks.

The respective departments 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 interdisciplinary 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 18 credits 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 04 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 18 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., 163 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 HODs of the college shall arrange separate class work and timetable 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 up to III semester in case of regular entry students and only III semester in case of lateral entry students. Students having 7 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 is to be completed simultaneously with a Major degree program. vi)

Registration for Honors:

- i) The eligible and interested students shall apply through the HOD of his/her parent department. The whole process should be completed within one week before the start of every semester. Selected students shall be permitted to register the courses under Honors.
- ii) The selected students shall submit their willingness to the principal through his/her parent department offering Honors. The parent department shall maintain the record of student pursuing the Honors.
- iii) The students enrolled in the Honors courses will be monitored continuously. An advisor/mentor from parent department shall be assigned to a group of students to monitor the progress.
- iv) There is no fee for registration of subjects for Honors program offered in offline at the respective institutions.

17. Attendance Requirements:

- i) A student shall be eligible to appear for the Institution external examinations if he/she acquires a minimum of 40% attendance in each subject and 75% of attendance in aggregate of all the subjects.
- ii) 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.
- iii) Shortage of Attendance below 65% in aggregate shall in NO CASE be condoned.
- iv) A stipulated fee shall be payable towards condonation of shortage of attendance to the University/Institution.
- v) 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.
- vi) 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.
- vii) If any candidate fulfils the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.
- viii) 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 16/17.

- i) A student shall be promoted from first year to second year if he/she fulfils the minimum attendance requirement as per university/institution 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 fulfilment of academic regulations. In such case, he/she shall be in the academic regulations into which he/she is readmitted, and the BoS members of concerned Departments will suggest the substitute subjects.

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	Superior	10
80 - 89	A(Excellent)	9
70 - 79	B(Very Good)	8
60 - 69	C (Good)	7
50 - 59	D (Average)	6
40 - 49	E (Pass)	5
< 40	F (Fail)	0
Absent	Ab (Absent)	0

- 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.
- 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 point 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.,

$$SGPA = \frac{\sum(C_i \times G_i)}{\sum C_i}$$

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 over all the semesters of a program, i.e.,

$$CGPA = \frac{\sum(C_i \times S_i)}{\sum C_i}$$

Where “S_i” is the SGPA of the ith semester and
C_i is the total number of credits up to 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	$\geq 6.5 < 7.5$
Second Class	$\geq 5.5 < 6.5$
Pass Class	$\geq 5.0 < 5.5$

CGPA to Percentage conversion Formula – (CGPA – 0.5) x 10

20. With-holding of Results

If the candidate has any dues not paid to the Institution 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 credit job-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, 130 credits.

(b) Entry Policy:

Modalities on multiple entry by the student into the B.Tech. programme will be provided in due course of time.

Note: The Universities/Institution 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 entrepreneurship programme/to establish start-ups. 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 Head of the department of the respective college shall forward such proposals submitted by the students to the principal. An evaluation committee constituted by the Institution 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 fulfilment 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 into 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 90 days.

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. Amendment of Regulations:

The institution may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the institute.

28. 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. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor / Chairman of Academic Council is final.
- v. The Universities/Institution may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the Universities/Institution.
- vi. 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.

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ACADEMIC REGULATIONS (R23)
FOR B. TECH. (LATERAL ENTRY SCHEME)

(Effective for the students admitted into II year through Lateral Entry Scheme 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 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 for 123 credits and secures all 123 credits.
- (b) Award of B.Tech. degree with Honors if he/she fulfils the following:
 - (i) Student secures additional 18 credits fulfilling all the requisites of a B.Tech. program i.e., 123 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 forfeit 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. All other regulations as applicable for B. Tech. Four-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).

**RULES FOR
DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN
EXAMINATIONS**

	Nature of Malpractices/Improper conduct	Punishment
	<i>If the candidate:</i>	
1.(a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The Hall Ticket of the candidate is to be cancelled and handed over to the examination of the autonomous college.
3	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred for four consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practical and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for four consecutive semesters from class work and all examinations, if his involvement is established. Otherwise, the candidate is debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.

4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject only.
6.	Refuses to obey the orders of the Chief Superintendent /Assistant - Superintendent /any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the Controller of Examinations / Assistant Controller of Examinations, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. If the candidate physically assaults the invigilator/ Controller of Examinations / Assistant Controller of Examinations, then the candidate is also debarred and forfeits his/her seat. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.

9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the college expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person (s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject only or in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester / year examinations, depending on the recommendation of the committee.
12.	If any malpractice is detected, which is not covered in the above clauses 1 to 11 shall be reported to the College for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions: (if the squad reports that the college is also involved in encouraging malpractices)
3. A show cause notice shall be issued to the college.
4. Impose a suitable fine on the college.
5. Shifting the examination centre from the college to another college for a specific period of not less than one year.

Note:-Whenever the performance of a student is cancelled in any subject/subjects due to Malpractice, he has to register for End Examinations in that subject/subjects consequently and has to fulfil all the norms required for the award of Degree.



SANTHIRAM ENGINEERING COLLEGE

(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Course Structure

B.Tech I-Year I Semester:

S. No	Subject Code	Course Category	Name of the Subject	Hours/Week			
				L	T	P	C
1	23A94101	BS&H	COMMUNICATIVE ENGLISH	2	0	0	2
2	23A93101	BS	CHEMISTRY	3	0	0	3
3	23A91101	BS&H	LINEAR ALGEBRA & CALCULUS	3	0	0	3
4	23A03102	ES	BASIC CIVIL AND MECHANICAL ENGINEERING	3	0	0	3
5	23A05101	ES	INTRODUCTION TO PROGRAMMING	3	0	0	3
6	23A94102	BS&H	COMMUNICATIVE ENGLISH LAB	0	0	2	1
7	23A93102	BS	CHEMISTRY LAB	0	0	2	1
8	23A03103	ES	ENGINEERING WORKSHOP	0	0	3	1.5
9	23A05103	ES	COMPUTER PROGRAMMING LAB	0	0	3	1.5
10	23A99102	BS&H	HEALTH AND WELLNESS YOGA AND SPORTS	0	0	1	0.5

B.Tech I-Year II Semester:

S. No	Subject Code	Course Category	Name of the Subject	Hours/Week			
				L	T	P	C
1	23A91202	BS&H	DIFFERENTIAL EQUATIONS & VECTOR CALCULUS	3	0	0	3
2	23A04101	ES	BASIC ELECTRICAL & ELECTRONICS ENGINEERING	3	0	0	3
3	23A03101	ES	ENGINEERING GRAPHICS	1	0	4	3
4	23A05204	PC	DATA STRUCTURES	3	0	0	3
5	23A92101	BS&H	ENGINEERING PHYSICS	3	0	0	3
6	23A05102	ES	IT WORKSHOP	0	0	2	1
7	23A92102	BS&H	ENGINEERING PHYSICS LAB	0	0	2	1
8	23A04102	ES	ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP	0	0	3	1.5
9	23A05205	PC	DATASTRUCTURES LAB	0	0	3	1.5
10	23A99101	BS&H	NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE	0	0	1	0.5

**SANTHIRAM ENGINEERING COLLEGE****(AUTONOMOUS)****DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING****Course Structure****B.Tech II-Year I Semester:**

S. No	Subject Code	Course Category	Name of the Subject	Hours/Week			
				L	T	P	C
1	23A91305	BS	DISCRETE MATHEMATICS & GRAPH THEORY	3	0	0	3
2	23A99303	HS	UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT	2	1	0	3
3	23A04310	ES	DIGITAL LOGIC & COMPUTER ORGANIZATION	3	0	0	3
4	23A05307	PC	ADVANCED DATA STRUCTURES & ALGORITHMS ANALYSIS	3	0	0	3
5	23A05308	PC	OBJECT ORIENTED PROGRAMMING THROUGH JAVA	3	0	0	3
6	23A05309	PC	ADVANCED DATA STRUCTURES AND ALGORITHMS ANALYSIS LAB	0	0	3	1.5
7	23A05310	PC	OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB	0	0	3	1.5
8	23A05306	SC	PYTHON PROGRAMMING	0	1	2	2
9	23A93303	MC(NC)	ENVIRONMENTAL SCIENCE	2	0	0	0

B.Tech II-Year II Semester:

S. No	Subject Code	Course Category	Name of the Subject	Hours/Week			
				L	T	P	C
1	23A95402	PC	ORGANIZATIONAL BEHAVIOR	2	0	0	2
2	23A91407	BS	PROBABILITY & STATISTICS	3	0	0	3
3	23A05411	PC	OPERATING SYSTEMS	3	0	0	3
4	23A05412	PC	DATABASE MANAGEMENT SYSTEMS	3	0	0	3
5	23A05413	PC	SOFTWARE ENGINEERING	3	0	0	3
6	23A05414	PC	OPERATING SYSTEMS LAB	0	0	3	1.5
7	23A05415	PC	DATABASE MANAGEMENT SYSTEMS LAB	0	0	3	1.5
8	23A05416	PC	FULL STACK DEVELOPMENT-I	0	1	2	2
9	23A99405	PC	DESIGN THINKING AND INNOVATION	1	0	2	2

**SANTHIRAM ENGINEERING COLLEGE****(AUTONOMOUS)****DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING****Course Structure****B.Tech III-Year I Semester:**

S. No	Subject Code	Course Category	Name of the Subject	Hours/Week			
				L	T	P	C
1	23A33301	ES	ARTIFICIAL INTELLIGENCE	3	0	0	3
2	23A05519	PC	COMPUTER NETWORKS & INTERNET PROTOCOLS	3	0	0	3
3	23A05520	PC	AUTOMATA THEORY AND COMPILER DESIGN	3	0	0	3
4	23A05517	PC	INTRODUCTION TO QUANTUM TECHNOLOGIES AND APPLICATIONS	3	0	0	3
5	23A05521	PE	OBJECT ORIENTED ANALYSIS AND DESIGN PE-I	3	0	0	3
6	23A05522	PE	SOFT COMPUTING PE-I	3	0	0	3
7	23A04519	PE	MICROPROCESSORS AND MICROCONTROLLERS PE-I	3	0	0	3
8	23A05523	PE	DATA WAREHOUSING & DATA MINING PE-I	3	0	0	3
9	23A01501	OE	GREEN BUILDINGS OE-I	3	0	0	3
10	23A01502	OE	CONSTRUCTION TECHNOLOGY AND MANAGEMENT OE-I	3	0	0	3
11	23A02503	OE	ELECTRICAL SAFETY PRACTICES AND STANDARDS OE-I	3	0	0	3
12	23A03504	OE	SUSTAINABLE ENERGY TECHNOLOGIES OE-I	3	0	0	3
13	23A04527	OE	ELECTRONIC CIRCUITS OE-I	3	0	0	3
14	23A91513	OE	MATHEMATICS FOR MACHINE LEARNING AND AI OE-I	3	0	0	3
15	23A92503	OE	MATERIALS CHARACTERIZATION TECHNIQUES OE-I	3	0	0	3
16	23A93504	OE	CHEMISTRY OF ENERGY SYSTEMS OE-I	3	0	0	3
17	23A94505	OE	ENGLISH FOR COMPETITIVE EXAMINATIONS OE-I	3	0	0	3
18	23A95507	OE	ENTREPRENEURSHIP OE-I AND NEW VENTURE CREATION	3	0	0	3
19	23A33505	PC	ARTIFICIAL INTELLIGENCE LAB	0	0	3	1.5
20	23A05524	PC	COMPUTER NETWORKS & INTERNET PROTOCOLS LAB	0	0	3	1.5
21	23A05525	SC	FULL STACK DEVELOPMENT-II (SKILL ENHANCEMENT COURSE)	0	1	2	2
22	23A04526	SC	TINKERING LAB	0	0	2	1
23	23A99507	MC(C)	EVALUATION OF COMMUNITY SERVICE INTERNSHIP	-	-	-	2

**SANTHIRAM ENGINEERING COLLEGE****(AUTONOMOUS)****DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING****Course Structure****B.Tech III-Year II Semester:**

S. No	Subject Code	Course Category	Name of the Subject	Hours/Week			
				L	T	P	C
1	23A33402	PC	MACHINE LEARNING	3	0	0	3
2	23A05626	PC	CLOUD COMPUTING	3	0	0	3
3	23A05627	PC	CRYPTOGRAPHY & NETWORK SECURITY	3	0	0	3
4	23A05628	PE	SOFTWARE TESTING METHODOLOGIES	3	0	0	3
5	23A05629	PE	INTRODUCTION TO CYBER SECURITY	3	0	0	3
6	23A05630	PE	DEVOPS	3	0	0	3
7	23A04640	PE	EMBEDDED SYSTEMS DESIGN	3	0	0	3
8	23A05633	PE	SOFTWARE PROJECT MANAGEMENT	3	0	0	3
9	23A05634	PE	MOBILE ADHOC NETWORKS	3	0	0	3
10	23A33506	PE	NATURAL LANGUAGE PROCESSING	3	0	0	3
11	23A05635	PE	DISTRIBUTED OPERATING SYSTEM	3	0	0	3
12	23A33403	OE	MACHINE LEARNING LAB	0	0	3	1.5
13	23A05637	OE	CRYPTOGRAPHY & NETWORK SECURITY LAB	0	0	3	1.5
14	23A94403	SC	SOFT SKILLS	1	0	2	2
15	23A99608	MC(NC)	TECHNICAL PAPER WRITING & IPR	2	0	0	0
16	23A05638	PC	WORKSHOP	0	0	0	0
17	23A01603	OE	DISASTER MANAGEMENT	3	0	0	3
18	23A03605	OE	SUSTAINABILITY IN ENGINEERING PRACTICES	3	0	0	3
19	23A02604	OE	RENEWABLE ENERGY SOURCES	3	0	0	3
20	23A03606	OE	AUTOMATION AND ROBOTICS	3	0	0	3
21	23A04639	OE	DIGITAL ELECTRONICS	3	0	0	3
22	23A91614	OE	OPTIMIZATION TECHNIQUES FOR ENGINEERS	3	0	0	3
23	23A91609	OE	MATHEMATICAL FOUNDATION OF QUANTUM TECHNOLOGIES	3	0	0	3
24	23A92604	OE	PHYSICS OF ELECTRONIC MATERIALS AND DEVICES	3	0	0	3
25	23A93605	OE	CHEMISTRY OF POLYMERS AND APPLICATIONS	3	0	0	3
26	23A94607	OE	ACADEMIC WRITING AND PUBLIC SPEAKING	3	0	0	3
27	23A99609	PC	MINI PROJECT	0	0	0	0

**SANTHIRAM ENGINEERING COLLEGE****(AUTONOMOUS)****DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING****Course Structure****B.Tech IV-Year I Semester:**

S. No	Subject Code	Course Category	Name of the Subject	Hours/Week			
				L	T	P	C
1	23A32610	PC	DEEP LEARNING	2	1	0	3
2	23A95708	PC	BUSINESS ETHICS AND CORPORATE GOVERNANCE (MC-II)	2	0	0	2
3	23A95709	PC	E-BUSINESS (MC-II)	2	0	0	2
4	23A95710	PC	MANAGEMENT SCIENCE(MC-II)	2	0	0	2
5	23A05741	PE	SOFTWARE ARCHITECTURE & DESIGN PATTERNS (PE-IV)	3	0	0	3
6	23A05742	PE	BLOCKCHAIN TECHNOLOGY(PE-IV)	3	0	0	3
7	23A05743	PE	AUGMENTED REALITY & VIRTUAL REALITY (PE-IV)	3	0	0	3
8	23A32506	PE	INTERNET OF THINGS (PE-IV)	3	0	0	3
9	23A05744	PE	INTRODUCTION TO APPLICATION OF ARTIFICIAL INTELLIGENCE TO ROBOTICS (PE-IV)	2	1	0	3
10	23A05745	PE	REINFORCEMENT LEARNING (PE-IV)	2	1	0	3
11	23A05746	PE	AGILE METHODOLOGIES (PE-V)	3	0	0	3
12	23A05747	PE	METaverse (PE-V)	3	0	0	3
13	23A32612	PE	COMPUTER VISION (PE-V)	3	0	0	3
14	23A05748	PE	CYBERPHYSICAL SYSTEMS (PE-V)	3	0	0	3
15	23A32609	PE	SOCIAL NETWORK ANALYSIS (PE-V)	2	1	0	3
16	23A05749	PE	INTRODUCTION TO LARGE LANGUAGE MODELS (PE-V)	2	1	0	3
17	23A01704	OE	BUILDING MATERIALS AND SERVICES (OE-III)	3	0	0	3
18	23A01705	OE	ENVIRONMENTAL IMPACT ASSESSMENT (OE-III)	3	0	0	3
19	23A02705	OE	SMART GRID TECHNOLOGIES (OE-III)	3	0	0	3
20	23A03707	OE	3D PRINTING TECHNOLOGIES (OE-III)	3	0	0	3
21	23A04519	OE	MICROPROCESSORS AND MICROCONTROLLERS (OE-III)	3	0	0	3
22	23A91716	OE	WAVELET TRANSFORMS AND ITS APPLICATIONS (OE-III)	3	0	0	3
23	23A92705	OE	SMART MATERIALS AND DEVICES (OE-III)	3	0	0	3
24	23A92706	OE	INTRODUCTION TO QUANTUM MECHANICS (OE-III)	3	0	0	3
25	23A93706	OE	GREEN CHEMISTRY AND CATALYSIS FOR SUSTAINABLE ENVIRONMENT (OE-III)	3	0	0	3
26	23A95711	OE	EMPLOYABILITY SKILLS (OE-III)	3	0	0	3
27	23A01706	OE	GEO-SPATIAL TECHNOLOGIES (OE-IV)	3	0	0	3
28	23A01707	OE	SOLID WASTE MANAGEMENT (OE-IV)	3	0	0	3
29	23A02706	OE	ELECTRIC VEHICLES (OE-IV)	3	0	0	3
30	23A03708	OE	TOTAL QUALITY MANAGEMENT (OE-IV)	3	0	0	3
31	23A04755	OE	TRANSDUCERS AND SENSORS (OE-IV)	3	0	0	3
32	23A32611	OE	INTRODUCTION TO QUANTUM COMPUTING (OE-IV)	3	0	0	3
33	23A91715	OE	FINANCIAL MATHEMATICS (OE-IV)	3	0	0	3

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34	23A92707	OE	SENSORS AND ACTUATORS FOR ENGINEERING APPLICATIONS (OE- IV)	3	0	0	3
35	23A93707	OE	CHEMISTRY OF NANOMATERIALS AND APPLICATIONS (OE-IV)	3	0	0	3
36	23A95712	OE	LITERARY VIBES (OE-IV)	3	0	0	3
37	23A05750	SC	PROMPT ENGINEERING (SEC)	0	1	2	2
38	23A95713	MC(NC)	GENDER SENSITIZATION (AC)	2	0	0	0

B.Tech IV -Year II Semester:

S. No	Subject Code	Course Category	Name of the Subject	Hours/Week			
				L	T	P	C
01	23A05852		INTERNSHIP	--	--	--	4
02	23A05853		PROJECT	--	--	--	8



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I B.Tech I Semester Course Structure



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S.No	Subject Code	Course Category	Name of the Subject	Hours/Week			Credits	Marks		
				Lecture	Tutorial	Practical		Internal	External	Total
1	23A94101	BS&H	COMMUNICATIVE ENGLISH	2	0	0	2	30	70	100
2	23A93101	BS	CHEMISTRY	3	0	0	3	30	70	100
3	23A91101	BS&H	LINEAR ALGEBRA & CALCULUS	3	0	0	3	30	70	100
4	23A03102	ES	BASIC CIVIL AND MECHANICAL ENGINEERING	3	0	0	3	30	70	100
5	23A05101	ES	INTRODUCTION TO PROGRAMMING	3	0	0	3	30	70	100
6	23A94102	BS&H	COMMUNICATIVE ENGLISH LAB	0	0	2	1	30	70	100
7	23A93102	BS	CHEMISTRY LAB	0	0	2	1	30	70	100
8	23A03103	ES	ENGINEERING WORKSHOP	0	0	3	1.5	30	70	100
9	23A05103	ES	COMPUTER PROGRAMMING LAB	0	0	3	1.5	30	70	100
10	23A99102	BS&H	HEALTH AND WELLNESS YOGA AND SPORTS	0	0	1	0.5	0	100	100



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I B.Tech I Semester Syllabus



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I B.Tech. I Sem.

L	T	P	C
2	0	0	2

(23A94101) COMMUNICATIVE ENGLISH

Course Category	Basic Science & Humanities (BS & H)
Course Enrichment Relevance	Skill Development

COURSE OBJECTIVES:

1. 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

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, Extensive and Intensive reading.
- **Writing:** Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.
- **Grammar:** Parts of Speech, Basic Sentence Structures-forming questions
- **Vocabulary:** Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

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 audio texts.
- **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:** Cohesive devices - linkers, use of articles and zero article; prepositions.
- **Vocabulary:** Homonyms, Homophones, Homographs.



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UNIT-III

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, paraphrasing
- **Grammar:** Verbs - tenses; subject-verb agreement; Compound words, Collocations
- **Vocabulary:** Compound words, Collocations

UNIT-IV

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: Official Letters, Resumes
- **Grammar:** Reporting verbs, Direct & Indirect speech, Active & Passive Voice
- **Vocabulary:** Words often confused, Jargons

UNIT-V

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:** Formal oral presentations on topics from academic contexts
- **Reading:** Reading comprehension.
- **Writing:** Writing structured essays on specific topics, Writing review on the book reading.
- **Grammar:** Editing short texts - identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)
- **Vocabulary:** Technical Jargons

TEXT BOOKS:

1. Pathfinder: Communicative English for Undergraduate Students, 1 st Edition, Orient Black Swan, 2023 (Units 1,2 & 3)
2. Empowering with Language by Cengage Publications, 2023 (Units 4 & 5)



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REFERENCE BOOKS:

1. Dubey, Sham Ji & Co. English for Engineers, Vikas Publishers, 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 Handbook for Building a Superior Vocabulary. Anchor, 2014

e-Resources and Digital Material:

1. www.bbc.co.uk/learningenglish
2. <https://dictionary.cambridge.org/grammar/british-grammar/>
3. www.eslpod.com/index.html
4. <https://www.learngrammar.net/>
5. <https://english4today.com/english-grammar-online-with-quizzes>
6. <https://www.talkenglish.com/grammar/grammar.aspx>

COURSE OUTCOMES:

1. Understand the context, topic, and pieces of specific information from social or transactional dialogues. (L1)
2. Apply grammatical structures to formulate sentences and correct word forms. (L3)
3. Analyze discourse markers to speak clearly on a specific topic in informal discussions. (L4)
4. Evaluate reading/listening texts and to write summaries based on global comprehension of these texts. (L5)
5. Create a coherent paragraph, essay, and resume. (L6)

Remarks:

VOCABULARY

1. <https://www.youtube.com/c/DailyVideoVocabulary/videos>
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA??

**SANTHIRAM ENGINEERING COLLEGE****(AUTONOMOUS)****DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**

I B.Tech. I Sem.

L	T	P	C
3	0	0	3

(23A93101) CHEMISTRY

Course Category	Basic Science (BS)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To familiarize engineering chemistry and its applications
2. To train the students on the principles and applications of electrochemistry and polymers
3. To introduce instrumental methods, and applications

UNIT-I STRUCTURE AND BONDING MODELS

Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of Ψ and Ψ^2 , particle in one dimensional box, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O_2 and CO , etc. π -molecular orbitals of butadiene and benzene, calculation of bond order. Crystal field theory- splitting in octahedral and tetrahedral geometry. Properties of coordination compounds.

UNIT-II MODERN ENGINEERING MATERIALS

Conductors, Insulators-Basic Concept, Applications, Semiconductors - Introduction, basic concept, application Superconductors-Introduction basic concept, applications. Supercapacitors: Introduction, Basic Concept-Classification - Applications. Nano materials: Introduction, classification, properties and applications of Fullerenes, carbon nano tubes and Graphines nanoparticles.

UNIT-III ELECTROCHEMISTRY AND APPLICATIONS

Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations). Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples. Primary cells – Zinc-air battery, Secondary cells –lithium-ion batteries-working of the batteries including cell reactions; Fuel cells, hydrogen-oxygen fuel cell-working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC).



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT-IV 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 –Thermo and Thermosetting plastics, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibres. 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), Polyl Lactic Acid (PLA).

UNIT-V INSTRUMENTAL METHODS AND APPLICATIONS

Electromagnetic spectrum. Absorption of radiation: Beer-Lamberts law. UV-Visible Spectroscopy, electronic transition, Instrumentation, IR spectroscopies, fundamental modes and selection rules, Instrumentation. Chromatography-Basic Principle, Classification-HPLC: Principle, Instrumentation and Applications.

TEXT BOOKS:

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. K N Jayaveera, G V Subba Reddy and C Rama Chandraiah, Engineering Chemistry 1/e Mc Graw Hill Education (India) Pvt Ltd, New Delhi 2016
4. B.K Sharma Engineering Chemistry, Krishna Prakashan, Meerut.

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. Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd Edition

e- Resources and Digital Material:

1. <https://www.digimat.in/nptel/courses/video/122106028/L01.html>
2. <https://www.digimat.in/nptel/courses/video/104101115/L01.html>

COURSE OUTCOMES:

1. Compare the materials of construction for battery and electrochemical sensors
2. Explain the preparation, properties, and applications of thermoplastics & thermosetting & elastomers, conducting polymers.
3. Explain the principles of spectrometry, slc in separation of solid and liquid mixtures.
4. Apply the principle of Band diagrams in the application of conductors and semiconductors.
5. Summarize the concepts of Instrumental methods.



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I B.Tech. I Sem.

L	T	P	C
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(23A91101) LINEAR ALGEBRA & CALCULUS

Course Category	Basic Science & Humanities (BS & H)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. 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.

UNIT-I MATRICES

Rank of a matrix by echelon form, normal form. Cauchy–Binet formulae (without proof). Inverse of Non- singular matrices by Gauss-Jordan method, System of linear equations: Consistency of linear system of equations, Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Jacobi and Gauss Seidel Iteration Methods.

UNIT-II EIGENVALUES, EIGENVECTORS AND ORTHOGONAL TRANSFORMATION

Eigenvalues, Eigenvectors and their properties, Diagonalization of a matrix, 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.

UNIT-III CALCULUS

Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), Problems and applications on the above theorems. Curvature: Radius of curvature, Centre of curvature.

UNIT-IV PARTIAL DIFFERENTIATION AND APPLICATIONS (MULTI VARIABLE CALCULUS)

Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Directional derivative, 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.



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UNIT-V MULTIPLE INTEGRALS (MULTI VARIABLE CALCULUS)

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

TEXT BOOKS:

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, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, Micheael Greenberg, Pearson publishers, 9th edition
5. Higher Engineering Mathematics, H. K Das, Er. Rajnish Verma, S. Chand Publications, 2014, Third Edition (Reprint 2021)

e-Resources and Digital Material:

1. <https://elibrary.in.pearson.com>
2. <https://archive.nptel.ac.in/courses/111/106/111106051/>

COURSE OUTCOMES:

1. Develop and use of matrix algebra techniques that are needed by engineers for practical applications.
2. Utilize mean value theorems to real life problems
3. Familiarize with functions of several variables which is useful in optimization
4. Learn important tools of calculus in higher dimensions.
5. Familiarize with double and triple integrals of functions of several variables in two dimensions using Cartesian and polar coordinates and in three dimensions using cylindrical and spherical coordinates.



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I B.Tech. I Sem.

L	T	P	C
3	0	0	3

**(23A03102) BASIC CIVIL AND MECHANICAL ENGINEERING PART A:
BASIC CIVIL ENGINEERING**

Course Category	Engineering Science (ES)
Course Enrichment Relevance	Skill Development

COURSE OBJECTIVES:

1. Get familiarized with the scope and importance of Civil and Mechanical Engineering in different sectors and industries.
2. Introduce the preliminary concepts of Building Planning, Building Construction, Materials and the related tests.
3. Acquire preliminary knowledge of surveying and understand the importance of the quality of the drinking water.

UNIT-I BASICS OF CIVIL ENGINEERING

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-Tests on these materials.

Factors to be considered in Building Planning- Nature of Buildings- Typical Layouts of a Residential Building- Industrial Building- Commercial Building like a Supermarket / Hotel /Theatre.

UNIT-II SURVEYING

Surveying: Objectives of Surveying- Horizontal Measurements- Vertical Measurements Angular Measurements- Levelling instruments used for levelling- Introduction to Bearings Simple problems on levelling and bearings-Contour mapping.

UNIT-III TRANSPORTATION ENGINEERING, WATER RESOURCES AND ENVIRONMENTAL ENGINEERING

Importance of Transportation in Nations economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements - Simple Differences - Basic geometric design elements of a highway- Camber- Stopping Sight Distance- Super Elevation-Introduction.

Water Resources and Environmental Engineering: Sources of water- Quality of water Specifications and Tests- Introduction to Hydrology- Hydrograph-Ground Water - Irrigation-Rain water Harvesting Rain water runoff- Water Storage Structures (Simple introduction to Dams and Reservoirs).



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TEXT BOOKS:

1. G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, Tata McGraw Hill publications (India) Pvt. Ltd.
2. Basic Civil Engineering, S.S. Bhavikatti, New Age International Publishers.
3. Engineering Materials, Dr. S.C. Rangwala, Charotar Publishing House.

REFERENCE BOOKS:

1. Surveying, Vol- I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers.
2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers, Delhi.

e- Resources and Digital Material:

1. <https://www.nptelvideos.com/course.php?id=285>
2. <https://nptel.ac.in/courses/105101087>

COURSE OUTCOMES:

1. Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society.
2. Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying.
3. Realize the importance of Transportation in nations economy and the engineering measures related to highways in terms of geometrics.



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L	T	P	C
3	0	0	3

(23A03102) BASIC CIVIL AND MECHANICAL ENGINEERING PART

B: BASIC MECHANICAL ENGINEERING

Course Category	Engineering Science (ES)
Course Enrichment Relevance	Skill Development

COURSE OBJECTIVES:

1. Explain different engineering materials and manufacturing processes.
2. Provide an overview of different thermal and mechanical systems, introduce basics of robotics and its applications

UNIT-I 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.

Engineering Materials - Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials.

UNIT-II MANUFACTURING PROCESSES AND THERMAL ENGINEERING

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

Thermal Engineering – working principle of Boilers, Otto cycle, Diesel cycle, Refrigeration and air-conditioning cycles, IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles.

UNIT-III POWER PLANTS, MECHANICAL POWER \ TRANSMISSION & INTRODUCTION TO ROBOTICS

Power plants - working principle of Steam, Diesel, Hydro, Nuclear power plants.

Mechanical Power Transmission - Belt Drives, Chain, Rope drives, Cotter and Knuckle joints, Gear Drives and their applications.

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)

TEXT BOOKS:

1. Internal Combustion Engines by V. Ganesan, By Tata McGraw Hill publications (India) Pvt. Ltd.



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2. A Text book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd.
3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, cengage learning India pvt. Ltd

REFERENCE BOOKS:

1. Appu Kuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I
2. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak M Pandey, Springer publications
3. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt. Ltd.

e- Resources and Digital Material:

1. <https://www.nptelvideos.com/video.php?id=1191&c=7>
2. <https://nptel.ac.in/courses/112105249>

COURSE OUTCOMES:

1. Understand the importance of water resources and storage structures so that the Social responsibilities of water conservation will be appreciated.
2. Understand the different manufacturing processes and explain the basics of thermal engineering and its applications.
3. Describe the working of different mechanical power transmission systems and power plants, learn basics of robotics.

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I B.Tech. I Sem.

L	T	P	C
3	0	0	3

(23A05101) INTRODUCTION TO PROGRAMMING

Course Category	Engineering Science (ES)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

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

UNIT-I INTRODUCTION TO PROGRAMMING AND PROBLEM SOLVING

History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program - Algorithms, flowcharts (Using Dia Tool), pseudo code. Introduction to Compilation and Execution, Primitive Data Types, Variables, and Constants, Basic Input and Output, Operations, Type Conversion, and Casting. Problem solving techniques: Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms.

UNIT-II CONTROL STRUCTURES

Simple sequential programs, Conditional Statements (if, if-else, switch), Loops (for, while, do-while) Break and Continue.

UNIT-III ARRAYS AND STRINGS

Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Introduction to Strings.

UNIT-IV POINTERS & USER DEFINED DATA TYPES

Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, dynamic memory management. User-defined data types-Structures and Unions, Bit-fields, self-referential structures.



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UNIT-V FUNCTIONS & FILE HANDLING

Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters, command line arguments, recursion. Scope and Lifetime of Variables, Basics of File Handling, random access to a file. Note: The syllabus is designed with C Language as the fundamental language of implementation.

TEXT BOOKS:

1. The C Programming Language, Brian W. Kernighan and Dennis M. Ritchie, Prentice- Hall, 1988
2. Schaums Outline of Programming with C, Byron S Gottfried, McGraw-Hill Education, 1996

REFERENCE BOOKS:

1. Computing fundamentals and C Programming, Balagurusamy, E., McGraw-Hill Education, 2008.
2. Programming in C, Rema Theraja, Oxford, 2016, 2nd edition C Programming, A Problem- Solving approach, Forouzan, Gilberg, Prasad CENAGE 3rd Edition
3. C Programming, A Problem- s o l v i n g Approach, Forouzan, Gilberg, Prasad, CENAGE, 3rd Edition
4. C How to Program, 9th Edition, Paul Deitel, Pearson edition.
5. How to solve it by computer, R.G. Dromey, Prentice Hall international edition

e- Resources and Digital Material:

1. https://onlinecourses.nptel.ac.in/noc20_cs06/preview

COURSE OUTCOMES:

1. Understand basics of computers, the concept of algorithm and algorithmic thinking.
2. Analyze a problem and develop an algorithm to solve it.
3. Implement various algorithms using the C programming Language
4. Understand more advanced features of C language.
5. Develop problem-solving skills and the ability to debug and optimize the code.



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I B.Tech. I Sem.

L	T	P	C
0	0	2	1

(23A94102) COMMUNICATIVE ENGLISH LAB

Course Category	Basic Science & Humanities (BS & H)
Course Enrichment Relevance	Skill Development

COURSE OBJECTIVES:

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

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. Interviews Skills

Suggested Software:

- Walden Infotech
- Young India Films

REFERENCE BOOKS:

1. Meenakshi Raman, Sangeeta-Sharma. Technical Communication. Oxford Press.2018.
2. Grant Taylor: English Conversation Practice, Tata McGraw-Hill Education India, 2016
3. Hewing's, Martin. Cambridge Academic English (B2). CUP, 2012.
4. T. Balasubramanyam, A Textbook of English Phonetics for Indian Students, (3rd Ed) Trinity Press.

e-Resources and Digital Material:

1. www.esl-lab.com
2. www.englishmedialab.com



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3. www.englishinteractive.net
4. <https://www.britishcouncil.in/english/online>
5. <http://www.letstalkpodcast.com/>
6. https://www.youtube.com/c/mmmEnglish_Emma/featured

COURSE OUTCOMES:

1. Understand the different aspects of the English language proficiency with emphasis on LSRW skills. (L1)
2. Apply communication skills through various language learning activities. (L3)
3. Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension. (L4)
4. Evaluate and exhibit professionalism in participating in debates and group discussions. (L5)
5. Create effective resonate and prepare themselves to face interviews in future. (L6)

Remarks:

Additional E-Resources:

1. <https://www.youtube.com/c/ArnelsEverydayEnglish/featured>
2. <https://www.youtube.com/c/engvidAdam/featured>
3. <https://www.youtube.com/c/EnglishClass101/featured>
4. <https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists>
5. https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw

Voice & Accent:

1. <https://www.youtube.com/user/letstalkaccent/videos>
2. <https://www.youtube.com/c/EngLanguageClub/featured>
3. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc
4. https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA

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I B.Tech. I Sem.

L	T	P	C
0	0	2	1

(23A93102) CHEMISTRY LAB

Course Category	Basic Science (BS)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. Verify the fundamental concepts with experiments.

List of Experiments:

1. Measurement of 10Dq by spectrophotometric method.
2. Conductometric titration of strong acid vs. strong base.
3. Conductometric titration of weak acid vs. strong base.
4. Determination of cell constant and conductance of solutions.
5. Potentiometry - determination of redox potentials and emfs.
6. Determination of Strength of an acid in Pb-Acid battery.
7. Preparation of a Bakelite.
8. Verify Lambert-Beer's law.
9. Wavelength measurement of sample through UV-Visible Spectroscopy.
10. Identification of simple organic compounds by IR.
11. Preparation of nanomaterials by precipitation method.
12. Estimation of Ferrous Iron by Dichrometry.

TEXT BOOKS:

1. Skoog and West, Principles of Instrumental Analysis, Thomson, 2007.
2. J.M. Lehn, Supra Molecular Chemistry, VCH Publications

REFERENCE BOOKS:

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

e-Resources and Digital Material:

1. <https://www.labsafety.org/report-a-lab-accident>
2. <https://www.labsafety.org/product/lab-safety-rules>

COURSE OUTCOMES:

1. Determine the cell constant and conductance of solutions.
2. Prepare advanced polymer Bakelite materials.
3. Measure the strength of an acid present in secondary batteries.
4. Analyse the IR spectra of some organic compounds.
5. Calculate strength of acid in Pb-Acid battery.



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I B.Tech. I Sem.

L	T	P	C
0	0	3	1.5

(23A03103) ENGINEERING WORKSHOP

Course Category	Engineering Science (ES)
Course Enrichment Relevance	Skill Development

COURSE OBJECTIVES:

1. To familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills.

1. **Demonstration:** Safety practices and precautions to be observed in workshop.
2. **Wood Working:** Familiarity with different types of woods and tools used in wood Working and Make 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, Developments of following sheet metal job from GI sheets.

a) Tapered tray b) Conical funnel c) Elbow pipe d) Brazing

4. **Fitting:** Familiarity with different types of tools used in fitting and do the following fitting Exercises

a) V-fit b) Dovetail fit c) Semi- circular fit d) Bicycle tire puncture and change of two- Wheeler tyre.

5. **Electrical Wiring:** Familiarity with different types of basic electrical circuits and make the Following connections

a) Parallel and series b) Two-way switch c) Go down lighting d) Tube light
e) Three phase motor f) Soldering of wires

6. **Foundry Trade:** Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns.

7. **Welding Shop:** Demonstration and practice on Arc Welding and Gas welding.

Preparation of Lap Joint and Butt joint.

8. **Plumbing:** Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters.



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TEXT BOOKS:

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. Raghuvanshi, Dhanpath Rai & Co., 2015 & 2017

REFERENCE BOOKS:

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

COURSE OUTCOMES:

1. Identify workshop tools and their operational capabilities.
2. Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding.
3. Apply fitting operations in various applications.
4. Apply basic electrical engineering knowledge for House Wiring Practice.

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L	T	P	C
0	0	3	1.5

(23A05103) COMPUTER PROGRAMMING LAB

Course Category	Engineering Science (ES)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

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

WEEK-1:

Objective: Getting familiar with the programming environment on the computer and writing the first program.

Suggested Experiments/Activities:

Tutorial 1: Problem-solving using Computers.

Lab1: Familiarization with programming environment

- i) Basic Linux environment and its editors like Vi, Vim & Emacs etc.
- ii) Exposure to Turbo C, gcc
- iii) Writing simple programs using printf (), scanf ()

WEEK- 2:

Objective: 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.

Suggested Experiments /Activities:

Tutorial 2: Problem-solving using Algorithms and Flow charts.

Lab 1: Converting algorithms/flow charts into C Source code. 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- 3:

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

Suggested Experiments/Activities:

Tutorial 3: Variable types and type conversions:

Lab 3: Simple computational problems using arithmetic expressions.

- i) Finding the square root of a given number
- ii) Finding compound interest
- iii) Area of a triangle using herons formulae
- iv) Distance travelled by an object



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WEEK-4:

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

Suggested Experiments/Activities:

Tutorial4: Operators and the precedence and as associativity:

Lab4: Simple computational problems using the operator- precedence and associativity

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- 5:

Objective: Explore the full scope of different variants of -if construct- namely if-else, null 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-.

Suggested Experiments/Activities:

Tutorial-5: Branching and logical expressions:

Lab 5: Problems involving if-then-else structures.

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- 6:

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.

Suggested Experiments/Activities:



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Tutorial 6: Loops, while and for loops

Lab 6: Iterative problems e.g., the sum of series

- 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-7:

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.

Suggested Experiments/Activities:

Tutorial 7: 1 D Arrays: searching.

Lab 7: 1D Array manipulation, linear search

- i) Find the min and max of a 1-D integer array.
- ii) Perform linear search on 1D 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- 8:

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.

Suggested Experiments/Activities:

Tutorial 8: 2 D arrays, sorting and Strings.

Lab 8: Matrix problems, String operations, Bubble sort

- 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-9:

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



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Suggested Experiments/Activities:

Tutorial- 9: Pointers, structures and dynamic memory allocation

Lab 9: Pointers and structures, memory dereference.

- 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- 10:

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

Suggested Experiments/Activities:

Tutorial 10: Bitfields, Self-Referential Structures, Linked lists

Lab-10: Bitfields, linked lists

Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit- fields

- i) Create and display a singly linked list using self-referential structure.
- ii) Demonstrate the differences between structures and unions using a C program.
- iii) Write a C program to shift/rotate using bitfields.
- iv) Write a C program to copy one structure variable to another structure of the same type.

WEEK-11:

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

Suggested Experiments/Activities:

Tutorial 11: Functions, call by value, scope and extent,

Lab- 11: Simple functions using call by value, solving differential equations using Eulers theorem.

- 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.
- iv) Write a C function to demonstrate numerical integration of differential equations using Eulers method



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WEEK- 12:

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.

Suggested Experiments/Activities:

Tutorial-12: Recursion, the structure of recursive calls

Lab 12: Recursive functions

- 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.
- iv) Write a C Program to implement Ackermann function using recursion.
- v) Write a recursive function to find the sum of series.

WEEK- 13:

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

Suggested Experiments/Activities:

Tutorial 13: Call by reference, dangling pointers

Lab 13: Simple functions using Call by reference, Dangling pointers.

- i) Write a C program to swap two numbers using call by reference.
- ii) Demonstrate Dangling pointer problem using a C program.
- iii) Write a C program to copy one string into another using pointer.
- iv) Write a C program to find no of lowercase, uppercase, digits and other characters using pointers.

WEEK14:

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

Suggested Experiments/Activities:

Tutorial-14: File handling

Lab 14: File operations

- 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) Copy the contents of one file to another file.
- iv) Write a C program to merge two files into the third file using command-line arguments.
- v) Find no. of lines, words and characters in a file
- vi) Write a C program to print last n characters of a given file.

TEXT BOOKS:

1. Ajay Mittal, Programming in C: A practical approach, Pearson.
2. Byron Gottfried, Schaum' s Outline of Programming with C, McGraw Hill



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REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice- Hall of India
2. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

COURSE OUTCOMES:

1. Read, understand, and trace the execution of programs written in C language.
2. Select the right control structure for solving the problem.
3. Develop C programs which utilize memory efficiently using programming constructs like pointers.
4. Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.



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I B.Tech. I Sem.

L	T	P	C
0	0	1	0.5

(23A99102) HEALTH AND WELLNESS YOGA AND SPORTS

Course Category	Basic Science & Humanities (BS & H)
Course Enrichment Relevance	Environment & Sustainability

COURSE OBJECTIVES:

1. The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the 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) of all age groups. **Activities:**

1. Organizing health awareness programmes in community
2. Preparation of health profile
3. Preparation of chart for balance diet for all age group

UNIT-II:

Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and 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 viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc. Practicing general and specific warm up, aerobics
2. Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running.

REFERENCE BOOKS:

1. Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn. Jones & Bartlett Learning, 2022
2. T.K.V.Desikachar. The Heart of Yoga: Developing a Personal Practice
3. Archie J.Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993
4. Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere Third Edition, William Morrow Paperbacks, 2014
5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. Human Kinetics, Inc.2014



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COURSE OUTCOMES:

1. Understand the importance of yoga and sports for Physical fitness and sound health.
2. Demonstrate an understanding of health-related fitness components.
3. Compare and contrast various activities that help enhance their health.
4. Assess current personal fitness levels
5. Develop Positive Personality

Remarks:

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities of Health/Sports/Yoga.
2. Institutes must provide field/facility and offer the minimum of five choices of as many as Games/Sports.
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totaling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

I B.Tech II Semester Course Structure

**SANTHIRAM ENGINEERING COLLEGE****(AUTONOMOUS)****DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**

S. No	Subject Code	Course Category	Name of the Subject	Hours/Week			Credits	Marks		
				Lecture	Tutorial	Practical		Internal	External	Total
1	23A91202	BS&H	DIFFERENTIAL EQUATIONS & VECTOR CALCULUS	3	0	0	3	30	70	100
2	23A04101	ES	BASIC ELECTRICAL & ELECTRONICS ENGINEERING	3	0	0	3	30	70	100
3	23A03101	ES	ENGINEERING GRAPHICS	1	0	4	3	30	70	100
4	23A05204	PC	DATA STRUCTURES	3	0	0	3	30	70	100
5	23A92101	BS&H	ENGINEERING PHYSICS	3	0	0	3	30	70	100
6	23A05102	ES	IT WORKSHOP	0	0	2	1	30	70	100
7	23A92102	BS&H	ENGINEERING PHYSICS LAB	0	0	2	1	30	70	100
8	23A04102	ES	ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP	0	0	3	1.5	30	70	100
9	23A05205	PC	DATASTRUCTURE S LAB	0	0	3	1.5	30	70	100
10	23A99101	BS&H	NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE	0	0	1	0.5	0	100	100

I B.Tech II Semester Syllabus

**SANTHIRAM ENGINEERING COLLEGE****(AUTONOMOUS)****DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**

I B.Tech. II Sem.

L	T	P	C
3	0	0	3

(23A91202) DIFFERENTIAL EQUATIONS & VECTOR CALCULUS

Course Category	Basic Science & Humanities (BS & H)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To enlighten the learners in the concept of differential equations and multivariable calculus.
2. To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications.

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 Trajectory, Newton's Law of cooling – Law of natural growth and decay- Electrical circuits.

UNIT-II LINEAR DIFFERENTIAL EQUATIONS OF HIGHER ORDER (CONSTANT COEFFICIENTS)

Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskian, Method of variation of parameters. Simultaneous linear equations, Euler-Cauchy's Linear Equations. Applications to L-C-R Circuit problems and Simple Harmonic motion

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 applies to scalar point functions- Gradient, Directional derivative, del applied to vector point functions-Divergence and Curl, vector identities

UNIT-V VECTOR INTEGRATION

Line integral-circulation-work done, surface integral-flux, green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and related problems.



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TEXT BOOKS:

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 Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
5. Higher Engineering Mathematics, B. V. Ramana, McGraw Hill Education, 2017

COURSE OUTCOMES:

1. Solve the differential equations related to various engineering fields.
2. Identify solution methods for partial differential equations that model physical processes.
3. Interpret the physical meaning of different operators such as gradient, curl and divergence
4. Estimate the work done against a field, circulation and flux using vector calculus.



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I B.Tech. II Sem.

L	T	P	C
3	0	0	3

(23A04101) BASIC ELECTRICAL & ELECTRONICS ENGINEERING PART

A: BASIC ELECTRICAL ENGINEERING

Course Category	Engineering Science (ES)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. 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.

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, Super Position theorem, 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, Concept of power factor (Simple Numerical problems).

UNIT-II MACHINES AND MEASURING INSTRUMENTS

Machines:

Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.

Measuring Instruments:

Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone bridge.

UNIT-III ENERGY RESOURCES, ELECTRICITY BILL & SAFETY MEASURES

Energy Resources:

Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Nuclear, Solar & Wind power generation.

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.



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Equipment Safety Measures:

Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

TEXT 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

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. Bhattacharya, Person Publications, 2018, Second Edition.

e-Resources and Digital Material:

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

COURSE OUTCOMES:

1. Remember the fundamental laws, operating principles of motors, generators, MC and MI instruments.
2. Understand the problem solving concepts associated to AC and DC circuits, construction and operation of AC and DC machines, measuring instruments; different power generation mechanisms, Electricity billing concept and important safety measures related to electrical operations
3. Apply mathematical tools and fundamental concepts to derive various equations related to machines, circuits and measuring instruments; electricity bill calculations and layout representation of electrical power systems.
4. Analyze different electrical circuits, performance of machines and measuring instruments.
5. Evaluate different circuit configurations, Machine performance and Power systems operation.



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I B.Tech. II Sem.

L	T	P	C
3	0	0	3

(23A04101) BASIC ELECTRICAL & ELECTRONICS ENGINEERING PART B: BASIC ELECTRONICS ENGINEERING

Course Category	Engineering Science (ES)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. This course provides the student with the fundamental skills to understand the principles of digital electronics, basics of semiconductor devices like diodes & transistors, characteristics and its applications.

UNIT-I 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-II BASIC ELECTRONIC CIRCUITS AND INSTRUMENTATION

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.

UNIT-III DIGITAL ELECTRONICS

Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, Gray code, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates- NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple combinational circuits-Half and Full Adder, Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only).

TEXT BOOKS:

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009

REFERENCE BOOKS:

1. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.



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2. Santiram Kal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.
3. R. T. Paynter, Introductory Electronic Devices & Circuits Conventional Flow Version, Pearson Education, 2009.

COURSE OUTCOMES:

1. Apply the concept of science and mathematics to understand the working of diodes, transistors, and their applications.
2. Explain the characteristics of diodes and transistors.
3. Familiarize with the number systems, codes, Boolean algebra and logic gates.
4. Understand the working mechanism of different combinational, sequential circuits and their role in the digital systems.



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I B.Tech. II Sem.

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1	0	4	3

(23A03101) ENGINEERING GRAPHICS

Course Category	Engineering Science (ES)
Course Enrichment Relevance	Skill Development

COURSE OBJECTIVES:

1. Understand the basic principles and conventions of engineering drawing, use Engineering instruments and draw engineering curves.
2. Use orthographic projections and make the students draw the projections of lines Inclined to both the
3. Draw the projections of the Solids in different positions with respect to the Reference planes.
4. Understand the importance of sectioning and concept of development of surfaces.
5. Represent and convert isometric views to orthographic views and vice versa.

UNIT-I INTRODUCTION TO ENGINEERING GRAPHICS, CURVES AND SCALES

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.

Curves: construction of ellipse, parabola, hyperbola and Rectangular Hyperbola by general, Cycloids and Involute by general with Normal and tangent to Curves.

Scales: Plain scales, diagonal scales and Vernier scales.

UNIT-II ORTHOGRAPHIC PROJECTIONS, PROJECTIONS OF STRAIGHT LINES AND PLANES

Orthographic Projections: Reference plane, importance of reference lines or Plane Projections of a point situated in any one of the four quadrants.

Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes and its Traces.

Projections of Planes: regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.



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UNIT-III PROJECTIONS OF SOLIDS

Projections of Solids: Types of solids: Polyhedra and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to other and axes inclined to both the reference planes.

UNIT-IV SECTIONS OF SOLIDS AND DEVELOPMENT OF SURFACES

Sections of Solids: Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only.

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

UNIT-V CONVERSION OF VIEWS AND COMPUTER GRAPHICS

Conversion of Views: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Computer graphics: Creating 2D&3D drawings of objects including PCB and Transformations using Auto CAD (Not for end examination).

TEXT BOOKS:

1. N.D. Bhatt, Engineering Drawing, 53/e, Charotar Publishers, 2016.
2. K.L. Narayana &P. Kannaiah, Engineering Drawing, 3/e, SciTech Publishers, 2012.

REFERENCE BOOKS:

1. Engineering Drawing, M.B. Shah and B.C. Rana, Pearson Education Inc,2009.
2. Engineering Drawing with an Introduction to AutoCAD, Dhananjay Jolhe, Tata McGraw Hill, 2017.
3. Venugopal, Engineering Drawing and Graphics, 3/e, New Age Publishers, 2000.
4. K.C. John, Engineering Graphics, 2/e, PHI, 2013.
5. Basant Agarwal and C.M. Agarwal, Engineering Drawing, Tata McGraw Hill,2008.

e-Resources and Digital Material:

1. <https://nptel.ac.in/courses/112/105/112105294/>
2. <https://nptel.ac.in/courses/112/103/112103019/>

COURSE OUTCOMES:

1. Understand the principles of engineering drawing, including engineering curves, Scales, orthographic and isometric projections.



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2. Draw and interpret orthographic projections of Points, lines, Planes and solids in front, top and side views.
3. Understand and apply concepts of sectional views to represent details of solids in simple positions.
4. Gain a clear understanding of the principles behind development of surfaces and to understand how to unfold basic geometric shapes into flat patterns.
5. Develop the ability to draw isometric views and orthographic views and should be able to convert isometric views to orthographic views and vice versa.



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L	T	P	C
3	0	0	3

(23A05204) DATA STRUCTURES

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

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

UNIT-I

Introduction to Linear Data Structures: Definition and importance of linear data structures, Abstract data types (ADTs) and their implementation, Overview of time and space complexity analysis for linear data structures. Searching Techniques: Linear & Binary Search, Sorting Techniques: Bubble sort, Selection sort, Insertion Sort

UNIT-II

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-III

Stacks: Introduction to stacks: properties and operations, implementing stacks using arrays and linked lists, Applications of stacks in expression evaluation, backtracking, reversing list etc.

UNIT-IV

Queues: Introduction to queues: properties and operations, implementing queues using arrays and linked lists, Applications of queues in breadth-first search, scheduling, etc.

Deque: Introduction to deque (double-ended queues), Operations on deque and their applications.

UNIT-V

Trees: Introduction to Trees, binary tree and its properties, binary tree representation. Binary Search Tree – Insertion, Deletion & Traversal. Height Balanced Search Tree: AVL Tree and operations.

Hashing: Brief introduction to hashing and hash functions, Collision resolution techniques: chaining and open addressing, Hash tables: basic implementation and operations, Applications of hashing in unique identifier generation, caching, etc.



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TEXT BOOKS:

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

COURSE OUTCOMES:

1. Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.
2. Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.
3. Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.
4. 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.
5. Devise novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees.
6. Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.



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3	0	0	3

(23A92101) ENGINEERING PHYSICS

Course Category	Basic Science & Humanities (BS & H)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To bridge the gap between the Physics in school at 10+2 level and UG level engineering courses by identifying the importance of the optical phenomenon like interference, diffraction etc, enlightening the periodic arrangement of atoms in crystalline solids and concepts of quantum mechanics, introduce novel concepts of dielectric and magnetic materials, physics of semiconductors.

UNIT-I WAVE OPTICS

Interference: Introduction - Principle of superposition - Interference of light - Interference in thin films (Reflection Geometry) & applications - Colours in thin films - Newtons Rings, Determination of wavelength and refractive index. **Diffraction:** Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit & N-slits (Qualitative) - Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative). **Polarization:** Introduction - Types of polarization - Polarization by reflection, refraction and Double refraction - Nicols Prism - Half wave and Quarter wave plates.

UNIT-II CRYSTALLOGRAPHY AND X-RAY DIFFRACTION

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters - Bravais Lattices - crystal systems (3D) - coordination number - packing fraction of SC, BCC & FCC - Miller indices - separation between successive (hkl) planes.

X-ray diffraction: Bragg's law - Intensity of diffracted beams, X-ray Diffractometer - crystal structure determination by Laue's and powder methods.

UNIT-III DIELECTRIC MATERIALS & MAGNETIC MATERIALS

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 & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials.



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UNIT-IV QUANTUM MECHANICS AND FREE ELECTRON THEORY

Quantum Mechanics Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well. Free Electron Theory Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory – electrical conductivity based on quantum free electron theory - Fermi-Dirac distribution - Density of states - Fermi energy.

UNIT-V SEMICONDUCTORS

Semiconductors Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – Determination of Energy Band Gap (E_g) Extrinsic semiconductors: density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation - Hall effect and its applications.

TEXT BOOKS:

1. A Text book of Engineering Physics - M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy, S. Chand Publications, 11th Edition 2019.
2. Engineering Physics - D.K.Bhattacharya and Poonam Tandon, Oxford press (2015).

REFERENCE BOOKS:

1. Engineering Physics - B.K. Pandey and S. Chaturvedi, Cengage Learning.
2. Engineering Physics - Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.
3. Engineering Physics” - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press.
4. Engineering Physics - M.R. Srinivasan, New Age international publishers (2009).

e- Resources and Digital Material:

1. <http://ndl.iitkgp.ac.in/document/aUUzSzg0NXozaDZheVpnMEtnb3lZclAvRWlIWmN0VUxxeFpzVURYaUxyWT0>
2. <https://books.google.com/books?id=fGo7BgUozoMC&printsec=frontcover>

COURSE OUTCOMES:

1. Analyze the intensity variation of light due to polarization, interference and diffraction.
2. Familiarize with the basics of crystals and their structures.
3. Summarize various types of polarization of dielectrics and classify the magnetic materials.
4. Explain the basic concepts of Quantum Mechanics and the band theory of solids.
5. Identify the type of semiconductor using Hall effect.



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(23A05102) IT WORKSHOP

Course Category	Engineering Science (ES)
Course Enrichment Relevance	Skill Development

COURSE OBJECTIVES:

1. To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables
2. To demonstrate configuring the system as Dual boot both Windows and other Operating Systems Viz. Linux, BOSS
3. To teach basic command line interface commands on Linux.
4. To teach the usage of Internet for productivity and self-paced life-long learning
5. To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spread sheets and Presentation tools.

PC Hardware & Software Installation

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.

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.

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.

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

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



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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.



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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,

LOOKUP/VLOOKUP

Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

POWER POINT

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?'"

REFERENCE BOOKS:



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1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003
2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech, 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 Anfinson 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

COURSE OUTCOMES:

1. Perform Hardware troubleshooting.
2. Understand Hardware components and inter dependencies.
3. Safeguard computer systems from viruses/worms.
4. Document/ Presentation preparation. CO5: Perform calculations using spreadsheets

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I B.Tech. II Sem.

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(23A92102) ENGINEERING PHYSICS LAB

Course Category	Basic Science & Humanities (BS & H)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. 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 dielectric and magnetic materials by conducting experiments.

List of Experiments:

1. Determination of radius of curvature of a given plano convex lens by Newton's rings.
2. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
3. Verification of Brewster's law
4. Determination of dielectric constant using charging and discharging method.
5. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
6. Determination of wavelength of Laser light using diffraction grating.
7. Estimation of Planck's constant using photoelectric effect.
8. Determination of the resistivity of semiconductors by four probe methods.
9. Determination of energy gap of a semiconductor using p-n junction diode.
10. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method.
11. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.
12. Determination of temperature coefficients of a thermistor.
13. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum.
14. Determination of magnetic susceptibility by Kundt's tube method.
15. Determination of rigidity modulus of the material of the given wire using Torsional pendulum.
16. Sonometer: Verification of laws of stretched string.
17. Determination of young's modulus for the given material of wooden scale by non-uniform bending (or double cantilever) method.
18. Determination of Frequency of electrically maintained tuning fork by Melde's experiment.

Note: Any TEN of the listed experiments are to be conducted. Out of which any TWO experiments may be conducted in virtual mode.



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REFERENCE BOOKS:

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

e-Resources and Digital Material:

1. www.vlab.co.in
2. <https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype>

COURSE OUTCOMES:

1. Operate optical instruments like travelling microscope and spectrometer.
2. Estimate the wavelengths of different colors using diffraction grating.
3. Plot the intensity of the magnetic field of circular coil carrying current with distance.
4. Calculate the band gap of a given semiconductor.
5. Identify the type of semiconductor using Hall effect.

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I B.Tech. II Sem.

L	T	P	C
0	0	3	1.5

(23A04102) ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP**PART A: ELECTRICAL ENGINEERING LAB**

Course Category	Engineering Science (ES)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To impart knowledge on the fundamental laws & theorems of electrical circuits, functions of electrical machines and energy calculations.

Activities: (PART A & PART B)

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: (PART A)

1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Measurement of Resistance using Wheat stone bridge
4. Magnetization Characteristics of DC shunt Generator
5. Measurement of Power and Power factor using Single-phase wattmeter
6. Measurement of Earth Resistance using Megger
7. Calculation of Electrical Energy for Domestic Premises

Note: Minimum Six Experiments to be performed.



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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

COURSE OUTCOMES:

1. Understand the Electrical circuit design concept; measurement of resistance, power, power factor; concept of wiring and operation of Electrical Machines and Transformer.
2. Apply the theoretical concepts and operating principles to derive mathematical models for circuits, Electrical machines and measuring instruments; calculations for the measurement of resistance, power and power factor.
3. Apply the theoretical concepts to obtain calculations for the measurement of resistance, power and power factor.
4. Analyse various characteristics of electrical circuits, electrical machines and measuring instruments.
5. Design suitable circuits and methodologies for the measurement of various electrical parameters; Household and commercial wiring.

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I B.Tech. II Sem.

L	T	P	C
0	0	3	1.5

**(23A04102) ELECTRICAL & ELECTRONICS ENGINEERING
WORKSHOP****PART B: ELECTRONICS ENGINEERING LAB**

Course Category	Engineering Science (ES)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To impart knowledge on the principles of digital electronics and fundamentals of electron devices & its applications.

List of Experiments:

1. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
2. Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
3. Implementation of half wave and full wave rectifiers
4. Plot Input & Output characteristics of BJT in CE and CB configurations
5. Frequency response of CE amplifier.
6. Simulation of RC coupled amplifier with the design supplied
7. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs.
8. 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

Note: Minimum Six Experiments to be performed. All the experiments shall be implemented using both Hardware and Software.

REFERENCE BOOKS:

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education, 2009.

COURSE OUTCOMES:

1. Identify & testing of various electronic components
2. Understand the usage of electronic measuring instruments.
3. Plot and discuss the characteristics of various electron devices.
4. Explain the operation of a digital circuit.



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I B.Tech. II Sem.

L	T	P	C
0	0	3	1.5

(23A05205) DATA STRUCTURES LAB

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. 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.

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: 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 3: 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 4: Double Linked List Implementation

- i) Implement a doubly linked list and perform various operations to understand its properties and applications.
- i) Implement a circular linked list and perform insertion, deletion, and traversal.

Exercise 5: Stack Operations

- i) Implement a stack using arrays and linked lists.



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- 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 6: 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 7: 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 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.

TEXT BOOKS:

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.

COURSE OUTCOMES:



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1. Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.
2. Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.
3. Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.
4. 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.
5. Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.



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I B.Tech. II Sem.

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(23A99101) NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE

Course Category	Basic Science & Humanities (BS & H)
Course Enrichment Relevance	Environment & Sustainability

COURSE OBJECTIVES:

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

UNIT I: Orientation General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, career guidance. **Activities:**

1. Conducting- ice breaking sessions-expectations from the course-knowing personal talents and skills
2. Conducting orientations programs for the students - future plans-activities-releasing road map etc.
3. Displaying success stories-motivational biopics- award winning movies on societal issues etc.
4. Conducting talent show in singing patriotic songs-paintings- any other contribution.

UNIT II: Nature & Care Activities:

1. Best out of waste competition.
2. Poster and signs making competition to spread environmental awareness.
3. Recycling and environmental pollution article writing competition.
4. Organizing 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. Write a summary on any book related to environmental issues.

UNIT III: Community Service Activities:

1. Conducting One Day Special Camp in a village contacting village-area leaders-Survey in the village, identification of problems- helping them to solve via media-authorities-experts-etc.
2. Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS.
3. Conducting consumer Awareness. Explaining various legal provisions etc.
4. Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.
5. Any other programmes in collaboration with local charities, NGOs etc.



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REFERENCE BOOKS:

1. Nirmalya Kumar Sinha & Surajit Majumder, A Text Book 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. and Cornwell D. A., “Introduction to Environmental Engineering”, McGraw Hill, New York 4/e 2008
4. Masters G. M., Joseph K. and 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.

COURSE OUTCOMES:

1. Understand the importance of discipline, character and service motto.
2. Solve some societal issues by applying acquired knowledge, facts, and techniques.
3. Explore human relationships by analyzing social problems.
4. Determine to extend their help for the fellow beings and downtrodden people.
5. Develop leadership skills and civic responsibilities.

Remarks:

General Guidelines:

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

Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

II B.Tech I Semester Course Structure

**SANTHIRAM ENGINEERING COLLEGE****(AUTONOMOUS)****DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING****Course Structure**

S.No	Subject Code	Course Category	Name of the Subject	Hours/Week			Credits	Marks		
				Lecture	Tutorial	Practical		Internal	External	Total
1	23A91305	BS	DISCRETE MATHEMATICS & GRAPH THEORY	3	0	0	3	30	70	100
2	23A99303	HS	UNIVERSAL HUMAN VALUES - UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT	2	1	0	3	30	70	100
3	23A04310	ES	DIGITAL LOGIC & COMPUTER ORGANIZATION	3	0	0	3	30	70	100
4	23A05307	PC	ADVANCED DATA STRUCTURES & ALGORITHMS ANALYSIS	3	0	0	3	30	70	100
5	23A05308	PC	OBJECT ORIENTED PROGRAMMING THROUGH JAVA	3	0	0	3	30	70	100
6	23A05309	PC	ADVANCED DATA STRUCTURES AND ALGORITHMS ANALYSIS LAB	0	0	3	1.5	30	70	100
7	23A05310	PC	OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB	0	0	3	1.5	30	70	100
8	23A05306	SC	PYTHON PROGRAMMING	0	1	2	2	30	70	100
9	23A93303	MC(NC)	ENVIRONMENTAL SCIENCE	2	0	0	0	30	0	30
10	23A91304	BS	COMPETITIVE ABILITY COURSE - I	2	nil	nil	0	30	0	30

II B.Tech I Semester Syllabus



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II B.Tech. I Sem.

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3	0	0	3

(23A91305) DISCRETE MATHEMATICS & GRAPH THEORY

Course Category	Basic Science (BS)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

UNIT-I MATHEMATICAL LOGIC

Introduction, Statements and Notation, Connectives, Well-formed formulas, Tautology, Duality law, Equivalence, Implication, Normal Forms, functionally complete set of connectives, Inference Theory of Statement Calculus, Predicate Calculus, Inference theory of Predicate Calculus

UNIT-II SET THEORY

The Principle of Inclusion- Exclusion, Pigeon hole principle and its application, Functions composition of functions, Inverse Functions, Recursive Functions, Lattices and its properties. Algebraic structures: Algebraic Systems-Examples and General Properties, Semi groups and Monoids, groups, sub groups, homomorphism, Isomorphism

UNIT-III ELEMENTARY COMBINATORICS

Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutations with Constrained Repetitions, Binomial Coefficients, The Binomial and Multinomial Theorems

UNIT-IV RECURRENCE RELATIONS

Generating Functions of Sequences, Calculating Coefficients of Generating Functions, Recurrence relations, Solving Recurrence Relations by Substitution and Generating functions, The Method of Characteristic roots, Solutions of Inhomogeneous, Recurrence Relations

UNIT-V GRAPHS

Basic Concepts, Isomorphism and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multigraphs and Euler Circuits, Hamiltonian Graphs

TEXT BOOKS:

1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, 2002
2. Kenneth H. Rosen, Discrete Mathematics and its Applications with Combinatorics and Graph Theory, 7th Edition, McGraw Hill Education (India) Private Limited.

REFERENCE BOOKS:



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

1. Joe L. Mott, Abraham Kandel and Theodore P. Baker, Discrete Mathematics for Computer Scientists & Mathematicians, 2nd Edition, Pearson Education
2. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science.

e- Resources and Digital Material:

1. <http://www.cs.yale.edu/homes/aspnes/classes/202/notes.pdf>

COURSE OUTCOMES:

1. Apply mathematical logic to solve problems
2. Understand the concepts and perform the operations related to sets, relations and functions. Gain the conceptual background needed and identify structures of algebraic nature.
3. Apply basic counting techniques to solve combinatorial problems.
4. Formulate problems and solve recurrence relations.
5. Apply Graph Theory in solving computer science problems

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II B.Tech. I Sem.

L	T	P	C
2	1	0	3

**(23A99303) UNIVERSAL HUMAN VALUES - UNDERSTANDING
HARMONY AND ETHICAL HUMAN CONDUCT**

Course Category	Humanities & Social Sciences (HS)
Course Enrichment Relevance	Human Values

COURSE OBJECTIVES:

1. 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.
2. 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
3. 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.

**UNIT-I INTRODUCTION TO VALUE EDUCATION (6 LECTURES
AND 3 TUTORIALS FOR PRACTICE SESSION)**

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

Lecture 4: 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 Practice Sessions for

UNIT I - Introduction to Value Education PS1 Sharing about

Oneself PS2 Exploring Human Consciousness PS3

Exploring Natural Acceptance



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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 PRACTICE SESSION)

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



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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 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

TEXT BOOKS:

1. 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
2. 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. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, 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

e-Resources and Digital Material:

1. <https://fdp-si.aicte-india.org/UHV%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf>
2. <https://fdp-si.aicte-india.org/UHV%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf>
3. <https://fdp-si.aicte-india.org/UHV%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%202023.pdf>
5. <https://fdp-si.aicte-india.org/UHV%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%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-S2A%20Und%20Nature-Existence.pdf>



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COURSE OUTCOMES:

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



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II B.Tech. I Sem.

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(23A04310) DIGITAL LOGIC & COMPUTER ORGANIZATION

Course Category	Engineering Science (ES)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. The main objective of the course is to provide students with a comprehensive understanding of digital logic design principles and computer organization fundamentals
2. Describe memory hierarchy concepts
3. Explain input/output (I/O) systems and their interaction with the CPU, memory, and peripheral devices

UNIT-I DATA REPRESENTATION

Binary Numbers, Fixed Point Representation. Floating Point Representation. Number base conversions, Octal and Hexadecimal Numbers, components, Signed binary numbers, Binary codes.

Digital Logic Circuits-I: Basic Logic Functions, Logic gates, universal logic gates, Minimization of Logic expressions. K-Map Simplification, Combinational Circuits, Decoders, Multiplexers.

UNIT-II DIGITAL LOGIC CIRCUITS-II

Sequential Circuits, Flip-Flops, Binary counters, Registers, Shift Registers, Ripple counters.

Basic Structure of Computers: Computer Types, Functional units, Basic operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers, Computer Generations, Von- Neumann Architecture.

UNIT-III COMPUTER ARITHMETIC

Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed-operand Multiplication, Fast Multiplication, Integer Division, Floating-Point Numbers and Operations

Processor Organization: Fundamental Concepts, Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control and Multi programmed Control

UNIT-IV THE MEMORY ORGANIZATION

Basic Concepts, Semiconductor RAM Memories, Read-Only Memories, Speed, Size and Cost, Cache Memories, Performance Considerations, Virtual Memories, Memory Management Requirements, Secondary Storage

UNIT-V INPUT /OUTPUT ORGANIZATION

Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces



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TEXT BOOKS:

1. Computer Organization, Carl Hamacher, Zvonko Vranesic, Safwat Zaky, 6th edition, McGraw Hill, 2023
2. Digital Design, 6th Edition, M. Morris Mano, Pearson Education, 2018
3. Computer Organization and Architecture, William Stallings, 11th Edition, Pearson, 2022.

REFERENCE BOOKS:

1. Computer Systems Architecture, M. Moris Mano, 3rd Edition, Pearson, 2017.
2. Computer Organization and Design, David A. Paterson, John L. Hennessy, Elsevier, 2004
3. Fundamentals of Logic Design, Roth, 5th Edition, Thomson, 2003

e-Resources and Digital Material:

1. <https://nptel.ac.in/courses/106/103/106103068>

COURSE OUTCOMES:

1. Design Combinational Circuits with the help of logic gates (L2).
2. Design sequential Circuits and demonstrate an understanding of computer functional units. (L2, L6)
3. Analyze the design and operation of processors, including instruction execution, pipelining, and control unit mechanisms, to comprehend their role in computer systems. (L3)
4. Describe memory hierarchy concepts, including cache memory, virtual memory, and secondary storage, and evaluate their impact on system performance and scalability. (L3)
5. Explain input/output (I/O) systems and their interaction with the CPU, memory, and peripheral devices, including interrupts, DMA, and I/O mapping techniques. (L3)

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II B.Tech. I Sem.

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(23A05307) ADVANCED DATA STRUCTURES & ALGORITHMS ANALYSIS

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. provide knowledge on advance data structures frequently used in Computer Science domain
2. Develop skills in algorithm design techniques popularly used
3. Understand the use of various data structures in the algorithm design
4. Provide knowledge on backtracking and branch and bound techniques commonly used for solving combinatorial and optimization problems.
5. Develop an understanding of NP-Hard and NP-Complete problems, with a focus on Cook's theorem and their computational complexity.

UNIT-I INTRODUCTION TO ALGORITHM ANALYSIS, AVL TREES

Introduction to Algorithm Analysis, Space and Time Complexity analysis, Asymptotic Notations. AVL Trees - Creation, Insertion, Deletion operations and Applications B-Trees - Creation, Insertion, Deletion operations and Applications

UNIT-II HEAP TREES (PRIORITY QUEUES), DIVIDE AND CONQUER

Heap Trees (Priority Queues) - Min and Max Heaps, Operations and Applications Graphs - Terminology, Representations, Basic Search and Traversals, Connected Components and Biconnected Components, applications Divide and Conquer: The General Method, Quick Sort, Merge Sort, Strassen's matrix multiplication, Convex Hull

UNIT-III GREEDY METHOD, DYNAMIC PROGRAMMING

Greedy Method: General Method, Job Sequencing with deadlines, Knapsack Problem, Minimum cost spanning trees, Single Source Shortest Paths. Dynamic Programming: General Method, All pairs shortest paths, Single Source Shortest Paths – General Weights (Bellman Ford Algorithm), Optimal Binary Search Trees, 0/1 Knapsack, String Editing, Travelling Salesperson problem

UNIT-IV BACKTRACKING, BRANCH AND BOUND

Backtracking: General Method, 8-Queens Problem, Sum of Subsets problem, Graph Coloring, 0/1 Knapsack Problem Branch and Bound: The General Method, 0/1 Knapsack Problem, Travelling Salesperson problem



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UNIT-V NP HARD AND NP COMPLETE PROBLEMS, NP HARD GRAPH PROBLEMS

NP Hard and NP Complete Problems: Basic Concepts, Cook's theorem, NP Hard Graph Problems: Clique Decision Problem (CDP), Chromatic Number Decision Problem (CNDP), Traveling Salesperson Decision Problem (TSP) NP Hard Scheduling Problems: Scheduling Identical Processors, Job Shop Scheduling

TEXT BOOKS:

1. Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni, Sartaj; Mehta, Dinesh 2nd Edition Universities Press
2. Computer Algorithms/ C++ Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran 2nd Edition University Press

REFERENCE BOOKS:

1. Data Structures and program design in C, Robert Kruse, Pearson Education Asia
2. An introduction to Data Structures with applications, Trembley & Sorenson, McGraw Hill
3. The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth, Addison-Wesley, 1997.
4. Data Structures using C & C++: Langsam, Augenstein&Tanenbaum, Pearson, 1995
5. Algorithms + Data Structures & Programs: N. Wirth, PHI
6. Fundamentals of Data Structures in C++: Horowitz Sahni & Mehta, Galgotia Pub
7. Data structures in Java: Thomas Standish, Pearson Education Asia

e-Resources and Digital Material:

1. https://www.tutorialspoint.com/advanced_data_structures/index.asp
2. <http://peterindia.net/Algorithms.html>
3. Abdul Bari, 1. Introduction to Algorithms (youtube.com)

COURSE OUTCOMES:

1. Illustrate the working of the advanced tree data structures and their applications (L2)
2. Understand the Graph data structure, traversals and apply them in various contexts. (L2)
3. Use various data structures in the design of algorithms (L3)
4. Recommend appropriate data structures based on the problem being solved (L5)
5. Analyze algorithms with respect to space and time complexities (L4)



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(23A05308) OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

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

UNIT-I OBJECT ORIENTED PROGRAMMING

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 print() Method, Static Variables and Methods, Attribute Final, **Introduction to Operators**, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.

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

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.



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(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT-III ARRAYS

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

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, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

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

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.

Java Database Connectivity: Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, ResultSet Interface

Java FX GUI: Java FX Scene Builder, Java FX App Window Structure, displaying text and image, event handling, laying out nodes in scene graph, mouse events (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



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REFERENCE BOOKS:

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

e- Resources and Digital Material:

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

COURSE OUTCOMES:

1. Analyze problems, design solutions using OOP principles, and implement them efficiently in Java. (L4)
2. Design and implement classes to model real-world entities, with a focus on attributes, behaviors, and relationships between objects (L4)
3. Demonstrate an understanding of inheritance hierarchies and polymorphic behaviour, including method overriding and dynamic method dispatch. (L3)
4. Apply Competence in handling exceptions and errors to write robust and fault-tolerant code. (L3)
5. Perform file input/output operations, including reading from and writing to files using Java I/O classes, graphical user interface (GUI) programming using JavaFX. (L3) and choose appropriate data structure of Java to solve a problem (L6)

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II B.Tech. I Sem.

L	T	P	C
0	0	3	1.5

**(23A05309) ADVANCED DATA STRUCTURES AND ALGORITHMS
ANALYSIS LAB**

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. acquire practical skills in constructing and managing Data structures
2. apply the popular algorithm design methods in problem-solving scenarios

Experiments covering the Topics:

- Operations on AVL trees, B-Trees, Heap Trees
- Graph Traversals
- Sorting techniques
- Minimum cost spanning trees
- Shortest path algorithms
- 0/1 Knapsack Problem
- Travelling Salesperson problem
- Optimal Binary Search Trees
- N-Queens Problem
- Job Sequencing

Sample Programs:

1. Construct an AVL tree for a given set of elements which are stored in a file. And implement insert and delete operation on the constructed tree. Write contents of tree into a new file using in-order.
2. Construct B-Tree an order of 5 with a set of 100 random elements stored in array. Implement searching, insertion and deletion operations.
3. Construct Min and Max Heap using arrays, delete any element and display the content of the Heap.
4. Implement BFT and DFT for given graph, when graph is represented by a) Adjacency Matrix
b) Adjacency Lists
5. Write a program for finding the bi-connected components in a given graph.
6. Implement Quick sort and Merge sort and observe the execution time for various input sizes (Average, Worst and Best cases).



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7. Compare the performance of Single Source Shortest Paths using Greedy method when the graph is represented by adjacency matrix and adjacency lists
8. Implement Job sequencing with deadlines using Greedy strategy.
9. Write a program to solve 0/1 Knapsack problem Using Dynamic Programming.
10. Implement N-Queens Problem Using Backtracking.
11. Use Backtracking strategy to solve 0/1 Knapsack problem.
12. Implement Travelling Sales Person problem using Branch and Bound approach.

REFERENCE BOOKS:

1. Fundamentals of Data Structures in C++, Horowitz Ellis, Sahni Sartaj, Mehta, Dinesh, 2 nd Edition, Universities Press
2. Computer Algorithms/C++ Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2 nd Edition, University Press
3. Data Structures and program design in C, Robert Kruse, Pearson Education Asia
4. An introduction to Data Structures with applications, Trembley & Sorenson, McGraw Hill

e-Resources and Digital Material:

1. <http://cse01-iiith.vlabs.ac.in/>
2. <http://peterindia.net/Algorithms.html>

COURSE OUTCOMES:

1. Design and develop programs to solve real world problems with the popular algorithm design methods. (L5)
2. Demonstrate an understanding of Non-Linear data structures by developing implementing the operations on AVL Trees, B-Trees, Heaps and Graphs. (L2)
3. Critically assess the design choices and implementation strategies of algorithms and data structures in complex applications. (L5)
4. Utilize appropriate data structures and algorithms to optimize solutions for specific computational problems. (L3)
5. Compare the performance of different of algorithm design strategies (L4)
6. Design algorithms to new real world problems (L6)

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II B.Tech. I Sem.

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0	0	3	1.5

(23A05310) OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. Practice object-oriented programming in the Java programming language
2. Implement Classes, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
3. Illustrate inheritance, Exception handling mechanism, JDBC connectivity
4. 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, JavaFX GU

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 StringBuffer to delete, remove character.



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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 implements 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 ()



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- c) Write a Program illustrating Daemon Threads.
- d) Write a JAVA program Producer Consumer Problem

Exercise – 8 :

- 8. Write a JAVA program that import and use the user defined packages
- 9. Without writing any code, build a GUI that display text in label and image in an ImageView (use JavaFX)
- 10. Build a Tip Calculator app using several JavaFX components and learn how to respond to user interactions with the GUI

Exercise – 9 :

- a) Write a java program that connects to a database using JDBC
- b) Write a java program to connect to a database using JDBC and insert values into it.
- c) Write a java program to connect to a database using JDBC and delete values from it

TEXT BOOKS:

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

REFERENCE BOOKS:

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

e- Resources and Digital Material:

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

COURSE OUTCOMES:

- 1. Demonstrate a solid understanding of Java syntax, including data types, control structures, methods, classes, objects, inheritance, polymorphism, and exception handling. (L2)
- 2. Apply fundamental OOP principles such as encapsulation, inheritance, polymorphism, and abstraction to solve programming problems effectively. (L3)



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3. Familiar with commonly used Java libraries and APIs, including the Collections Framework, Java I/O, JDBC, and other utility classes. (L2)
4. Develop problem-solving skills and algorithmic thinking, applying OOP concepts to design efficient solutions to various programming challenges. (L3)
5. Proficiently construct graphical user interface (GUI) applications using JavaFX (L4)
6. Develop new programs for solving typical computer science problems (L6)

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II B.Tech. I Sem.

L	T	P	C
0	1	2	2

(23A05306) PYTHON PROGRAMMING

Course Category	Skill Oriented Course (SC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. Introduce core programming concepts of Python programming language.
2. Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries
3. Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these

UNIT-I: History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupiter Notebook.

Parts of Python Programming Language: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the type () Function and Is Operator, Dynamic and Strongly Typed Language.

Control Flow Statements: if statement, if-else statement, if...elif...else, Nested if statement, while Loop, for Loop, continue and break Statements, Catching Exceptions Using try and except Statement.

Sample Experiments:

1. Write a program to find the largest element among three Numbers.
2. Write a Program to display all prime numbers within an interval
3. Write a program to swap two numbers without using a temporary variable.
4. Demonstrate the following Operators in Python with suitable examples. i) Arithmetic Operators ii) Relational Operators iii) Assignment Operators iv) Logical Operators v) Bit wise Operators vi) Ternary Operator vii) Membership Operators viii) Identity Operators
5. Write a program to add and multiply complex numbers
6. Write a program to print multiplication table of a given number

UNIT-II: Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the function, return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.



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Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.

Lists: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement.

Sample Experiments:

7. Write a program to define a function with multiple return values.
8. Write a program to define a function using default arguments.
9. Write a program to find the length of the string without using any library functions.
10. Write a program to check if the substring is present in a given string or not.
11. Write a program to perform the given operations on a list: i. Addition ii. Insertion iii. slicing
12. Write a program to perform any 5 built-in functions by taking any list

UNIT-III: Dictionaries: Creating Dictionary, Accessing and Modifying key: value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement.

Tuples and Sets: Creating Tuples, Basic Tuple Operations, tuple () Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function, Sets, Set Methods, Frozen set.

Sample Experiments:

13. Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples.
14. Write a program to count the number of vowels in a string (No control flow allowed).
15. Write a program to check if a given key exists in a dictionary or not.
16. Write a program to add a new key-value pair to an existing dictionary.
17. Write a program to sum all the items in a given dictionary.

UNIT-IV: 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.



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Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, Encapsulation, Inheritance, Polymorphism.

18. Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper-case words from source must be lowered.

19. Python program to print each line of a file in reverse order.

20. Python program to compute the number of characters, words and lines in a file.

21. Write a program to create, display, append, insert and reverse the order of the items in the array.

22. Write a program to add, transpose and multiply two matrices.

23. Write a Python program to create a class that represents a shape. Include methods to calculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square.

UNIT-V: Introduction to Data Science: Functional Programming, JSON and XML in Python, NumPy with Python, Pandas.

Sample Experiments:

24. Python program to check whether a JSON string contains complex object or not.

25. Python Program to demonstrate NumPy arrays creation using array () function.

26. Python program to demonstrate use of ndim, shape, size, dtype.

27. Python program to demonstrate basic slicing, integer and Boolean indexing.

28. Python program to find min, max, sum, cumulative sum of array

29. Create a dictionary with at least five keys and each key represent value as a list where this list contains at least ten values and convert this dictionary as a pandas' data frame and explore the data through the data frame as follows:

a) Apply head () function to the pandas' data frame

b) Perform various data selection operations on Data Frame

30. Select any two columns from the above data frame, and observe the change in one attribute with respect to other attribute with scatter and plot operations in matplotlib

REFERENCE BOOKS:

1. Gowrishankar S, Veena A., Introduction to Python Programming, CRC Press.



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2. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2ndEdition, Pearson, 2024
3. Introduction to Programming Using Python, Y. Daniel Liang, Pearson

e- Resources and Digital Material:

1. <https://www.coursera.org/learn/python-for-applied-data-science-ai>
2. <https://www.coursera.org/learn/python?specialization=python#syllabus>

COURSE OUTCOMES:

1. Classify data structures of Python (L4)
2. Apply Python programming concepts to solve a variety of computational problems (L3)
3. Understand the principles of object-oriented programming (OOP) in Python, including classes, objects, inheritance, polymorphism, and encapsulation, and apply them to design and implement Python programs (L3)
4. Become proficient in using commonly used Python libraries and frameworks such as JSON, XML, NumPy, pandas (L2)
5. Exhibit competence in implementing and manipulating fundamental data structures such as lists, tuples, sets, dictionaries (L3)
6. Propose new solutions to computational problems (L6)



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II B.Tech. I Sem.

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2	0	0	0

(23A93303) ENVIRONMENTAL SCIENCE

Course Category	Mandatory Course (Non-credit)
Course Enrichment Relevance	Environment & Sustainability

COURSE OBJECTIVES:

1. To make the students to get awareness on environment
2. 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
3. To save earth from the inventions by the engineers.

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

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

Biodiversity and its Conservation : Introduction 0 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-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity



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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 pollutio
- 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, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – 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 ‘H I V /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, hill slopes, etc

TEXT BOOKS:

1. Textbook of Environmental Studies for Undergraduate Courses Erach Bharucha for University Grants Commission, Universities Press
2. Palaniswamy, "Environmental Studies", Pearson education
3. S.Azeem Unnisa, "Environmental Studies" Academic Publishing Company
4. K.Raghavan Nambiar,

REFERENCE BOOKS:

1. Deeksha Dave and E.Sai Baba Reddy, “Textbook of Environmental Science”, Cengage Publications.
2. M.Anji Reddy, “Text book of Environmental Sciences and Technology”, BS Publication.



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3. J.P.Sharma, Comprehensive Environmental studies, Laxmi publications
4. J. Glynn Henry and Gary W. 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 Wendell P. Ela, "Introduction to Environmental Engineering and Science, Prentice Hall of India Private limited.

COURSE OUTCOMES:

1. Grasp the multidisciplinary nature of environment studies and various renewable resources.
2. Understand the bio geo chemical cycles and ecological pyramids.
3. Can able to know the resources and their pollution methods
4. Can understand the social issues.
5. Can understand the women and child development and environmental technology.

II B.Tech II Semester Course Structure



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Course Structure

S.No	Subject Code	Course Category	Name of the Subject	Hours/Week			Credits	Marks		
				Lecture	Tutorial	Practical		Internal	External	Total
1	23A95402	PC	ORGANIZATIONAL BEHAVIOR	2	0	0	2	30	70	100
2	23A91407	BS	PROBABILITY & STATISTICS	3	0	0	3	30	70	100
3	23A05411	PC	OPERATING SYSTEMS	3	0	0	3	30	70	100
4	23A05412	PC	DATABASE MANAGEMENT SYSTEMS	3	0	0	3	30	70	100
5	23A05413	PC	SOFTWARE ENGINEERING	3	0	0	3	30	70	100
6	23A05414	PC	OPERATING SYSTEMS LAB	0	0	3	1.5	30	70	100
7	23A05415	PC	DATABASE MANAGEMENT SYSTEMS LAB	0	0	3	1.5	30	70	100
8	23A05416	SC	FULL STACK DEVELOPMENT-I	0	1	2	2	30	70	100
9	23A99405	PC	DESIGN THINKING AND INNOVATION	1	0	2	2	30	70	100
10	23A91410	MC(NC)	COMPETITIVE ABILITY COURSE - II	4	0	0	0	30	0	30
11	23A99406	MC(NC)	MINOR PROJECT	0	0	3	0	50	0	50

II B.Tech II Semester Syllabus

**SANTHIRAM ENGINEERING COLLEGE****(AUTONOMOUS)****DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**

II B.Tech. II Sem.

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2	0	0	2

(23A95402) ORGANIZATIONAL BEHAVIOR

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To enable student's comprehension of organizational behavior
2. To offer knowledge to students on self-motivation, leadership and management
3. To facilitate them to become powerful leaders
4. To Impart knowledge about group dynamics
5. To make them understand the importance of change and development

UNIT-I INTRODUCTION TO ORGANIZATIONAL BEHAVIOR

Meaning, definition, nature, scope and functions - Organizing Process - Making organizing effective -Understanding Individual Behavior -Attitude -Perception - Learning -Personality.

UNIT-II MOTIVATION AND LEADING

Theories of Motivation- Maslow's Hierarchy of Needs - Herzberg's Two Factor Theory - Vroom's theory of expectancy - Mc Clelland's theory of needs -Mc Gregor's theory X and theory Y- Adam's equity theory.

UNIT-III ORGANIZATIONALCULTURE

Introduction - Meaning, scope, definition, Nature - Organizational Climate - Leadership - Traits Theory-Managerial Grid - Transactional Vs Transformational Leadership - Qualities of good Leader - Conflict Management -Evaluating Leader.

UNIT-IV GROUP DYNAMICS

Introduction - Meaning, scope, definition, Nature- Types of groups - Determinants of group behaviour - Group process - Group Development - Group norms - Group cohesiveness -Small Groups - Group decision making - Team building - Conflict in the organization - Conflict resolution

UNIT-V ORGANIZATIONAL CHANGE AND DEVELOPMENT

Introduction -Nature, Meaning, scope, definition and functions- Organizational Culture - Changing the Culture - Change Management - Work Stress Management - Organizational management - Managerial implications of organization's change and development

TEXT BOOKS:

1. Luthans, Fred, Organizational Behavior, McGraw-Hill, 12 Th edition.
2. P Subba Ran, Organizational Behavior, Himalaya Publishing House.



SANTHIRAM ENGINEERING COLLEGE

(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

REFERENCE BOOKS:

1. McShane, Organizational Behavior, TMH
2. Nelson, Organizational Behavior, Thomson.
3. Robbins, P. Stephen, Timothy A. Judge, Organizational Behavior, Pearson.

e-Resources and Digital Material:

1. <https://www.slideshare.net/Knight1040/organizational-culture-9608857s://www.slideshare.net/AbhayRajpoot3/motivation-165556714>
<https://www.slideshare.net/harshrastogi1/group-dynamics-159412405>
2. <https://www.slideshare.net/vanyasingla1/organizational-change-development-26565951>

COURSE OUTCOMES:

1. Define the Organizational Behavior, its nature and scope. (L2)
2. Understand the nature and concept of Organizational behavior (L2)
3. Apply theories of motivation to analyses the performance problems (L3)
4. Analyses the different theories of leadership and Develop as powerful leader (L4,L5)
5. Evaluate group dynamics (L5)

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II B.Tech. II Sem.

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3	0	0	3

(23A91407) PROBABILITY & STATISTICS

Course Category	Basic Science (BS)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

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

UNIT-I DESCRIPTIVE STATISTICS

Statistics Introduction, Population vs Sample, Collection of data, primary and secondary data, Measures of Central tendency, Measures of Variability (spread or variance) Skewness, Kurtosis, correlation, correlation coefficient, rank correlation, regression coefficients, method of least squares, regression lines.

UNIT-II PROBABILITY

Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties, mathematical expectation.

UNIT-III PROBABILITY DISTRIBUTIONS

Probability distributions: Binomial, Poisson and Normal-their properties (Chebyshevs inequality). Approximation of the binomial distribution to normal distribution.

UNIT-IV ESTIMATION AND TESTING OF HYPOTHESIS, LARGE SAMPLE TESTS

Estimation-parameters, statistics, sampling distribution, point estimation, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors and power of the test. Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems

UNIT-V SMALL SAMPLE TESTS

Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test), χ^2 - test for goodness of fit, χ^2 - test for independence of attributes.

TEXT BOOKS:

1. Miller and Freunds, 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.



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REFERENCE BOOKS:

1. S. Ross, a First Course in Probability, Pearson Education India, 2002.
2. W. Feller, an Introduction to Probability Theory and its Applications, 1/e, Wiley, 1968.
3. B. V. Ramana, Higher Engineering Mathematics, Mc Graw Hill Education.

e-Resources and Digital Material:

1. https://onlinecourses.nptel.ac.in/noc21_ma74/preview
2. https://onlinecourses.nptel.ac.in/noc22_mg31/preview

COURSE OUTCOMES:

1. Acquire knowledge in finding the analysis of the data quantitatively or categorically and various statistical elementary tools.
2. Develop skills in designing mathematical models involving probability, random variables and the critical thinking in the theory of probability and its applications in real life problems.
3. Apply the theoretical probability distributions like binomial, Poisson, and Normal in the relevant application areas.
4. Analyze to test various hypotheses included in theory and types of errors for large samples.
5. Apply the different testing tools like t-test, F-test, chi-square test to analyze the relevant real-life problems.



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(23A05411) OPERATING SYSTEMS

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

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

UNIT-I 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 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 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 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.



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UNIT-V 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

e- Resources and Digital Material:

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

COURSE OUTCOMES:

1. Describe the basics of the operating systems, mechanisms of OS to handle processes, threads, and their communication. (L1)
2. Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection. (L2)
3. Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system. (L3)
4. Illustrate different conditions for deadlock and their possible solutions. (L2)
5. Analyze the memory management and its allocation policies. (L4)



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(23A05412) DATABASE MANAGEMENT SYSTEMS

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

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

UNIT-I INTRODUCTION

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

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

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)

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).



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UNIT-V TRANSACTION CONCEPT

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

e-Resources and Digital Material:

1. <https://nptel.ac.in/courses/106/105/106105175/>
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01275806667282022456_shared/overview

COURSE OUTCOMES:

1. Understand the basic concepts of database management systems (L2)
2. Analyze a given database application scenario to use ER model for conceptual design of the database (L4)
3. Utilize SQL proficiently to address diverse query challenges (L3).
4. Employ normalization methods to enhance database structure (L3)
5. Assess and implement transaction processing, concurrency control and database recovery protocols in databases. (L4)



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(23A05413) SOFTWARE ENGINEERING

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. The objectives of this course are to introduce
2. Software life cycle models, Software requirements and SRS document.
3. Project Planning, quality control and ensuring good quality software.
4. Software Testing strategies, use of CASE tools, Implementation issues, validation & verification procedures.

UNIT-I INTRODUCTION

Evolution, Software development projects, Exploratory style of software developments, Emergence of software engineering, Notable changes in software development practices, Computer system engineering.

Software Life Cycle Models: Basic concepts, Waterfall model and its extensions, Rapid application development, Agile development model, Spiral model.

UNIT-II SOFTWARE PROJECT MANAGEMENT

Software project management complexities, Responsibilities of a software project manager, Metrics for project size estimation, Project estimation techniques, Empirical Estimation techniques, COCOMO, Halstead's software science, risk management.

Requirements Analysis and Specification: Requirements gathering and analysis, Software Requirements Specification (SRS), Formal system specification, Axiomatic specification, Algebraic specification, Executable specification and 4GL.

UNIT-III SOFTWARE DESIGN

Overview of the design process, how to characterize a good software design Layered arrangement of modules, Cohesion and Coupling. approaches to software design.

Agility: Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, Tool Set for the Agile Process (Text Book 2)

Function-Oriented Software Design: Overview of SA/SD methodology, Structured analysis, Developing the DFD model of a system, Structured design, Detailed design, and Design Review.

User Interface Design: Characteristics of a good user interface, Basic concepts, Types of user interfaces, Fundamentals of component-based GUI development, and user interface design methodology.



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UNIT-IV CODING AND TESTING

Coding, Code review, Software documentation, Testing, Black-box testing, White-Box testing, Debugging, Program analysis tools, Integration testing, testing object-oriented programs, Smoke testing, and Some general issues associated with testing.

Software Reliability and Quality Management: Software reliability. Statistical testing, Software quality, Software quality management system, ISO 9000. SEI Capability maturity model. Few other important quality standards, and Six Sigma.

UNIT-V COMPUTER-AIDED SOFTWARE ENGINEERING (CASE)

CASE and its scope, CASE environment, CASE support in the software life cycle, other characteristics of CASE tools, Towards second generation CASE Tool, and Architecture of a CASE Environment.

Software Maintenance: Characteristics of software maintenance, Software reverse engineering, Software maintenance process models and Estimation of maintenance cost. **Software Reuse:** reuse- definition, introduction, reason behind no reuse so far, Basic issues in any reuse program, A reuse approach, and Reuse at organization level.

TEXT BOOKS:

1. Fundamentals of Software Engineering, Rajib Mall, 5th Edition, PHI.
2. Software Engineering A Practitioner's Approach, Roger S. Pressman, 9th Edition, Mc Graw Hill International Edition.

REFERENCE BOOKS:

1. Software Engineering, Ian Sommerville, 10th Edition, Pearson.
2. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.

e- Resources and Digital Material:

1. <https://nptel.ac.in/courses/106/105/106105182/>
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01260589506387148827_shared/overview
3. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013382690411003904735_shared/overview

COURSE OUTCOMES:

1. Perform various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance (L3)
2. Analyse various software engineering models and apply methods for design and development of software projects. (L4)
3. Develop system designs using appropriate techniques. (L3)
4. Understand various testing techniques for a software project. (L2)
5. Apply standards, CASE tools and techniques for engineering software projects (L3)



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(23A05414) OPERATING SYSTEMS LAB

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. Provide insights into system calls, file systems, semaphores,
 2. Develop and debug CPU Scheduling algorithms, page replacement algorithms, thread implementation
 3. Implement Bankers Algorithms to Avoid the Dead Lock
-
1. Practicing of Basic UNIX Commands.
 2. Write programs using the following UNIX operating system calls
fork, exec, getpid, exit, wait, close, stat, opendir and readdir
 3. Simulate UNIX commands like cp, ls, grep, etc.,
 4. Simulate the following CPU scheduling algorithms
a) FCFS b) SJF c) Priority d) Round Robin
 5. Control the number of ports opened by the operating system with
a) Semaphore b) Monitors.
 6. Write a program to illustrate concurrent execution of threads using pthreads library.
 7. Write a program to solve producer-consumer problem using Semaphores.
 8. Implement the following memory allocation methods for fixed partition
a) First fit b) Worst fit c) Best fit
 9. Simulate the following page replacement algorithms
a) FIFO b) LRU c) LFU
 10. Simulate Paging Technique of memory management.
 11. Implement Bankers Algorithm for Dead Lock avoidance and prevention



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12. Simulate the following file allocation strategies

a) Sequential b) Indexed c) Linked

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

e- Resources and Digital Material:

1. <https://www.cse.iitb.ac.in/~mythili/os/>
2. <http://peterindia.net/OperatingSystems.html>

COURSE OUTCOMES:

1. Trace different CPU Scheduling algorithms (L2).
2. Implement Bankers Algorithms to Avoid the Dead Lock (L3).
3. Evaluate Page replacement algorithms (L5).
4. Illustrate the file organization techniques (L4).
5. Illustrate Inter process Communication and concurrent execution of threads (L4)

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L	T	P	C
0	0	3	1.5

(23A05415) DATABASE MANAGEMENT SYSTEMS LAB

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. Populate and query a database using SQL DDL/DML Commands
 2. Declare and enforce integrity constraints on a database
 3. Writing Queries using advanced concepts of SQL
 4. Programming PL/SQL including procedures, functions, cursors and triggers.
-
1. Creation, altering and dropping 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, RAISEAPPLICATION ERROR.



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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 nonindexing 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:

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

REFERENCE BOOKS:

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

e-Resources and Digital Material:

COURSE OUTCOMES:

1. Utilizing Data Definition Language (DDL), Data Manipulation Language (DML), and Data Control Language (DCL) commands effectively within a database environment (L3)
2. Constructing and execute queries to manipulate and retrieve data from databases. (L3)
3. Develop application programs using PL/SQL. (L3)
4. Analyze requirements and design custom Procedures, Functions, Cursors, and Triggers, leveraging their capabilities to automate tasks and optimize database functionality (L4)
5. Establish database connectivity through JDBC (Java Database Connectivity) (L3)



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(23A05416) FULL STACK DEVELOPMENT-I

Course Category	Skill Oriented Course (SC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. Make use of HTML elements and their attributes for designing static web pages
2. Build a web page by applying appropriate CSS styles to HTML elements
3. Experiment with JavaScript to develop dynamic web pages and validate forms

Experiments covering the Topics:

- Lists, Links and Images
- HTML Tables, Forms and Frames
- HTML 5 and Cascading Style Sheets, Types of CSS
- Selector forms
- CSS with Color, Background, Font, Text and CSS Box Model
- Applying JavaScript - internal and external, I/O, Type Conversion
- JavaScript Conditional Statements and Loops, Pre-defined and User-defined Objects
- JavaScript Functions and Events
- Node.js

Sample Experiments:

1. Lists, Links and Images

- a. Write a HTML program, to explain the working of lists.
Note: It should have an ordered list, unordered list, nested lists and ordered list in an unordered list and definition lists.
- b. Write a HTML program, to explain the working of hyperlinks using <a> tag and href, target Attributes.
- c. Create a HTML document that has your image and your friend's image with a specific height and width. Also when clicked on the images it should navigate to their respective profiles.
- d. Write a HTML program, in such a way that, rather than placing large images on a page, the preferred technique is to use thumbnails by setting the height and width parameters to something like to 100*100 pixels. Each thumbnail image is also a link to a full sized version of the image. Create an image gallery using this technique

2. HTML Tables, Forms and Frames

- Write a HTML program, to explain the working of tables. (use tags: <table>, <tr>, <th>, <td> and attributes: border, rowspan, colspan)



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- Write a HTML program, to explain the working of tables by preparing a timetable. (Note: Use <caption> tag to set the caption to the table & also use cell spacing, cell padding, border, rowspan, colspan etc.).
- Write a HTML program, to explain the working of forms by designing Registration form. (Note: Include text field, password field, number field, date of birth field, checkboxes, radio buttons, list boxes using <select>&<option> tags, <text area> and two buttons ie: submit and reset. Use tables to provide a better view).
- Write a HTML program, to explain the working of frames, such that page is to be divided into 3 parts on either direction. (Note: first frame image, second frame paragraph, third frame ☐ hyperlink. And also make sure of using “no frame” attribute such that frames to be fixed).

3. HTML 5 and Cascading Style Sheets, Types of CSS

- a. Write a HTML program, that makes use of <article>, <aside>, <figure>, <figcaption>, <footer>, <header>, <main>, <nav>, <section>, <div>, tags.
- b. Write a HTML program, to embed audio and video into HTML web page.
- c. Write a program to apply different types (or levels of styles or style specification formats) - inline, internal, external styles to HTML elements. (identify selector, property and value).

4. Selector forms

- a. Write a program to apply different types of selector forms
 - Simple selector (element, id, class, group, universal)
 - Combinator selector (descendant, child, adjacent sibling, general sibling)
 - Pseudo-class selector
 - Pseudo-element selector
 - Attribute selector

5. CSS with Color, Background, Font, Text and CSS Box Model

- a. Write a program to demonstrate the various ways you can reference a color in CSS.
- b. Write a CSS rule that places a background image halfway down the page, tilting it horizontally. The image should remain in place when the user scrolls up or down.
- c. Write a program using the following terms related to CSS font and text:
 - i. font-size
 - ii. font-weight
 - iii. font-style
 - iv. text-decoration
 - v. text-transformation
 - vi. text-alignment
- d. Write a program, to explain the importance of CSS Box model using
 - i. Content
 - ii. Border
 - iii. Margin
 - iv. padding

6. Applying JavaScript - internal and external, I/O, Type Conversion

- a. Write a program to embed internal and external JavaScript in a web page.
- b. Write a program to explain the different ways for displaying output.
- c. Write a program to explain the different ways for taking input.
- d. Create a webpage which uses prompt dialogue box to ask a voter for his name and age. Display the information in table format along with either the voter can vote or not

7. JavaScript Pre-defined and User-defined Objects

- a. Write a program using document object properties and methods.
- b. Write a program using window object properties and methods.
- c. Write a program using array object properties and methods.
- d. Write a program using math object properties and methods.



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- e. Write a program using string object properties and methods.
- f. Write a program using regex object properties and methods.
- g. Write a program using date object properties and methods.
- h. Write a program to explain user-defined object by using properties, methods, accessors, constructors and display.

8. JavaScript Conditional Statements and Loops

- a. Write a program which asks the user to enter three integers, obtains the numbers from the user and outputs HTML text that displays the larger number followed by the words "LARGER NUMBER" in an information message dialog. If the numbers are equal, output HTML text as "EQUAL NUMBERS".
- b. Write a program to display week days using switch case.
- c. Write a program to print 1 to 10 numbers using for, while and do-while loops.
- d. Write a program to print data in object using for-in, for-each and for-of loops
- e. Develop a program to determine whether a given number is an 'ARMSTRONG NUMBER' or not. [Eg: 153 is an Armstrong number, since sum of the cube of the digits is equal to the number i.e., $1^3 + 5^3 + 3^3 = 153$]
- f. Write a program to display the denomination of the amount deposited in the bank in terms of 100's, 50's, 20's, 10's, 5's, 2's & 1's. (Eg: If deposited amount is Rs.163, the output should be 1-100's, 1-50's, 1-10's, 1-2's & 1-1's)

9. Javascript Functions and Events

- a. Design a appropriate function should be called to display
 - Factorial of that number
 - Fibonacci series up to that number
 - Prime numbers up to that number
 - Is it palindrome or not
- b. Design a HTML having a text box and four buttons named Factorial, Fibonacci, Prime, and Palindrome. When a button is pressed an appropriate function should be called to display
 - 11. Factorial of that number
 - 12. Fibonacci series up to that number
 - 13. Prime numbers up to that number
 - 14. Is it palindrome or not
- c. Write a program to validate the following fields in a registration page
 - i. Name (start with alphabet and followed by alphanumeric and the length should not be less than 6 characters)
 - ii. Mobile (only numbers and length 10 digits)
 - iii. E-mail (should contain format like xxxxxxx@xxxxxx.xxx)

TEXT BOOKS:

1. Programming the World Wide Web, 7th Edition, Robert W Sebesta, Pearson, 2013.
2. Web Programming with HTML5, CSS and JavaScript, John Dean, Jones & Bartlett Learning, 2019 (Chapters 1-11).
3. Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, 2nd edition, APress, O Reilly.

e- Resources and Digital Material:

1. <https://www.w3schools.com/html>
2. <https://www.w3schools.com/css>
3. <https://www.w3schools.com/js/>
4. <https://www.w3schools.com/nodejs>
5. <https://www.w3schools.com/typescript>



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COURSE OUTCOMES:

1. Design Websites.(L6)
2. Apply Styling to web pages.(L4)
3. Make Web pages interactive.(L6)
4. Design Forms for applications.(L6)
5. Choose Control Structure based on the logic to be implemented & Understand HTML tags, Attributes and CSS properties (L2) (L3)



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II B.Tech. II Sem.

L	T	P	C
1	0	2	2

(23A99405) DESIGN THINKING AND INNOVATION

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. The objective of this course is to familiarize students with design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for real-time problems.

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 modelling, how to set specifications, Explaining their own product design.



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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.

TEXT BOOKS:

1. Tim Brown, Change by design, Harper Bollins (2009)
2. Idris Mootee, Design Thinking for Strategic Innovation, 2013, John Wiley & Sons.

REFERENCE BOOKS:

1. David Lee, Design Thinking in the Classroom, Ulysses press
2. Shruti N Shetty, Design the Future, Norton Press
3. William Lidwell, Universal Principles of Design- Kritin Holden, Jill Butter.
4. Chesbrough, H., The Era of Open Innovation – 2013

e- Resources and Digital Material:

1. <https://nptel.ac.in/courses/110/106/110106124/>
2. <https://nptel.ac.in/courses/109/104/109104109/>
3. https://swayam.gov.in/nd1_noc19_mg60/preview

COURSE OUTCOMES:

1. Define the concepts related to design thinking. (L1, L2)
2. Explain the fundamentals of Design Thinking and innovation (L1, L2)
3. Apply the design thinking techniques for solving problems in various sectors. (L3)
4. Analyse to work in a multidisciplinary environment (L4)
5. Evaluate the value of creativity (L5)

III B.Tech I Semester Course Structure

**SANTHIRAM ENGINEERING COLLEGE****(AUTONOMOUS)****DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING****III B.Tech. I Sem. - Course Structure**

S.No	Subject Code	Course Category	Name of the Subject	Hours/Week			Credits	Marks		
				Lecture	Tutorial	Practical		Internal	External	Total
1	23A33301	ES	ARTIFICIAL INTELLIGENCE	3	0	0	3	30	70	100
2	23A05519	PC	COMPUTER NETWORKS & INTERNET PROTOCOLS	3	0	0	3	30	70	100
3	23A05520	PC	AUTOMATA THEORY AND COMPILER DESIGN	3	0	0	3	30	70	100
4	23A05517	PC	INTRODUCTION TO QUANTUM TECHNOLOGIES AND APPLICATIONS	3	0	0	3	30	70	100
5	23A05521	PE	PE-I: OBJECT ORIENTED ANALYSIS AND DESIGN	3	0	0	3	30	70	100
6	23A05522	PE	PE-I: SOFT COMPUTING	3	0	0	3	30	70	100
7	23A04519	PE	PE-I: MICROPROCESSORS AND MICROCONTROLLERS	3	0	0	3	30	70	100
8	23A05523	PE	PE-I: DATA WAREHOUSING & DATA MINING	3	0	0	3	30	70	100
9	23A01501	OE	OE-I: GREEN BUILDINGS	3	0	0	3	30	70	100
10	23A01502	OE	OE-I: CONSTRUCTION TECHNOLOGY AND MANAGEMENT	3	0	0	3	30	70	100
11	23A02503	OE	OE-I: ELECTRICAL SAFETY PRACTICES AND STANDARDS	3	0	0	3	30	70	100
12	23A03504	OE	OE-I: SUSTAINABLE ENERGY TECHNOLOGIES	3	0	0	3	30	70	100
13	23A04527	OE	OE-I: ELECTRONIC CIRCUITS	3	0	0	3	30	70	100
14	23A91513	OE	OE-I: MATHEMATICS FOR MACHINE LEARNING AND AI	3	0	0	3	30	70	100
15	23A92503	OE	OE-I: MATERIALS CHARACTERIZATION TECHNIQUES	3	0	0	3	30	70	100
16	23A93504	OE	OE-I: CHEMISTRY OF ENERGY SYSTEMS	3	0	0	3	30	70	100
17	23A94505	OE	OE-I: ENGLISH FOR COMPETITIVE EXAMINATIONS	3	0	0	3	30	70	100
18	23A95507	OE	OE-I: ENTREPRENEURSHIP AND NEW VENTURE CREATION	3	0	0	3	30	70	100



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19	23A33505	PC	ARTIFICIAL INTELLIGENCE LAB	0	0	3	1.5	30	70	100
20	23A05524	PC	COMPUTER NETWORKS & INTERNET PROTOCOLS LAB	0	0	3	1.5	30	70	100
21	23A05525	SC	FULL STACK DEVELOPMENT-II (SKILL ENHANCEMENT COURSE)	0	1	2	2	30	70	100
22	23A04526	SC	TINKERING LAB	0	0	2	1	30	70	100
23	23A99507	MC(C)	EVALUATION OF COMMUNITY SERVICE INTERNSHIP	-	-	-	2	0	50	50

III B.Tech I Semester Syllabus

**SANTHIRAM ENGINEERING COLLEGE****(AUTONOMOUS)****DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**

III B.Tech. I Sem.

L	T	P	C
3	0	0	3

(23A33301) ARTIFICIAL INTELLIGENCE

Course Category	Engineering Science (ES)
Course Enrichment Relevance	Employability

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 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 SEARCHING & GAME PLAYING

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-Adversarial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions.

UNIT-III REPRESENTATION OF KNOWLEDGE

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 Dempster Shafer theory.

UNIT-IV LOGIC CONCEPTS

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 EXPERT SYSTEMS

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



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

TEXT BOOKS:

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 Mack worth, Randy Goebel, Computational Intelligence: a logical approach, Oxford University Press.
2. G. Luger, Artificial Intelligence: Structures and Strategies for complex problemsolving, Fourth Edition, Pearson Education.
3. J. Nilsson, Artificial Intelligence: A new Synthesis, Elsevier Publishers.
4. Artificial Intelligence, SarojKaushik, CENGAGE Learning.

e-Resources and Digital Material:

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

COURSE OUTCOMES:

1. Learning About Basics of Artificial Intelligence
2. Apply Searching Techniques for Solving a Problem
3. Learning About Knowledge Representation and Predicate Logic to Apply in Problem Solving
4. To Understand and Learn About Logic Concept and Reinforcement Learning
5. To Learn About Architecture and Implementation About Expert Systems

**SANTHIRAM ENGINEERING COLLEGE****(AUTONOMOUS)****DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**

III B.Tech. I Sem.

L	T	P	C
3	0	0	3

(23A05519) COMPUTER NETWORKS & INTERNET PROTOCOLS

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. Understand the basic concepts of Computer Networks.
2. Introduce the layered approach for design of computer networks.
3. Expose the network protocols used in Internet environment.
4. Explain the format of headers of IP, TCP and UDP.
5. Familiarize with the applications of Internet.
6. Elucidate the design issues for a computer network.

UNIT-I COMPUTER NETWORKS AND THE INTERNET

What Is the Internet, Network Edge, The Network Core, Delay, Loss, and Throughput in Packet Switched Networks (Textbook 2), Reference Models, Multimedia Networks, Guided Transmission Media, Wireless Transmission (Textbook 1)

UNIT-II THE DATA LINK LAYER, ACCESS NETWORKS, AND LANS

Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols (Textbook 1) Introduction to the Link Layer, Error-Detection and -Correction Techniques, Multiple Access Links and Protocols, Switched Local Area Networks, Link Virtualization: A Network as a Link Layer, Data Center Networking, Retrospective: A Day in the Life of a Web Page (Packet) (Textbook 2).

UNIT-III THE NETWORK LAYER

Routing Algorithms, Internetworking, The Network Layer in The Internet (Textbook 1).

UNIT-IV THE TRANSPORT LAYER

Connectionless Transport: UDP (Textbook 2), The Internet Transport Protocols: TCP, Congestion Control (Textbook 1).

UNIT-V THE APPLICATION LAYER

Principles of Network Applications, The Web and HTTP, Electronic Mail in the Internet, DNS The Internet's Directory Service, Peer-to-Peer Applications, Video Streaming and Content Distribution Networks (Textbook 2).

TEXT BOOKS:

1. Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, 6th Edition, PEARSON.
2. James F. Kurose, Keith W. Ross, Computer Networking: A Top-Down Approach, 6th Edition, Pearson, 2019.



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REFERENCE BOOKS:

1. Forouzan, Data Communications and Networking, 5th Edition, McGraw Hill Publication.
2. Youlu Zheng, Shakil Akhtar, Networks for Computer Scientists and Engineers, Oxford Publishers, 2016.

e-Resources and Digital Material:

1. <https://nptel.ac.in/courses/106105183/25>
2. <https://www.nptelvideos.in/2012/11/computer-networks.html>
3. <https://nptel.ac.in/courses/106105183/3>

COURSE OUTCOMES:

1. Identify the software and hardware components of a computer network
2. Design software for a computer network
3. Develop error, routing, and congestion control algorithms
4. Assess critically the existing routing protocols
5. Explain the functionality of each layer of a computer network
6. Choose the appropriate transport protocol based on the application requirements



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III B.Tech. I Sem.

L	T	P	C
3	0	0	3

(23A05520) AUTOMATA THEORY AND COMPILER DESIGN

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. Able to understand the concept of abstract machines, construct FA, Regular Expressions for the regular languages and equivalent FSMs
2. Able to construct pushdown automata equivalent to Context free Grammars, construct Turing Machines and understand undecidability
3. Emphasize the concepts learnt in phases of compiler, lexical analyser and Top-down parser.
4. Able to understand the concepts of Bottom-up parser, Intermediate Code Generation
5. Able to understand the concepts of Code optimizer and Code Generation.

UNIT-I INTRODUCTION TO AUTOMATA AND REGULAR EXPRESSIONS

Introduction to Automata and Regular Expressions: Introduction, Alphabets, Strings and Languages, Chomsky Hierarchy, Automata and Grammars, Regular Grammar and Language, Finite Automata, Deterministic finite Automata (DFA), Nondeterministic finite Automata (NFA), Equivalence of NFA and DFA, Minimization of Finite Automata, Regular Expressions, Converting Regular Grammar and Expression into Finite Automata, Pumping lemma for regular sets, Closure properties of regular sets (Without proof).

UNIT-II CONTEXT FREE GRAMMARS AND PUSHDOWN AUTOMATA

Context Free Grammars and Pushdown Automata: Context Free Language, Context Free Grammar, Derivation and Parse tree, Ambiguity, Simplification of CFG's, Chomsky Normal Form, Greibach Normal Form, Push Down Automat (PDA), Design of PDA, Equivalence of PDA and CFL/CFG

UNIT-III TURING MACHINES AND INTRODUCTION TO COMPILERS

Turing Machines and Introduction to Compilers: Turing Machine, TM Model, Language acceptance, Design of Turing Machine, Compilers, Phases of Compiler, The role of Lexical Analyzer, Input Buffering.

UNIT-IV PARSERS AND INTERMEDIATE CODE GENERATION

Parsers and Intermediate Code Generation: Parser, Top-Down parsers: Recursive Descent Parsers, Predictive Parsers, Bottom-up Parsers: Shift-Reduce Parsing, LR parsers, Intermediate Code Generation: Three address codes.



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UNIT-V CODE OPTIMIZATION AND CODE GENERATION

Code Optimization and Code Generation: Code Optimization: Peephole optimization, Basic blocks and flow graphs, DAG, Principles of Source Code Optimization, Code Generation: Issues in Design of Code Generation, Simple Code Generator.

TEXT BOOKS:

1. Introduction to Automata theory languages and Computation, Hopcroft H.E. and Ullman Jeffrey.D, 3/e, 2006, Pearson Education, New Delhi, India
2. Mishra K L P and Chandrasekaran N, Theory of Computer Science - Automata, Languages and Computation, 2/e, 2007, PHI, New Delhi, India
3. Compilers: Principles, Techniques, and Tools, Updated 2e July 2023 Alfred V. Aho , Monica S. Lam, Ravi Sethi , Jeffrey D. Ullman , Sorav Bansal

REFERENCE BOOKS:

1. Introduction to Languages and Theory of Computation, John C Martin, 1/e, 2009, Tata McGraw Hill Education, Hyderabad, India.
2. Introduction to Theory of Computation, Sipser, 2/e, 2005, Thomson, Australia.
3. Compiler Construction: Principles And Practice, Kenneth C. Loudon, Thomson/ Delmar Cengage Learning, 2006.
4. Lex &yacc, Doug Brown, John Levine and Tony Mason, 2 nd Edition, O'reilly Media
5. Engineering a compiler, Keith Cooper and Linda Torczon, 2 nd Edition, Morgan Kaufmann, 2011.

e-Resources and Digital Material:

1. https://onlinecourses.nptel.ac.in/noc21_cs19/preview
2. https://onlinecourses.nptel.ac.in/noc23_cs57/preview

COURSE OUTCOMES:

1. Demonstrate knowledge on Automata Theory, Regular Expression and Analyze and Design of finite automata, and prove equivalence of various finite automata
2. Demonstrate knowledge on context free grammar, Analyze and design of PDA and TM
3. Understand the basic concept of compiler design, and its different phases which will be helpful to construct new tools like LEX, YACC, etc.
4. Ability to implement semantic rules into a parser that performs attribution while parsing and apply error detection and correction methods.
5. Apply the code optimization techniques to improve the space and time complexity of programs while programming and Ability to design a compiler.

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III B.Tech. I Sem.

L	T	P	C
3	0	0	3

(23A05517) INTRODUCTION TO QUANTUM TECHNOLOGIES AND APPLICATIONS

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. Introduce fundamental quantum concepts like superposition and entanglement.
2. Understand theoretical structure of qubits and quantum information
3. Explore conceptual challenges in building quantum computers.
4. Explain principles of quantum communication and computing
5. Examine real-world applications and the future of quantum technologies.

UNIT-I INTRODUCTION TO QUANTUM THEORY AND TECHNOLOGIES

Introduction to Quantum Theory and Technologies: The transition from classical to quantum physics, Fundamental principles explained conceptually: Superposition, Entanglement, Uncertainty Principle, Wave-particle duality, Classical vs Quantum mechanics – theoretical comparison, Quantum states and measurement: nature of observation, Overview of quantum systems: electrons, photons, atoms, The concept of quantization: discrete energy levels, Why quantum? Strategic, scientific, and technological significance, A snapshot of quantum technologies: Computing, Communication, and Sensing, National and global quantum missions: India's Quantum Mission, EU, USA, China

UNIT-II THEORETICAL STRUCTURE OF QUANTUM INFORMATION SYSTEMS

Theoretical Structure of Quantum Information Systems: What is a qubit? Conceptual understanding using spin and polarization, Comparison: classical bits vs quantum bits, Quantum systems: trapped ions, superconducting circuits, photons (nanoengineering view), Quantum coherence and decoherence – intuitive explanation, Theoretical concepts: Hilbert spaces, quantum states, operators – only interpreted in abstract, The role of entanglement and non-locality in systems, Quantum information vs classical information: principles and differences, Philosophical implications: randomness, determinism, and observer role



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT-III BUILDING A QUANTUM COMPUTER – THEORETICAL CHALLENGES AND REQUIREMENTS

Building a Quantum Computer – Theoretical Challenges and Requirements: What is required to build a quantum computer (conceptual overview), Fragility of quantum systems: decoherence, noise, and control, Conditions for a functional quantum system: Isolation, Error management, Scalability, Stability, Theoretical barriers: Why maintaining entanglement is difficult, Error correction as a theoretical necessity, Quantum hardware platforms (brief conceptual comparison), Superconducting circuits, Trapped ions, Photonics, Vision vs reality: what's working and what remains elusive, The role of quantum software in managing theoretical complexities

UNIT-IV QUANTUM COMMUNICATION AND COMPUTING – THEORETICAL PERSPECTIVE

Quantum Communication and Computing – Theoretical Perspective: Quantum vs Classical Information, Basics of Quantum Communication, Quantum Key Distribution (QKD), Role of Entanglement in Communication, The Idea of the Quantum Internet Secure Global Networking, Introduction to Quantum Computing, Quantum Parallelism (Many States at Once), Classical vs Quantum Gates, Challenges: Decoherence and Error Correction, Real-World Importance and Future Potential

UNIT-V APPLICATIONS, USE CASES, AND THE QUANTUM FUTURE

Applications, Use Cases, and the Quantum Future: Real-world application domains: Healthcare (drug discovery), Material science, Logistics and optimization, Quantum sensing and precision timing, Industrial case studies: IBM, Google, Microsoft, PsiQuantum, Ethical, societal, and policy considerations, Challenges to adoption: cost, skills, standardization, Emerging careers in quantum: roles, skillsets, and preparation pathways, Educational and research landscape – India's opportunity in the global quantum race

TEXT BOOKS:

1. Michael A. Nielsen, Isaac L. Chuang, Quantum Computation and Quantum Information, Cambridge University Press, 10th Anniversary Edition, 2010.
2. Eleanor Rieffel and Wolfgang Polak, Quantum Computing: A Gentle Introduction, MIT Press, 2011.
3. Chris Bernhardt, Quantum Computing for Everyone, MIT Press, 2019

REFERENCE BOOKS:

1. David McMahon, Quantum Computing Explained, Wiley, 2008
2. Phillip Kaye, Raymond Laflamme, Michele Mosca, An Introduction to Quantum Computing, Oxford University Press, 2007
3. Scott Aaronson, Quantum Computing Since Democritus, Cambridge University Press, 2013.
4. Alastair I.M. Rae, Quantum Physics: A Beginner's Guide, Oneworld Publications, Revised Edition, 2005.



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5. Eleanor G. Rieffel, Wolfgang H. Polak, Quantum Computing: A Gentle Introduction, MIT Press, 2011.
6. Leonard Susskind, Art Friedman, Quantum Mechanics: The Theoretical Minimum, Basic Books, 2014.
7. Bruce Rosenblum, Fred Kuttner, Quantum Enigma: Physics Encounters Consciousness, Oxford University Press, 2nd Edition, 2011.

e- Resources and Digital Material:

1. IBM Quantum Experience and Qiskit Tutorials
2. Coursera – Quantum Mechanics and Quantum Computation by UC Berkeley
3. edX – The Quantum Internet and Quantum Computers
4. YouTube – Quantum Computing for the Determined by Michael Nielsen
5. Qiskit Textbook – IBM Quantum

COURSE OUTCOMES:

1. Explain core quantum principles in a non-mathematical manner
2. Compare classical and quantum information systems
3. Identify theoretical issues in building quantum computers.
4. Discuss quantum communication and computing concepts
5. Recognize applications, industry trends, and career paths in quantum technology



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III B.Tech. I Sem.

L	T	P	C
3	0	0	3

(23A05521) PE-I: OBJECT ORIENTED ANALYSIS AND DESIGN

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. Understand the basic concepts of object-oriented techniques
2. Build the Model of the software system using UML diagrams
3. Elucidate design patterns as templates for good design
4. Learn the object-oriented methodology in software design
5. Explore testing techniques for object-oriented software.

UNIT-I INTRODUCTION

The Structure of Complex systems, The Inherent Complexity of Software, Attributes of Complex System, Organized and Disorganized Complexity, Bringing Order to Chaos, Designing Complex Systems.

Case Study: System Architecture: Satellite-Based Navigation.

UNIT-II INTRODUCTION TO UML

Importance of modelling, principles of modelling, object-oriented modelling, conceptual model of the UML, Architecture, and Software Development Life Cycle.

Basic Structural Modelling: Classes, Relationships, common Mechanisms, and diagrams.

Case Study: Control System: Traffic Management.

UNIT-III CLASS & OBJECT DIAGRAMS

Terms, concepts, Modelling techniques for Class & Object Diagrams. Advanced Structural Modelling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages.

Case Study: AI: Cryptanalysis.

UNIT-IV BASIC BEHAVIOURAL MODELLING-I

Interactions, Interaction diagrams Use cases, Use case Diagrams, Activity Diagrams.

Case Study: Web Application: Vacation Tracking System.

UNIT-V ADVANCED BEHAVIOURAL MODELLING

Events and signals, state machines, processes and Threads, time and space, state chart diagrams. Architectural Modelling: Component, Deployment, Component diagrams and Deployment diagrams

Case Study: Weather Forecasting

TEXT BOOKS:



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1. Dr. N. AppaRao, Dr. P. Vijay Kumar: Managerial Economics and Financial Analysis, Cengage Publications, New Delhi 2011
2. Dr. A. R. Aryasri Managerial Economics and Financial Analysis, TMH 2011
3. Prof.J.V.Prabhakararao, Prof. P. Venkatarao. Managerial Economics and Financial Analysis, Ravindra Publication

REFERENCE BOOKS:

1. Dr. B. Kuberudu and Dr. T. V. Ramana: Managerial Economics & Financial Analysis, Himalaya Publishing House, 2014.
2. V. Maheswari: Managerial Economics, Sultan Chand.2014
3. Suma Damodaran: Managerial Economics, Oxford 2011.
4. VanithaAgarwal: Managerial Economics, Pearson Publications 2011.
5. Sanjay Dhameja: Financial Accounting for Managers, Pearson.
6. Maheswari: Financial Accounting, Vikas Publications.
7. S. A. Siddiqui& A. S. Siddiqui: Managerial Economics and Financial Analysis, New Age International Publishers, 2012

COURSE OUTCOMES:

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III B.Tech. I Sem.

L	T	P	C
3	0	0	3

(23A05522) PE-I: SOFT COMPUTING

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:**UNIT-I INTRODUCTION TO SOFT COMPUTING**

Introduction-Artificial Intelligence-Artificial Neural Networks-Fuzzy Systems-Genetic Algorithm and Evolutionary Programming-Swarm Intelligent Systems-Classification of ANNs-McCulloch and Pitts Neuron Model-Learning Rules: Hebbian and Delta-Perceptron Network-Adaline Network-Madaline Network.

UNIT-II ARTIFICIAL NEURAL NETWORKS

Back propagation Neural Networks - Kohonen Neural Network -Learning Vector Quantization Hamming Neural Network - Hopfield Neural Network- Bi-directional Associative Memory - Adaptive Resonance Theory Neural Networks- Support Vector Machines - Spike Neuron Models.

UNIT-III FUZZY SYSTEMS

Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets - Classical Relations and Fuzzy Relations Membership Functions -Defuzzification - Fuzzy Arithmetic and Fuzzy Measures - Fuzzy Rule Base and Approximate Reasoning - Introduction to Fuzzy Decision Making.

UNIT-IV GENETIC ALGORITHMS

Basic Concepts- Working Principles -Encoding- Fitness Function - Reproduction - Inheritance Operators - Cross Over - Inversion and Deletion -Mutation Operator - Bit-wise Operators - Convergence of Genetic Algorithm

UNIT-V HYBRID SYSTEMS

Hybrid Systems -Neural Networks, Fuzzy Logic and Genetic -GA Based Weight Determination - LR Type Fuzzy Numbers - Fuzzy Neuron - Fuzzy BP Architecture - Learning in Fuzzy BP- Inference by Fuzzy BP - Fuzzy ArtMap: A Brief Introduction – Soft Computing Tools - GA in Fuzzy Logic Controller Design - Fuzzy Logic Controller

TEXT BOOKS:

1. S. Rajsekaran& G.A. VijayalakshmiPai, Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications, 4th Edition, Prentice Hall of India,2003.

REFERENCE BOOKS:

1. Timothy J Ross,” Fuzzy Logic with Engineering Applications”, 3rd Edition, John Wiley and Sons,2016.



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2. David E. Goldberg, " Genetic Algorithm in Search Optimization and Machine Learning" Addison Wesley, 2009.
3. Karray, Soft Computing and Intelligent Systems Design: Theory, Tools and Applications, 1st Edition, Pearson Education, 2009.

COURSE OUTCOMES:

1. Learn soft computing techniques and their applications.
2. Analyze various neural network architectures.
3. Define the fuzzy systems.
4. Understand the genetic algorithm concepts and their applications
5. Identify and select a suitable Soft Computing technology to solve the problem; construct a solution and implement a Soft Computing solution.

**SANTHIRAM ENGINEERING COLLEGE****(AUTONOMOUS)****DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**

III B.Tech. I Sem.

L	T	P	C
3	0	0	3

(23A04519) PE-I: MICROPROCESSORS AND MICROCONTROLLERS

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To comprehend the architecture, operation, and configurations of the 8086 microprocessors.
2. To get familiar with 8086 programming concepts, instruction set, and assembly language development tools
3. To study the interfacing of 8086 with memory, peripherals, and controllers for various applications.
4. To learn the architecture, instruction set, and programming of the 8051 microcontrollers.
5. To understand microcontroller interfacing techniques, peripheral programming, and processor comparisons.

UNIT-I 8086 ARCHITECTURE:

main features, pin diagram/description, 8086 microprocessor family, internal architecture, bus interfacing unit, execution unit, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration.

UNIT-II 8086 PROGRAMMING:

Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

UNIT-III 8086 INTERFACING:

Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, interfacing switches and LEDs, interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.

UNIT-IV MICROCONTROLLER:

Microcontroller - Architecture of 8051 Special Function Registers (SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming



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UNIT-V INTERFACING MICROCONTROLLER:

Interfacing Microcontroller - Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation - Comparison of Microprocessor, Microcontroller, PIC and ARM processors

TEXT BOOKS:

1. Microprocessors and Interfacing Programming and Hardware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rd Edition, 1994.
2. K M Bhurchandi, A K Ray, Advanced Microprocessors and Peripherals, 3rd edition, McGraw Hill Education, 2017.
3. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System Design, 2nd edition, Pearson, 2012

REFERENCE BOOKS:

1. Ramesh S Gaonkar, Microprocessor Architecture Programming and Applications with the 8085, 6th edition, Penram International Publishing, 2013
2. Kenneth J. Ayala, The 8051 Microcontroller, 3rd edition, Cengage Learning, 2004.

COURSE OUTCOMES:

1. Gain knowledge on the architecture, operation, and configurations of the 8086 microprocessors.
2. Get familiar with 8086 programming concepts, instruction set, and assembly language development tools.
3. Know the interfacing of 8086 with memory, peripherals, and controllers for various applications
4. Learn the architecture, instruction set, and programming of the 8051 microcontrollers.
5. Understand microcontroller interfacing techniques, peripheral programming, and processor comparisons



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III B.Tech. I Sem.

L	T	P	C
3	0	0	3

(23A05523) PE-I: DATA WAREHOUSING & DATA MINING

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. Familiarize with mathematical foundations of data mining tools.
2. Introduce classical models and algorithms in data warehouses and data mining.
3. Investigate the kinds of patterns that can be discovered by association rule mining, classification and clustering.
4. Explore data mining techniques in various applications like social, scientific and environmental context.

UNIT-I BASIC CONCEPTS

Data Warehousing Components - building a Data Warehouse Database Architectures for Parallel Processing Parallel DBMS Vendors- Multidimensional Data Model - Data Warehouse Schemas for Decision Support, Concept Hierarchies - Characteristics of OLAP Systems - Typical OLAP Operations, OLAP and OLTP.

UNIT-II INTRODUCTION TO DATA MINING SYSTEMS

Introduction to Data Mining Systems - Knowledge Discovery Process Data Mining Techniques - Issues applications- Data Objects and attribute types, Statistical description of data. Data Preprocessing Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilarity measures.

UNIT-III MINING FREQUENT PATTERNS

Mining Frequent Patterns, Associations and Correlations Mining Methods- Pattern Evaluation Method - Pattern Mining in Multilevel, Multi-Dimensional Space, Constraint Based Frequent Pattern Mining, Classification using Frequent Patterns.

UNIT-IV DECISION TREE INDUCTION

Decision Tree Induction Bayesian Classification Rule Based Classification, Classification by Back Propagation - Support Vector Machines Lazy Learners - Model Evaluation and Selection- Techniques to improve Classification Accuracy. Clustering Techniques - Cluster Analysis- Partitioning Methods Hierarchical Methods Density Based Methods -. Grid Based Methods Evaluation of clustering - Clustering high dimensional data-Clustering with constraints, Outlier analysis-outlier detection methods.

UNIT-V WEKA TOOL

Datasets Introduction, Iris plants database. Breast cancer database, Auto imports database Introduction to WEKA, The Explorer Getting started, Exploring the explorer, Learning algorithms, Clustering algorithms. Association rule learners.



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TEXT BOOKS:

1. Jiawei Han and Micheline Kamber Data Mining Concepts and Techniques Third Edition Elsevier

REFERENCE BOOKS:

1. Alex Berson and Stephen J. Smith. Data Warehousing, Data Mining & OLAP. Tata McGraw — 1st Edition, 34th Reprint 201d.
2. K.P. Soman. Shyam Diwakar and X'. Ajax, Insights into Data Mining Theory and Practice. Eastern Family Edition, Prentice Hall of India, 2006.
3. Ian H. Witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques, Elsevier. Second Edition.

COURSE OUTCOMES:

1. Design a Data warehouse system and perform business analysis with OLAP tools
2. Apply suitable pre-processing and visualization techniques for data analysis
3. Apply frequent pattern and association rule mining techniques for data analysis
4. Design appropriate classification and Clustering techniques for data analysis
5. Infer knowledge from raw data

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III B.Tech. I Sem.

L	T	P	C
3	0	0	3

(23A01501) OE-I: GREEN BUILDINGS

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To understand the fundamental concepts of green buildings, their necessity, and sustainable features.
2. To analyze green building concepts, rating systems, and their benefits in India
3. To apply green building design principles, energy efficiency measures, and renewable energy sources.
4. To evaluate air conditioning systems, HVAC designs, and energy modeling for sustainable buildings.
5. To assess material conservation strategies, waste management, and indoor environmental quality in green buildings.

UNIT-I UNIT – I

Introduction to Green Building– Necessity of Green Buildings, Benefits of Green Buildings, Green Building Materials and Equipment in India, Key Requisites for Constructing A Green Building, Important Sustainable Features for Green Buildings.

UNIT-II UNIT – II

Green Building Concepts and Practices– Indian Green Building Council, Green Building Movement in India, Benefits Experienced in Green Buildings, Launch of Green Building Rating Systems, Residential Sector, Market Transformation; Green Building Opportunities and Benefits: Opportunities of Green Buildings, Green Building Features, Material and Resources, Water Efficiency, Optimum Energy Efficiency, Typical Energy-Saving Approaches in Buildings, LEED India Rating System, and Energy Efficiency

UNIT-III UNIT III

Green Building Design Introduction, Reduction in Energy Demand, Onsite Sources and Sinks, Maximizing System Efficiency, Steps to Reduce Energy Demand and Use Onsite Sources and Sinks, Use of Renewable Energy Sources, Eco-Friendly Captive Power Generation for Factories, Building Requirements.

UNIT-IV UNIT – IV

Air Conditioning– Introduction, CII Godrej Green Business Centre, Design Philosophy, Design Interventions, Energy Modeling, HVAC System Design, Chiller Selection, Pump Selection, Selection of Cooling towers, Selection of Air Handling Units, Pre-Cooling of Fresh Air, Interior Lighting Systems, Key Features of The Building, Eco-Friendly Captive Power Generation for Factories, Building Requirements



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT-V UNIT – V

Material Conservation– Handling of Non-Process Waste, Waste Reduction During Construction, Materials with Recycled Content, Local Materials, Material Reuse, Certified Wood, Rapidly Renewable Building Materials and Furniture. Indoor Environment Quality and Occupational Health– Air Conditioning, Indoor Air Quality, Sick Building Syndrome, tobacco Smoke.

TEXT BOOKS:

1. Handbook on Green Practices published by Indian Society of Heating Refrigerating and Air conditioning Engineers, 2009.
2. Green Building Hand Book by tom woolley and Sam kimings, 2009.

REFERENCE BOOKS:

1. Complete Guide to Green Buildings by Trish riley
2. Standard for the design for High Performance Green Buildings by Kent Peterson, 2009
3. Energy Conservation Building Code ECBC-2020, published by BEE

e- Resources and Digital Material:

1. <https://archive.nptel.ac.in/courses/105/102/105102195/>

COURSE OUTCOMES:

1. Understand the importance of green buildings, their necessity, and sustainable features.
2. Analyze various green building practices, rating systems, and their impact on environmental sustainability.
3. Apply principles of green building design to enhance energy efficiency and incorporate renewable energy sources.
4. Evaluate HVAC systems, energy-efficient air conditioning techniques, and their role in sustainable building design.
5. Assess material conservation techniques, waste reduction strategies, and indoor air quality management in green buildings.

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III B.Tech. I Sem.

L	T	P	C
3	0	0	3

(23A01502) OE-I: CONSTRUCTION TECHNOLOGY AND MANAGEMENT

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To understand project management fundamentals, organizational structures, and leadership principles in construction
2. To analyze manpower planning, equipment management, and cost estimation in civil engineering projects.
3. To apply planning, scheduling, and project management techniques such as CPM and PERT.
4. To evaluate various contract types, contract formation, and legal aspects in construction management.
5. To assess safety management practices, accident prevention strategies, and quality management systems in construction.

UNIT-I

Introduction: Project forms, Management Objectives and Functions; Organizational Chart of A Construction Company; Manager's Duties and Responsibilities; Public Relations; Leadership and Team - Work; Ethics, Morale, Delegation and Accountability.

UNIT-II

Man, and Machine: Man-Power Planning, Training, Recruitment, Motivation, Welfare Measures and Safety Laws; Machinery for Civil Engineering., Earth Movers and Hauling Costs, Factors Affecting Purchase, Rent, and Lease of Equipment, and Cost Benefit Estimation.

UNIT-III

Planning, Scheduling and Project Management: Planning Stages, Construction Schedules and Project Specification, Monitoring and Evaluation; Bar-Chart, CPM, PERT, Network-formulation and Time Computation.

UNIT-IV

Contracts: Types of Contracts, formation of Contract – Contract Conditions – Contract for Labour, Material, Design, Construction – Drafting of Contract Documents Based On IBRD/MORTH Standard Bidding Documents – Construction Contracts – Contract Problems – Arbitration and Legal Requirements Computer Applications in Construction Management: Software for Project Planning, Scheduling and Control.



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UNIT-V

Safety Management – Implementation and Application of QMS in Safety Programs, ISO 9000 Series, Accident Theories, Cost of Accidents, Problem Areas in Construction Safety, Fall Protection, Incentives, Zero Accident Concepts, Planning for Safety, Occupational Health and Ergonomics.

TEXT BOOKS:

1. Construction Project Management, SK. Sears, GA. Sears, RH. Clough, John Wiley and Sons, 6th Edition, 2016.
2. Construction Project Scheduling and Control by Saleh Mubarak, 4th Edition, 2019
3. Pandey, I.M (2021) Financial Management 12th edition. Pearson India Education Services Pvt. Ltd.

REFERENCE BOOKS:

1. Brien, J.O. and Plotnick, F.L., CPM in Construction Management, Mcgraw Hill, 2010
2. Punmia, B.C., and Khandelwal, K.K., Project Planning and control with PERT and CPM, Laxmi Publications, 2002
3. Construction Methods and Management: Pearson New International Edition 8 th Edition Stephens Nunnally.
4. Rhoden, M and Cato B, Construction Management and Organisational Behaviour, Wiley Blackwell, 2016.

e-Resources and Digital Material:

1. <https://archive.nptel.ac.in/courses/105/104/105104161/>
2. <https://archive.nptel.ac.in/courses/105/103/105103093/>

COURSE OUTCOMES:

1. Understand (Cos) project management fundamentals, organizational structures, and leadership principles in construction.
2. Analyze manpower planning, equipment management, and cost estimation in civil engineering projects.
3. Apply planning, scheduling, and project management techniques such as CPM and PERT.
4. Evaluate various contract types, contract formation, and legal aspects in construction management.
5. Assess safety management practices, accident prevention strategies, and quality management systems in construction.

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III B.Tech. I Sem.

L	T	P	C
3	0	0	3

(23A02503) OE-I: ELECTRICAL SAFETY PRACTICES AND STANDARDS

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:**UNIT-I INTRODUCTION TO ELECTRICAL SAFETY**

Fundamentals of Electrical safety -Electric Shock-physiological effects of electric current Safety requirements Hazards of electricity-Arc-Blast-Causes for electrical failure.

UNIT-II SAFETY COMPONENTS

Introduction to conductors and insulators- voltage classification -safety against over voltages-safety against static electricity-Electrical safety equipment 's Fire extinguishers for electrical safety.

UNIT-III GROUNDING

General requirements for grounding and bonding- Definitions- System grounding Equipment grounding -The Earth-Earthing Practices-Determining safe approach distance Determining archazard category

UNIT-IV SAFETY PRACTICES

General first aid-Safety in handling hand held electrical appliances tools-Electrical safety in train stations-swimming pools, external lighting installations, medical locations-Case studies.

UNIT-V STANDARDS FOR ELECTRICAL SAFETY

Electricity Acts- Rules & regulations- Electrical standards-NFPA 70 E-OSHA standards IEEE standards-National Electrical Code 2005 – National Electric Safety code NESC - Statutory requirements from electrical inspectorate

TEXT BOOKS:

1. Massimo A . G . Mitolo , Electrical Safety of Low - Voltage Systems, Mc Graw Hill, USA, 2009.
2. Mohamed El-Sharkawi, Electric Safety-Practice and Standards, CRC Press, USA, 2014

COURSE OUTCOMES:

1. Understanding the Fundamentals of Electrical Safety
2. Identifying and Applying Safety Components
3. Analyzing Grounding Practices and Electrical Bonding
4. Applying Safety Practices in Electrical Installations and Environments
5. Evaluating Electrical Safety Standards and Regulatory Compliance

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III B.Tech. I Sem.

L	T	P	C
3	0	0	3

(23A03504) OE-I: SUSTAINABLE ENERGY TECHNOLOGIES

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. demonstrate the importance the impact of solar radiation, solar PV modules
2. understand the principles of storage in PV systems
3. discuss solar energy storage systems and their applications.
4. get knowledge in wind energy and bio-mass
5. gain insights in geothermal energy, ocean energy and fuel cells.

UNIT-I: - SOLAR RADIATION: Role and potential of new and renewable sources, the solar energy option, Environmental impact of solar power, structure of the sun, the solar constant, sun-earth relationships, coordinate systems and coordinates of the sun, extraterrestrial and terrestrial solar radiation, solar radiation on tilted surface, instruments for measuring solar radiation and sun shine, solar radiation data, numerical problems.

SOLAR PV MODULES AND PV SYSTEMS: PV Module Circuit Design, Module Structure, Packing Density, Interconnections, Mismatch and Temperature Effects, Electrical and Mechanical Insulation, Lifetime of PV Modules, Degradation and Failure, PV Module Parameters, Efficiency of PV Module, Solar PV Systems-Design of Off Grid Solar Power Plant. Installation and Maintenance.

UNIT-II: - STORAGE IN PV SYSTEMS: Battery Operation, Types of Batteries, Battery Parameters, Application and Selection of Batteries for Solar PV System, Battery Maintenance and Measurements, Battery Installation for PV System.

UNIT-III: - SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of concentrating collectors, orientation.

SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods, sensible, latent heat and stratified storage, solar ponds, solar applications- solar heating/cooling technique, solar distillation and drying, solar cookers, central power tower concept and solar chimney.



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UNIT-IV:- WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, betz criteria, types of winds, wind data measurement.

BIO-MASS: Principles of bio-conversion, anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, utilization for cooking, bio fuels, I.C. engine operation and economic aspects

UNIT-V:- GEOTHERMAL ENERGY: Origin, Applications, Types of Geothermal Resources, Relative Merits

OCEAN ENERGY: Ocean Thermal Energy; Open Cycle & Closed Cycle OTEC Plants, Environmental Impacts, Challenges

FUEL CELLS: Introduction, Applications, Classification, Different Types of Fuel Cells Such as Phosphoric Acid Fuel Cell, Alkaline Fuel Cell, PEM Fuel Cell, MC Fuel Cell.

TEXT BOOKS:

1. Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/TMH
2. Non-Conventional Energy Resources- Khan B.H/ Tata McGraw Hill, New Delhi, 2006

REFERENCE BOOKS:

1. Principles of Solar Engineering - D. Yogi Goswami, Frank Kreith & John F Kreider / Taylor & Francis
2. Non-Conventional Energy - Ashok V Desai /New Age International (P) Ltd
3. Renewable Energy Technologies -Ramesh & Kumar /Narosa
4. Non-conventional Energy Source- G.D Roy/Standard Publishers

e-Resources and Digital Material:

1. <https://nptel.ac.in/courses/112106318>
2. <https://youtube.com/playlistlist=PLyqSpQzTE6M-ZgdjYukayF6QevPv7WE-r&si=-mwIa2X-SuSiNy13>
3. https://youtube.com/playlistlist=PLyqSpQzTE6M-ZgdjYukayF6QevPv7WE-r&si=Apfjx6oDfz1Rb_N3
4. https://youtu.be/zx04Kl8y4dEsi=VmOvp_OgqisILTAF

COURSE OUTCOMES:

1. Illustrate the importance of solar radiation and solar PV modules
2. Discuss the storage methods in PV systems
3. Explain the solar energy storage for different applications
4. Understand the principles of wind energy, and bio-mass energy.
5. Attain knowledge in geothermal energy, ocean energy and fuel cells.



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III B.Tech. I Sem.

L	T	P	C
3	0	0	3

(23A04527) OE-I: ELECTRONIC CIRCUITS

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To understand semiconductor diodes, their characteristics and applications.
2. To explore the operation, configurations, and biasing of BJTs.
3. To study the operation, analysis, and coupling techniques of BJT amplifiers.
4. To learn the operation, applications and uses of feedback amplifiers and oscillators.
5. To analyze the characteristics, configurations, and applications of operational amplifiers.

UNIT-I:-Semiconductor Diode and Applications: Introduction, PN junction diode – structure, operation and VI characteristics, Half-wave, Full-wave and Bridge Rectifiers with and without Filters, Positive and Negative Clipping and Clamping circuits (Qualitative treatment only).

Special Diodes: Zener and Avalanche Breakdowns, VI Characteristics of Zener diode, Zener diode as voltage regulator, Construction, operation and VI characteristics of Tunnel Diode, LED, Varactor Diode, Photo Diode.

UNIT-II:- Bipolar Junction Transistor (BJT): Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor as a switch and Amplifier, Transistor Biasing and Stabilization - Operating point, DC & AC load lines, Biasing - Fixed Bias, Self-Bias, Bias Stability, Bias Compensation using Diodes.

UNIT-III:-Single stage amplifiers: Classification of Amplifiers - Distortion in amplifiers, Analysis of CE, CC and CB configurations with simplified hybrid model.

Multistage amplifiers: Different Coupling Schemes used in Amplifiers - RC coupled amplifiers, Transformer Coupled Amplifier, Direct Coupled Amplifier; Multistage RC coupled BJT amplifier (Qualitative treatment only)

UNIT-IV:-Feedback amplifiers: Concepts of feedback, Classification of feedback amplifiers, Effect of feedback on amplifier characteristics, Voltage Series, Voltage Shunt, Current Series and Current Shunt Feedback Configurations (Qualitative treatment only).

Oscillators: Classification of oscillators, Condition for oscillations, RC Phase shift Oscillators, Generalized analysis of LC Oscillators-Hartley and Colpitts Oscillators, Wien Bridge Oscillator.



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UNIT-V:-Op-amp: Classification of IC 'S, basic information of Op-amp, ideal and practical Op-amp, 741 op-amp and its features, modes of operation-inverting, non-inverting, differential.

Applications of op-amp: Summing, scaling and averaging amplifiers, Integrator, Differentiator, phase shift oscillator and comparator.

TEXT BOOKS:

1. Electronics Devices and Circuits, J. Millman and Christos. C. Halkias, 3rd edition, Tata McGraw Hill, 2006
2. Electronics Devices and Circuits Theory, David A. Bell, 5th Edition, Oxford University press. 2008.

REFERENCE BOOKS:

1. Electronics Devices and Circuits Theory, R.L. Boylestad, Louis Nashelsky and K.Lal Kishore, 12th edition, 2006, Pearson, 2006.
2. Electronic Devices and Circuits, N.Salivahanan, and N.Suresh Kumar, 3rd Edition, TMH, 2012
3. Microelectronic Circuits, S.Sedra and K.C.Smith, 5th Edition, Oxford University Press

COURSE OUTCOMES:

1. Understand semiconductor diodes, their characteristics and applications.
2. Explore the operation, configurations, and biasing of BJTs.
3. Gain knowledge about the operation, analysis, and coupling techniques of BJT amplifiers.
4. Learn the operation, applications and uses of feedback amplifiers and oscillators.
5. Analyze the characteristics, configurations, and applications of operational amplifiers.

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III B.Tech. I Sem.

L	T	P	C
3	0	0	3

(23A91513) OE-I: MATHEMATICS FOR MACHINE LEARNING AND AI

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To provide a strong mathematical foundation for understanding and developing AI/ML algorithms.
2. To enhance the ability to apply linear algebra, probability, and calculus in AI/ML models.
3. To equip students with optimization techniques and graph-based methods used in AI applications.
4. To develop critical problem-solving skills for analyzing mathematical formulations in AI/ML.

UNIT-I: - LINEAR ALGEBRA FOR MACHINE LEARNING (08)

Review of Vector spaces, basis, linear independence, Vector and matrix norms, Matrix factorization techniques, Eigenvalues, eigenvectors, diagonalization, Singular Value Decomposition (SVD) and Principal Component Analysis (PCA).

UNIT-II: - PROBABILITY AND STATISTICS FOR AI (08)

Probability distributions: Gaussian, Binomial, Poisson. Bayes 'Theorem, Maximum Likelihood Estimation (MLE), and Maximum a Posteriori (MAP). Entropy and Kullback-Leibler (KL) Divergence in AI, Cross entropy loss, Markov chains.

UNIT-III: - OPTIMIZATION TECHNIQUES FOR ML (08)

Multivariable calculus: Gradients, Hessians, Jacobians. Constrained optimization: Lagrange multipliers and KKT conditions. Gradient Descent and its variants (Momentum, Adam) Newton's method, BFGS method.

UNIT-IV: - VECTOR CALCULUS & TRANSFORMATIONS (08)

Vector calculus: Gradient, divergence, curl. Fourier Transform & Laplace Transform in ML applications.

UNIT-V: - GRAPH THEORY FOR AI (08)

Graph representations: Adjacency matrices, Laplacian matrices. Bayesian Networks & Probabilistic Graphical Models. Introduction to Graph Neural Networks (GNNs).

TEXT BOOKS:

1. Mathematics for Machine Learning by Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, Cambridge University Press, 2020.
2. Pattern Recognition and Machine Learning by Christopher Bishop, Springer.



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REFERENCE BOOKS:

1. Gilbert Strang, Linear Algebra and Its Applications, Cengage Learning, 2016.
2. Jonathan Gross, Jay Yellen, Graph Theory and Its Applications, CRC Press, 2018.

e- Resources and Digital Material:

1. MIT– Mathematics for Machine Learning <https://ocw.mit.edu>
2. Stanford CS229 – Machine Learning Course <https://cs229.stanford.edu/>
3. DeepAI – Mathematical Foundations for AI <https://deepai.org>

COURSE OUTCOMES:

1. Apply linear algebra concepts to ML techniques like PCA and regression. L3 (Apply)
2. Analyze probabilistic models and statistical methods for AI applications. L4 (Analyze)
3. Implement optimization techniques for machine learning algorithms. L3 (Apply)
4. Utilize vector calculus and transformations in AI-based models. L3 (Apply)
5. Develop graph-based AI models using mathematical representations. L5 (Evaluate)

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III B.Tech. I Sem.

L	T	P	C
3	0	0	3

(23A92503) OE-I: MATERIALS CHARACTERIZATION TECHNIQUES

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To provide exposure to different characterization techniques.
2. To explain the basic principles and analysis of different spectroscopic techniques.
3. To elucidate the working of Scanning electron microscope - Principle, limitations and applications.
4. To illustrate the working of the Transmission electron microscope (TEM) - SAED patterns and its applications.
5. To educate the uses of advanced electric and magnetic instruments for characterization.

UNIT-I STRUCTURE ANALYSIS BY POWDER X-RAY DIFFRACTION

Introduction, Bragg's law of diffraction, Intensity of Diffracted beams, Factors affecting Diffraction, Intensities, Structure of polycrystalline Aggregates, Determination of crystal structure, Crystallite size by Scherer and Williamson-Hall (W-H) Methods, Small angle X-ray scattering (SAXS) (in brief).

UNIT-II MICROSCOPY TECHNIQUE -1 –SCANNING ELECTRON MICROSCOPY (SEM)

Introduction, Principle, Construction and working principle of Scanning Electron Microscopy, Specimen preparation, Different types of modes used (Secondary Electron and Backscatter Electron), Advantages, limitations and applications of SEM

UNIT-III MICROSCOPY TECHNIQUE -2 - TRANSMISSION ELECTRON MICROSCOPY (TEM)

Construction and Working principle, Resolving power and Magnification, Bright and dark fields, Diffraction and image formation, Specimen preparation, Selected Area Diffraction, Applications of Transmission Electron Microscopy, Difference between SEM and TEM, Advantage and Limitations of Transmission Electron Microscopy

UNIT-IV SPECTROSCOPY TECHNIQUES

Principle, Experimental arrangement, Analysis and advantages of the spectroscopic techniques – (i) UV-Visible spectroscopy (ii) Raman Spectroscopy, (iii) Fourier Transform infrared (FTIR) spectroscopy, (iv) X-ray photoelectron spectroscopy (XPS).

UNIT-V ELECTRICAL & MAGNETIC CHARACTERIZATION TECHNIQUES

Electrical Properties analysis techniques (DC conductivity, AC conductivity) Activation Energy, Effect of Magnetic field on the electrical properties (Hall Effect). Magnetization measurement by induction method, Vibrating sample Magnetometer (VSM) and SQUID.



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TEXT BOOKS:

1. Material Characterization: Introduction to Microscopic and Spectroscopic Methods – Yang Leng – John Wiley & Sons (Asia) Pvt. Ltd. 2013
2. Microstructural Characterization of Materials - David Brandon, Wayne D Kalpan, John Wiley & Sons Ltd., 2008

REFERENCE BOOKS:

1. Fundamentals of Molecular Spectroscopy – IV Ed. – Colin Neville Banwell and Elaine M. McCash, Tata McGraw-Hill, 2008.
2. Elements of X-ray diffraction – Bernard Dennis Cullity & Stuart R Stocks, Prentice Hall, 2001 – Science.
3. Practical Guide to Materials Characterization: Techniques and Applications - Khalid Sultan – Wiley – 2021.
4. Materials Characterization Techniques - Sam Zhang, Lin Li, Ashok Kumar - CRC Press - 2008

e-Resources and Digital Material:

1. <https://nptel.ac.in/courses/115/103/115103030/>
2. https://nptel.ac.in/content/syllabus_pdf/113106034.pdf
3. <https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-mm08/>

COURSE OUTCOMES:

1. Analyze the crystal structure and crystallite size by various methods L1, L2, L3, L4
2. Analyze the morphology of the sample by using a Scanning Electron Microscope L1, L2, L4
3. Analyze the morphology and crystal structure of the sample by using Transmission Electron Microscope L1, L2, L3
4. Explain the principle and experimental arrangement of various spectroscopic techniques L1, L2
5. Identify the construction and working principle of various Electrical & Magnetic Characterization technique L1, L2



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L	T	P	C
3	0	0	3

(23A93504) OE-I: CHEMISTRY OF ENERGY SYSTEMS

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To make the student understand basic electrochemical principles such as standard electrode potentials, emf and applications of electrochemical principles in the design of batteries.
2. To understand the basic concepts of processing and limitations of Fuel cells & their applications
3. To impart knowledge to the students about fundamental concepts of photo chemical cells, reactions and applications
4. Necessarily of harnessing alternate energy resources such as solar energy and its basic concepts.
5. To impart knowledge to the students about fundamental concepts of hydrogen storage in different materials and liquification method.

UNIT-I ELECTROCHEMICAL SYSTEMS

Galvanic cell, Nernst equation, standard electrode potential, application of EMF, electrical double layer, polarization, Batteries- Introduction, Lead-acid, Nickel- cadmium, Lithium-ion batteries and their applications.

UNIT-II FUEL CELLS

Fuel cell- Introduction, Basic design of fuel cell, working principle, Classification of fuel cells, Polymer electrolyte membrane (PEM) fuel cells, Solid-oxide fuel cells (SOFC), Fuel cell efficiency and applications.

UNIT-III PHOTO AND PHOTO ELECTROCHEMICAL CONVERSIONS

Photochemical cells Introduction and applications of photochemical reactions, specificity of photo electrochemical cell, advantage of photoelectron catalytic conversions and their applications.

UNIT-IV SOLAR ENERGY

Introduction and prospects, photovoltaic (PV) technology, concentrated solar power (CSP), Solar cells and applications.

UNIT-V HYDROGEN STORAGE

Hydrogen storage and delivery: State-of-the art, Established technologies, Chemical and Physical methods of hydrogen storage, Compressed gas storage, Liquid hydrogen storage, Other storage methods, Hydrogen storage in metal hydrides, metal organic frameworks (MOF), Metal oxide porous structures, hydrogel, and Organic hydrogen carriers.



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TEXT BOOKS:

1. Physical chemistry by Ira N. Levine
2. Essentials of Physical Chemistry, Bahl and Bahl and Tuli.
3. Inorganic Chemistry, Silver and Atkins

REFERENCE BOOKS:

1. Fuel Cell Hand Book 7th Edition, by US Department of Energy (EG&G technical services and corporation)
2. Hand book of solar energy and applications by ArvindTiwari and Shyam.
3. Solar energy fundamental, technology and systems by Klaus Jagar et.al.
4. Hydrogen storage by Levine Klebonoff

COURSE OUTCOMES:

1. Solve the problems based on electrode potential, Describe the Galvanic Cell Differentiate between Lead acid and Lithium-ion batteries, Illustrate the electrical double layer
2. Describe the working Principle of Fuel cell, Explain the efficiency of the fuel cell Discuss about the Basic design of fuel cells, Classify the fuel cell
3. Differentiate between Photo and Photo electrochemical Conversions, Illustrate the photochemical cells, Identify the applications of photochemical reactions, Interpret advantages of photoelectron catalytic conversion.
4. Apply the photo voltaic technology, demonstrate about solar energy and prospects Illustrate the Solar cells, discuss about concentrated solar power
5. Differentiate Chemical and Physical methods of hydrogen storage, Discuss the metal organic frame work, Illustrate the carbon and metal oxide porous structures Describe the liquification methods.



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L	T	P	C
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(23A94505) OE-I: NENGLISH FOR COMPETITIVE EXAMINATIONS

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To enable the students to learn about the structure of competitive English
2. To understand the grammatical aspects and identify the errors
3. To enhance verbal ability and identify the errors
4. To improve word power to answer competitive challenges
5. To make them ready to crack competitive exams

UNIT-I

GRAMMAR-1: Nouns-classification-errors-Pronouns-types-errors-Adjectives-types-errors-Articles-definite-indefinite Degrees of Comparison-Adverbs-types- errors-Conjunctions-usage Prepositions-usage-Tag Questions, types-identifying errors- Practice

UNIT-II

GRAMMAR-2: Verbs-tenses- structure-usages- negatives- positives- time adverbs-Sequence of tenses--If Clause Voice-active voice and passive voice- reported Speech-Agreement- subject and verb-Modals-Spotting Errors-Practices

UNIT-III VERBAL ABILITY

VERBAL ABILITY: Sentence Completion-Verbal analogies-Word Groups-Instructions-Critical Reasoning-Verbal deduction Select appropriate pair-Reading Comprehension-Paragraph-Jumbles-Selecting the proper statement by reading a given paragraph.

UNIT-IV READING COMPREHENSION AND VOCUBULARY

READING COMPREHENSION AND VOCUBULARY: Competitive Vocabulary: Word Building Memory Techniques-Synonyms, Antonyms, Affixes-Prefix & Suffix-One-word substitutes-Compound Words-Phrasal Verbs-Idioms and Phrases-Homophones Linking Words-Modifiers-Intensifiers - Mastering Competitive Vocabulary- Cracking the unknowing passage-speed reading techniques-Skimming & Scanning-types of answering Elimination methods

UNIT-V WRITING FOR COMPETITIVE EXAMINATIONS

WRITING FOR COMPETITIVE EXAMINATIONS: Punctuation- Spelling rules- Word Order-Sub Skills of Writing- Paragraph meaning-salient features types - Note-making, Note-taking, summarizing-precise writing- Paraphrasing-Expansion of proverbs Essay writing-types

TEXT BOOKS:

1. Wren & Martin, English for Competitive Examinations, S.Chand & Co, 2021
2. Objective English for Competitive Examination, Tata McGraw Hill, New Delhi, 2014.

REFERENCE BOOKS:



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1. Hari Mohan Prasad, Objective English for Competitive Examination, Tata McGraw Hill, New Delhi, 2014.
2. Philip Sunil Solomon, English for Success in Competitive Exams, Oxford 2016
3. Shalini Verma, Word Power Made Handy, S Chand Publications
4. Neira, Anjana Dev & Co. Creative Writing: A Beginner's Manual. Pearson Education India, 2008.
5. Abhishek Jain, Vocabulary Learning Techniques Vol.I&II, RR Global Publishers 2013.
6. Michel Swan, Practical English Usage, Oxford, 2006.

e-Resources and Digital Material:

1. <https://www.grammar.cl/english/parts-of-speech.htm>
2. <https://academicguides.waldenu.edu/writingcenter/grammar/partsofspeech>
3. <https://learnenglish.britishcouncil.org/grammar/english-grammar-reference/active-passive-voice>
4. <https://languagetool.org/insights/post/verb-tenses/>
5. <https://www.britishcouncil.in/blog/best-free-english-learning-resources-british-council>
6. <https://www.careerride.com/post/social-essays-for-competitive-exams-586.aspx>

COURSE OUTCOMES:

1. Identify the basics of English grammar and its importance L1, L2
2. Explain the use of grammatical structures in sentences L1, L2
3. Demonstrate the ability to use various concepts in grammar and vocabulary and their applications in everyday use and in competitive exams L3
4. Analyze an unknown passage and reach conclusions about it. L4
5. Choose the appropriate form of verbs in framing sentences L5
6. Develop speed reading and comprehending ability thereby perform better in competitive exams L3

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L	T	P	C
3	0	0	3

(23A95507) OE-I: ENTREPRENEURSHIP AND NEW VENTURE CREATION

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To foster an entrepreneurial mind-set for venture creation and intrapreneurial leadership.
2. To encourage creativity and innovation
3. To enable them to learn pitching and presentation skills
4. To make the students understand MVP development and validation techniques to determine Product-Market fit and Initiate Solution design, Prototype for Proof of Concept.
5. To enhance the ability of analyzing Customer and Market segmentation, estimate Market size, develop and validate Customer Persona

UNIT-I ENTREPRENEURSHIP FUNDAMENTALS AND CONTEXT

Meaning and concept, attributes and mindset of entrepreneurial and intrapreneurial leadership, role models in each and their role in economic development. An understanding of how to build entrepreneurial mindset, skill sets, attributes and networks while on campus. Core Teaching Tool: Simulation, Game, Industry Case Studies (Personalized for students – 16 industries to choose from), Venture Activity

LEARNING OUTCOMES

At the end of the Unit, the learners will be able to Understand the concept of Entrepreneur and Entrepreneurship in India Analyze recent trends in Entrepreneurship role in economic development Develop a creative mind set and personality in starting a business.

UNIT-II PROBLEM & CUSTOMER IDENTIFICATION

Understanding and analyzing the macro- Problem and Industry perspective - technological, socioeconomic and urbanization trends and their implication on new opportunities - Identifying passion - identifying and defining problem using Design thinking principles - Analyzing problem and validating with the potential customer - Understanding customer segmentation, creating and validating customer personas. Core Teaching Tool: Several types of activities including Class, game, Gen AI, Get out of the Building 'and Venture Activity.

LEARNING OUTCOMES

At the end of the Unit, the learners will be able to Understand the problem and Customer identification. B.Tech. Analyze problem and validating with potential customer Evaluate customer segmentation and customer personas



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UNIT-III SOLUTION DESIGN, PROTOTYPING & OPPORTUNITY ASSESSMENT AND SIZING

Understanding Customer Jobs-to-be-done and crafting innovative solution design to map to customers' needs and create a strong value proposition - Understanding prototyping and Minimum Viable product (MVP) - Developing a feasibility prototype with differentiating value, features and benefits - Assess relative market position via competition analysis - Sizing the market and assess scope and potential scale of the opportunity. Core Teaching Tool: Venture Activity, no-code Innovation tools, Class activity

LEARNING OUTCOMES

At the end of the Unit, the learners will be able to Analyze jobs-to-be-done Evaluate customer needs to create a strong value proposition Design and draw prototyping and MVP

UNIT-IV BUSINESS & FINANCIAL MODEL, GO-TO-MARKET PLAN

Introduction to Business model and types, Lean approach, 9 block lean canvas model, riskiest assumptions to Business models. Importance of Build - Measure - Learn approach.

Business planning: components of Business plan- Sales plan, People plan and financial plan. Financial Planning: Types of costs, preparing a financial plan for profitability using financial template, understanding basics of Unit economics and analyzing financial performance.

Introduction to Marketing and Sales, Selecting the Right Channel, creating digital presence, building customer acquisition strategy.

Choosing a form of business organization specific to your venture, identifying sources of funds: Debt & Equity, Map the Start-up Life-cycle to Funding Options.

Core Teaching Tool: Founder Case Studies - Sama and Securely Share; Class activity and discussions; Venture Activities.

LEARNING OUTCOMES

At the end of the Unit, the learners will be able to: Understand lean approach in business models Apply business plan, sales plan and financial plan Analyze financial planning, marketing channels of distribution. Design their own venture and source of funds.

UNIT-V SCALE OUTLOOK AND VENTURE PITCH READINESS

Understand and identify potential and aspiration for scale vis-a-vis your venture idea. Persuasive Storytelling and its key components. Build an Investor ready pitch deck. Core Teaching Tool: Expert talks; Cases; Class activity and discussions; Venture Activities.

LEARNING OUTCOMES

At the end of the Unit, the learners will be able to Understand aspiration for scale Analyze venture idea and its key components Evaluate and build investor ready pitch

REFERENCE BOOKS:



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1. Simon Sinek, Start with Why, Penguin Books limited. (2011)
2. Brown Tim, Change by Design Revised & Updated: How Design Thinking Transforms Organizations and Inspires Innovation, Harper Business. (2019)
3. Namita Thapar (2022) The Dolphin and the Shark: Stories on Entrepreneurship, Penguin Books Limited
4. Saras D. Sarasvathy, (2008) Effectuation: Elements of Entrepreneurial Expertise, Elgar Publishing Ltd.

COURSE OUTCOMES:

1. Develop an entrepreneurial mindset and appreciate the concept of entrepreneurship L
2. Comprehend the process of problem-opportunity identification through design thinking, identify market potential and customers while developing a compelling value proposition solution L
3. Analyze and refine business models to ensure sustainability and profitability L3
4. Build Prototype for Proof of Concept and validate MVP of their practice venture idea L4
5. Create business plan, conduct financial analysis and feasibility analysis to assess the financial viability of a venture L5
6. Prepare and deliver an investible pitch deck of their practice venture to attract stakeholders L6



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L	T	P	C
0	0	3	1.5

(23A33505) ARTIFICIAL INTELLIGENCE LAB

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Professional Ethics

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 and machine learning.
-
1. Write a Program to Implement Breadth First Search using Python.
 2. Write a program to implement Best First Searching Algorithm
 3. Write a Program to Implement Depth First Search using Python.
 4. Write a program to implement the Heuristic Search
 5. Write a python program to implement A* and AO* algorithm. (Ex: find the shortest path)
 6. Write a Program to Implement Water-Jug problem using Python.
 7. Write a Program to Implement Alpha-Beta Pruning using Python.
 8. Write a Program to implement 8-Queens Problem using Python.
 9. Write a program to schedule a meeting among a 5 busy people using Default Reasoning the output should give the time, place and day of the meeting.
 10. Write a program to implement the Unification algorithm
 11. Develop a knowledge base system consisting of facts and rules about some specialized knowledge domain
 12. Write a program to implement 8 puzzle programs using different heuristics. Using it play the game Tic-Tac-Toe at the end the game the program should display the no. of nodes generated, cutoff values at each stage in the form of a table.



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TEXT BOOKS:

1. PrateekJoshi, Artificial Intelligence with Python, Packt Publishing, 2017.
2. Xiao, Perry. Artificial intelligence programming with Python: from zero to hero. John Wiley & Sons, 2022.

REFERENCE BOOKS:

1. Stuart J. Russell and Peter Norvig, Artificial Intelligence A Modern Approach, Fourth Edition, Pearson, 2020
2. Martin C. Brown (Author), Python: The Complete Reference McGraw Hill Education, Fourth edition, 2018
3. R. NageswaraRao , Core Python Programming Dreamtech Press India Pvt Ltd 2018.

e- Resources and Digital Material:

1. https://onlinecourses.nptel.ac.in/noc19_cs40/preview
2. https://onlinecourses.nptel.ac.in/noc19_cs41/preview

COURSE OUTCOMES:

1. Understand the Mathematical and statistical perspectives of machine learning algorithms through python programming (L2)
2. Appreciate the importance of visualization in the data analytics solution. (L5)
3. Derive insights using Machine learning algorithms (L5)
4. Implement and demonstrate AI and ML algorithms. (L5)
5. Evaluate different algorithms. (L6)



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III B.Tech. I Sem.

L	T	P	C
0	0	3	1.5

(23A05524) COMPUTER NETWORKS & INTERNET PROTOCOLS LAB

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To understand the working principle of various communication protocols.
2. To understand the network simulator environment and visualize a network topology
3. Observe its performance
4. To analyze the traffic flow and the contents of protocol frames.
5. Familiarize with the applications of Internet.

List of Experiments:

1. Implement the data link layer framing methods such as character, character-stuffing and bit stuffing.
2. Write a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRC CCIP.
3. Develop a simple data link layer that performs the flow control using the sliding window protocol, and loss recovery using the Go-Back-N mechanism.
4. Implement Dijkstra's algorithm to compute the shortest path through a network.
5. Take an example subnet of hosts and obtain a broadcast tree for the subnet.
6. Implement distance vector routing algorithm for obtaining routing tables at each node.
7. Implement data encryption and data decryption.
8. Write a program for congestion control using Leaky bucket algorithm.
9. Write a program for frame sorting technique used in buffers.
10. Programs using Wireshark
 - i. Packet Capture Using Wire shark
 - ii. Starting Wire shark
 - iii. Viewing Captured Traffic iv. Analysis and Statistics & Filters.



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11. How to run Nmap scan .

12. Operating System Detection using Nmap.

13. Do the following using NS2 Simulator

- i. NS2 Simulator-Introduction
- ii. Simulate to Find the Number of Packets Dropped
- iii. Simulate to Find the Number of Packets Dropped by TCP/UDP
- iv. Simulate to Find the Number of Packets Dropped due to Congestion
- v. Simulate to Compare Data Rate& Throughput.
- vi. Simulate to Plot Congestion for Different Source/Destination
- vii. Simulate to Determine the Performance with respect to transmission of Packets.

TEXT BOOKS:

1. Andrew S.Tanenbaum, David j.wetherall, Computer Networks, 6th Edition, PEARSON
2. James F.Kurose, Keith W. Ross, Computer Networking: A Top-Down 6th edition, Pearson, 2019.
3. Computer Networks: A Systems Approach-Bruce Davie, VMware-Larry Peterson, Princeton University-2019.

REFERENCE BOOKS:

1. Computer Networks–B. K. MathanNagan, T. Mahalakshmi- Charulatha Publications PrivateLimited-2019.
2. Computer Networks-Dr.Amol V. Dhumane Nitin N. Sakhare-NiraliPrakashan Publishers-2024.
3. Data Communications and Networking with TCPIP Protocol Suite-Behrouz A. ForouzanMcGraw Hill-6th Edition.

e-Resources and Digital Material:

COURSE OUTCOMES:

1. To understand the working principle of various communication protocols.



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2. To understand the network simulator environment and visualize a network topology and
3. Observe its performance.
4. To analyze the traffic flow and the contents of protocol frames.
5. Critique the existing routing protocols.

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L	T	P	C
0	1	2	2

**(23A05525) FULL STACK DEVELOPMENT-II
(SKILL ENHANCEMENT COURSE)**

Course Category	Skill Oriented Course (SC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. Make use of Modern- day JavaScript with ES6 standards for designing Dynamic web pages
2. Building robust & responsive User Interfaces using popular JavaScript library React.js'. Building robust backend APIs using Express.js'
3. Establishing the connection between frontend (React) User interfaces and backend APIs (Express) with Data Bases(My SQL)
4. Familiarize students with GitHub for remote repository hosting and collaborative development.

Sample Experiments:**1. Introduction to Modern JavaScript and DOM**

- a. Write a JavaScript program to link JavaScript file with the HTML page
- b. Write a JavaScript program to select the elements in HTML page using selectors
- c. Write a JavaScript program to implement the event listeners
- d. Write a JavaScript program to handle the click events for the HTML button elements
- e. Write a JavaScript program to with three types of functions i. Function declaration ii. Function definition iii. Arrow functions

2. Basics of React. js

- a. Write a React program to implement a counter button using react class components
- b. Write a React program to implement a counter button using react functional components
- c. Write a React program to handle the button click events in functional component
- d. Write a React program to conditionally render a component in the browser



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e. Write a React program to display text using String literals

3. Important concepts of React. js

- a. Write a React program to implement a counter button using React use State hook
- b. Write a React program to fetch the data from an API using React use Effect hook
- c. Write a React program with two react components sharing data using Props.
- d. Write a React program to implement the forms in react
- e. Write a React program to implement the iterative rendering using map() function.

4. Introduction to Git and GitHub

a. Setup

Install Git on local machine.

Configure Git (user name, email).

Create GitHub account and generate a personal access token.

b. Basic Git Workflow

Create a local repository using git init

Create and add files → git add.

Commit files → git commit -m "Initial commit"

Connect to GitHub remote → git remote add origin

Push to GitHub → git push -u origin main

c. Branching and Collaboration

Create a branch → git checkout -b feature1

Merge branch to main → git merge feature1

Resolve merge conflicts (guided)

5. Upload React Project to GitHub

Create a new React app using npx create-react-app myapp



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Initialize a git repo and push to GitHub

Use .gitignore to exclude node modules

Create multiple branches: feature/navbar, feature/form Practice

merge and pull requests (can use GitHub GUI) .

6. Introduction to Node. js and Express. js

- a. Write a program to implement the `_hello world` 'message in the route through the browser using Express
- b. Write a program to develop a small website with multiple routes using Express. js
- c. Write a program to print the `_hello world` 'in the browser console using Express. js
- d. Write a program to implement the CRUD operations using Express. js
- e. Write a program to establish the connection between API and Database using Express – My SQL driver

7. Introduction to My SQL

- a. Write a program to create a Database and table inside that database using My SQL Command line client
- b. Write a My SQL queries to create table, and insert the data, update the data in the table
- c. Write a My SQL queries to implement the subqueries in the My SQL command line client
- d. Write a My SQL program to create the script files in the My SQL workbench
- e. Write a My SQL program to create a database directory in Project and initialize a database. sql file to integrate the database into API

8. Team Collaboration Using GitHub o Form groups of 2–3 students

Create a shared GitHub repo Assign

tasks and work in branches

Use Issues, Pull Requests, and Code R

Document code with README.md



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TEXT BOOKS:

1. Web Design with HTML, CSS, JavaScript and JQuery Set Book by Jon Duckett
Professional JavaScript for Web Developers Book by Nicholas C. Zakas
2. John Dean, Web Programming with HTML5, CSS and JavaScript, Jones & Bartlett Learning, 2019.
3. Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, 2nd edition, APress, O'Reilly.
4. Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-by-Step Guide to Creating Dynamic Websites by Robin Nixon
5. AZAT MARDAN, Full Stack Java Script: Learn Back bone. js, Node.js and Mongo DB.2015

REFERENCE BOOKS:

1. Full-Stack JavaScript Development by Eric Bush.
2. Programming the World Wide Web, 7th Edition, Robert W Sebesta, Pearson, 2013.
3. Tomasz Dyl, KamilPrzeorski, MaciejCzarnecki, Mastering Full Stack React Web Development 2017

e-Resources and Digital Material:

1. <https://ict.iitk.ac.in/product/full-stack-developer-html5-css3-js-bootstrap-php-4/>
2. <https://www.w3schools.com/html/>
3. <https://www.w3schools.com/css/>
4. <https://www.w3schools.com/js/>
5. <https://www.w3schools.com/nodejs/>
6. <https://education.github.com/git-cheat-sheet-education.pdf>

COURSE OUTCOMES:

1. Building fast and interactive UIs
2. Applying Declarative approach for developing web apps
3. Understanding ES6 features to embrace modern JavaScript
4. Building reliable APIs with Express. Js
5. Create and manage Git repositories, track changes, and push code to GitHub.

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L	T	P	C
0	0	2	1

(23A04526) TINKERING LAB

Course Category	Skill Oriented Course (SC)
Course Enrichment Relevance	Skill Development

COURSE OBJECTIVES:

- 1) Make your own parallel and series circuits using breadboard for any application of your choice.
- 2) Design and 3D print a Walking Robot
- 3) Design and 3D Print a Rocket.
- 4) Temperature & Humidity Monitoring System (DHT11 + LCD)
- 5) Water Level Detection and Alert System
- 6) Automatic Plant Watering System
- 7) Bluetooth-Based Door Lock System
- 8) Smart Dustbin Using Ultrasonic Sensor
- 9) Fire Detection and Alarm System
- 10) RFID-Based Attendance System
- 11) Voice-Controlled Devices via Google Assistant
- 12) Heart Rate Monitoring Using Pulse Sensor
- 13) Soil Moisture-Based Irrigation
- 14) Smart Helmet for Accident Detection
- 15) Milk Adulteration Detection System
- 16) Water Purification via Activated Carbon
- 17) Solar Dehydrator for Food Drying
- 18) Temperature-Controlled Chemical Reactor



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- 19) Ethanol Mini-Plant Using Biomass
- 20) Smart Fluid Flow Control (Solenoid + pH Sensor)
- 21) Portable Water Quality Tester
- 22) AI Crop Disease Detection
- 23) AI-based Smart Irrigation
- 24) ECG Signal Acquisition and Plotting
- 25) AI-Powered Traffic Flow Prediction
- 26) Smart Grid Simulation with Load Monitoring
- 27) Smart Campus Indoor Navigator
- 28) Weather Station Prototype
- 29) Firefighting Robot with Sensor Guidance
- 30) Facial Recognition Dustbin
- 31) Barcode-Based Lab Inventory System
- 32) Growth Chamber for Plants
- 33) Biomedical Waste Alert System
- 34) Soil Classification with AI
- 35) Smart Railway Gate
- 36) Smart Bin Locator via GPS and Load Sensors
- 37) Algae-Based Water Purifier
- 38) Contactless Attendance via Face Recognition

Note: A minimum of 8 to 10 experiments must be completed by the students.

e- Resources and Digital Material:



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COURSE OUTCOMES:

1. Identify real-world problems and formulate innovative ideas by applying basic engineering and scientific principles
2. Demonstrate hands-on skills in using tools, components, and prototyping equipment (e.g., Arduino, 3D printer, sensors, mechanical kits).
3. Design and develop simple prototypes to test and validate concepts through iterative experimentation.
4. Collaborate effectively in teams to brainstorm, plan, and execute mini-projects with creative and sustainable solutions.
5. Document and present the tinkering process, prototype functionality, and outcomes with clarity, using appropriate technical and visual communication methods.



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L	T	P	C
-	-	-	2

(23A99507) EVALUATION OF COMMUNITY SERVICE INTERNSHIP

Course Category	Mandatory Course (credit)
Course Enrichment Relevance	Environment & Sustainability

COURSE OBJECTIVES:

REFERENCE BOOKS:

e-Resources and Digital Material:

COURSE OUTCOMES:

III B.Tech II Semester Course Structure

**SANTHIRAM ENGINEERING COLLEGE****(AUTONOMOUS)****DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING****III B.Tech. II Sem. - Course Structure**

S.No	Subject Code	Course Category	Name of the Subject	Hours/Week			Credits	Marks		
				Lecture	Tutorial	Practical		Internal	External	Total
1	23A33402	PC	MACHINE LEARNING	3	0	0	3	30	70	100
2	23A05626	PC	CLOUD COMPUTING	3	0	0	3	30	70	100
3	23A05627	PC	CRYPTOGRAPHY & NETWORK SECURITY	3	0	0	3	30	70	100
4	23A05628	PE	SOFTWARE TESTING METHODOLOGIES	3	0	0	3	30	70	100
5	23A05629	PE	INTRODUCTION TO CYBER SECURITY	3	0	0	3	30	70	100
6	23A05630	PE	DEVOPS	3	0	0	3	30	70	100
7	23A04640	PE	EMBEDDED SYSTEMS DESIGN	3	0	0	3	30	70	100
8	23A05633	PE	SOFTWARE PROJECT MANAGEMENT	3	0	0	3	30	70	100
9	23A05634	PE	MOBILE ADHOC NETWORKS	3	0	0	3	30	70	100
10	23A33506	PE	NATURAL LANGUAGE PROCESSING	3	0	0	3	30	70	100
11	23A05635	PE	DISTRIBUTED OPERATING SYSTEM	3	0	0	3	30	70	100
12	23A33403	OE	MACHINE LEARNING LAB	0	0	3	1.5	30	70	100
13	23A05637	OE	CRYPTOGRAPHY & NETWORK SECURITY LAB	0	0	3	1.5	30	70	100
14	23A94403	SC	SOFT SKILLS	1	0	2	2	30	70	100
15	23A99608	MC(NC)	TECHNICAL PAPER WRITING & IPR	2	0	0	0	40	0	40
16	23A05638	PC	WORKSHOP	0	0	0	0	50	0	50
17	23A01603	OE	DISASTER MANAGEMENT	3	0	0	3	30	70	100
18	23A03605	OE	SUSTAINABILITY IN ENGINEERING PRACTICES	3	0	0	3	30	70	100
19	23A02604	OE	RENEWABLE ENERGY SOURCES	3	0	0	3	30	70	100
20	23A03606	OE	AUTOMATION AND ROBOTICS	3	0	0	3	30	70	100
21	23A04639	OE	DIGITAL ELECTRONICS	3	0	0	3	30	70	100
22	23A91614	OE	OPTIMIZATION TECHNIQUES FOR ENGINEERS	3	0	0	3	30	70	100
23	23A91609	OE	MATHEMATICAL FOUNDATION OF QUANTUM TECHNOLOGIES	3	0	0	3	30	70	100
24	23A92604	OE	PHYSICS OF ELECTRONIC MATERIALS AND DEVICES	3	0	0	3	30	70	100



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25	23A93605	OE	CHEMISTRY OF POLYMERS AND APPLICATIONS	3	0	0	3	30	70	100
26	23A94607	OE	ACADEMIC WRITING AND PUBLIC SPEAKING	3	0	0	3	30	70	100
27	23A99609	PC	MINI PROJECT	0	0	0	0	50	0	50



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III-B.Tech II-Semester Syllabus



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III B.Tech. II Sem.

L	T	P	C
3	0	0	3

(23A33402) MACHINE LEARNING

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. Define machine learning and its different types (supervised and unsupervised) and understand their applications.
2. Apply supervised learning algorithms including decision trees and k-nearest neighbors (k-NN).
3. Implement unsupervised learning techniques, such as K-means clustering.

UNIT-I INTRODUCTION TO MACHINE LEARNING

Evolution of Machine Learning, Paradigms for ML, Learning by Rote, Learning by Induction, Reinforcement Learning, Types of Data, Matching, Stages in Machine Learning, Data Acquisition, Feature Engineering, Data Representation, Model Selection, Model Learning, Model Evaluation, Model Prediction, Search and Learning, Data Sets.

UNIT-II NEAREST NEIGHBOR-BASED MODELS

Introduction to Proximity Measures, Distance Measures, Non-Metric Similarity Functions, Proximity Between Binary Patterns, Different Classification Algorithms Based on the Distance Measures, K-Nearest Neighbor Classifier, Radius Distance Nearest Neighbor Algorithm, KNN Regression, Performance of Classifiers, Performance of Regression Algorithms.

UNIT-III MODELS BASED ON DECISION TREES

Decision Trees for Classification, Impurity Measures, Properties, Regression Based on Decision Trees, Bias–Variance Trade-off, Random Forests for Classification and Regression. **The Bayes Classifier:** Introduction to the Bayes Classifier, Bayes ‘Rule and Inference, The Bayes Classifier and its Optimality, Multi-Class Classification | Class Conditional Independence and Naive Bayes Classifier (NBC)

UNIT-IV LINEAR DISCRIMINANTS FOR MACHINE LEARNING

Introduction to Linear Discriminants, Linear Discriminants for Classification, Perceptron Classifier, Perceptron Learning Algorithm, Support Vector Machines, Linearly Non-Separable Case, Non-linear SVM, Kernel Trick, Logistic Regression, Linear Regression, Multi-Layer Perceptrons (MLPs), Backpropagation for Training an MLP.



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT-V CLUSTERING

Introduction to Clustering, Partitioning of Data, Matrix Factorization Clustering of Patterns, Divisive Clustering, Agglomerative Clustering, Partitional Clustering, K-Means Clustering, Soft Partitioning, Soft Clustering, Fuzzy C-Means Clustering, Rough Clustering, Rough K-Means Clustering Algorithm, Expectation Maximization-Based Clustering, Spectral Clustering.

TEXT BOOKS:

1. Machine Learning Theory and Practice, M N Murthy, V S Ananthanarayana, Universities Press (India), 2024

REFERENCE BOOKS:

1. Machine Learning, Tom M. Mitchell, McGraw-Hill Publication, 2017
2. Machine Learning in Action, Peter Harrington, DreamTech
3. Introduction to Data Mining, Pang-Ning Tan, Michel Steinbach, Vipin Kumar, 7th Edition, 2019.

COURSE OUTCOMES:

1. Identify machine learning techniques suitable for a given problem. (L3)
2. Solve real-world problems using various machine learning techniques. (L3)
3. Apply Dimensionality reduction techniques for data preprocessing. (L3)
4. Explain what is learning and why it is essential in the design of intelligent machines. (L2)
5. Evaluate Advanced learning models for language, vision, speech, decision making etc. (L5)



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III B.Tech. II Sem.

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3	0	0	3

(23A05626) CLOUD COMPUTING

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To explain the evolving computer model called cloud computing.
2. To introduce the various levels of services that can be achieved by cloud.
3. To describe the security aspects in cloud.

UNIT-I BASICS OF CLOUD COMPUTING

Introduction to cloud computing: Introduction, Characteristics of cloud computing, Cloud Models, Cloud Services Examples, Cloud Based services and applications. **Cloud concepts and Technologies:** Virtualization, Load balancing, Scalability and Elasticity, Deployment, Replication, Monitoring, Software defined, Network function virtualization, Map Reduce, Identity and Access Management, services level Agreements, Billing. **Cloud Services and Platforms:** Compute Services, Storage Services, Database Services, Application services, Content delivery services Analytics Services, Deployment and Management Services, Identity and Access Management services, Open-Source Private Cloud software.

UNIT-II HADOOP AND PYTHON

Hadoop Map Reduce: Apache Hadoop, Hadoop Map Reduce Job Execution, Hadoop Schedulers, Hadoop Cluster set up. **Cloud Application Design:** Reference Architecture for Cloud Applications, Cloud Application Design Methodologies, Data Storage Approaches. **Python Basics:** Introduction, Installing Python, Python data Types & Data Structures, Control flow, Function, Modules, Packages, File handling, Date/Time Operations, Classes.

UNIT-III PYTHON FOR CLOUD COMPUTING

Python for Cloud: Python for Amazon web services, Python for Google Cloud Platform, Python for windows Azure, Python for Map Reduce, Python packages of Interest, Python web Application Framework, Designing a RESTful web API. **Cloud Application Development in Python:** Design Approaches, Image Processing APP, Document Storage App, Map Reduce App, Social Media Analytics App.

UNIT-IV BIG DATA, MULTIMEDIA AND TUNING

Big Data Analytics: Introduction, Clustering Big Data, Classification of Big data Recommendation of Systems. **Multimedia Cloud:** Introduction, Case Study: Live video Streaming App, Streaming Protocols, case Study: Video Transcoding App. **Cloud Application Benchmarking and Tuning:** Introduction, Workload Characteristics, Application Performance Metrics, Design Considerations for a Benchmarking Methodology, Benchmarking Tools, Deployment Prototyping, Load Testing & Bottleneck Detection case Study, Hadoop benchmarking case Study.



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UNIT-V APPLICATIONS AND ISSUES IN CLOUD

Cloud Security: Introduction, CSA Cloud Security Architecture, Authentication, Authorization, Identity Access Management, Data Security, Key Management, Auditing. **Cloud for Industry, Health care & Education:** Cloud Computing for Health care, Cloud computing for Energy Systems, Cloud Computing for Transportation Systems, Cloud Computing for Manufacturing Industry, Cloud computing for Education. **Migrating in to a Cloud:** Introduction, Broad Approaches to migrating into the cloud, the seven- step model of migration in to a cloud. **Organizational readiness and Change Management in The Cloud Age:** Introduction, Basic concepts of Organizational Readiness, Drivers for changes: A frame work to comprehend the competitive environment, common change management models, change management maturity models, Organizational readiness self- assessment. **Legal Issues in Cloud Computing:** Introduction, Data Privacy and security Issues, cloud contracting models, Jurisdictional issues raised by virtualization and at a location, commercial and business considerations, Special Topics.

TEXT BOOKS:

1. Cloud computing Ahands - on Approach By Arshdeep Bahga, Vijay Madisetti, Universities Press, 2016
2. Cloud Computing Principles and Paradigms: By RajKumar Buyya, James Broberg, Andrzej Goscinski, Wiley, 2016

REFERENCE BOOKS:

1. Masterin g Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S Thamarai Selvi, TMH
2. Cloud computing AHands-On Approach by Arshdeep Bahga and Vijay Madisetti.
3. Cloud Computing: A Practical Approach, Anthony T.Velte, To by J.Velte, Robert Elsenpeter, Tata Mc Graw Hill, rp 2011.
4. Enterprise Cloud Computing, Gautam Shroff, Cambridge University Press, 2010.
5. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, George Reese,O_Reilly, SPD, rp 2011.
6. Essentials of Cloud Computing by K.Chandrasekaran. CRC Press.

e- Resources and Digital Material:

1. Cloud computing – Course (nptel.ac.in)

COURSE OUTCOMES:

1. Ability to create cloud computing environment
2. Ability to design applications for Cloud environment
3. Design & develop back up strategies for cloud data based on features.
4. Use and Examine different cloud computing services.
5. Apply different cloud programming model as perneed.

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III B.Tech. II Sem.

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3	0	0	3

(23A05627) CRYPTOGRAPHY & NETWORK SECURITY

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. The concepts of classical encryption techniques and concepts of finite fields and number theory
2. Working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes, and message digests, and public key algorithms
3. Design issues and working principles of various authentication protocols, PKI standards
4. Various secure communication standards including Kerberos, IPsec, TLS and email
5. Concepts of cryptographic utilities and authentication mechanisms to design secure applications

UNIT-I COMPUTER AND NETWORK SECURITY CONCEPTS

Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security, Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography, Block Ciphers: Traditional Block Cipher Structure, The Data Encryption Standard, Advanced Encryption Standard: AES Structure, AES Transformation Functions

UNIT-II NUMBER THEORY

The Euclidean Algorithm, Modular Arithmetic, Fermat's and Euler's Theorems, The Chinese Remainder Theorem, Discrete Logarithms, Finite Fields: Finite Fields of the Form $GF(p)$, Finite Fields of the Form $GF(2^n)$. **Public Key Cryptography:** Principles, Public Key Cryptography Algorithms, RSA Algorithm, Diffie Hellman Key Exchange, Elliptic Curve Cryptography.

UNIT-III CRYPTOGRAPHIC HASH FUNCTIONS

Application of Cryptographic Hash Functions, Requirements & Security, Secure Hash Algorithm, Message Authentication Functions, Requirements & Security, HMAC & CMAC. **Digital Signatures:** NIST Digital Signature Algorithm, Distribution of Public Keys, X.509 Certificates, Public-Key Infrastructure

UNIT-IV USER AUTHENTICATION

Remote User Authentication Principles, Kerberos. **Electronic Mail Security:** Pretty Good Privacy (PGP) And S/MIME. **IP Security:** IP Security Overview, IP Security Policy, Security Payload, Combining Security Associations, Internet Key Exchange.



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UNIT-V TRANSPORT LEVEL SECURITY

Web Security Requirements, Transport Layer Security (TLS), HTTPS, Secure Shell (SSH) **Fire walls:** Fire wall Character is tics and Access Policy, Types of Fire walls, Fire wall Location and Configurations.

TEXT BOOKS:

1. Cryptography and Network Security – William Stallings, Pearson Education, 8th Edition.
2. Cryptography, Network Security and Cyber Laws–Bernard Menezes, Cengage Learning, 2010 edition.

REFERENCE BOOKS:

1. Cryptography and Network Security- Behrouz A Forouzan, Debdeep Mukhopadhyaya, Mc- Graw Hill, 3rd Edition, 2015.
2. Network Security Illustrated, Jason Albanese and Wes Sonnenreich, MGH Publishers, 2003.

e- Resources and Digital Material:

1. <https://nptel.ac.in/courses/106/105/106105031/lecture>
2. <https://nptel.ac.in/courses/106/105/106105031/lecturehttps://nptel.ac.in/courses/106/105/106105162/lecture> by Dr. Sourav Mukhopadhyay IIT Kharagpur [VideoLecture]
3. <https://www.mitel.com/articles/web-communication-cryptography-and-network-security> web articles by Mitel Power Connections

COURSE OUTCOMES:

1. Identify information security goals, classical encryption techniques and acquire fundamental knowledge on the concepts off in it fields and number theory
2. Compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication
3. Apply the knowledge of cryptographic check sums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes.
4. Demonstrate the ability to apply user authentication principles including Kerberos for secure authentication
5. Gain proficiency in securing web communications using TLS and HTTPS, manage secure remote access with SSH, and design firewall policies

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III B.Tech. II Sem.

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3	0	0	3

(23A05628) SOFTWARE TESTING METHODOLOGIES

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To study the fundamental concepts of software testing which includes objectives, process, criteria, strategies, and methods.
2. To discuss various software testing types and levels of testing like black and white box testing along with levels unit test, integration, regression, and system testing.
3. It also helps to learn the types of bugs, testing levels with which the student can very well identify a bug and correct as when it happens.
4. It provides knowledge on transaction flow testing and data flow testing techniques so that the flow of the program is tested as well.
5. To learn the domain testing, path testing and logic-based testing to explore the testing process easier.

UNIT-I INTRODUCTION

Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs, Flow graphs and Path testing: - Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

UNIT-II TRANSACTION FLOW TESTING

transaction flows, transaction flow testing techniques. Dataflow testing: - Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing.

UNIT-III DOMAIN TESTING

domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

UNIT-IV PATHS, PATH PRODUCTS AND REGULAR EXPRESSIONS

path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection. Logic Based Testing: -over view, decision tables, path expressions, kv charts, specifications.

UNIT-V STATE, STATE GRAPHS AND TRANSITION TESTING

state graphs, good & bad state graphs, state testing, Testability tips. Graph Matrices and Application: -Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools

TEXT BOOKS:



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1. Software Testing techniques – Boris Beizer, Dreamtech, second edition.
2. Software Testing Tools – Dr. K.V.K.K. Prasad, Dreamtech.

REFERENCE BOOKS:

1. The craft of software testing – Brian Marick, Pearson Education.
2. Software Testing Techniques – SPD(Oreille)
3. Software Testing in the Real World – Edward Kit, Pearson.
4. Effective methods of Software Testing, Perry, John Wiley.
5. Art of Software Testing – Meyers, John Wiley.

COURSE OUTCOMES:

1. Know the basic concepts of software testing and its essentials.
2. Able to identify the various bugs and correcting them after knowing the consequences of the bug.
3. Use of program's control flow as a structural model is the corner stone of testing.
4. Performing functional testing using control flow and transaction flow graphs.



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III B.Tech. II Sem.

L	T	P	C
3	0	0	3

(23A05629) INTRODUCTION TO CYBER SECURITY

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. The course is designed to provide awareness on different cybercrimes, cyber offenses, tools and methods used in cybercrime.

UNIT-I INTRODUCTION TO CYBERCRIME

Introduction, Cybercrime, and Information Security, who are Cybercriminals, Classifications of Cybercrimes, And Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

UNIT-II CYBER OFFENSES HOW CRIMINALS PLAN THEM

Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber Cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing

UNIT-III CYBERCRIME MOBILE AND WIRELESS DEVICES

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT-IV TOOLS AND METHODS USED IN CYBERCRIME

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

UNIT-V CYBER SECURITY ORGANIZATIONAL IMPLICATIONS

Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

TEXT BOOKS:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA.

REFERENCE BOOKS:



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1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan- Hwa(john) Wu,J. David Irwin.CRC Press T&F Group

e- Resources and Digital Material:

1. <http://nptel.ac.in/courses/106105031/40>
2. <http://nptel.ac.in/courses/106105031/39>
3. <http://nptel.ac.in/courses/106105031/38>

COURSE OUTCOMES:

1. Classify the cybercrimes and understand the Indian ITA 2000
2. Analyse the vulnerabilities in any computing system and find the solutions
3. Predict the security threats of the future
4. Investigate the protection mechanisms
5. Design security solutions for organizations

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III B.Tech. II Sem.

L	T	P	C
3	0	0	3

(23A05630) DEV OPS

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. Understand collaboration and productivity by automating infrastructure and workflows
2. Familiarize with continuous measuring applications performance

UNIT-I DEV OPS

An Overview, Dev Ops: Origins, Dev Ops: Roots, Dev Ops: Practices Dev Ops: Culture. **Adopting Dev Ops:** Developing the Playbook. Developing a Business Case for a Dev Ops: Developing the Business Case

UNIT-II

Completing the Business Model Canvas, Customer Segments, Value Segments, Value Propositions, Channels, Customer Relationships, Revenue Streams, Key Resources, Key Activities, Key Partnerships, Cost Structures. Dev Ops Plays for Optimizing the delivery Pipeline: Dev Ops as an optimization Exercise, Core Themes, The Dev Ops Plays, Specializing Core Plays

UNIT-III DEV OPS PLAYS FOR DRIVING INNOVATION

Optimize to Innovate, The Uber Syndrome, Innovation and the Role of Technology, Core Themes, play: Build a Dev Ops Platform, play: Deliver Micro services Architectures, play: DevOps an API Economy, play: Organizing for Innovation.

UNIT-IV SCALING DEV OPS FOR THE ENTERPRISE

Core Themes, play: Dev Ops Center of Competency, play: Developing Culture of Innovation at Scale, play: Developing a Culture of continuous Improvement, play: Team Models for Dev Ops, play: Standardization of Tools and Process, play: Security Considerations for Dev Ops, Play: Dev Ops and Outsourcing.

UNIT-V LEADING DEV OPS ADOPTION IN THE ENTERPRISE

Play: Dev Ops as a transformation Exercise, play: Developing a Culture of Collaboration and Trust, play: Dev Ops Thinking for the Line of Business, play: starting with Pilot Projects, Play: Rearing Unicorns on an Aircrafts Carrier. Appendix Case Study: Example Dev Ops Adoption Roadmap Organization Background, Roadmap Structure, Adoption Roadmap.

TEXT BOOKS:

1. Sanjeev Sharma, The Dev Ops Adoption Playbook, Published by John Wiley & Sons, Inc.2017



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REFERENCE BOOKS:

1. Sanjeev Sharma & Bernie Coyne, Dev Ops for Dummies, Published by John Wiley & Sons, Inc.
2. Michael Huttermann, Dev Ops for Developers, Apress publishers, 2012.

e- Resources and Digital Material:

1. Online Learning Resources: Learning Dev Ops with Terra form Infrastructure Automation Course Udemy

COURSE OUTCOMES:

1. After completion of the course, students will be able to Enumerate the principles of continuous development and deployment, automation of configuration management, inter-team collaboration, and IT serviceability
2. Describe Dev Ops & Dev Sec Ops methodologies and their key concepts
3. Illustrate the types of version control systems, continuous integration tools, continuous monitoring tools, and cloud models
4. Set up complete private infrastructure using version control systems and CI/CD tools

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III B.Tech. II Sem.

L	T	P	C
3	0	0	3

(23A04640) EMBEDDED SYSTEMS DESIGN

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To understand the history, classification, and design process of embedded systems
2. To explore the core components of embedded systems, including processors, memory, and I/O components.
3. To introduce onboard and external communication interfaces used in embedded systems.
4. To explain different firmware design approaches and programming techniques for embedded systems.
5. To provide an understanding of real-time operating systems and task management in embedded systems.

UNIT-I INTRODUCTION TO EMBEDDED SYSTEMS

History of embedded systems, Classification of embedded systems based on generation and complexity, Purpose of embedded systems, The embedded system design process-requirements, specification, architecture design, designing hardware and software, components, system integration, Applications of embedded systems, and characteristics of embedded systems.

UNIT-II TYPICAL EMBEDDED SYSTEM

Core of the embedded system-general purpose and domain specific processors, ASICs, PLDs, COTs; Memory-ROM, RAM, memory according to the type of interface, memory shadowing, memory selection for embedded systems, Sensors, actuators, I/O components: seven segment LED, relay, piezo buzzer, push button switch, other sub-systems: reset circuit, brownout protection circuit, oscillator circuit real time clock, watch dog timer.

UNIT-III COMMUNICATION INTERFACE

Onboard communication interfaces-I2C, SPI, CAN, parallel interface; External communication interfaces-RS232 and RS485, USB, infrared, Bluetooth, Wi-Fi, ZigBe, GPRS, GSM.

UNIT-IV EMBEDDED FIRMWARE DESIGN AND DEVELOPMENT

Embedded firmware design approaches-super loop-based approach, operating system-based approach; embedded firmware development languages-assembly language-based development, high level language-based development.



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UNIT-V RTOS BASED EMBEDDED SYSTEM DESIGN

Operating system basics, types of operating systems, tasks, process and threads, multiprocessing and multitasking, task scheduling: non-pre-emptive and pre-emptive scheduling; task communication shared memory, message passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/ Synchronization Issues, Task Synchronization Techniques

TEXT BOOKS:

1. Introduction to Embedded Systems - Shibu KV, Mc Graw Hill Education.
2. Computers as Components –Wayne Wolf, Morgan Kaufmann (second edition).

REFERENCE BOOKS:

1. Embedded System Design -Frank Vahid, Tony Grivargis, John Wiley.
2. Embedded Systems- An integrated approach - Lyla b das, Pearson education 2012.
3. Embedded Systems – Raj Kamal, TMH

COURSE OUTCOMES:

1. Classify embedded systems based on their purpose, generation, and complexity.
2. Identify and select appropriate hardware components for an embedded system design.
3. Differentiate and implement various communication protocols like I2C, SPI, and CAN
4. Develop firmware using assembly and high-level programming languages.
5. Analyze and apply RTOS-based task scheduling and synchronization techniques.



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III B.Tech. II Sem.

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3	0	0	3

(23A05633) SOFTWARE PROJECT MANAGEMENT

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. This course is designed to enable the students to understand the fundamental principles of Software Project management & will also have a good knowledge of the responsibilities of a project manager and how to handle them

UNIT-I CONVENTIONAL SOFTWARE MANAGEMENT

The water fall model, conventional software Management performance Evolution of Software Economics: software Economics. Pragmatic Software Cost Estimation Improving Software Economics: Reducing Software Product Size, Improving Software Processes, Improving Team Effectiveness, Improving Automation, Achieving Required Quality, Peer Inspections.

UNIT-II THE OLD WAY AND THE NEW

The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process. Lifecycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases. Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts

UNIT-III WORK FLOWS OF THE PROCESS

Software process work flows, Inter Trans work flows. Check points of the Process: Major Milestones, Minor Milestones, Periodic status assessments. Iterative Process Planning: work break down structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning

UNIT-IV PROCESS AUTOMATION

Automation Building Blocks, The Project Environment. Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicators Tailoring the Process: Process discriminants. Managing people and organizing teams.

UNIT-V PROJECT ORGANIZATIONS AND RESPONSIBILITIES

Line - of-Business Organizations, Project Organizations, evolution of Organizations. Future Software Project Management: modern Project Profiles, Next generation Software economics, modern process transitions. Case Study: The Command Center Processing and Display System-Replacement (CCPDS-R)

TEXT BOOKS:

1. Software Project Management, Walker Royce, Pearson Education, 2012



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2. Bob Hughes, Mike Cotterell and Rajib Mall Software Project Management, 6th Edition, McGraw Hill Edition, 2017

REFERENCE BOOKS:

1. Pankaj Jalote, Software Project Management in practice, 5th Edition, Pearson Education, 2017.
2. Murali K. Chemuturi, Thomas M. Cagley Jr. Mastering Software Project Management: Best Practices, Tools and Techniques, J. Ross Publishing, 2010
3. Sanjay Mohapatra, Software Project Management, Cengage Learning, 2011

e-Resources and Digital Material:

1. <http://nptel.ac.in/courses/106101061/29>

COURSE OUTCOMES:

1. Describe the fundamentals of Project Management
2. Recognize and use Project Scheduling Techniques
3. Familiarize with Project Control Mechanisms
4. Understand Team Management
5. Recognize the importance of Project Documentation and Evaluation

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(23A05634) MOBILE ADHOC NETWORKS

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. Knowledge of mobile ad hoc networks, design and implementation issues, and available solutions.
2. Knowledge of routing mechanisms and the three classes of approaches: proactive, on-demand, and hybrid.
3. Knowledge of clustering mechanisms and the different schemes that have been employed, e.g., hierarchical, flat, and leaderless.
4. Knowledge of the 802.11 Wireless Lan (WiFi) and Bluetooth standards.

UNIT-I INTRODUCTION TO AD HOC NETWORKS

Characteristics of MANETs, Applications of MANETs and challenges of MANETs - Routing in MANETs: Criteria for classification, Taxonomy of MANET routing algorithms, Topology based routing algorithms, Position based routing algorithms, other routing algorithms.

UNIT-II DATA TRANSMISSION

Broadcast storm problem, Broadcasting, Multicasting and Geocasting -TCP over Ad Hoc: TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc

UNIT-III BASICS OF WIRELESS, SENSORS AND APPLICATIONS

Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer.

UNIT-IV DATA RETRIEVAL IN SENSOR NETWORKS

Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs, Sensor Networks and mobile robots-Security: Security in Ad Hoc networks, Key management, Secure routing, Cooperation in MANETs, Intrusion Detection systems

UNIT-V SENSOR NETWORK PLATFORMS AND TOOLS

Sensor Network Hardware, Berkeley motes, Sensor Network Programming Challenges, Node-Level Software Platforms -Operating System: Tiny OS -Imperative Language: nesC, Data flow style language: Tiny GALS, Node Level Simulators, ns2 and its sensor network extension.

TEXT BOOKS:

1. Ad Hoc and Sensor Networks –Theory and Applications, Carlos Corderio Dharma
P. Aggarwal, World Scientific Publications, March 2006, ISBN –981-256-681-3



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2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN –978-1-55860-914-3 (Morgan Kauffman)

COURSE OUTCOMES:

1. Describe the unique issues in ad-hoc/sensor networks.
2. Describe current technology trends for the implementation and deployment of wireless adhoc/sensor networks.
3. Discuss the challenges in designing MAC, routing and transport protocols for wireless adhoc/sensor networks.
4. Discuss the challenges in designing routing and transport protocols for wireless Adhoc/sensor networks.
5. Comprehend the various sensor network Platforms, tools and applications

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(23A33506) NATURAL LANGUAGE PROCESSING

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. Explain and apply fundamental algorithms and techniques in the area of natural language processing (NLP)
2. Discuss approaches to syntax and semantics in NLP.
3. Examine current methods for statistical approach to machine translation.
4. Teach machine learning techniques used in NLP.

UNIT-I INTRODUCTION TO NATURAL LANGUAGE

The Study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different Levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English Syntax.

UNIT-II GRAMMARS AND PARSING

Grammars and Parsing – Top – Down and Bottom-Up Parsers, Transition Network Grammars, Feature Systems and Augmented Grammars, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks, Bayes Rule, Shannon's Game, Entropy and Cross Entropy.

UNIT-III GRAMMARS FOR NATURAL LANGUAGE

Grammars for Natural Language, Movement Phenomenon in Language, Gap Threading, Human Preferences in Parsing, Shift Reduce Parsers, Deterministic Parsers.

UNIT-IV SEMANTIC INTERPRETATION

Semantic & Logical form, Word senses & ambiguity, the basic logical form language, encoding ambiguity in the logical form, Verbs & States in logical form, the microroles, Speech acts & embedded sentences, Defining semantics structure model theory. **Language Modelling:** Introduction, nGram Models, Language model Evaluation, Parameter Estimation, Language Model Adaption, Types of Language Models, Language-Specific Modelling Problems, Multilingual and Cross lingual Language Modelling



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UNIT-V MACHINE TRANSLATION

Survey: Introduction, Problems of Machine Translation, Is Machine Translation Possible, Brief History, Possible Approaches, Current Status. Anusaraka or Language Accessor: Background, Cutting the Gordian Knot, The Problem, Structure of Anusaraka System, User Interface, Linguistic Area, Giving up Agreement in Anusaraka Output, Language Bridges. **Multilingual Information Retrieval:** Introduction, Document Pre-processing, Monolingual Information Retrieval, CLIR, MLIR, Evaluation in Information Retrieval, Tools, Software and Resources. **Multilingual Automatic Summarization:** Introduction, Approaches to Summarization, Evaluation, How to Build a Summarizer, Competitions and Datasets.

TEXT BOOKS:

1. James Allen, Natural Language Understanding, 2nd Edition, 2003, Pearson Education.
2. Multilingual Natural Language Processing Applications: From Theory To Practice- Daniel M. Bikel and Imed Zitouni, Pearson Publications.
3. Natural Language Processing, A paninian perspective, Akshar Bharathi, Vineetchaitanya, Prentice Hall of India.

REFERENCE BOOKS:

1. Charniak, Eugene, Statistical Language Learning, MIT Press, 1993.
2. Jurafsky, Dan and Martin, James, Speech and Language Processing, 2nd Edition, Prentice Hall, 2008.
3. Manning, Christopher and Henrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.

e- Resources and Digital Material:

1. <https://nptel.ac.in/courses/106/105/106105158/http://www.nptelvideos.in/2012/11/natural-languageprocessing.html>

COURSE OUTCOMES:

1. Understand the various NLP Applications and Organization of Natural language, able to learn and implement realistic applications using Python.
2. Apply the various Parsing techniques, Bayes Rule, Shannon game, Entropy and Cross Entropy.
3. Understand the fundamentals of CFG and parsers and mechanisms in ATN's
4. Apply Semantic Interpretation and Language Modelling
5. Apply the concept of Machine Translation and multilingual Information Retrieval systems and Automatic Summarization.

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(23A05635) DISTRIBUTED OPERATING SYSTEM

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To study, learn, and understand the main concepts of advanced operating systems (parallel processing systems, distributed systems, real time systems, network operating systems, and open-source operating systems)
2. Hardware and software features that support these systems.

UNIT-I ARCHITECTURES OF DISTRIBUTED SYSTEMS

System Architecture Types, Distributed Operating Systems, Issues in Distributed Operating Systems, Communication Primitives. Theoretical Foundations: Inherent Limitations of a Distributed System, Lamport's Logical Clocks, Vector Clocks, Causal Ordering of Messages, Termination Detection.

UNIT-II DISTRIBUTED MUTUAL EXCLUSION

The Classification of Mutual Exclusion Algorithms, Non-Token –Based Algorithms: Lamport's Algorithm, The Ricart-Agrawala Algorithm, Maekawa's Algorithm, Token Based Algorithms: Suzuki-Kasami's Broadcast Algorithm, Singhal's Heuristic Algorithm, Raymond's Heuristic Algorithm.

UNIT-III DISTRIBUTED DEADLOCK DETECTION

Preliminaries, Deadlock Handling Strategies in Distributed Systems, Issues in Deadlock Detection and Resolution, Control Organizations for Distributed Deadlock Detection, Centralized- Deadlock – Detection Algorithms, Distributed Deadlock Detection Algorithms, Hierarchical Deadlock Detection Algorithms

UNIT-IV MULTIPROCESSOR SYSTEM ARCHITECTURES

Introduction, Motivation for multiprocessor Systems, Basic Multiprocessor System Architectures Multi-Processor Operating Systems: Introduction, Structures of Multiprocessor Operating Systems, Operating Design Issues, Threads, Process Synchronization, Processor Scheduling. Distributed File Systems: Architecture, Mechanisms for Building Distributed File Systems, Design Issues

UNIT-V DISTRIBUTED SCHEDULING

Issues in Load Distributing, Components of a Load Distributed Algorithm, Stability, Load Distributing Algorithms, Requirements for Load Distributing, Task Migration, Issues in task Migration Distributed Shared Memory: Architecture and Motivation, Algorithms for Implementing DSM, Memory Coherence, Coherence Protocols, Design Issues

TEXT BOOKS:



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1. Advanced Concepts in Operating Systems, Mukesh Singhal, Niranjana G. Shivaratri, Tata Mc GrawHill Edition 2001

REFERENCE BOOKS:

1. Distributed Systems: Andrew S. Tanenbaum, Maarten Van Steen, Pearson Prentice Hall, Edition – 2, 2007

COURSE OUTCOMES:

1. Understand the design approaches of advanced operating systems
2. Analyze the design issues of distributed operating systems.
3. Evaluate design issues of multi-processor operating systems
4. Identify the requirements Distributed File System and Distributed Shared Memory.
5. Formulate the solutions to schedule the real time applications.

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(23A33403) MACHINE LEARNING LAB

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To learn about computing central tendency measures and Data preprocessing techniques
 2. To learn about classification and regression algorithms
 3. To apply different clustering algorithms for a problem.
-
1. Compute Central Tendency Measures: Mean, Median, Mode Measure of Dispersion: Variance, Standard Deviation.
 2. Apply the following Pre-processing techniques for a given dataset. a. Attribute selection b. Handling Missing Values c. Discretization d. Elimination of Outliers
 3. Apply KNN algorithm for classification and regression
 4. Demonstrate decision tree algorithm for a classification problem and perform parameter tuning for better results
 5. Demonstrate decision tree algorithm for a regression problem
 6. Apply Random Forest algorithm for classification and regression
 7. Demonstrate Naïve Bayes Classification algorithm.
 8. Apply Support Vector algorithm for classification
 9. Demonstrate simple linear regression algorithm for a regression problem
 10. Apply Logistic regression algorithm for a classification problem
 11. Demonstrate Multi-layer Perceptron algorithm for a classification problem
 12. Implement the K-means algorithm and apply it to the data you selected. Evaluate performance by measuring the sum of the Euclidean distance of each example from its class center. Test the performance of the algorithm as a function of the parameters K.
 13. Demonstrate the use of Fuzzy C-Means Clustering
 14. Demonstrate the use of Expectation Maximization based clustering algorithm

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(23A05637) CRYPTOGRAPHY & NETWORK SECURITY LAB

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:**List of Experiments:**

1. Write a C program that contains a string (char pointer) with a value `_Hello world` . The program should XOR each character in this string with 0 and displays the result.
2. Write a C program that contains a string (char pointer) with a value `_Hello world` . The program should AND or and XOR each character in this string with 127 and display the result.
3. Write a Java program to perform encryption and decryption using the following algorithms a. Ceaser cipher b. Substitution cipher c. Hill Cipher
4. Write a C/JAVA program to implement the DES algorithm logic.
5. Write a C/JAVA program to implement the Blowfish algorithm logic.
6. Write a C/JAVA program to implement the Rijndael algorithm logic.
7. Write the RC4 logic in Java Using Java cryptography; encrypt the text —Hello worldl using Blowfish. Create your own key using Java key tool.
8. Write a Java program to implement RSA algorithm.
9. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.
10. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.
- 11.11. Calculate the message digest of a text using the MD5 algorithm in JAVA.

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(23A94403) SOFT SKILLS

Course Category	Skill Oriented Course (SC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To encourage all round development of the students by focusing on soft skills
2. To make the students aware of critical thinking and problem-solving skills
3. To enhance healthy relationship and understanding within and outside an organization
4. To function effectively with heterogeneous teams

UNIT – I: Soft Skills & Communication Skills

Soft Skills - Introduction, Need - Mastering Techniques of Soft Skills – Communication Skills - Significance, process, types - Barriers of communication - Improving techniques

Activities: Intrapersonal Skills- Narration about self- strengths and weaknesses- clarity of thought – self-expression – articulating with felicity (The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes and literary sources)

Interpersonal Skills- Group Discussion – Debate – Team Tasks - Book and film Reviews by groups - Group leader presenting views (non- controversial and secular) on contemporary issues or on a given topic. Verbal Communication- Oral Presentations-Extempore- brief addresses and speeches- convincing negotiating- agreeing and disagreeing with professional grace. Non-verbal communication – Public speaking – Mock interviews – presentations with an objective to identify non- verbal clues and remedy the lapses on observation

UNIT – II: Critical Thinking

Active Listening – Observation – Curiosity – Introspection – Analytical Thinking – Open-mindedness – Creative Thinking - Positive thinking - Reflection

Activities: Gathering information and statistics on a topic - sequencing – assorting – reasoning – critiquing issues – placing the problem – finding the root cause - seeking viable solution – judging with rationale – evaluating the views of others - Case Study, Story Analysis

UNIT – III: Problem Solving & Decision Making

Meaning & features of Problem Solving – Managing Conflict – Conflict resolution – Team building - Effective decision making in teams – Methods & Styles

Activities: B.Tech - CSE R23 Regulation 55 Placing a problem which involves conflict of interests, choice and views – formulating the problem – exploring solutions by proper reasoning – Discussion on



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important professional, career and organizational decisions and initiate debate on the appropriateness of the decision. Case Study & Group Discussion

UNIT – IV: Emotional Intelligence & Stress Management

Managing Emotions – Thinking before Reacting – Empathy for Others – Self-awareness – Self Regulation – Stress factors – Controlling Stress – Tips Activities: Providing situations for the participants to express emotions such as happiness, enthusiasm, gratitude, sympathy, and confidence, compassion in the form of written or oral presentations.

Providing opportunities for the participants to narrate certain crisis and stress –ridden situations caused by failure, anger, jealousy, resentment and frustration in the form of written and oral presentation, Organizing Debates

UNIT – V: Corporate Etiquette

Etiquette- Introduction, concept, significance - Corporate etiquette - meaning, modern etiquette, benefits - Global and local culture sensitivity - Gender Sensitivity - Etiquette in interaction- Cell phone etiquette - Dining etiquette - Netiquette - Job interview etiquette - Corporate grooming tips - Overcoming challenges Activities Providing situations to take part in the Role Plays where the students will learn about bad and good manners and etiquette - Group Activities to showcase gender sensitivity, dining etiquette etc. - Conducting mock job interviews - Case Study - Business Etiquette Games

NOTE:-

1. The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes, epics, scriptures, autobiographies and literary sources which bear true relevance to the prescribed skill.
2. Case studies may be given wherever feasible for example for Decision Making- The decision of King Lear.

TEXT BOOKS:

1. Mitra Barun K, Personality Development and Soft Skills, Oxford University Press, Pap/Cdr edition 2012
2. Dr Shikha Kapoor, Personality Development and Soft Skills: Preparing for Tomorrow, K I 2018 ,esuoH gnihsilbuP lanoitanretnI

REFERENCE BOOKS:

1. Sharma, Prashant, Soft Skills: Personality Development for Life Success, BPB Publications 2018
2. Alex K,Soft SkillsS.Chand& Co, 2012 (Revised edition)



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3. Gajendra Singh Chauhan & Sangeetha Sharma, Soft Skills: An Integrated Approach to Maximise Personality Published by Wiley, 2013
4. Pillai, Sabina & Fernandez Agna, Soft Skills and Employability Skills, Cambridge University Press, 2018
5. Dr. Rajiv Kumar Jain, Dr. Usha Jain, Life Skills (Paperback English) Publisher : Vayu Education of India, 2014

e-Resources and Digital Material:

1. https://youtu.be/DUlsNJtg2L8?list=PLLy_2iUCG87CQhELCytvXh0E_ybOO1_q
2. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7Kl_J
3. <https://youtu.be/-Y-R9hDI7IU>
4. <https://youtu.be/gkLsn4ddmTs>
5. <https://youtu.be/2bf9K2rRWwo>
6. <https://youtu.be/FchfE3c2jzc> <https://youtu.be/FchfE3c2jzc> <https://www.businesstrainingworks.com/training-resource/five-free-business-etiquette-training-games/>, https://onlinecourses.nptel.ac.in/noc24_hs15/preview https://onlinecourses.nptel.ac.in/noc21_hs76/preview

COURSE OUTCOMES:

1. List out various elements of soft skills
2. Describe methods for building professional image
3. Apply critical thinking skills in problem solving
4. Analyse the needs of an individual and team for well-being
5. Assess the situation and take necessary decisions
6. Create a productive work place atmosphere using social and work-life skills ensuring personal and emotional well-being

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(23A99608) TECHNICAL PAPER WRITING & IPR

Course Category	Mandatory Course (Non-credit)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To enable the students to practice the basic skills of research paper writing
2. To make the students understand the importance of IP and to educate them on the basic concepts of Intellectual Property Rights.
3. To practice the basic skills of performing quality literature review
4. To help them in knowing the significance of real real-lifetime and procedure of Patents.
5. To enable them learn the procedure of obtaining Patents, Copyrights, & Trade Marks

UNIT-I PRINCIPLES OF TECHNICAL WRITING

styles in technical writing; clarity, precision, coherence and logical sequence in writing-avoiding ambiguity- repetition, and vague language -highlighting your findings discussing your limitations -hedging and criticizing -plagiarism and paraphrasing.

UNIT-II TECHNICAL RESEARCH PAPER WRITING

Abstract- Objectives-Limitations-Review of Literature Problems and Framing Research Questions- Synopsis

UNIT-III PROCESS OF RESEARCH

publication mechanism: types of journals- indexing-seminars- conferences- proof reading – plagiarism style; seminar & conference paper writing; Methodology-discussion-results-citation rules

UNIT-IV INTRODUCTION TO INTELLECTUAL PROPERTY

Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

UNIT-V LAW OF COPY RIGHTS

Fundamentals of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer. Patent law, intellectual property audits.

TEXT BOOKS:



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1. Deborah. E. Bouchoux, Intellectual Property Rights, Cengage Learning India, 2013
2. Meenakshi Raman, Sangeeta Sharma. Technical Communication: Principles and practices. Oxford.

REFERENCE BOOKS:

1. R.Myneni, Law of Intellectual Property, 9th Ed, Asia law House, 2019.
2. Prabuddha Ganguli, Intellectual Property Rights Tata McGraw Hill, 2001
3. P.Naryan, Intellectual Property Law, 3rd Ed, Eastern Law House, 2007.
4. Adrian Wallwork. English for Writing Research Papers Second Edition. Springer Cham Heidelberg New York, 2016
5. Dan Jones, Sam Dragga, Technical Writing Style

e-Resources and Digital Material:

1. <https://theconceptwriters.com.pk/principles-of-technical-writing>
2. <https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.html>
3. <https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.html>
4. <https://www.manuscriptedit.com/scholar-hangout/process-publishing-research-paper-journal>
5. <https://www.icsi.edu/media/website/IntellectualPropertyRightLaws&Practice.pdf>
6. <https://lawbhoomi.com/intellectual-property-rights-notes/>,
<https://www.extension.purdue.edu/extmedia/ec/ec-723.pdf>

COURSE OUTCOMES:

1. Identify key secondary literature related to their proposed technical paper writing
2. Explain various principles and styles in technical writing
3. Use the acquired knowledge in writing a research/technical paper
4. Analyse rights and responsibilities of holder of Patent, Copyright, Trademark, International Trademark etc.
5. Evaluate different forms of IPR available at national & international level
6. Develop skill of making search of various forms of IPR by using modern tools and techniques.

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(23A05638) WORKSHOP

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Skill Development

COURSE OBJECTIVES:**COURSE OUTCOMES:**



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(23A01603) DISASTER MANAGEMENT

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To understand the fundamental concepts of natural disasters, their occurrence, and disaster risk reduction strategies.
2. To analyze the impact of cyclones on structures and explore retrofitting techniques for adaptive reconstruction.
3. To apply wind engineering principles and computational techniques in designing wind resistant structures.
4. To evaluate earthquake effects on buildings and develop strategies for seismic retrofitting.
5. To assess seismic safety planning, design considerations, and innovative construction materials for disaster-resistant structures.

UNIT-I

Introduction to Natural Disasters– Brief Introduction to Different Types of Natural Disasters, Occurrence of Disasters in Different Climatic and Geographical Regions, Hazard Maps (Earthquake and Cyclone) of The World and India, Regulations for Disaster Risk Reduction, Post- Disaster Recovery and Rehabilitation (Socioeconomic Consequences).

UNIT-II

Cyclones and Their Impact– Climate Change and Its Impact on Tropical Cyclones, Nature of Cyclonic Wind, Velocities and Pressure, Cyclone Effects, Storm Surges, Floods, and Landslides. Behavior of Structures in Past Cyclones and Windstorms, Case Studies. Cyclonic Retrofitting, Strengthening of Structures, and Adaptive Sustainable Reconstruction. Life-Line Structures Such as Temporary Cyclone Shelters.

UNIT-III

Wind Engineering and Structural Response– Basic Wind Engineering, Aerodynamics of Bluff Bodies, Vortex Shedding, and Associated Unsteadiness Along and Across Wind forces. Lab: Wind Tunnel Testing and Its Salient Features. Introduction to Computational Fluid Dynamics (CFD). General Planning and Design Considerations Under Windstorms and Cyclones. Wind Effects on Buildings, towers, Glass Panels, Etc., and Wind-Resistant Features in Design. Codal Provisions, Design Wind Speed, Pressure Coefficients. Coastal Zoning Regulations for Construction and Reconstruction in Coastal Areas. Innovative Construction Materials and Techniques, Traditional Construction Techniques in Coastal Areas



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UNIT-IV

Seismology and Earthquake Effects– Causes of Earthquakes, Plate Tectonics, Faults, Seismic Waves; Magnitude, Intensity, Epicenter, Energy Release, and Ground Motions. Earthquake Effects– On Ground, Soil Rupture, Liquefaction, Landslides. Performance of Ground and Buildings in Past Earthquakes– Behavior of Various Types of Buildings and Structures, Collapse Patterns; Behavior of Non-Structural Elements Such as Services, Fixtures, and Mountings – Case Studies. Seismic Retrofitting– Weakness in Existing Buildings, Aging, Concepts in Repair, Restoration, and Seismic Strengthening

UNIT-V

Planning and Design Considerations for Seismic Safety– General Planning and Design Considerations; Building forms, Horizontal and Vertical Eccentricities, Mass and Stiffness Distribution, Soft Storey Effects, Etc.; Seismic Effects Related to Building Configuration. Plan and Vertical Irregularities, Redundancy, and Setbacks. Construction Details– Various Types of Foundations, Soil Stabilization, Retaining Walls, Plinth Fill, Flooring, Walls, Openings, Roofs, Terraces, Parapets, Boundary Walls, Underground and Overhead Tanks, Staircases, and Isolation of Structures. Innovative Construction Materials and Techniques. Local Practices– Traditional Regional Responses. Computational Investigation Techniques.

TEXT BOOKS:

1. David Alexander, Natural Disasters, 1st Edition, CRC Press, 2017

REFERENCE BOOKS:

1. Ben Wisner, J.C. Gaillard, and Ilan Kelman (Editors), Handbook of Hazards and Disaster Risk Reduction and Management, 2nd Edition, Routledge, 2012.
2. Damon P. Coppola, Introduction to International Disaster Management, 4th Edition, Butterworth-Heinemann, 2020.
3. Bimal Kanti Paul, Environmental Hazards and Disasters: Contexts, Perspectives and Management, 2nd Edition, Wiley-Blackwell, 2020.

e- Resources and Digital Material:

1. <https://nptel.ac.in/courses/124107010>
2. https://onlinecourses.swayam2.ac.in/cec19_hs20/preview

COURSE OUTCOMES:

1. Understand the fundamental concepts of natural disasters, their occurrence, and disaster risk reduction strategies.
2. Analyze the impact of cyclones on structures and explore retrofitting techniques for adaptive reconstruction.
3. Apply wind engineering principles and computational techniques in designing wind resistant structures.
4. Evaluate earthquake effects on buildings and develop strategies for seismic retrofitting
5. Assess seismic safety planning, design considerations, and innovative construction materials for disaster-resistant structures.



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(23A03605) SUSTAINABILITY IN ENGINEERING PRACTICES

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To understand the fundamentals of sustainability, the carbon cycle, and the environmental impact of construction materials.
2. To analyze sustainable construction materials, their durability, and life cycle assessment.
3. To apply energy calculations in construction materials and assess their embodied energy.
4. To evaluate green building standards, energy codes, and performance ratings.
5. To assess the environmental effects of energy use, climate change, and global warming.

UNIT-I INTRODUCTION

Introduction and Definition of Sustainability - Carbon Cycle - Role of Construction Material: Concrete and Steel, Etc. - CO₂ Contribution From Cement and Other Construction Materials.

UNIT-II MATERIALS USED IN SUSTAINABLE CONSTRUCTION

Construction Materials and Indoor Air Quality - No/Low Cement Concrete - Recycled and Manufactured Aggregate - Role of QC and Durability - Life Cycle and Sustainability.

UNIT-III ENERGY CALCULATIONS

Components of Embodied Energy - Calculation of Embodied Energy for Construction Materials - Energy Concept and Primary Energy - Embodied Energy Via-A-Vis Operational Energy in Conditioned Building - Life Cycle Energy Use

UNIT-IV GREEN BUILDINGS

Control of Energy Use in Building - ECBC Code, Codes in Neighboring Tropical Countries - OTTV Concepts and Calculations Features of LEED and TERI GRIHA Ratings - Role of Insulation and Thermal Properties of Construction Materials - Influence of Moisture Content and Modeling - Performance Ratings of Green Buildings - Zero Energy Building

UNIT-V ENVIRONMENTAL EFFECTS

Non-Renewable Sources of Energy and Environmental Impact Energy Norm, Coal, Oil, Natural Gas - Nuclear Energy - Global Temperature, Green House Effects, Global Warming - Acid Rain: Causes, Effects and Control Methods - Regional Impacts of Temperature Change.



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TEXT BOOKS:

1. Charles J Kibert, Sustainable Construction: Green Building Design & Delivery, 4th Edition , Wiley Publishers 2016.
2. Steve Goodhew, Sustainable Construction Process, Wiley Blackwell, UK, 2016.

REFERENCE BOOKS:

1. Craig A. Langston & Grace K.C. Ding, Sustainable Practices in the Built Environment, Butterworth Heinemann Publishers, 2011.
2. William P Spence, Construction Materials, Methods & Techniques (3e), Yesdee Publication Pvt. Ltd, 2012.

e- Resources and Digital Material:

1. <https://archive.nptel.ac.in/courses/105/105/105105157>

COURSE OUTCOMES:

1. Understand the fundamentals of sustainability, the carbon cycle, and the environmental impact of construction materials.
2. Analyze sustainable construction materials, their durability, and life cycle assessment.
3. Apply energy calculations in construction materials and assess their embodied energy
4. Evaluate green building standards, energy codes, and performance ratings.
5. Assess the environmental effects of energy use, climate change, and global warming

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III B.Tech. II Sem.

L	T	P	C
3	0	0	3

(23A02604) RENEWABLE ENERGY SOURCES

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:**UNIT-I SOLAR ENERGY**

Solar radiation - beam and diffuse radiation, solar constant, Sun at Zenith, attenuation and measurement of solar radiation, local solar time, derived solar angles, sunrise, sunset and day length. flat plate collectors, concentrating collectors, storage of solar energy-thermal storage.

UNIT-II PV ENERGY SYSTEMS

Introduction, The PV effect in crystalline silicon basic principles, the film PV, Other PV technologies, Solar PV modules from solar cells, mismatch in series and parallel connections design and structure of PV modules, Electrical characteristics of silicon PV cells and modules, Stand-alone PV system configuration, Grid connected PV systems.

UNIT-III WIND ENERGY

Principle of wind energy conversion-Basic components of wind energy conversion systems; wind mill components, various types and their constructional features; design considerations of horizontal and vertical axis wind machines: analysis of aerodynamic forces acting on wind mill blades- wind data and energy estimation and site selection considerations.

UNIT-IV GEOTHERMAL ENERGY

Estimation and nature of geothermal energy, geothermal sources and resources like hydrothermal, geopressed hot dry rock, magma. Advantages, disadvantages and application of geothermal energy, prospects of geothermal energy in India.

UNIT-V MISCELLANEOUS ENERGY TECHNOLOGIES

Ocean Energy: Tidal Energy-Principle of working, Operation methods, advantages and limitations. Wave Energy-Principle of working, energy and power from waves, wave energy conversion devices, advantages and limitations. Bio mass Energy: Biomass conversion technologies, Biogas generation plants, Classification, advantages and disadvantages, constructional details, site selection, digester design consideration Fuel cell: Principle of working of various types of fuel cells and their working, performance and limitations

TEXT BOOKS:

1. G. D. Rai, -Non-Conventional Energy Sources,4th Edition, Khanna Publishers, 2000.



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2. Chetan Singh Solanki -Solar Photovoltaics fundamentals, technologies and applications 2nd Edition PHI Learning Private Limited. 2012.

REFERENCE BOOKS:

1. Stephen Peake, Renewable Energy Power for a Sustainable Future, Oxford International Edition, 2018.
2. S. P. Sukhat me, Solar Energy,3rd Edition, Tata Mc Graw Hill Education Pvt. Ltd, 2008
3. B H Khan, Non-Conventional Energy Resources, 2nd Edition, Tata Mc Graw Hill Education Pvt Ltd, 2011.
4. S. Hasan Saeed and D.K.Sharma,Non-Conventional Energy Resources,3rd Edition, S.K.Kataria& Sons, 2012.
5. G. N. Tiwari and M.K.Ghosal,Renewable Energy Resource: Basic Principles and Applications, Narosa Publishing House, 2004

e- Resources and Digital Material:

1. <https://nptel.ac.in/courses/103103206>
2. <https://nptel.ac.in/courses/108108078>

COURSE OUTCOMES:

1. Understand principle operation of various renewable energy sources.
2. Identify site selection of various renewable energy sources.
3. Analyze various factors affecting on solar energy measurements, wind energy conversion techniques, Geothermal, Biomasss, Tidal Wave and Fuel cell energies L3
4. Design of Solar PV modules and considerations of horizontal and vertical axis Wind energy systems.
5. Apply the concepts of Geo Thermal Energy, Ocean Energy, Bio mass and Fuel Cells for generation of power.

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(23A03606) AUTOMATION AND ROBOTICS

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. Fundamentals of industrial automation, production types, automation strategies, and hardware elements used in modern manufacturing processes.
2. Understanding of automated manufacturing systems, and strategies for improving productivity and flexibility in industrial automation.
3. Knowledge of industrial automation and robotics, sensors, and end-effector design for modern manufacturing environments.
4. Explain industrial automation and robotics, and trajectory planning for intelligent and efficient manufacturing applications.
5. Familiarity of industrial automation and robotics, and practical applications in manufacturing processes.

UNIT-I INTRODUCTION TO AUTOMATION

Introduction to Automation, Need, Types, Basic elements of an automated system, Manufacturing Industries, Types of production, Functions in manufacturing, Organization and information processing in manufacturing, Automation strategies and levels of automation, Hardware components for automation and process control, mechanical feeders, hoppers, orienters, high speed automatic insertion devices.

UNIT-II AUTOMATED FLOW LINES

Automated flow lines, Part transfer methods and mechanisms, types of Flow lines, flow line with/without buffer storage, Quantitative analysis of flow lines. Assembly line balancing: Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

UNIT-III INTRODUCTION TO INDUSTRIAL ROBOTICS

Introduction to Industrial Robotics, Classification of Robot Configurations, functional line diagram, degrees of freedom. Components common types of arms, joints grippers, factors to be considered in the design of grippers. Robot actuators and Feedback components: Actuators, Pneumatic, Hydraulic actuators, Electric & Stepper motors, comparison. Position sensors - potentiometers, resolvers, encoders - velocity sensors, Tactile sensors, Proximity sensors.



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UNIT-IV MANIPULATOR K I N E M A T I C S

Manipulator Kinematics, Homogenous transformations as applicable to rotation and translation - D-H notation, forward inverse kinematics. Manipulator Dynamics: Differential transformations, Jacobians, Lagrange - Euler and Newton Euler formations. Trajectory Planning: Trajectory Planning and avoidance of obstacles path planning, skew motion, joint integrated motion - straight line motion.

UNIT-V ROBOT PROGRAMMING

Robot Programming, Methods of programming - requirements and features of programming languages, software packages. Problems with programming languages. Robot Application in Manufacturing: Material Transfer - Material handling, loading and unloading - Process - spot and continuous arc welding & spray painting - Assembly and Inspection.

TEXT BOOKS:

1. Automation, Production systems and CIM, M.P. Groover/Pearson Edu..
2. Industrial Robotics - M.P. Groover, TMH

REFERENCE BOOKS:

1. Robotics, FuKS, McGrawHill, 4th edition, 2010.
2. An Introduction to Robot Technology, P. Coiffet and M. Chaironze, Kogam Page Ltd. 1983 London
3. Robotic Engineering, Richard D. Klafter, Prentice Hall
4. Robotics, Fundamental Concepts and analysis - Ashitave Ghosal, Oxford Press, 1/e, 2006
5. Robotics and Control, Mittal RK & Nagrath IJ, TMH.

e-Resources and Digital Material:

1. <https://www.youtube.com/watch?v=yxZm9WQJUA0&list=PLRLB5WCqU54UJG45UnazSYmmhl-gt76o>
2. <https://www.youtube.com/watch?v=6f3bvIhSWyM&list=PLRLB5WCqU54X5Vy4DwjfSODT3ZJgwEjyE>

COURSE OUTCOMES:

1. Understand and analyze the structure and functions of automated manufacturing systems, and evaluate hardware components for efficient production
2. Analyze and design automated flow lines with or without buffer storage, perform quantitative evaluations, apply assembly line balancing techniques.
3. Classify robot configurations, select suitable actuators and sensors, analyze and apply automation and robotics principles to optimize production efficiency and flexibility.
4. Apply kinematic and dynamic modeling using D-H notation and select appropriate hardware and control strategies for real-world industrial scenario to analyze and design automated and robotic systems.
5. Design, program, and implement robotic systems, understand and apply robotics technology to manufacturing tasks.



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(23A04639) DIGITAL ELECTRONICS

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To Learn Boolean algebra, logic simplification techniques, and combinational circuit design.
2. To analyze combinational circuits like adders, subtractors, and code converters.
3. To explore combinational logic circuits and their applications in digital design.
4. To understand sequential logic circuits, including latches, flip-flops, counters, and shift registers.
5. To gain knowledge about programmable logic devices and digital IC's.

UNIT-I LOGIC SIMPLIFICATION AND COMBINATIONAL LOGIC DESIGN

Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Introduction to Logic Gates, Ex-OR, ExNOR operations, Minimization of Switching Functions: Karnaugh map method, Logic function realization: AND-OR, OR-AND and NAND/NOR realizations.

UNIT-II INTRODUCTION TO COMBINATIONAL DESIGN 1

Binary Adders, Subtractors and BCD adder, Code converters - Binary to Gray, Gray to Binary, BCD to excess3, BCD to Seven Segment display.

UNIT-III COMBINATIONAL LOGIC DESIGN 2

Decoders, Encoders, Priority Encoder, Multiplexers, Demultiplexers, Comparators, Implementations of Logic Functions using Decoders and Multiplexers.

UNIT-IV SEQUENTIAL LOGIC DESIGN

Latches, Flip-flops, S-R, D, T, JK and Master-Slave JK FF, Edge triggered FF, set up and hold times, Ripple counters, Shift registers.

UNIT-V PROGRAMMABLE LOGIC DEVICES

ROM, Programmable Logic Devices (PLA and PAL). **Digital IC's:** Decoder (74x138), Priority Encoder (74x148), multiplexer (74x151) and de-multiplexer (74x155), comparator (74x85).

TEXT BOOKS:

1. Digital Design, M.Morris Mano & Michel D. Ciletti, 5th Edition, Pearson Education, 1999
2. Switching theory and Finite Automata Theory, ZviKohavi and NirahK.Jha, 2nd Edition, Tata McGraw Hill, 2005.



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REFERENCE BOOKS:

1. Fundamentals of Logic Design, Charles H Roth, Jr., 5th Edition, Brooks/Cole Cengage Learning, 2004.

COURSE OUTCOMES:

1. Learn Boolean algebra, logic simplification techniques, and combinational circuit design.
2. Analyze combinational circuits like adders, subtractors, and code converters.
3. Explore combinational logic circuits and their applications in digital design
4. Understand sequential logic circuits, including latches, flip-flops, counters, and shift registers
5. Gain knowledge about programmable logic devices and digital IC's.



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(23A91614) OPTIMIZATION TECHNIQUES FOR ENGINEERS

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

UNIT-I LINEAR PROGRAMMING I

Introduction, Applications of Linear Programming, Standard form of a Linear Programming Problem, Geometry of Linear Programming Problems, Basic Definitions in Linear Programming. Simplex Method, Simplex Algorithm and Two-phase Simplex Method, Big-M method.

UNIT-II LINEAR PROGRAMMING II

Duality in Linear Programming: Symmetric Primal-Dual Relations, General Primal-Dual Relations, Duality Theorem, Dual Simplex Method, Transportation Problem and assignment problem, Complementary slackness Theorem

UNIT-III NON-LINEAR PROGRAMMING

Unconstrained optimization techniques: Introduction: Classification of Unconstrained minimization methods, Direct Search Methods: Random Search Methods: Descent Method and Fletcher Powell Method, Grid Search Method

UNIT-IV NON-LINEAR PROGRAMMING

Constrained optimization techniques: Introduction, Characteristics of a constrained problem, Random Search Methods, complex method, Sequential linear programming, Basic approach in methods of Feasible directions, Zoutendijk's method of feasible directions: direction finding problem, determination of step length, Termination criteria

UNIT-V GEOMETRIC PROGRAMMING

Unconstrained Minimization Problems: solution of unconstrained geometric programming using differential calculus and arithmetic-geometric inequality. Constrained minimization Problems: Solution of a constrained geometric programming problem, primal-dual programming in case of less-than inequalities, geometric programming with mixed inequality constraints.

TEXT BOOKS:

1. Singiresu S Rao., Engineering Optimization: Theory and Practices, New Age Int. (P) Ltd. Publishers, New Delhi
2. J. C. Panth, Introduction to Optimization Techniques, (7-e) Jain Brothers, New Delhi.

REFERENCE BOOKS:



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1. Harvey M. Wagner, Principles of Operation Research, Printice-Hall of India Pvt. Ltd. New Delhi.
2. Peressimi A.L., Sullivan F.E., Vhl, J. J. Mathematics of Non-linear Programming, Springer – Verlag

e- Resources and Digital Material:

1. https://onlinecourses.nptel.ac.in/noc24_ee122/preview
2. <https://archive.nptel.ac.in/courses/111/105/111105039/>
3. https://onlinecourses.nptel.ac.in/noc21_ce60/preview

COURSE OUTCOMES:

1. Understand the meaning, purpose, tools of Operations Research and linear programming in solving practical problems in industry
2. Interpret the transportation models' solutions and infer solutions to the real-world problems
3. Develop mathematical skills to analyze and solve nonlinear programming models arising from a wide range of applications
4. Apply the concept of non-linear programming for solving the problems involving non linear constraints and objectives
5. Apply the concept of unconstrained geometric programming for solving the problems involving non-linear constraints and objectives.

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(23A91609) MATHEMATICAL FOUNDATION OF QUANTUM TECHNOLOGIES

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To provide students with essential linear algebra foundations including vector spaces, inner products, and operators for quantum mechanical applications.
2. To develop understanding of the transition from finite-dimensional systems to infinite-dimensional function spaces and Hilbert space concepts
3. To establish quantum mechanical formalism including measurement theory, uncertainty relations, and time evolution principles.
4. To enable students to apply quantum mechanical principles to solve problems in simple quantum systems and understand statistical interpretation.
5. To introduce advanced concepts in composite systems, measurement processes, and modern perspectives in quantum mechanics.

UNIT-I LINEAR ALGEBRA FOUNDATION FOR QUANTUM MECHANICS

Vector spaces definition and examples ($\mathbb{R}^2$, $\mathbb{R}^3$, function spaces), Inner products (dot product, orthogonality, normalization), Linear operators (matrices, eigenvalues, eigenvectors), Finite-dimensional examples (2x2 matrices, spin-1/2 systems), Dirac notation introduction, Change of basis (transformations, unitary matrices).

UNIT-II FROM FINITE TO INFINITE DIMENSIONS

Function spaces (L^2 space, square-integrable functions), Inner products for functions (dx), Orthogonal function sets (Fourier series, basis functions), Introduction to Hilbert space concept (complete inner product spaces), Position and momentum representations (wave functions), Operators on functions (d/dx, multiplication by x).

UNIT-III QUANTUM MECHANICAL FORMALISM

Mathematical formulation (states as vectors, observables as operators), Measurement theory (Born rule, expectation values, probabilities), Uncertainty relations (mathematical derivation from commutators), Time evolution (Schrodinger equation, unitary evolution).

UNIT-IV APPLICATIONS AND STATISTICAL INTERPRETATION

Simple applications (infinite square well, harmonic oscillator), Statistical interpretation (ensembles, pure vs mixed states), Measurement process (von Neumann measurement scheme).



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UNIT-V ADVANCED TOPICS

Composite systems (tensor products basic introduction), Reversibility and irreversibility (unitary evolution vs measurement), Thermodynamic connections (equilibrium states, entropy), Modern perspectives (decoherence, measurement problem conceptual).

TEXT BOOKS:

1. David J. Griffiths, Darrell F. Schroeter, Introduction to Quantum Mechanics, 3rd Edition, Cambridge University Press (2018).
2. R. Shankar, Principles of Quantum Mechanics, 2nd Edition, Kluwer Academy/Plenum Publishers (1994).

REFERENCE BOOKS:

1. George. F. Simmons, Introduction to Topology and Modern Analysis, MedTech Science Press
2. Gilbert Strang, Linear Algebra and Its Applications, 4th Edition, Cengage Learning (2006)
3. John von Neumann and Robert T Beyer, Mathematical Foundations of Quantum Mechanics, Princeton Univ. Press (1996).

e-Resources and Digital Material:

1. [https://eclass.uoa.gr/modules/document/file.php/CHEM248/Griffiths%20 - %20Introduction%20to%20Quantum%20Mechanics%203rd%20ed%202018.pdf](https://eclass.uoa.gr/modules/document/file.php/CHEM248/Griffiths%20-%20Introduction%20to%20Quantum%20Mechanics%203rd%20ed%202018.pdf)
2. [https://fisica.net/mecanica-quantica/Shankar%20 - %20Principles% 20of% 20quantum%20 mechanics. pdf](https://fisica.net/mecanica-quantica/Shankar%20-%20Principles%20of%20quantum%20mechanics.pdf)

COURSE OUTCOMES:

1. Understand vector spaces, inner products, and linear operators with applications to quantum systems
2. Apply linear algebra concepts to function spaces and analyze the transition from finite to infinite dimensional systems.
3. Analyze quantum mechanical formalism including measurement theory, uncertainty relations, and time evolution
4. Apply quantum mechanical principles to solve problems in simple quantum systems and evaluate statistical interpretations.
5. Evaluate advanced concepts in composite systems and synthesize understanding of measurement processes and modern quantum theory.



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L	T	P	C
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(23A92604) PHYSICS OF ELECTRONIC MATERIALS AND DEVICES

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To make the students to understand the concept of crystal growth, defects in crystals and thin films
2. To provide insight into various semiconducting materials and their properties
3. To develop a strong foundation in semiconductor physics and device engineering.
4. To elucidate excitonic and luminescent processes in solid-state materials.
5. To understand the principles, technologies, and applications of modern display systems.

UNIT-I FUNDAMENTALS OF MATERIALS SCIENCE

Introduction, Phase rule, Phase Diagram, Elementary idea of Nucleation and Growth, Methods of crystal growth. The basic idea of point, line, and planar defects. Concept of thin films, preparation of thin films, Deposition of thin film using sputtering methods (RF and glow discharge).

UNIT-II SEMICONDUCTORS

Introduction, charge carriers in semiconductors, effective mass, Diffusion and drift, Diffusion and recombination, Diffusion length. The Fermi level & Fermi-Dirac distribution, Electron and Hole in quantum well, change of electron-hole concentration-Qualitative analysis, Temperature dependency of carrier concentration, Conductivity and mobility, Effects of temperature and doping on mobility, High field effects

UNIT-III PHYSICS OF SEMICONDUCTOR DEVICES

Introduction, Band structure, PN junctions and their typical characteristics under equilibrium and under bias, Heterojunctions, Transistors, MOSFETs.

UNIT-IV EXCITONS AND LUMINESCENCE

Luminescence: Different types of luminescence, basic definitions, Light emission in solids, Inter-band luminescence, Direct and indirect gap materials. Photoluminescence: General Principles of photoluminescence, Excitation and relaxation, OLED, Quantum-dot. Electroluminescence: General Principles of electroluminescence, light emitting diode, diode laser.

UNIT-V DISPLAY DEVICES

LCD, three-dimensional display: Holographic display, light-field displays: Head-mounted display, MOEMS (Micro-Opto-Electro-Mechanical Systems) and MEMS displays.

TEXT BOOKS:



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1. Principles of Electronic Materials and Devices-S.O. Kasap, McGraw-Hill Education (India) Pvt. Ltd., 4th edition, 2021
2. Semiconductor physics & devices: basic principles, 4th Edition, McGraw-Hill, 2012.

REFERENCE BOOKS:

1. Solid State Electronic Devices -B.G. Streetman and S. Banerjee, PHI Learning, 6th edition
2. Electronic Materials Science- Eugene A. Irene, Wiley, 2005
3. Electronic Components and Materials, Grover and Jamwal, Dhanpat Rai and Co., New Delhi., 2012.
4. An Introduction to Electronic Materials for Engineers-Wei Gao, Zhengwei Li, Nigel Sammes, World Scientific Publishing Co. Pvt. Ltd. 2nd Edition, 2011

e- Resources and Digital Material:

1. <https://nptel.ac.in/courses/113/106/113106062>
2. https://onlinecourses.nptel.ac.in/noc20_ph24/preview

COURSE OUTCOMES:

1. Understand crystal growth and thin film preparation
2. Summarize the basic concepts of semiconductors
3. Illustrate the working of various semiconductor devices
4. Analyze various luminescent phenomena and the devices based on these concepts
5. Explain the working of different display devices

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3	0	0	3

(23A93605) CHEMISTRY OF POLYMERS AND APPLICATIONS

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To understand the basic principles of polymers
2. To understand natural polymers and their applications
3. To impart knowledge to the students about synthetic polymers, their preparation and importance.
4. To enumerate the applications of hydrogel polymers
5. To enumerate applications of conducting and degradable polymers in engineering.

UNIT-I POLYMERS-BASICS AND CHARACTERIZATION

Basic concepts: monomers, repeating units, degree of polymerization, linear, branched and network polymers, classification of polymers, Polymerization: addition, condensation, copolymerization and coordination polymerization. Average molecular weight concepts: number, weight and viscosity average molecular weights, polydispersity and molecular weight distribution. Measurement of molecular weight: End group, viscosity, light scattering, osmotic and ultracentrifugation methods, analysis and testing of polymers.

UNIT-II NATURAL POLYMERS & MODIFIED CELLULOSICS

Natural Polymers: Chemical & Physical structure, properties, source, important chemical modifications, applications of polymers such as cellulose, lignin, starch, rosin, shellac, latexes, vegetable oils and gums, proteins. Modified cellulosic: Cellulose esters and ethers such as Ethyl cellulose, CMC, HPMC, cellulose acetals, Liquid crystalline polymers; specialty plastics- PES, PAES, PEEK, PEA.

UNIT-III SYNTHETIC POLYMERS

Addition and condensation polymerization processes– Bulk, Solution, Suspension and Emulsion polymerization. Preparation and significance, classification of polymers based on physical properties. Thermoplastics, Thermosetting plastics, Fibers and elastomers, General Applications. Preparation of Polymers based on different types of monomers, Olefin polymers (PE,PVC), Butadiene polymers(BUNA-S,BUNA-N), nylons, Urea-formaldehyde, phenol – formaldehyde, Melamine Epoxy and Ion exchange resins

UNIT-IV HYDROGELS OF POLYMER NETWORKS

Definitions of Hydrogel, polymer networks, Types of polymer networks, Methods involved in hydrogel preparation, Classification, Properties of hydrogels, Applications of hydrogels in drug delivery.



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UNIT-V CONDUCTING AND DEGRADABLE POLYMERS

Conducting polymers: Introduction, Classification, Mechanism of conduction in Poly Acetylene, Poly Aniline, Poly Thiophene, Doping, Applications.

Degradable polymers: Introduction, Classifications, Examples, Mechanism of degradation, poly lactic acid, Nylon-6, Polyesters, applications.

TEXT BOOKS:

1. A Text book of Polymer science, Billmayer
2. Polymer Chemistry – G.S.Mishra
3. Polymer Chemistry – Gowarikar

REFERENCE BOOKS:

1. Organic polymer Chemistry, K.J.Saunders, Chapman and Hall
2. Advanced Organic Chemistry, B.Miller, Prentice Hall
3. Polymer Science and Technology by Premamoy Ghosh, 3rd edition, McGraw-Hill, 2010.

COURSE OUTCOMES:

1. Classify the polymers, explain polymerization mechanism, differentiate addition, condensation polymerizations, Describe measurement of molecular weight of polymer
2. Describe the physical and chemical properties of natural polymers and Modified celluloses.
3. Differentiate Bulk, solution, Suspension and emulsion polymerization, describe fibers and elastomers, Identify the thermosetting and thermo polymers.
4. Identify types of polymer networks, describe methods involve in hydrogel preparation, Explain applications of hydrogels in drug delivery
5. Explain classification and mechanism of conducting and degradable polymers

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(23A94607) ACADEMIC WRITING AND PUBLIC SPEAKING

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To encourage all round development of the students by focusing on writing skills
2. To make the students aware of non-verbal skills
3. To develop analytical skills
4. To deliver effective public speeches

UNIT-I INTRODUCTION TO ACADEMIC WRITING

Introduction to Academic Writing – Essential Features of Academic Writing – Courtesy – Clarity – Conciseness – Correctness – Coherence – Completeness – Types – Descriptive, Analytical, Persuasive, Critical writing

UNIT-II ACADEMIC JOURNAL ARTICLE

Art of condensation- summarizing and paraphrasing - Abstract Writing, writing Project Proposal, writing application for internship, Technical/Research/Journal Paper Writing
??? Conference Paper writing - Editing, Proof Reading - Plagiarism

UNIT-III ESSAY & WRITING REVIEWS

Compare and Contrast – Argumentative Essay – Exploratory Essay – Features and Analysis of Sample Essays – Writing Book Report, Summarizing, Book/film Review- SoP

UNIT-IV PUBLIC SPEAKING

Introduction, Nature, characteristics, significance of Public Speaking Presentation
4 Ps of Presentation Stage Dynamics Answering Strategies Analysis of Impactful Speeches- Speeches for Academic events

UNIT-V PUBLIC SPEAKING AND NON-VERBAL DELIVERY

Body Language – Facial Expressions-Kinesics – Oculistics – Proxemics – Haptics – Chronemics
-Paralanguage - Signs

TEXT BOOKS:

1. Critical Thinking, Academic Writing and Presentation Skills: MG University Edition Paperback 1 January 2010 Pearson Education; First edition (1 January 2010)
2. Pease, Allan & Barbara. The Definitive Book of Body Language RHUS Publishers, 2016

REFERENCE BOOKS:



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1. Alice Savage, Masoud Shafiei Effective Academic Writing, 2Ed., 2014 .sserP
ytisrevinU drofxO
2. Shalini Verma, Body Language, S Chand Publications 2011.
3. Sanjay Kumar and Pushpalata, Communication Skills 2E 2015, Oxford.
4. Sharon Gerson, Steven Gerson, Technical Communication Process and Product,
Pearson, New Delhi, 2014
5. Elbow, Peter. Writing with Power. OUP USA, 1998

e- Resources and Digital Material:

1. <https://youtu.be/NNhTIT81nH8>
2. <https://www.youtube.com/watch?v=478ccrWKY-A>
3. <https://www.youtube.com/watch?v=nzGo5ZC1gMw>
4. <https://www.youtube.com/watch?v=Qve0ZBmJMh4>
5. <https://courses.lumenlearning.com/publicspeakingprinciples/chapter/chapter-12-nonverbalaspects-of-delivery/>
6. https://onlinecourses.nptel.ac.in/noc21_hs76/preview

COURSE OUTCOMES:

1. Understand various elements of Academic Writing L1, L2
2. Identify sources and avoid plagiarism L1, L2
3. Demonstrate the knowledge in writing a Research paper L3, Analyse different types of essays L4
4. Assess the speeches of others and know the positive strengths of speakers L5
5. Build confidence in giving an impactful presentation to the audience L3

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(23A99609) MINI PROJECT

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Entrepreneurship

COURSE OBJECTIVES:**COURSE OUTCOMES:**

IV B.Tech I Semester Course Structure



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IV B.Tech. I Sem. - Course Structure

S. No	Subject Code	Course Category	Name of the Subject	Hours/Week			Credits	Marks		
				Lecture	Tutorial	Practical		Internal	External	Total
1	23A32610	PC	DEEP LEARNING	2	1	0	3	30	70	100
2	23A95708	PC	BUSINESS ETHICS AND CORPORATE GOVERNANCE (MC-II)	2	0	0	2	30	70	100
3	23A95709	PC	E-BUSINESS (MC-II)	2	0	0	2	30	70	100
4	23A95710	PC	MANAGEMENT SCIENCE(MC-II)	2	0	0	2	30	70	100
5	23A05741	PE	SOFTWARE ARCHITECTURE & DESIGN PATTERNS (PE-IV)	3	0	0	3	30	70	100
6	23A05742	PE	BLOCKCHAIN TECHNOLOGY(PE-IV)	3	0	0	3	30	70	100
7	23A05743	PE	AUGMENTED REALITY & VIRTUAL REALITY (PE-IV)	3	0	0	3	30	70	100
8	23A32506	PE	INTERNET OF THINGS (PE-IV)	3	0	0	3	30	70	100
9	23A05744	PE	INTRODUCTION TO APPLICATION OF ARTIFICIAL INTELLIGENCE TO ROBOTICS (PE-IV)	2	1	0	3	30	70	100
10	23A05745	PE	REINFORCEMENT LEARNING (PE-IV)	2	1	0	3	30	70	100
11	23A05746	PE	AGILE METHODOLOGIES (PE-V)	3	0	0	3	30	70	100
12	23A05747	PE	METaverse (PE-V)	3	0	0	3	30	70	100
13	23A32612	PE	COMPUTER VISION (PE-V)	3	0	0	3	30	70	100
14	23A05748	PE	CYBERPHYSICAL SYSTEMS (PE-V)	3	0	0	3	30	70	100
15	23A32609	PE	SOCIAL NETWORK ANALYSIS (PE-V)	2	1	0	3	30	70	100
16	23A05749	PE	INTRODUCTION TO LARGE LANGUAGE MODELS (PE-V)	2	1	0	3	30	70	100
17	23A01704	OE	BUILDING MATERIALS AND SERVICES (OE-III)	3	0	0	3	30	70	100
18	23A01705	OE	ENVIRONMENTAL IMPACT ASSESSMENT (OE-III)	3	0	0	3	30	70	100
19	23A02705	OE	SMART GRID TECHNOLOGIES (OE-III)	3	0	0	3	30	70	100
20	23A03707	OE	3D PRINTING TECHNOLOGIES (OE-III)	3	0	0	3	30	70	100
21	23A04519	OE	MICROPROCESSORS AND MICROCONTROLLERS (OE-III)	3	0	0	3	30	70	100
22	23A91716	OE	WAVELET TRANSFORMS AND ITS APPLICATIONS (OE-III)	3	0	0	3	30	70	100
23	23A92705	OE	SMART MATERIALS AND DEVICES (OE-III)	3	0	0	3	30	70	100
24	23A92706	OE	INTRODUCTION TO QUANTUM MECHANICS (OE-III)	3	0	0	3	30	70	100
25	23A93706	OE	GREEN CHEMISTRY AND CATALYSIS FOR SUSTAINABLE	3	0	0	3	30	70	100



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			ENVIRONMENT (OE-III)							
26	23A95711	OE	EMPLOYABILITY SKILLS (OE-III)	3	0	0	3	30	70	100
27	23A01706	OE	GEO-SPATIAL TECHNOLOGIES (OE-IV)	3	0	0	3	30	70	100
28	23A01707	OE	SOLID WASTE MANAGEMENT (OE-IV)	3	0	0	3	30	70	100
29	23A02706	OE	ELECTRIC VEHICLES (OE-IV)	3	0	0	3	30	70	100
30	23A03708	OE	TOTAL QUALITY MANAGEMENT (OE-IV)	3	0	0	3	30	70	100
31	23A04755	OE	TRANSDUCERS AND SENSORS (OE-IV)	3	0	0	3	30	70	100
32	23A32611	OE	INTRODUCTION TO QUANTUM COMPUTING (OE-IV)	3	0	0	3	30	70	100
33	23A91715	OE	FINANCIAL MATHEMATICS (OE-IV)	3	0	0	3	30	70	100
34	23A92707	OE	SENSORS AND ACTUATORS FOR ENGINEERING APPLICATIONS (OE-IV)	3	0	0	3	30	70	100
35	23A93707	OE	CHEMISTRY OF NANOMATERIALS AND APPLICATIONS (OE-IV)	3	0	0	3	30	70	100
36	23A95712	OE	LITERARY VIBES (OE-IV)	3	0	0	3	30	70	100
37	23A05750	SC	PROMPT ENGINEERING (SEC)	0	1	2	2	30	70	100
38	23A95713	MC(NC)	GENDER SENSITIZATION (AC)	0	0	2	0	30	0	30



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IV B.Tech I Semester Syllabus



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IV B.Tech. I Sem.

L	T	P	C
2	1	0	3

(23A32610) DEEP LEARNING

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. Demonstrate the major technology trends driving Deep Learning
2. Build, train, and apply fully connected deep neural networks
3. Implement efficient (vector zed) neural networks
4. Analyse the key parameters and hyper parameters in a neural network's architecture

UNIT-I LINEAR ALGEBRA

Scalars, Vectors, Matrices and Tensors, Matrix operations, types of matrices, Norms, Eigen decomposition, Singular Value Decomposition, Principal Components Analysis. Probability and Information Theory: Random Variables, Probability Distributions, Marginal Probability, Conditional Probability, Expectation, Variance and Covariance, Bays'Rule, Information Theory. Numerical Computation: Overflow and Underflow, Gradient-Based Optimization, Constrained Optimization, Linear Least Squares.

UNIT-II MACHINE LEARNING

Basics and Under fitting, Hyper parameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood, Bayesian Statistics, Supervised and Unsupervised Learning, Stochastic Gradient Descent, Challenges Motivating Deep Learning. Deep Feed forward Networks: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and other Differentiation Algorithms.

UNIT-III REGULARIZATION FOR DEEP LEARNING

Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop and Manifold Tangent Classifier. Optimization for Training Deep Models: Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms.

UNIT-IV CONVOLUTION NETWORKS

The Convolution Operation, Pooling, Convolution, Basic Convolution Functions, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, Basis for Convolution Networks.



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UNIT-V SEQUENCE MODELLING

Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, Echo State Networks, LSTM, Gated RNNs, Optimization for Long-Term Dependencies, Auto encoders, Deep Generative Models.

TEXT BOOKS:

1. Ian Good fellow, Joshua Bagnio, Aaron Carville, —Deep Learningl, MIT Press,2016.

REFERENCE BOOKS:

1. Fundamentals of Deep Learning, Designing next-generation machine intelligence algorithms, Nikhil Baume, O'Reilly, Sheriff Publishers,2019.
2. Deep learning Cook Book, Practical recipes to get started Quickly, Douse Using, O'Reilly, Sheriff Publishers, 2019

e-Resources and Digital Material:

1. <https://keras.io/datasets/>
2. <http://deeplearning.net/tutorial/deeplearning.pdf>
3. <https://arxiv.org/pdf/1404.7828v4.pdf>
4. <https://www.cse.iitm.ac.in/~miteshk/CS7015.html>
5. <https://www.deeplearningbook.org>
6. <https://nptel.ac.in/courses/106105215>

COURSE OUTCOMES:

1. Demonstrate the mathematical foundation of neural network
2. Describe the machine learning basics
3. Differentiate architecture of deep neural network
4. Build a convolution neural network
5. Build and train RNN and LSTMs

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IV B.Tech. I Sem.

L	T	P	C
2	0	0	2

(23A95708) BUSINESS ETHICS AND CORPORATE GOVERNANCE (MC-II)

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To make the student understand the principles of business ethics
2. To enable them in knowing about the ethics in management
3. To facilitate the student's role in corporate culture
4. To impart knowledge about the fair-trade practices
5. To encourage the student in knowing about the corporate governance

UNIT-I ETHICS

Introduction – Meaning – Nature, Scope, significance, Loyalty, and ethical behavior. Value systems - Business Ethics - Types, Characteristics, Factors, Contradictions and Ethical Practices in Management Corporate Social Responsibility – Issues of Management – Crisis Management.

LEARNING OUTCOMES: - After completion of this unit student will Understand the meaning of loyalty and ethical Behavior Explain various types of Ethics Analyze issues & crisis of management

UNIT-II ETHICS IN MANAGEMENT

Introduction- Ethics in production, finance, Human resource management and Marketing Management the Ethical Value System – Universalism, Utilitarianism, Distributive Justice, Social Contracts, Individual Freedom of Choice, Professional Codes; Culture and Ethics – Ethical Values in different Cultures - Culture and Individual Ethics – professional ethics and technical ethics.

LEARNING OUTCOMES: - After completion of this unit student will Understand the meaning of ethics in various areas of management Compare and contrast professional ethics and technical ethics Develop ethical values in self and organization

UNIT-III CORPORATE CULTURE

Introduction - Meaning, definition, Nature, and significance – Key elements of corporate culture, shared values, beliefs and norms, rituals, symbols and language - Types of corporate culture, hierarchical culture, market driven culture – Organization leadership and corporate culture, leadership styles and their impact on culture, transformational leadership and culture change.

LEARNING OUTCOMES: - After completion of this unit student will 61 B.Tech - CSE R23 Regulation Define corporate culture Understand the key elements of corporate culture Analyze organization leadership and corporate culture



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UNIT-IV LEGAL FRAME WORK

Law and Ethics -Agencies enforcing Ethical Business Behavior - Legal Impact – Environmental Protection, Fair Trade Practices, legal Compliances, Safeguarding Health and wellbeing of Customers – Corporate law, Securities and financial regulations, corporate governance codes and principles.

LEARNING OUTCOMES: - After completion of this unit student will Understand Law and Ethics Analyze Different fair-trade practices Make use of Environmental Protection and Fair-Trade Practices

UNIT-V CORPORATE GOVERNANCE

Introduction - Meaning – Corporate governance code, transparency & disclosure -Role of auditors, board of directors and shareholders. Global issues, accounting and regulatory frame work - Corporate scams - Committees in India and responsibility. BoDs composition, Cadbury Committee - Various committees - Reports Benefits and Limitations. abroad, corporate

LEARNING OUTCOMES: - After completion of this unit student will Understand corporate governance code Analyze role of auditors, board of directors and shareholders in corporate governance Implementing corporate social responsibility in India.

TEXT BOOKS:

1. Murthy CSV: Business Ethics and Corporate Governance, HPH July 2017
2. Bholananth Dutta, S.K. Podder – Corporation Governance, VBH. June 2010

REFERENCE BOOKS:

1. Dr. K. Nirmala, KarunakaraReaddy. Business Ethics and Corporate Governance, HPH
2. H.R.Machiraju: Corporate Governance, HPH, 2013
3. K. Venkataramana, Corporate Governance, SHBP.
4. N.M.Khandelwal. Indian Ethos and Values for Managers

e-Resources and Digital Material:

1. https://onlinecourses.nptel.ac.in/noc21_mg46/
2. <https://archive.nptel.ac.in/courses/110/105/110105138/>
3. https://onlinecourses.nptel.ac.in/noc21_mg54/
4. https://onlinecourses.nptel.ac.in/noc22_mg54/
5. <https://archive.nptel.ac.in/courses/109/106/109106117/>

COURSE OUTCOMES:

1. Understand the Ethics and different types of Ethics.
2. Understand business ethics and ethical practices in management
3. Understand the role of ethics in management
4. Apply the knowledge of professional ethics & technical ethics
5. Analyze corporate law, ethics, codes & principles
6. Evaluate corporate governance & corporate scams



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L	T	P	C
2	0	0	2

(23A95709) E-BUSINESS (MC-II)

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To provide knowledge on emerging concept on E-Business related aspect.
2. To understand various electronic markets & business models.
3. To impart the information about electronic payment systems & banking.
4. To create awareness on security risks and challenges in E-commerce
5. To the students aware on different e-marketing channels & strategies.

UNIT-I ELECTRONIC BUSINESS

Introduction – Nature, meaning, significance, functions and advantages - Definition of Electronic Business - Functions of Electronic Commerce (EC)- Advantages & Disadvantages of E-Commerce –E Commerce and E-Business, Internet Services, Online Shopping- E-Commerce Opportunities for Industries.

Learning Outcomes: -After completion of this unit student Understand the concept of E-Business Contrast and compare E-Commerce & E-Business Evaluate opportunities of E-commerce for industry

UNIT-II ELECTRONIC MARKETS AND BUSINESS MODELS

Introduction –E-Shops-E-Malls E-Groceries - Portals - Vertical Portals-Horizontal Portals - Advantages of Portals -Business Models- Business to Business (B2B)-Business to Customers(B2C) - Business to Government(B2G)-Auctions-B2B Portals in India Learning Outcomes: -After completion of this unit student will Understand the concept of business models Contrast and compare Vertical portal and Horizontal portals

Analyze the B2B,B2C and B2G model

UNIT-III ELECTRONIC PAYMENT SYSTEMS

Introduction to electronic payment systems (EPS) -Types of electronic payments - Credit/debit cards, e wallets, UPI, and crypto currencies -Smart cards and digital wallets: Features and usage - Electronic Fund Transfer (EFT): Role in business transactions - Infrastructure requirements and regulatory aspects of e-payments Learning Outcomes: -After completion of this unit student will Understand the Electronic payment system Contrast and compare EFT and smart cards Analyze debit card and credit cards



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UNIT-IV E-SECURITY

Security risks and challenges in electronic commerce - Cyber threats - Phishing, hacking, identity theft, and malware - Digital Signatures & Certificates - Security protocols over public networks (HTTP, SSL, TLS) -Firewalls in securing e-business platforms.

Learning Outcomes: -After completion of this unit student will Understand E-Security Contrast and compare security protocols and public network Evaluate on Digital signature

UNIT-V E-MARKETING Introduction – Online Marketing – Advantages of Online Marketing – Internet Advertisement – Advertisement Methods – Conducting Online Market Research– – E-marketing planning: Online branding, social media marketing, and email marketing - E-business strategies: Digital advertising, content marketing, and analytics – E-Customer Relationship Management (eCRM) E-supply chain management (e-SCM)

Learning Outcomes: -After completion of this unit student will Understand the concept of online marketing Apply the knowledge of online marketing Compare e-CRM and e-SCM

TEXT BOOKS:

1. Arati Oturkar&Sunil Khilari. E-Business. Everest Publishing House, 2022
2. P.T.S Joseph. E-Commerce, Fourth Edition, Prentice Hall of India, 2011

REFERENCE BOOKS:

1. Debjani, Kamallesh K Bajaj. E-Commerce, Second Edition Tata McGraw-Hill's, 2005
2. Dave Chaffey.E-Commerce E-Management, Second Edition, Pearson, 2012.
3. Henry Chan. E-Commerce Fundamentals and Application, RaymondLeathamWiley India 2007
4. S. Jaiswal. E-Commerce GalgotiaPublication Pvt Ltd., 2003.

e-Resources and Digital Material:

1. <https://www.slideshare.net/fatimahAlkreem/e-businessppt-67935771>
2. <https://www.slideshare.net/VikramNani/e-commerce-business-models>
3. <https://www.slideshare.net/WelingkarDLP/electronic-security>
4. <https://www.slideshare.net/RiteshGoyal/electronic-payment-system>
5. <https://www.slideshare.net/Ankitha2404/emarketing-ppt>

COURSE OUTCOMES:

1. Remember E-Business & its nature, scope and functions.
2. Understand E-market-Models which are practicing by the organizations
3. Apply the concepts of E-Commerce in the present globalized world.
4. Analyze the various E-payment systems & importance of net banking.
5. Evaluate market research strategies & E-advertisements.
6. Understand importance of E-security & control

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L	T	P	C
2	0	0	2

(23A95710) MANAGEMENT SCIENCE (MC-II)

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To provide fundamental knowledge on Management, Administration, Organization & its concepts.
2. To make the students understand the role of management in Production
3. To impart the concept of HRM in order to have an idea on Recruitment, Selection, Training & Development, job evaluation and Merit rating concepts
4. To create awareness on identify Strategic Management areas & the PERT/CPM for better Project Management
5. To make the students aware of the contemporary issues in modern management

UNIT-I INTRODUCTION TO MANAGEMENT

Management - Concept and meaning - Nature-Functions - Management as a Science and Art and both. Schools of Management Thought - Taylor 's Scientific Theory-Henry Fayol's principles - Elton Mayo's Human relations - Organizational Designs - Line organization - Line & Staff Organization - Functional Organization - Matrix Organization - Project Organization - Committee form of Organization - Social responsibilities of Management.

LEARNING OUTCOMES: At the end of the Unit, the students will be able to Understand the concept of management and organization Apply the concepts & principles of management in real life industry. Analyze the organization chart & structure of an enterprise.

UNIT-II OPERATIONS MANAGEMENT

Principles and Types of Plant Layout - Methods of Production (Job, batch and Mass Production), Work Study - Statistical Quality Control- Material Management – Objectives - Inventory-Functions - Types, Inventory Techniques - EOQ-ABC Analysis - Marketing Management - Concept - Meaning - Nature Functions of Marketing - Marketing Mix - Channels of Distribution - Advertisement and Sales Promotion - Marketing Strategies based on Product Life Cycle.

LEARNING OUTCOMES: At the end of the Unit, the students will be able to Understand the core concepts of Operations Management Apply the knowledge of Quality Control, Work-study principles in real life industry. Evaluate Materials departments & Determine EOQ Analyze Marketing Mix Strategies for an enterprise. Create and design advertising and sales promotion



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UNIT-III HUMAN RESOURCES MANAGEMENT (HRM)

HRM - Definition and Meaning – Nature - Managerial and Operative functions - Job Analysis - Human Resource Planning (HRP) - Employee Recruitment-Sources of Recruitment - Employee Selection - Process - Employee Training and Development - methods - Performance Appraisal Concept - Methods of Performance Appraisal – Placement - Employee Induction - Wage and Salary Administration

LEARNING OUTCOMES: At the end of the Unit, the students will be able to Understand the concepts of HRM, Recruitment, Selection, Training & Development Analyze the need of training Evaluate performance appraisal Design the basic structure of salaries and wages

UNIT-IV STRATEGIC & PROJECT MANAGEMENT

Definition & Meaning - Setting of Vision - Mission - Goals - Corporate Planning Process - Environmental Scanning - Steps in Strategy Formulation and Implementation - SWOT Analysis - Project Management - Network Analysis - Programme Evaluation and Review Technique (PERT) - Critical Path Method (CPM) Identifying Critical Path - Probability of Completing the project within given time - Project Cost- Analysis - Project Crashing (Simple problems).

LEARNING OUTCOMES: At the end of the Unit, the students will be able to Understand Mission, Objectives, Goals & strategies for an enterprise Apply SWOT Analysis to strengthen the project Analyze Strategy formulation and implementation Evaluate PERT and CPM Techniques

UNIT-V CONTEMPORARY ISSUES IN MANAGEMENT

Customer Relations Management (CRM) - Total Quality Management (TQM) - Six Sigma Concept - Supply Chain Management (SCM) - Enterprise Resource Planning (ERP) - Performance Management – employee engagement and retention - Business Process Re-engineering and Bench Marking - Knowledge Management – change management – sustainability and corporate social responsibility.

LEARNING OUTCOMES At the end of the Unit, the students will be able to Understand modern management techniques Apply Knowledge in Understanding in TQM, SCM Analyze CRM, BPR Evaluate change management & sustainability

TEXT BOOKS:

1. Frederick S. Hillier, Mark S. Hillier. Introduction to Management Science, October 26, 2023
2. A.R Aryasri, Management Science, TMH, 2019

REFERENCE BOOKS:

1. Stoner, Freeman, Gilbert. Management, Pearson Education, New Delhi, 2019.
2. Koontz & Weihrich, Essentials of Management, 6/e, TMH, 2005.
3. Thomas N. Duening & John M. Ivancevich, Management Principles and Guidelines, Biztantra.
4. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2004.
5. Samuel C. Certo, Modern Management, 9/e, PHI, 2005



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e- Resources and Digital Material:

1. <https://www.slideshare.net/slideshow/introduction-to-management-and-organization-231308043/231308043>
2. <https://nptel.ac.in/courses/112107238>
3. <https://archive.nptel.ac.in/courses/110/104/110104068/>
4. <https://archive.nptel.ac.in/courses/110/105/110105069/>
5. https://onlinecourses.nptel.ac.in/noc24_mgl12/

COURSE OUTCOMES:

1. Remember the concepts & principles of management and designs of organization in a practical world
2. Understand the knowledge of Work-study principles & Quality Control techniques in industry
3. Apply the process of Recruitment & Selection in organization.
4. Analyze the concepts of HRM & different training methods.
5. Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project & to analyze the business through SWOT.
6. Create awareness on contemporary issues in modern management & technology.



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L	T	P	C
3	0	0	3

(23A05741) SOFTWARE ARCHITECTURE & DESIGN PATTERNS (PE-IV)

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To understand the concept of patterns and the Catalog.
2. To discuss the Presentation tier design patterns and their affect on: sessions, client access, validation and consistency.
3. To understand the variety of implemented bad practices related to the Business and Integration tiers.

UNIT-I ENVISIONING ARCHITECTURE

The Architecture Business Cycle, what is Software Architecture, Architectural patterns, reference models, reference architectures, architectural structures and views. Creating an Architecture: Quality Attributes, achieving qualities, Architectural styles and patterns, designing the Architecture, Documenting software architectures, Reconstructing Software Architecture.

UNIT-II ANALYZING ARCHITECTURES

Architecture Evaluation, Architecture design decision making, ATAM, CBAM. Moving from one system to many: Software Product Lines, Building systems from off the shelf components, Software architecture in future.

UNIT-III PATTERNS

Pattern Description, organizing catalogs, role in solving design problems, Selection and usage. Creational and Structural patterns: Abstract factory, builder, factory method, prototype, singleton, adapter, bridge, composite, façade, flyweight

UNIT-IV BEHAVIOURAL PATTERNS

Chain of responsibility, command, Interpreter, iterator, mediator, memento, observer, state, strategy. template method, visitor.

UNIT-V CASE STUDIES

A-7E – A case study in utilizing architectural structures, The World Wide Web - a case study in interoperability, Air Traffic Control – a case study in designing for high availability, Celsius Tech – a case study in product line development.

TEXT BOOKS:

1. Software Architecture in Practice, second edition, Len Bass, Paul Clements & Rick Kazman, Pearson Education, 2003.
2. Design Patterns, Erich Gamma, Pearson Education



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REFERENCE BOOKS:

1. Beyond Software architecture, Luke Hohmann, Addison wesley, 2003.
2. Software architecture, David M. Dikel, David Kane and James R. Wilson, Prentice Hall PTR, 2001
3. Software Design, David Budgen, second edition, Pearson education, 2003
4. Head First Design patterns, Eric Freeman & Elisabeth Freeman, O'REILLY, 2007.
5. Design Patterns in Java, Steven John Metsker & William C. Wake, Pearson education, 2006 J2EE Patterns, Deepak Alur, John Crupi & Dan Malks, Pearson education, 2003
6. J2EE Patterns, Deepak Alur, John Crupi & Dan Malks, Pearson education, 2003
7. Design Patterns in C#, Steven John metsker, Pearson education, 2004. 8. Pattern Oriented Software Architecture, F.Buschmann & others, John Wiley & Sons.

COURSE OUTCOMES:

1. To highlight the evolution of patterns.
2. To learn how to add functionality to designs while minimizing complexity
3. To learn what design patterns really are, and are not
4. To know about specific design patterns.
5. To learn how to use design patterns to keep code quality high without over design.



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L	T	P	C
3	0	0	3

(23A05742) BLOCKCHAIN TECHNOLOGY (PE-IV)

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. Understand how block chain systems (mainly Bit coin and Ethereum) work and to securely interact with them.
2. Design, build, and deploy smart contracts and distributed applications.
3. Integrate ideas from block chain technology into their own projects.

UNIT-I INTRODUCTION

Introduction, Scenarios, Challenges Articulated, Block chain, Block chain Characteristics, Opportunities Using Block chain, History of Block chain. Evolution of Block chain: Evolution of Computer Applications, Centralized Applications, Decentralized Applications, Stages in Block chain Evolution, Consortia, Forks, Public Block chain Environments, Type of Players in Block chain Ecosystem, Players in Market.

UNIT-II BLOCK CHAIN CONCEPTS

Block chain Concepts: Introduction, Changing of Blocks, Hashing, Merkle-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on block chain, data storage on block chain, wallets, coding on block chain: smart contracts, peer-to-peer network, types of block chain nodes, risk associated with block chain solutions, life cycle of block chain transaction.

UNIT-III ARCHITECTING BLOCK CHAIN SOLUTIONS

Architecting Block chain solutions: Introduction, Obstacles for Use of Block chain, Block chain Relevance Evaluation Framework, Block chain Solutions Reference Architecture, Types of Block chain Applications. Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Block chain Solutions, Architecture Considerations, Architecture with Block chain Platforms, Approach for Designing Block chain Applications

UNIT-IV ETHEREUM BLOCK CHAIN IMPLEMENTATION

Ethereum Block chain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit Testing, Ethereum Accounts, My Ether Wallet, Ethereum Networks/Environments, Infura, Ether scan, Ethereum Clients, Decentralized Application, Metamask, Tuna Fish Use Case Implementation, Open Zeppelin in contracts.



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UNIT-V HYPER LEDGER BLOCK CHAIN IMPLEMENTATION

Hyper ledger Implementation: Introduction, Use Case – Car Ownership Tracking, Hyper ledger Fabric, Hyper ledger Fabric Transaction Flow, FabCar Use Case Implementation, Invoking Chain code Functions Using Client Application. Advanced Concepts in Block chain: Introduction, Inter Planetary File System (IPFS), Zero Knowledge Proofs, Oracles, Self-Sovereign Identity, Block chain with IoT and AI/ML Quantum Computing and Block chain, Initial Coin Offering, Block chain Cloud Offerings, Block chain and its Future Potential.

TEXT BOOKS:

1. Ambadas, Arshad Sarfarz Ariff, Sham Block chain for Enterprise Application Developers, Wiley, 2020
2. Andreas M. Antonopoulos, Mastering Bitcoin: Programming the Open Blockchain, O'Reilly, 2017

REFERENCE BOOKS:

1. Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions, Joseph Bambara, Paul R. Allen, Mc Graw Hill.
2. Blockchain: Blueprint for a New Economy, Melanie Swan, O'Reilly

e-Resources and Digital Material:

1. <https://github.com/blockchainedindia/resource>

COURSE OUTCOMES:

1. Demonstrate the foundation of the Block chain technology and understand the processes in payment and funding.
2. Identify the risks involved in building Block chain applications.
3. Review of legal implications using smart contracts.
4. Choose the present landscape of Blockchain implementations and Understand Crypto currency markets
5. Examine how to profit from trading crypto currencies.

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(23A05743) AUGMENTED REALITY & VIRTUAL REALITY (PE-IV)

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. The primary objective of this course is to introduce students to the foundational principles and technologies of Virtual Reality (VR) and Augmented Reality (AR), along with the key devices, modeling techniques, and interaction mechanisms involved in creating immersive environments. The course will cover the essentials of VR and AR, including hardware, software, and human perception, as well as advanced concepts such as 3D modeling, interaction design, and audio rendering. Students will gain hands-on experience in the use of VR/AR systems and explore the challenges and methodologies for building interactive virtual environments.

UNIT-I INTRODUCTION TO VIRTUAL REALITY (VR)

Defining Virtual Reality, Key elements of virtual reality experience, Virtual Reality, Telepresence, Augmented Reality and Cyberspace. Bird's-Eye View: Hardware, Software, Human Physiology and Perception.

UNIT-II INPUT DEVICES (TRACKERS, NAVIGATION, AND GESTURE INTERFACES)

Three-dimensional position trackers, navigation and manipulation, interfaces and gesture interfaces.

UNIT-III MODELING

Geometric modeling, Kinematics modeling, Physical modeling, Behaviour modeling, Model management.

UNIT-IV AUGMENTED REALITY (AR)

Taxonomy, Technology and Features of Augmented Reality, AR Vs VR, Challenges with AR, AR systems and functionality, Augmented Reality Methods, Visualization Techniques for Augmented Reality, enhancing interactivity in AR Environments, Evaluating AR systems
AR software development: AR software, Camera parameters and camera calibration, Marker-based augmented reality, AR Toolkit.

UNIT-V INTERACTION & AUDIO

Interaction - Motor Programs and Remapping, Locomotion, Manipulation, Social Interaction. Audio -The Physics of Sound, The Physiology of Human Hearing, Auditory Perception, Auditory Rendering. Interaction - Motor Programs and Remapping, Locomotion, Manipulation, Social Interaction. Audio -The Physics of Sound, The Physiology of Human Hearing, Auditory Perception, Auditory Rendering. (From Text Book2)



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TEXT BOOKS:

1. Virtual Reality Technology, Second Edition, Gregory C. Burdea & Philippe Coiffet, John Wiley & Sons, Inc, 2017.
2. Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016.

REFERENCE BOOKS:

1. RajeshK.Maurya,Computer Graphics with Virtual Reality System, 3rd Edition, Wiley Publication, 2018
2. William R. Sherman and Alan B. Craig, Understanding Virtual Reality Interface, Application, and Design, 2nd Edition, Morgan Kaufmann Publishers, Elsevier, 2019.
3. GrigoreC.Burdea,PhilippeCoiffet,Virtual Reality Technology, 2nd Edition, Wiley,2017.
4. K.S. Hale and K. M. Stanney, Handbook on Virtual Environments, 2nd Edition, CRC Press, 2015.

e-Resources and Digital Material:

1. <http://vr.cs.uiuc.edu/vrbook.pdf>
2. <https://nptel.ac.in/courses/106/106/106106138>

COURSE OUTCOMES:

1. Understand the core concepts of Virtual Reality and Augmented Reality, and their differences.
2. Learn about the hardware and software components required for VR and AR systems, as well as the impact of human physiology and perception on the virtual experience.
3. Gain knowledge of input devices (trackers, navigation, and gesture interfaces) and output devices (graphics, sound displays, and haptic feedback).
4. Develop skills in modeling techniques, including geometric, kinematics, physical, and behavior modeling for VR and AR environments.
5. Explore the technologies and methodologies used to create Augmented Reality systems, including marker-based AR and AR software development.

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(23A32506) INTERNET OF THINGS (PE-IV)

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. Understand the basics of Internet of Things and protocols.
2. Discuss the requirement of IoT technology
3. Introduce some of the application areas where IoT can be applied.
4. Understand the vision of IoT from a global perspective, understand its applications, determine its market perspective using gateways, devices and data management

UNIT-I INTRODUCTION TO IOT

Definition and Characteristics of IoT, physical design of IoT, IoT protocols, IoT communication models, IoT Communication APIs, Communication protocols, Embedded Systems, IoT Levels and Templates

UNIT – II PROTOTYPING IOT OBJECTS USING MICROPROCESSOR/MICROCONTROLLER

Working principles of sensors and actuators, setting up the board – Programming for IoT, Reading from Sensors, Communication: communication through Bluetooth, Wi-Fi.

UNIT-III IOT ARCHITECTURE AND PROTOCOLS

Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model, Protocols- 6LowPAN, RPL, CoAP, MQTT, IoT frameworks- Thing Speak.

UNIT-IV DEVICE DISCOVERY AND CLOUD SERVICES FOR IOT

Device discovery capabilities- Registering a device, Deregister a device, Introduction to Cloud Storage models and communication APIs Web-Server, Web server for IoT.

UNIT-V UAV IOT

Introduction to Unmanned Aerial Vehicles/Drones, Drone Types, Applications: Defense, Civil, Environmental Monitoring; UAV elements and sensors- Arms, motors, Electronic Speed Controller (ESC), GPS, IMU, ultra-sonic sensors; UAV Software –Arudpilot, Mission Planner, Internet of Drones (IoD)- Case study Fly Base.

TEXT BOOKS:

1. Vijay Madiseti and Arshdeep Bahga, Internet of Things (A Hands-on-Approach)ll, 1st Edition, VPT, 2014.
2. Handbook of unmanned aerial vehicles, K Valavanis;George J Vachtsevanos, New York, Springer, Boston, Massachusetts : Credo Reference, 2014. 2016.



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REFERENCE BOOKS:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatias Karnouskos, David Boyle, From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligencel, 1st Edition, Academic Press, 2014.
2. ArshdeepBahga, Vijay Madiseti Internet of Things: A Hands On Approach, Universities Press, 2014.
3. The Internet of Things, enabling technologies and use cases Pethuru Raj, Anupama C. Raman, CRC Press.
4. Francis daCosta, Rethinking the Internet of Things: A Scalable Approach to Connecting Everythingl, 1st Edition, Apress Publications, 2013
5. Cuno Pfister, Getting Started with the Internet of Things, O'Reilly Media, 2011, ISBN: 9781 4493- 9357-1
6. DGCA RPAS Guidance Manual, Revision 3 2020
7. Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs, John Baichtal

e-Resources and Digital Material:

1. <https://www.arduino.cc/>
2. <https://www.raspberrypi.org/>
3. <https://nptel.ac.in/courses/106105166/5>
4. <https://nptel.ac.in/courses/108108098/4>

COURSE OUTCOMES:

1. Understand general concepts of Internet of Things.
2. Apply design concept to IoT solutions
3. Analyze various M2M and IoT architectures
4. Evaluate design issues in IoT applications
5. Create IoT solutions using sensors, actuators and Devices



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(23A05744) INTRODUCTION TO APPLICATION OF ARTIFICIAL INTELLIGENCE TO ROBOTICS (PE-IV)

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. Understand the fundamentals of robotics, artificial intelligence, and robotic operating systems.
2. Analyze robot kinematics, dynamics, trajectory planning, and manipulator control.
3. Apply machine learning and deep learning techniques for robotic perception and object manipulation.
4. Design intelligent robotic navigation and decision-making systems using AI algorithms.
5. Explore AI-driven human-robot interaction, industrial robotics, and emerging applications.

UNIT-I

INTRODUCTION TO ROBOTICS AND ARTIFICIAL INTELLIGENCE

Introduction to Robotics, Components of Robotic Systems, Classification and Applications of Robots, Introduction to Artificial Intelligence, Mathematical Background for Robotics, Python as a Modeling and Simulation Tool, Introduction to Robot Operating System (ROS).

Robot Kinematics and Static Forces: Spatial Representation, Coordinate Transformations, Forward Kinematics, Inverse Kinematics, Jacobian Matrix, Singularities, Workspace Analysis, Static Force Analysis in Manipulators.

UNIT-II

Manipulator Dynamics: Acceleration of Rigid Bodies, Mass Distribution, Newton–Euler Formulation, Dynamic Equations of Manipulators, State-Space Representation.

Trajectory Planning and Manipulator Design: Joint-Space Trajectory Generation, Cartesian-Space Trajectory Generation, Manipulator Mechanism Design Principles, Design Examples.

Manipulator Control: Linear Control, Modeling and Control of a Single Joint, Nonlinear and Time-Varying Systems, Cartesian-Based Control Systems, Control Challenges in Robotic Manipulators.



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UNIT-III

Computer Vision and AI-Based Object Recognition: Fundamentals of Computer Vision, Image Processing Techniques, Artificial Neural Networks, Supervised Learning for Object Recognition, YOLOv8 Object Detection Framework.

Machine Learning for Robotic Manipulation: Fundamentals of Machine Learning, Machine Learning for Robot Arms, Reinforcement Learning, Q-Learning for Object Grasping, Deep Reinforcement Learning, Python Libraries and Tools for Machine Learning Implementation.

UNIT-IV

AI-Based Robot Navigation: Genetic Algorithms, Path Planning using Genetic Algorithms, Simultaneous Localization and Mapping (SLAM), Floor Finder Technique, Neural Network-Based Navigation.

Obstacle Avoidance and Intelligent Decision Making: Obstacle Avoidance Techniques, Decision Trees, Random Forests, Grid Search Methods, A* (A-Star) Algorithm, GPS-Based Path Planning and Navigation.

UNIT-V

Speech Recognition and Human-Robot Interaction: Fundamentals of Natural Language Processing, AI-Based Speech Recognition, Chatbots, Generative AI, Turing Test, Human-Robot Interaction, Robot Emotion Modeling.

Robot Hardware and Industrial Applications: Robot Hardware Components, Sensors and Environment Perception, Mobile Robots, Humanoid Robots, Industrial Robots (KUKA KR5), AI Applications in Robotics, Ethics, Safety, Future Trends in AI Robotics, Robot Demonstrations using ROS.

TEXT BOOKS:

1. John J. Craig, Introduction to Robotics: Mechanics and Control, Addison-Wesley.
2. Saeed B. Niku, Introduction to Robotics: Analysis, Systems, Applications, PHI Learning.
3. Francis X. Govers III, Artificial Intelligence for Robotics, Packt Publishing, Birmingham, UK, 2024.
4. R. Merzouki, A. K. Samantaray, P. M. Pathak, B. Ould Bouamama, Intelligent Mechatronic Systems: Modeling, Control and Diagnosis, Springer.

REFERENCE BOOKS:

1. Kevin M. Lynch and Frank C. Park, Modern Robotics: Mechanics, Planning, and Control, Cambridge University Press
2. Richard S. Sutton and Andrew G. Barto, Reinforcement Learning: An Introduction, MIT Press.
3. Steven M. LaValle, Planning Algorithms, Cambridge University Press.
4. Sebastian Thrun, Wolfram Burgard and Dieter Fox, Probabilistic Robotics, MIT Press.

e-Resources and Digital Material:



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1. <https://www.ros.org>
2. <https://opencv.org>
3. <https://pytorch.org>
4. <https://www.tensorflow.org>
5. <https://docs.ultralytics.com>
6. <https://nptel.ac.in>

COURSE OUTCOMES:

1. Demonstrate the mathematical foundations and principles of robotics and artificial intelligence.
2. Analyze robot kinematics, dynamics, and control strategies for robotic manipulators.
3. Develop AI-based perception systems using computer vision and machine learning techniques.
4. Design intelligent navigation and path-planning algorithms for autonomous robots.
5. Apply AI techniques for human–robot interaction and industrial robotic applications.



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(23A05745) REINFORCEMENT LEARNING (PE-IV)

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. Understand the fundamentals of reinforcement learning and its applications.
2. Learn bandit algorithms and exploration strategies
3. Analyze Markov Decision Processes and Bellman optimality
4. Study temporal difference learning and function approximation techniques.
5. Apply deep reinforcement learning algorithms for sequential decision-making problems.

UNIT-I

Introduction to Reinforcement Learning: Fundamentals of Reinforcement Learning, Agent-Environment Interaction, Applications of Reinforcement Learning.

Bandit Algorithms: Multi-Armed Bandit Problem, Upper Confidence Bound (UCB), Probably Approximately Correct (PAC).

UNIT-II

Introduction to Reinforcement Learning: Fundamentals of Reinforcement Learning, Agent-Environment Interaction, Applications of Reinforcement Learning.

Bandit Algorithms: Multi-Armed Bandit Problem, Upper Confidence Bound (UCB), Probably Approximately Correct (PAC).

UNIT-III

Dynamic Programming: Principles of Dynamic Programming, Value Functions.

Temporal Difference Methods: Temporal Difference Learning.

Eligibility Traces: Eligibility Traces and their Applications.

UNIT-IV

Function Approximation: Function Approximation Techniques.

Least Squares Methods: Least Squares Methods.

Deep Reinforcement Learning: Fitted Q, Deep Q Networks (DQN), Policy Gradient for Full Reinforcement Learning.

UNIT-V

Hierarchical Reinforcement Learning: Fundamentals and Applications.

Partially Observable Markov Decision Processes: POMDPs



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TEXT BOOKS:

1. R. S. Sutton and A. G. Barto, Reinforcement Learning: An Introduction, MIT Press, 1998

REFERENCE BOOKS:

1. R. S. Sutton and A. G. Barto, Reinforcement Learning: An Introduction, MIT Press, 1998.

e-Resources and Digital Material:

1. <https://www.andrew.cmu.edu/course/10-703/>
2. <https://nptel.ac.in>
3. <https://spinningup.openai.com>
4. <https://gymnasium.farama.org>
5. <https://pytorch.org>
6. <https://www.tensorflow.org>

COURSE OUTCOMES:

1. Demonstrate the fundamentals of reinforcement learning.
2. Analyze bandit algorithms and Markov Decision Processes.
3. Apply Bellman optimality and dynamic programming techniques.
4. Develop reinforcement learning models using function approximation and deep reinforcement learning
5. Analyze hierarchical reinforcement learning and partially observable environments.

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(23A05746) AGILE METHODOLOGIES (PE-V)

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To provide students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software.
2. To provide good understanding of software design and a set of software technologies and APIs.
3. To carry out detailed examination and demonstration of Agile development and testing techniques.
4. To discuss Agile software development

UNIT-I AGILE METHODOLOGY

Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values

UNIT-II AGILE PROCESSES

Lean Production - SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

UNIT-III AGILITY AND KNOWLEDGE MANAGEMENT

Agile Information Systems – Agile Decision Making - Earl_S Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment, leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM).

UNIT-IV AGILITY AND REQUIREMENTS ENGINEERING

Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.



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UNIT-V AGILITY AND QUALITY ASSURANCE

Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance - Test Driven Development – Agile Approach in Global Software Development.

TEXT BOOKS:

1. David J. Anderson and Eli Schragenheim, —Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, Prentice Hall, 2003.
2. Hazza and Dubinsky, —Agile Software Engineering, Series: Undergraduate Topics in Computer Science, Springer, 2009.

REFERENCE BOOKS:

1. Craig Larman, —Agile and Iterative Development: A Manager's Guide, Addison-Wesley, 2004.
2. Kevin C. Desouza, —Agile Information Systems: Conceptualization, Construction, and Management, Butterworth-Heinemann, 2007.

e-Resources and Digital Material:

1. <https://www.nptelvideos.com/video.phpid=904>

COURSE OUTCOMES:

1. Realize the importance of interacting with business stakeholders in determining the requirements for a software system
2. Perform iterative software development processes: how to plan them, how to execute them.
3. Point out the impact of social aspects on software development success.
4. Develop techniques and tools for improving team collaboration and software quality.
5. Perform Software process improvement as an ongoing task for development teams.
6. Show how agile approaches can be scaled up to the enterprise level.

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(23A05747) METAVERSE (PE-V)

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. Present and discuss Metaverse characteristics, concepts and layers.
2. Explain and analyses Metaverse technologies, tools, platforms, and applications.
3. Discuss design theories and practices relevant to the Metaverse.
4. Explore cyber security and cybercrime in the Metaverse
5. Examine open challenges in the Metaverse.

UNIT-I METAVERSE FUNDAMENTALS

:

Metaverse evolution, Metaverse importance and characteristics, the interdisciplinary nature of the Metaverse, Metaverse opportunities and risks, Computer-mediated communication (social presence theory, social information processing theory, media richness theory, cyborg theory), Avatar-mediated communication.

UNIT-II THE SEVEN LAYERS OF METAVERSE

Experience Discovery, Creator economy, Spatial computing, Decentralization, Human interface, Infrastructure Metaverse Technologies part I: AR/VR/MR/XR, 3D reconstruction, Game engines, Smart glasses, wearables, haptic devices, headsets and headwear.

UNIT-III METAVERSE TECHNOLOGIES PART II

:

Blockchain, smart contracts, tokens, NFTs, Cryptography, Artificial Intelligence (AI), Internet of Things (IoT), Edge computing and 5G, 6G. Design theories and practices: Social presence and co-presence, Motion sickness and cybersickness, Uncanny valley, Sense of self- location, sense of agency and sense of body ownership, Universal simulation principle, Prototyping, Evaluation techniques (qualitative and quantitative).

UNIT-IV TOOLS AND TECHNOLOGIES FOR METAVERSE UX AND UI

Tools and services for avatar systems, Spatial user interface design, Cross-platform user experience design, Multimodal user interface, Technologies and devices for human computer interaction in Metaverse, Metaverse platforms: Decentraland, SANDBOX, Roblox, Axie Infinity, uHive, Hyper Nation, Nakamoto (NAKA), Metahero (HERO), Star Atlas (ATLAS), Bloktopia (BLOK), Stageverse, Spatial, PalkaCity, Viverse, Sorare, Illuvium, Upland, Second Life, Sansar, Sensorium Galaxy



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UNIT-V METAVERSE APPLICATIONS - PART I

Gaming and entertainment, Travel and tourism, Education and learning, Remote working, Commerce and business, Metaverse applications - part II: Real estate, Banking and Finance, Healthcare, Social media, Fashion, Metaverse and cyber security: Cyber security concerns in Metaverse: Social engineering attacks, Data theft, Decentralization vs vulnerabilities, Cyber security risks in Metaverse: process, people, technology, Metaverse and cybercrime: Scam and theft, Rug pull, Money manipulation and wash trading, Money laundering, Metaverse challenges and open issues: Persistency, Interoperability and scalability, Maturity, Regulation, Usefulness and ease-of-use, Privacy and data security, Content creation, NFTs and creator economy, Social, legal and ethical issues in the Metaverse

TEXT BOOKS:

1. The Metaverse, Terry Winters, independently published, 2021, ISBN: 979-8450959283

REFERENCE BOOKS:

1. Ball, M., 2022, —The Metaverse and How It Will Revolutionize Everything—, Liveright, ISBN: 978 1324092032
2. Damar, M. (2021). Metaverse shape of your life for future: A bibliometric snapshot. Journal of Metaverse, 1(1), 1–8.
3. Day, J. (2022) Metaverse will see cyber warfare attacks unlike anything before: ‘Massively elevated’, February 28 .
<https://www.express.co.uk/news/science/1570844/metaverse-news-cyber-warfare-attacks-virtual-worlds-russia-china-spt>.
4. Polyviou, A., Sharma K., Pappas, I.O.(2023). Training in the metaverse: Employing physiological data to improve how we build metaverses for businesses. The next generation internet: The role of metaverses, AR, VR, MR, and digital twins, Temple University Institute for Business and Information Technology Link: <https://ibit.temple.edu/nextgenerationinternet>
5. QuHarrison T. , Keeney, S., 2022, —The Metaverse Handbook: Innovating for the Internet’s NextTectonic Shiftl, Wiley, ISBN: 978-1119892526
6. The mistocleous, M., Christodoulou, K., & Katelaris, L. (2023). An Educational Metaverse Experiment: The first on-chain and in- Metaverse academic course. Information Systems. EMCIS2022.Lecture Notes in Business Information Processing, Springer, Cham
7. Stephenson, N., 1992, —Snow Crashll, ISBN: 978-055338

COURSE OUTCOMES:

1. Understand the characteristics, and interdisciplinary nature of the Metaverse, the opportunities and risks it presents.
2. Analyze Metaverse layers, the technologies used in creating them, as well as design theories and practices for Metaverse.



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3. Examine and discuss Metaverse platforms, applications and the latest technological developments in this area.
4. Identify cyber security issues, understand cybercrime, and discuss the open challenges.
5. Building Metaverse Applications

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(23A32612) COMPUTER VISION (PE-V)

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. The objective of this course is to understand the basic issues in computer vision and major approaches to address the methods to learn the Linear Filters, segmentation by clustering, Edge detection, Texture.

UNIT-I LINEAR FILTERS

Introduction to Computer Vision, Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing Filters as Templates, Technique: Normalized Correlation and Finding Patterns, Technique: Scale and Image Pyramids.

UNIT-II EDGE DETECTION

Noise- Additive Stationary Gaussian Noise, Why Finite Differences Respond to Noise, Estimating Derivatives - Derivative of Gaussian Filters, Why Smoothing Helps, Choosing a Smoothing Filter, Why Smooth with a Gaussian? Detecting Edges-Using the Laplacian to Detect Edges, Gradient- Based Edge Detectors, Technique: Orientation Representations and Corners.

UNIT-III TEXTURE

Representing Texture –Extracting Image Structure with Filter Banks, Representing Texture using the Statistics of Filter Outputs, Analysis (and Synthesis) Using Oriented Pyramids –The Laplacian Pyramid, Filters in the Spatial Frequency Domain, Oriented Pyramids, Application: Synthesizing Textures for Rendering, Homogeneity, Synthesis by Sampling Local Models, Shape from Texture, Shape from Texture for Planes

UNIT-IV SEGMENTATION BY CLUSTERING

What is Segmentation, Human Vision: Grouping and Gestalt, Applications: Shot Boundary Detection and Background Subtraction. Image Segmentation by Clustering Pixels, Segmentation by Graph Theoretic Clustering. The Hough Transform, Fitting Lines, Fitting Curves

UNIT-V RECOGNITION BY RELATIONS BETWEEN TEMPLATES

Finding Objects by Voting on Relations between Templates, Relational Reasoning Using Probabilistic Models and Search, Using Classifiers to Prune Search, Hidden Markov Models, Application: HMM and Sign Language Understanding, Finding People with HMM.

TEXT BOOKS:

1. David A. Forsyth, Jean Ponce, Computer Vision – A modern Approach, PHI, 2003.



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REFERENCE BOOKS:

1. Geometric Computing with Clifford Algebras: Theoretical Foundations and Applications in Computer Vision and Robotics, Springer;1 edition,2001by Sommer.
2. Digital Image Processing and Computer Vision,1/e, by Sonka.
3. Computer Vision and Applications: Concise Edition (With CD) by Jack Academy Press, 2000.

e-Resources and Digital Material:

1. <https://nptel.ac.in/courses/106105216><https://nptel.ac.in/courses/108103174>

COURSE OUTCOMES:

1. Identify basic concepts, terminology, theories, models and methods in the field of computer vision,
2. Describe known principles of human visual system,
3. Describe basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition,
4. Suggest a design of a computer vision system for a specific problem.

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(23A05748) CYBER PHYSICAL SYSTEMS (PE-V)

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. The objective of this course is to provide students with a comprehensive understanding of the various techniques and methodologies used to design, secure, synchronize, and schedule operations within Cyber-Physical Systems (CPS). The course will cover symbolic synthesis for CPS, security aspects, distributed synchronization, real-time scheduling, and model integration, with an emphasis on both basic principles and advanced techniques.

UNIT-I SYMBOLIC SYNTHESIS FOR CYBER-PHYSICAL SYSTEMS

Introduction and Motivation, Basic Techniques - Preliminaries, Problem Definition, Solving the Synthesis Problem, Construction of Symbolic Models, Advanced Techniques: Construction of Symbolic Models, Continuous-Time Controllers, Software Tools

UNIT-II SECURITY OF CYBER-PHYSICAL SYSTEMS

Introduction and Motivation, Basic Techniques - Cyber Security Requirements, Attack Model, Countermeasures, Advanced Techniques: System Theoretic Approaches

UNIT-III SYNCHRONIZATION IN DISTRIBUTED CYBER-PHYSICAL SYSTEMS

Challenges in Cyber-Physical Systems, A Complexity-Reducing Technique for Synchronization, Formal Software Engineering, Distributed Consensus Algorithms, Synchronous Lockstep Executions, Time-Triggered Architecture, Related Technology, Advanced Techniques

UNIT-IV REAL-TIME SCHEDULING FOR CYBER-PHYSICAL SYSTEMS

Introduction and Motivation, Basic Techniques - Scheduling with Fixed Timing Parameters, Memory Effects, Multiprocessor/Multicore Scheduling, Accommodating Variability and Uncertainty

UNIT-V MODEL INTEGRATION IN CYBER-PHYSICAL SYSTEMS

Introduction and Motivation, Causality, Semantic Domains for Time, Interaction Models for Computational Processes, Semantics of CPS DSMLs, Advanced Techniques, For Spec, The Syntax of CyPhyML, Formalization of Semantics, Formalization of Language Integration.

TEXT BOOKS:

1. Raj kumar, Dion is io De Niz, and Mark Klein, Cyber-Physical Systems, Addison Wesley Professional.



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2. Rajeev Alur, Principles of Cyber-Physical Systems, MIT Press, 2015

COURSE OUTCOMES:

1. Understand the core principles behind CPS
2. Identify Security mechanisms of Cyber physical systems
3. Understand Synchronization in Distributed Cyber-Physical Systems
4. To Understand the Scheduling for Cyber-Physical Systems
5. To understand the various Cyber-Physical System models



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(23A32609) SOCIAL NETWORK ANALYSIS (PE-V)

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. Understand the fundamentals of social networks and network analysis.
2. Analyze community detection, link analysis, and link prediction techniques.
3. Learn network measures and network growth models.
4. Study graph representation learning using deep learning concepts.
5. Apply social network analysis techniques to real-world applications and case studies.

UNIT-I

Introduction: Introduction to Social Network Analysis.

Tutorials: Introduction to Python/Google Colab, Introduction to NetworkX Part I and Part II.

Network Measures: Basic Network Measures.

UNIT-II

Network Growth Models: Network Growth Models.

Link Analysis: Fundamentals of Link Analysis.

Graph Visualization: Tutorial on Graph Visualization Tools

UNIT-III

Community Detection: Community Detection – Part I and Part II.

Link Prediction: Fundamentals of Link Prediction

UNIT-IV

Community Detection: Community Detection – Part I and Part II.

Link Prediction: Fundamentals of Link Prediction

UNIT-V

Graph Representation Learning: Graph Representation Learning – Part I and Part II.

Tutorial: Coding on Graph Representation Learning.

Applications and Case Studies: Applications and Case Studies, Conclusion

TEXT BOOKS:

1. Tanmoy Chakraborty, Social Network Analysis, Wiley, 2021.
2. Albert-László Barabási, Network Science.
3. Stanley Wasserman and Katherine Faust, Social Network Analysis: Methods and Applications



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REFERENCE BOOKS:

1. Tanmoy Chakraborty, Social Network Analysis, Wiley, 2021.
2. Albert-László Barabási, Network Science
3. Stanley Wasserman and Katherine Faust, Social Network Analysis: Methods and Applications

e-Resources and Digital Material:

1. <https://networkx.org>
2. <https://colab.research.google.com>
3. <https://www.python.org>
4. <https://snap.stanford.edu> 5
5. <https://nptel.ac.in>
6. <https://networksciencebook.com>

COURSE OUTCOMES:

1. Demonstrate the fundamentals of social network analysis.
2. Analyze network measures, growth models, and link analysis techniques.
3. Apply community detection and link prediction methods on social networks
4. Develop graph representation learning models using deep learning techniques
5. Analyze real-world applications and case studies using social network analysis



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(23A05749) INTRODUCTION TO LARGE LANGUAGE MODELS (PE-V)

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. Understand the fundamentals of Natural Language Processing and statistical language models.
2. Learn deep learning techniques and word representation methods for language modeling
3. Study transformer architectures, pre-training strategies, and prompt-based learning.
4. Explore retrieval-augmented generation, knowledge graphs, and parameter-efficient adaptation techniques.
5. Analyze recent large language models, ethical issues, and practical applications of LLMs.

UNIT-I

Introduction to Large Language Models: Course Introduction, Introduction to Natural Language Processing, NLP Pipeline, Applications of NLP.

Statistical Language Models: Introduction to Statistical Language Models, Advanced Smoothing, Evaluation of Statistical Language Models.

UNIT-II

Introduction to Deep Learning: Perceptron, Artificial Neural Networks (ANN), Backpropagation, Convolutional Neural Networks (CNN), Introduction to PyTorch.

Word Representation: Word2Vec, fastText, GloVe, Tokenization Strategies.

Neural Language Models: CNN, RNN.

UNIT-III

Neural Language Models: LSTM, GRU, Sequence-to-Sequence Models, Greedy Decoding, Beam Search, Other Decoding Strategies: Nucleus Sampling, Temperature Sampling, Top-k Sampling, Attention in Sequence-to-Sequence Models.

Introduction to Transformers: Self Attention, Multi-Head Attention, Positional Encoding, Layer Normalization, Implementation of Transformers using PyTorch.



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UNIT-IV

Pre-Training Strategies: ELMo, BERT (Encoder-only Model), Encoder-Decoder Models, Decoder-only Models, Introduction to Hugging Face.

Instruction Tuning: Prompt-based Learning, Advanced Prompting Techniques, Prompt Sensitivity, Alignment of Language Models with Human Feedback (RLHF).

Retrieval-Augmented Generation: Open-book Question Answering, Retrieval from Structured and Unstructured Sources, Retrieval-Augmented Inference and Generation, Retrieval Augmentation Techniques, Key-Value Memory Networks, HotPotQA Solvers, Pointer Networks, Reading Comprehension, REALM, RAG, FiD, Uniformed, KGQA (EmbedKGQA, GrailQA).

UNIT-V

Knowledge Graphs: Representation, Completion, Tasks: Alignment and Isomorphism, Distinction between Graph Neural Networks and Neural Knowledge Graph Inference.

Parameter-efficient Adaptation: Prompt Tuning, Prefix Tuning, LoRA, Residual Stream Perspective, Interpretability Techniques.

Recent Large Language Models: Overview of GPT-4, Llama-3, Claude-3, Mistral, Gemini, Ethical NLP – Bias and Toxicity, Conclusion.

TEXT BOOKS:

1. Tanmoy Chakraborty, Introduction to Large Language Models, Wiley India, 1st Edition, 2025. ISBN: 9789363864740.
2. Dan Jurafsky and James H. Martin, Speech and Language Processing, 2nd Edition, Pearson Press, 2008.
3. Jacob Eisenstein, Natural Language Processing, First Edition, MIT Press, 2019.

REFERENCE BOOKS:

1. Tanmoy Chakraborty, Introduction to Large Language Models, Wiley India, 1st Edition, 2025.
2. Dan Jurafsky and James H. Martin, Speech and Language Processing, 2nd Edition, Pearson Press, 2008.
3. Jacob Eisenstein, Natural Language Processing, First Edition, MIT Press, 2019.

e-Resources and Digital Material:

1. Association for Computational Linguistics (ACL)
2. Empirical Methods in Natural Language Processing (EMNLP)
3. North American Chapter of the Association for Computational Linguistics (NAACL)
4. Neural Information Processing Systems (NeurIPS)
5. International Conference on Machine Learning (ICML)
6. International Conference on Learning Representations (ICLR)

COURSE OUTCOMES:



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1. Demonstrate the fundamentals of Natural Language Processing and statistical language models.
2. Analyze neural language models and transformer architectures.
3. Apply pre-training strategies, prompt-based learning, and retrieval-augmented techniques for language models.
4. Develop applications using knowledge graphs and parameter-efficient adaptation techniques
5. Analyze recent large language models and ethical issues in Natural Language Processing.

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(23A01704) BUILDING MATERIALS AND SERVICES (OE-III)

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To understand the properties, classifications, and applications of building materials like stones, bricks, tiles, wood, aluminum, glass, paints, and plastics. 2. 3. 4. 5. T
2. To analyze the composition, manufacturing process, and properties of cement and admixtures.
3. To apply knowledge of building components such as lintels, arches, walls, stairs, floors, roofs, foundations, and joinery.
4. To evaluate masonry, mortars, finishing techniques, and formwork systems.
5. To assess various building services including plumbing, ventilation, air conditioning, acoustics, and fire protection.

UNIT-I STONES AND BRICKS, TILES

Stones and Bricks, Tiles: Building Stones – Classifications and Quarrying – Properties – Structural Requirements – Dressing. Bricks – Composition of Brick Earth – Manufacture and Structural Requirements, Fly Ash, Ceramics. Timber, Aluminum, Glass, Paints and Plastics: Wood - Structure – Types and Properties – Seasoning – Defects; Alternate Materials for Timber – GI / Fibre – Reinforced Glass Bricks, Steel & Aluminum, Plastics.

UNIT-II CEMENT & ADMIXTURES

Cement & Admixtures: Types of Cement - Ingredients of Cement – Manufacture – Chemical Composition – Hydration - Field & Lab Tests – Fineness – Consistency – Initial & Final Setting – Soundness. Admixtures – Mineral & Chemical Admixtures – Uses

UNIT-III BUILDING COMPONENTS

Building Components: Lintels, Arches, Walls, Vaults – Stair Cases – Types of Floors, Types of Roofs – Flat, Curved, Trussed; Foundations – Types; Damp Proof Course; Joinery – Doors – Windows – Materials – Types.

UNIT-IV MORTARS, MASONRY AND FINISHING 'S MORTARS

Mortars, Masonry and Finishing 's Mortars: Lime and Cement Mortars Brick Masonry – Types – Bonds; Stone Masonry – Types; Composite Masonry – Brick-Stone Composite; Concrete, Reinforced Brick. Finishers: Plastering, Pointing, Painting, Claddings – Types – Tiles – ACP. Form Work: Types: Requirements – Standards – Scaffolding – Design; Shoring, Underpinning.



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UNIT-V BUILDING SERVICES & PLUMBING SERVICES

Building Services: Plumbing Services: Water Distribution, Sanitary – Lines & Fittings; Ventilations: Functional Requirements Systems of Ventilations. Air-Conditioning - Essentials and Types; Acoustics – Characteristic – Absorption – Acoustic Design; Fire Protection – Fire Hazards – Classification of Fire-Resistant Materials and Constructions.

TEXT BOOKS:

1. Building Materials and Construction – Arora Bindra, Dhanpat Roy Publications.
2. Building Materials and Construction by G C Sahu, Joygopal Jena McGraw hill Pvt Ltd 2015.

REFERENCE BOOKS:

1. Building Construction by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) Ltd., New Delh
2. P. C. Varghese, Building Materials, Prentice Hall of India, 2015.
3. N.Subramanian, "Building Materials Testing and Sustainability", Oxford Higher Education, 2019.
4. R. Chudley, Construction Technology, Longman Publishing Group, 1973.
5. S. K. Duggal, Building Materials, Oxford & IBH Publishing Co. Ltd., New Delhi, 2019

e-Resources and Digital Material:

1. <https://archive.nptel.ac.in/course.html>

COURSE OUTCOMES:

1. Understand the properties, classifications, and applications of building materials like stones, bricks, tiles, wood, aluminum, glass, paints, and plastics.
2. Analyze the composition, manufacturing process, and properties of cement and admixtures.
3. Apply knowledge of building components such as lintels, arches, walls, stairs, floors, roofs, foundations, and joinery.
4. Evaluate masonry, mortars, finishing techniques, and formwork systems.
5. Assess various building serv

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(23A01705) ENVIRONMENTAL IMPACT ASSESSMENT (OE-III)

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. Understand the principles, methodologies, and significance of Environmental Impact Assessment (EIA).
2. Analyze the impact of developmental activities on land use, soil, and water resources.
3. Evaluate the impact of development on vegetation, wildlife, and assess environmental risks.
4. Develop environmental audit procedures and assess compliance with environmental regulations.
5. Understand and apply environmental acts, notifications, and legal frameworks in EIA studies

UNIT-I CONCEPTS AND METHODOLOGIES OF EIA

Initial Environmental Examination, Elements of EIA, - Factors Affecting E-I-A Impact Evaluation and Analysis, Preparation of Environmental Base Map, Classification of Environmental Parameters- Criteria for The Selection of EIA Methodology, E I A Methods, Ad-Hoc Methods, Matrix Methods, Network Method Environmental Media Quality Index Method, Overlay Methods and Cost/Benefit Analysis.

UNIT-II IMPACT OF DEVELOPMENTAL ACTIVITIES AND LAND USE

Introduction and Methodology for The Assessment of Soil and Ground Water, Delineation of Study Area, Identification of Actives. Procurement of Relevant Soil Quality, Impact Prediction, Assessment of Impact Significance, Identification and Incorporation of Mitigation Measures. E I Ain Surface Water, Air and Biological Environment: Methodology for The Assessment of Impacts on Surface Water Environment, Air Pollution Sources, Generalized Approach for Assessment of Air Pollution Impact.

UNIT-III ASSESSMENT OF IMPACT ON VEGETATION, WILDLIFE AND RISK ASSESSMENT

Introduction - Assessment of Impact of Development Activities on Vegetation and Wildlife, Environmental Impact of Deforestation – Causes and Effects of Deforestation - Risk Assessment and Treatment of Uncertainty-Key Stages in Performing an Environmental Risk Assessment- Advantages of Environmental Risk Assessment.



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UNIT-IV ENVIRONMENTAL AUDIT

Introduction - Environmental Audit & Environmental Legislation Objectives of Environmental Audit, Types of Environmental Audit, Audit Protocol, Stages of Environmental Audit, Onsite Activities, Evaluation of Audit Data and Preparation of Audit Report

UNIT-V ENVIRONMENTAL ACTS AND NOTIFICATIONS

The Environmental Protection Act, The Water Preservation Act, The Air (Prevention & Control of Pollution Act), Wild Life Act - Provisions in The EIA Notification, Procedure for Environmental Clearance, Procedure for Conducting Environmental Impact Assessment Report- Evaluation of EIA Report. Environmental Legislation Objectives, Evaluation of Audit Data and Preparation of Audit Report. Post Audit Activities, Concept of ISO and ISO 14000.

TEXT BOOKS:

1. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B. S. Publication, Hyderabad 2nd edition 2011
2. Environmental Impact Assessment, by Canter Larry W., McGraw-Hill education Edi (1996)

REFERENCE BOOKS:

1. Environmental Engineering, by Peavy, H. S, Rowe, D. R, Tchobanoglous, G. McGraw Hill International Editions, New York 1985.
2. Environmental Science and Engineering, by Suresh K. Dhaneja, S.K., Katania & Sons Publication, New Delhi
3. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke, Prentice Hall Publishers
4. Environmental Pollution and Control, by H. S. Bhatia, Galgotia Publication (P) Ltd, Delhi

e-Resources and Digital Material:

1. <https://archive.nptel.ac.in/course.html>

COURSE OUTCOMES:

1. Apply various methodologies for conducting Environmental Impact Assessments.
2. Analyze the impact of land-use changes on soil, water, and air quality.
3. Evaluate the environmental impact on vegetation, wildlife, and conduct risk assessments.
4. Develop environmental audit reports and assess compliance with environmental policies.
5. Interpret and apply environmental acts and regulations related to EIA.

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(23A02705) SMART GRID TECHNOLOGIES (OE-III)

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:**UNIT-I INTRODUCTION TO SMART GRID**

Evolution of Electric Grid – Need for Smart Grid – Difference between conventional & smart grid – Overview of enabling technologies – International experience in Smart Grid deployment efforts – Smart Grid Road map for India – Smart Grid Architecture.

UNIT-II WIDE AREA MONITORING SYSTEM

Fundamentals of Synchro phasor Technology – concept and benefits of Wide Area Monitoring System – Structure and functions of Phasor Measuring Unit (PMU) and Phasor Data Concentrator (PDC) – Road Map for Synchrophasor applications (NAPSI) – Operational experience and Blackout analysis using PMU - Case study on PMU.

UNIT-III SMART METERS

Features and functions of Smart Meters – Functional specification – category of Smart Meters – Automatic Meter Reading (AMR) and Advanced Metering Infrastructure (AMI) drivers and benefits – AMI protocol – Demand Side Integration: Peak load, Outage and Power Quality management.

UNIT-IV INFORMATION AND COMMUNICATION TECHNOLOGY

Overview of Smart Grid Communication system – Modulation and Demodulation Techniques: Radio Communication – Mobile Communication – Power Line Communication – Optical Fibre Communication – Communication Protocol for Smart Grid.

UNIT-V SMART GRID APPLICATIONS AND CYBER SECURITY

Applications: Smart Grid Applications and Cyber Security: Applications : Overview and concept of Renewable Integration – Introduction to distributed generation - Role of Protective Relaying in Smart Grid – House Area Network – Advanced Energy Storage Technology: Flow battery – Fuel cell – SMES – Super capacitors – Plug – in Hybrid electric Vehicles - Cyber Security: Security issues in DG, Distribution Automation, AMI, Electric Vehicle Management Systems – Approach to assessment of smart grid cyber security risks – Methodologies. Cyber Security requirements – Smart Grid Information Model.



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TEXT BOOKS:

1. James Momoh, "SMART GRID: Fundamentals of Design and Analysis", John Wiley and Sons, New York, 2012
2. Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama,

REFERENCE BOOKS:

1. Power Grid Corporation of India Limited, "Smart Grid Primer", 1st Edition, Power Grid Corporation of India Limited, Bangalore, India, 2013.
2. Fereidoon.P.Sioshansi, "Smart Grid – Integrating Renewable, Distributed and Efficient Energy", 1st Edition, Academic Press, USA, 2011.
3. Stuart Borlase, "Smart Grids: Infrastructure, Technology and Solutions", 1st Edition, CRC Press Publication, England, 2013.
4. Phadke A G, Thorp J S, "Synchronized Phasor Measurements and Their Applications", 1st Edition, Springer, Newyork, 2012.

COURSE OUTCOMES:

1. Understanding the Concept and Evolution of Smart Grids. L2
2. Analyzing Wide Area Monitoring System and Synchrophasor Technology. L4
3. Applying Smart Metering and Advanced Metering Infrastructure (AMI) Concepts. L3
4. Evaluating Information and Communication Technology (ICT) Systems in Smart Grids. L5
5. Designing Smart Grid Applications and Cybersecurity Measures. L6

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(23A03707) 3D PRINTING TECHNOLOGIES (OE-III)

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. Understand the fundamental concepts of prototyping and distinguish between traditional and rapid prototyping methods.
2. Demonstrate the working principles, materials, and applications of solid-, liquid-, and powder-based RP systems.
3. Define the processes and classifications of rapid tooling and reverse engineering techniques.
4. Identify common errors in 3D printing and evaluate pre-processing, processing, and post-processing issues.
5. Familiarize RP-related software and its role in applications such as design, manufacturing, and medical fields.

UNIT-I INTRODUCTION TO 3D PRINTING

Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Need for time compression in product development, Usage of RP parts, Generic RP process, Distinction between RP and CNC, other related technologies, Classification of RP.

UNIT-II I SOLID AND LIQUID BASED RP SYSTEMS

Working Principle, Materials, Advantages, Limitations and Applications of Fusion Deposition Modelling (FDM), Laminated Object Manufacturing (LOM), Stereo lithography (SLA), Direct Light Projection System (DLP) and Solid Ground Curing (SGC).

UNIT-III POWDER BASED & OTHER RP SYSTEMS

Powder Based RP Systems: Working Principle, Materials, Advantages, Limitations and Applications of Selective Laser Sintering (SLS), Direct Metal Laser Sintering (DMLS), Laser Engineered Net Shaping (LENS) and Electron Beam Melting (EBM). Other RP Systems: Working Principle, Materials, Advantages, Limitations and Applications of Three-Dimensional Printing (3DP), Ballistic Particle Manufacturing (BPM) and Shape Deposition Manufacturing (SDM).

UNIT-IV RAPID TOOLING & REVERSE ENGINEERING

Rapid Tooling: Conventional Tooling Vs. Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling Methods, Soft and Hard Tooling methods. Reverse Engineering (RE): Meaning, Use, RE – The Generic Process, Phases of RE Scanning, Contact Scanners and Noncontact Scanners, Point Processing, Application Geometric Model, Development



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UNIT-V ERRORS IN 3D PRINTING AND APPLICATIONS

Pre-processing, processing and post-processing errors, Part building errors in SLA, SLS, etc. Software: Need for software, MIMICS, Magics, SurgiGuide, 3-matic, 3D-Doctor, Simplant, Velocity2, VoXim, Solid View, 3DView, etc., software, Preparation of CAD models, Problems with STL files, STL file manipulation, RP data formats: SLC, CLI, RPI, LEAF, IGES, HP/GL, CT, STEP. Applications: Design, Engineering Analysis and planning applications, Rapid Tooling, Reverse Engineering, Medical Applications of RP.

TEXT BOOKS:

1. Chee Kai Chua and Kah Fai Leong, "3D Printing and Additive Manufacturing Principles and Applications" 5/e, World Scientific Publications, 2017.
2. Ian Gibson, David W Rosen, Brent Stucker, "Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing", Springer, 2/e, 2010.

REFERENCE BOOKS:

1. Frank W.Liou, —Rapid Prototyping & Engineering Applications, CRC Press, Taylor & Francis Group, 2011.
2. Rafiq Noorani, — Rapid Prototyping: Principles and Applications in Manufacturing, John Wiley & Sons, 2006.

e-Resources and Digital Material:

1. NPTEL Course on Rapid Manufacturing.
2. <https://nptel.ac.in/courses/112/104/112104265/>
3. <https://www.hubs.com/knowledge-base/what-is-fdm-3d-printing/>
4. <https://slideplayer.com/slide/6927137/>
5. <https://www.mdpi.com/2073-4360/12/6/1334>
6. <https://www.centropiaggio.unipi.it/sites/default/files/course/material/2013-11-29%20->

COURSE OUTCOMES:

1. Define and explain the evolution and need for rapid prototyping in modern product L1,L2,L6 development.
2. Compare and contrast various 3D printing technologies based on working principles, L2,L4 materials, and limitations.
3. Apply knowledge of rapid tooling and reverse engineering techniques for industrial and L3,L5,L6 design applications.
4. Diagnose and interpret different types of errors encountered in 3D printing processes and L2,L3,L5, recommend solutions.
5. Use RP-specific software tools to manipulate STL files and prepare models for printing in L1,L3,L6 real-world scenarios.

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(23A04519) MICROPROCESSORS AND MICROCONTROLLERS (OE-III)

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To comprehend the architecture, operation, and configurations of the 8086 microprocessors.
2. To get familiar with 8086 programming concepts, instruction set, and assembly language development tools.
3. To study the interfacing of 8086 with memory, peripherals, and controllers for various applications.
4. To learn the architecture, instruction set, and programming of the 8051 microcontrollers.
5. To understand microcontroller interfacing techniques, peripheral programming, and processor comparisons.

UNIT-I 8086 ARCHITECTURE

8086 Architecture: Main features, pin diagram/description, 8086 microprocessor family, internal architecture, bus interfacing unit, execution unit, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration.

UNIT-II 8086 PROGRAMMING

8086 Programming: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

UNIT-III 8086 INTERFACING

8086 Interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, interfacing switches and LEDs, interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.

UNIT-IV

Microcontroller - Architecture of 8051 – Special Function Registers (SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming



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UNIT-V

Interfacing Microcontroller - Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation - Comparison of Microprocessor, Microcontroller, PIC and ARM processors

TEXT BOOKS:

1. Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rd Edition, 1994.
2. K M Bhurchandi, A K Ray, Advanced Microprocessors and Peripherals, 3rd edition, McGraw Hill Education, 2017.
3. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System Design, 2nd edition, Pearson, 2012.

REFERENCE BOOKS:

1. Ramesh S Gaonkar, Microprocessor Architecture Programming and Applications with the 8085, 6th edition, Penram International Publishing, 2013.
2. Kenneth J. Ayala, The 8051 Microcontroller, 3rd edition, Cengage Learning, 2004.

e-Resources and Digital Material:

COURSE OUTCOMES:

1. Gain knowledge on the architecture, operation, and configurations of the 8086 microprocessors.
2. Get familiar with 8086 programming concepts, instruction set, and assembly language development tools.
3. Know the interfacing of 8086 with memory, peripherals, and controllers for various applications.
4. Learn the architecture, instruction set, and programming of the 8051 microcontrollers.
5. Understand microcontroller interfacing techniques, peripheral programming, and processor comparisons.

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(23A91716) WAVELET TRANSFORMS AND ITS APPLICATIONS (OE-III)

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:**UNIT-I WAVELETS**

Wavelets and Wavelet Expansion Systems - Wavelet Expansion- Wavelet Transform-Wavelet System- More Specific Characteristics of Wavelet Systems -Haar Scaling Functions and Wavelets -effectiveness of Wavelet Analysis -The Discrete Wavelet Transform- The Discrete-Time and Continuous Wavelet Transforms.

UNIT-II A MULTIREOLUTION FORMULATION OF WAVELET SYSTEMS

Signal Spaces -The Scaling Function -Multiresolution Analysis - The Wavelet Functions - The Discrete Wavelet Transform- A Parseval's Theorem - Display of the Discrete Wavelet Transform and the Wavelet Expansion.

UNIT-III FILTER BANKS AND THE DISCRETE WAVELET TRANSFORM

UNIT III Filter Banks and the Discrete Wavelet Transform (08) Analysis - From Fine Scale to Coarse Scale- Filtering and Down-Sampling or Decimating -Synthesis - From Coarse Scale to Fine Scale -Filtering and Up-Sampling or Stretching - Input Coefficients - Lattices and Lifting - - Different Points of View.

UNIT-IV TIME-FREQUENCY AND COMPLEXITY

Multiresolution versus Time-Frequency Analysis- Periodic versus Nonperiodic Discrete Wavelet Transforms -The Discrete Wavelet Transform versus the Discrete-Time Wavelet Transform- Numerical Complexity of the Discrete Wavelet Transform.

UNIT-V BASES AND MATRIX EXAMPLES

Bases, Orthogonal Bases, and Biorthogonal Bases -Matrix Examples - Fourier Series Example - Sine Expansion Example - Frames and Tight Frames - Matrix Examples -Sine Expansion as a Tight Frame Example.

TEXT BOOKS:

1. C. Sidney Burrus, Ramesh A. Gopinath, "Introduction to Wavelets and Wavelets Transforms", Prentice Hall, (1997).
2. James S. Walker, "A Primer on Wavelets and their Scientific Applications", CRC Press, (1999).

REFERENCE BOOKS:

1. RaghuveerRao, "Wavelet Transforms", Pearson Education, Asia
2. C. S. Burrus, Ramose and A. Gopinath, Introduction to Wavelets and Wavelet Transform, Prentice Hall Inc.



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e-Resources and Digital Material:

1. <http://users.rowan.edu/~polikar/WAVELETS/WTtutorial.html>
2. <http://www.wavelet.org>
3. <https://jqichina.wordpress.com/wp-content/uploads/2012/02/ten-lectures-of-waveletsefbc88e5b08fe6b3a2e58d81e8aeb2efbc891.pdf>

COURSE OUTCOMES:

1. Statements
2. Understand wavelets and wavelet basis and characterize continuous and discrete wavelet transforms
3. Illustrate the multi resolution analysis and scaling functions
4. Understand multi resolution analysis and identify various wavelets and evaluate their time- frequency resolution properties.
5. Design certain classes of wavelets to specification and justify the basis of the application of wavelet transforms to different fields

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IV B.Tech. I Sem.

L	T	P	C
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(23A92705) SMART MATERIALS AND DEVICES (OE-III)

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To provide exposure to smart materials and their engineering applications.
2. To impart knowledge on the basics and phenomenon behind the working of smart materials
3. To explain the properties exhibited by smart materials
4. To educate various techniques used to synthesize and characterize smart materials
5. To identify the required smart material for distinct applications/devices

UNIT-I INTRODUCTION TO SMART MATERIALS

Historical account of the discovery and development of smart materials, Shape memory materials, chromoactive materials, magnetorheological materials, photoactive materials, Polymers and polymer composites (Basics).

UNIT-II PROPERTIES OF SMART MATERIALS

Optical, Electrical, Dielectric, Piezoelectric, Ferroelectric, Pyroelectric and Magnetic properties of smart materials.

UNIT-III SYNTHESIS OF SMART MATERIALS

Chemical route: Chemical vapour deposition, Sol-gel technique, Hydrothermal m

UNIT-IV CHARACTERIZATION TECHNIQUES

Powder X-ray diffraction, Raman spectroscopy (RS), UV-Visible spectroscopy, Scanning electron microscopy (SEM), Transmission electron microscopy (TEM), Atomic force microscopy (AFM).

UNIT-V SMART MATERIALS BASED DEVICES

Devices based on smart materials: Shape memory alloys in robotic hands, piezoelectric based devices, MEMS and intelligent devices.

TEXT BOOKS:

1. YaserDahman, Nanotechnology and Functional Materials for Engineers-, Elsevier, 2017
2. E. Zschech, C. Whelan, T. Mikolajick, Materials for Information Technology: Devices, Interconnects and Packaging Springer-Verlag London Limited 2005.

REFERENCE BOOKS:



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1. Gauenzi,P.,Smart Structures, Wiley, 2009. 2. 4.
2. Mahmood Ali of khazraei, Handbook of functional nanomaterials, Vol (1&2), Nova Publishers, 2014
3. Handbook of Smart Materials, Technologies, and Devices: Applications of Industry,4.0, Chaudhery Mustansar Hussain, Paolo Di Sia, Springer,2022.
4. Fundamentals of Smart Materials,Mohsen Shahinpoor, Royal Society of Chemistry, 2020

e-Resources and Digital Material:

1. https://onlinecourses.nptel.ac.in/e-learning/preview/noc22_me17

COURSE OUTCOMES:

1. Identify key discoveries that led to modern applications of shape memory materials, describe the two phases in shape memory alloys.
2. Describe how different external stimuli (light, electricity, heat, stress, and magnetism) influence smart material properties.
3. Summarize various types of synthesis of smart materials
4. Analyze various characterization techniques used for smart materials
5. Interpret the importance of smart materials in various devices



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(23A92706) INTRODUCTION TO QUANTUM MECHANICS (OE-III)

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To understand the fundamental differences between classical and quantum mechanics.
2. To study wave-particle duality, uncertainty principle, and their implications.
3. To learn and apply Schrödinger equations to basic quantum systems.
4. To use operator formalism and mathematical tools in quantum mechanics.
5. To explore angular momentum, spin and their quantum mechanical representations.

UNIT-I PRINCIPLES OF QUANTUM MECHANICS

Introduction: Limitations of classical Mechanics, Difficulties with classical theories of black body radiation and origin of quantum theory of radiation. Wave-particle duality: de Broglie wavelength, Heisenberg uncertainty principle. Schrödinger time independent and time dependent wave equation, Solution of the time dependent Schrödinger equation, Concept of stationary states, Physical significance of wave function (ψ), Orthogonal, Normalized and Orthonormal functions

UNIT-II ONE DIMENSIONAL PROBLEMS AND SOLUTIONS

Potential step – Reflection and Transmission at the interface. Potential well: Square well potential with rigid walls, Square well potential with finite walls. Potential barrier: Penetration of a potential barrier (tunneling effect). Periodic potential and Harmonic oscillator, Energy eigen functions and eigen values.

UNIT-III OPERATOR FORMALISM

Operators, Operator Algebra, Eigen values and Eigen vectors, Postulates of quantum mechanics, Matrix representation of wave functions and linear operators.

UNIT-IV MATHEMATICAL TOOLS FOR QUANTUM MECHANICS

The concept of row and column matrices, Matrix algebra, Hermitian operators – definition. Dirac's bra and ket notation, Expectation values, Heisenberg (operator) representation of harmonic oscillator, Ladder operators and their significance.

UNIT-V ANGULAR MOMENTUM AND SPIN

Angular momentum operators: Definition. Eigen functions and Eigen values of AM operators. Matrix representation of angular momentum operators, System with spin half ($1/2$), Spin angular momentum, Pauli 's spin matrices. Clebsch-Gordon coefficients. Rigid Rotator: Eigen functions and Eigen values.



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TEXT BOOKS:

1. Quantum Mechanics. Vol 1, A. MessiaNoth-Holland Pub. Co., Amsterdam, (1961).
2. A Text Book of Quantum Mechanics. P.M.Mathews and K.Venkatesam, Tata McGraw Hill, New Delhi,(1976).
3. Introduction to Quantum Mechanics. R.H.Dicke and J.P.Witke, Addison-Wisley Pub.Co.Inc.,London, (1960).
4. Quantum Mechanics. S.L.Gupta, V.Kumar, H.V.Sarama and R.C.Sharma, Jai PrakashNath& Co, Meerut, (1996).

REFERENCE BOOKS:

1. Quantum Mechanics. L.I. Schiff, McGraw Hill Book Co., Tokyo, (1968).
2. Introduction to Quantum Mechanics. Richard L. Liboff, Pearson Education Ltd (Fourth Edn.) 2003.

COURSE OUTCOMES:

1. Explain the key principles of quantum mechanics and wave-particle duality .
2. Apply Schrödinger equations to solve one-dimensional quantum problems
3. Solve quantum mechanical problems using operator and matrix methods
4. Evaluate quantum states using Dirac notation and expectation values.
5. Analyze angular momentum and spin systems using Pauli matrices and operators.



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(23A93706) GREEN CHEMISTRY AND CATALYSIS FOR SUSTAINABLE ENVIRONMENT (OE-III)

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. TO UNDERSTAND PRINCIPLE AND CONCEPTS OF GREEN CHEMISTRY.
2. TO UNDERSTAND THE TYPES OF CATALYSIS AND INDUSTRIAL APPLICATIONS.
3. TO APPLY GREEN SOLVENTS IN CHEMICAL SYNTHESIS
4. TO ENUMERATE DIFFERENT SOURCES OF GREEN ENERGY.
5. TO APPLY ALTERNATIVE GREENER METHODS FOR CHEMICAL REACTIONS

UNIT-I PRINCIPLES AND CONCEPTS OF GREEN CHEMISTRY

Introduction, Green chemistry Principles, sustainable development and green chemistry, E factor, atom economy, atom economic Reactions: Rearrangement and addition reactions and atom un-economic reactions: Substitution, elimination and Wittig reactions, Reducing Toxicity. Waste - problems and Prevention: Design for degradation, Polymer recycling

UNIT-II CATALYSIS AND GREEN CHEMISTRY

Introduction, Types of catalysis, Heterogeneous catalysis: Basics of Heterogeneous Catalysis, Zeolite and the Bulk Chemical Industry, Heterogeneous Catalysis in the Fine Chemical and Pharmaceutical Industries, Catalytic Converters, Homogeneous catalysis: Transition Metal Catalysts with Phosphine Ligands, Greener Lewis Acids, and Phase transfer catalysis, Bio-catalysis and Photo-catalysis with examples.

UNIT-III GREEN SOLVENTS IN CHEMICAL SYNTHESIS

Green Solvents: Concept, Tools and techniques for solvent selection, supercritical fluids: Super critical carbon dioxide, super critical water, Polyethylene glycol (PEG), Ionic liquids, Recycling of green solvents.

UNIT-IV EMERGING GREENER TECHNOLOGIES

Biomass as renewable resource, Energy: Energy from Biomass, Solar Power, Chemicals from Renewable Feedstocks, Chemicals from Fatty Acids, Polymers from Renewable Resources, Alternative Economies: The Syngas Economy, The Biorefinery, Design for energy efficiency, Mechanochemical synthesis.

UNIT-V ALTERNATIVE GREENER METHODS

Photochemical Reactions - Examples, Advantages and Challenges, Photo redox catalysis, single electron transfer reactions (SET), Examples of Photochemical Reactions, Microwave-assisted Reactions and Sonochemical reactions, examples and applications.



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TEXT BOOKS:

1. M. LANCASTER, GREEN CHEMISTRY AN INTRODUCTORY TEXT, ROYAL SOCIETY OF CHEMISTRY, 2002.
2. PAUL T. ANASTAS AND JOHN C. WARNER, GREEN CHEMISTRY THEORY AND PRACTICE, 4TH EDITION, OXFORD UNIVERSITY PRESS, USA

REFERENCE BOOKS:

1. Green Chemistry for Environmental Sustainability, First Edition, Sanjay K. Sharma and AckmezMudhoo, CRC Press, 2010.
2. Edited by Alvis Perosa and Maurizio Selva, Hand Book of Green chemistry Volume 8: GREEN NANOSCIENCE, WILEY-VCH, 2013.

COURSE OUTCOMES:

1. Apply the Green chemistry Principles for day-to-day life as well as synthesis, describe the sustainable development and green chemistry, explain economic and un-economic reactions, Demonstrate Polymer recycling.
2. Explain Heterogeneous catalyst and its applications in Chemical and Pharmaceutical Industries, Differentiate Homogeneous and Heterogeneous catalysis, Identify the importance of Bio and Photo Catalysis, Discuss Transition metal and Phase transfer Catalysis
3. Demonstrate Green solvents and importance, Discuss Supercritical carbondioxide, CO₂ Explain Supercritical water, recycling of green solvents.
4. Describe importance of Biomass and Solar Power, Illustrate Sonochemistry, Apply Green Chemistry for Sustainable Development; discuss the importance of Renewable resources, mechanochemical synthesis.
5. Discuss Alternative green methods like Photoredox catalysis, single electron transfer reactions (SET), Photochemical Reactions, Microwave-assisted Reactions and Sonochemical reactions, examples and applications

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(23A95711) EMPLOYABILITY SKILLS (OE-III)

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To encourage all round development of the students by focusing on productive skills
2. To make the students aware of Goal setting and writing skills
3. To enable them to know the importance of presentation skills in achieving desired goals.
4. To help them develop organizational skills through group activities
5. To function effectively with heterogeneous teams

UNIT-I GOAL SETTING AND SELF-MANAGEMENT

Definition, importance, types of Goal Setting – SMART Goal Setting – Advantages- Motivation – Intrinsic and Extrinsic Motivation – Self-Management - Knowing about self – SWOC Analysis

UNIT-II WRITING SKILLS

Definition, significance, types of writing skills – Resume writing Vs CV Writing - E-Mail writing, Cover Letters - E-Mail Etiquette -SoP (Statement of Purpose)

UNIT-III TECHNICAL PRESENTATION SKILLS

Nature, meaning & significance of Presentation Skills – Planning, Preparation, Presentation, Stage Dynamics –Anxiety in Public speaking (Glossophobia)- PPT & Poster Presentation

UNIT-IV GROUP PRESENTATION SKILLS

Body Language – Group Behaviour - Team Dynamics – Leadership Skills – Personality Manifestation- Group Discussion-Debate –Corporate Etiquette

UNIT-V JOB CRACKING SKILLS

Nature, characteristics, importance & types of Interviews – Job Interviews – Skills for success – Job searching skills - STAR method - FAQs- Answering Strategies – Mock Interviews

TEXT BOOKS:

1. Sabina Pillai, Agna Fernandez. Soft Skills & Employability Skills, 2014.Cambridge Publisher.
2. Alka Wadkar . Life Skills for Success, Sage Publications, 2016.



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REFERENCE BOOKS:

1. angadhar Joshi. Campus to Corporate Paperback, Sage Publications. 2015
2. Sherfield Montgomery Moody, Cornerstone Developing Soft Skills, Pearson Publications. 4 Ed. 2008
3. Shikha Kapoor. Personality Development and Soft Skills - Preparing for Tomorrow .1 Edition, Wiley, 2017
4. M. Sen Gupta, Skills for Employability, Innovative Publication, 2019.
5. Steve Duck and David T McMahan, The Basics f Communication Skills A Relational Perspective, Sage press, 2012.

e- Resources and Digital Material:

1. <https://youtu.be/gkLsn4ddmTs>
2. <https://youtu.be/2bf9K2rRWwo>
3. <https://youtu.be/FchfE3c2jzc>
4. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ
5. <https://www.youtube.com/c/skillopedia/videos>
6. https://onlinecourses.nptel.ac.in/noc25_hs96/preview

COURSE OUTCOMES:

1. Understand the importance of goals and try to achieve them
2. Explain the significance of self-management
3. Apply the knowledge of writing skills in preparing eye-catching resumes
4. Analyse various forms of Presentation skills
5. Judge the group behaviour appropriately
6. Develop skills required for employability.

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(23A01706) GEO-SPATIAL TECHNOLOGIES (OE-IV)

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To understand raster-based spatial analysis techniques, including query, overlay, and cost-distance analysis.
2. To analyze vector-based spatial analysis techniques such as topology, overlay, and proximity analysis.
3. To apply network analysis techniques for geocoding, shortest path analysis, and location-allocation problems.
4. To evaluate surface and geostatistical analysis methods, including terrain modeling, watershed analysis, and spatial interpolation.
5. To assess GIS customization, Web GIS, and mobile mapping techniques for real-world applications.

UNIT-I RASTER ANALYSIS

Raster Data Exploration: Query Analysis - Local Operations: Map Algebra, Reclassification, Logical and Arithmetic Overlay Operations—Neighborhood - Operations: Aggregation, Filtering – Extended Neighborhood-Operations- Zonal Operations - Statistical Analysis – Cost Distance Analysis-Least Cost Path.

UNIT-II VECTOR ANALYSIS

Non-Topological Analysis: Attribute Database Query, Structured Query Language, Co Ordinate Transformation, Summary Statistics, Calculation of Area, Perimeter and Distance – topological Analysis: Reclassification, Aggregation, Overlay Analysis: Point-In-Polygon, Line In-Polygon, Polygon-On-Polygon: Clip, Erase, Identity, Union, Intersection – Proximity Analysis: Buffering

UNIT-III NETWORK ANALYSIS

Network – Introduction - Network Data Model – Elements of Network - Building A Network Database - Geocoding – Address Matching - Shortest Path in A Network – Time and Distance Based Shortest Path Analysis – Driving Directions – Closest Facility Analysis – Catchment / Service Area Analysis-Location-Allocation Analysis

UNIT-IV SURFACE AND GEOSTATISTICAL ANALYSIS

Surface Data – Sources of X, Y, Z Data – DEM, TIN – Terrain Analysis – Slope, Aspect, Viewshed, Watershed Analysis: Watershed Boundary, Flow Direction, Flow Accumulation, Drainage Network, Spatial Interpolation: IDW, Spline, Kriging, Variogram.



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UNIT-V CUSTOMISATION, WEB GIS, MOBILE MAPPING

Customization of GIS: Need, Uses, Scripting Languages –Embedded Scripts – Use of Python Script - Web GIS: Web GIS Architecture, Advantages of Web GIS, Web Applications- Location Based Services: Emergency and Business Solutions - Big Data Analytics.

TEXT BOOKS:

1. Kang – Tsung Chang, Introduction to Geographical Information System, 4th Ed., Tata McGraw Hill Edition, 2008.
2. Lo, C.P. and Yeung, Albert K.W., Concepts and Techniques of Geographic Information Systems Prentice Hall, 2002.

REFERENCE BOOKS:

1. Michael N. Demers, Fundamentals of Geographic Information Systems, Wiley, 2009
2. Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasaraju, “An Introduction to Geographical Information Systems, Pearson Education, 2nd Edition, 2007.
3. John Peter Wilson, The Handbook of Geographic Information Science, Blackwell Pub., 2008

e-Resources and Digital Material:

1. <https://archive.nptel.ac.in/courses/105/105/105105202/>
2. https://onlinecourses.nptel.ac.in/noc19_cs76/preview

COURSE OUTCOMES:

1. Understand raster-based spatial analysis techniques, including query, overlay, and cost distance analysis.
2. Analyze vector-based spatial analysis techniques such as topology, overlay, and proximity analysis.
3. Apply network analysis techniques for geocoding, shortest path analysis, and location allocation problems.
4. Evaluate surface and geostatistical analysis methods, including terrain modeling, watershed analysis, and spatial interpolation.
5. Assess GIS customization, Web GIS, and mobile mapping techniques for real-world applications.

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IV B.Tech. I Sem.

L	T	P	C
3	0	0	3

(23A01707) SOLID WASTE MANAGEMENT (OE-IV)

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To understand the types, sources, and characteristics of solid waste, along with regulatory frameworks.
2. To analyze engineering systems for solid waste collection, storage, and transportation.
3. To apply resource and energy recovery techniques for sustainable solid waste management.
4. To evaluate landfill design, construction, and environmental impact mitigation strategies.
5. To assess hazardous waste management techniques, including biomedical and e-waste disposal.

UNIT-I UNIT 1

Solid Waste: Definitions, Types of Solid Wastes, Sources of Solid Wastes, Characteristics, and Perspectives; Properties of Solid Wastes, Sampling of Solid Wastes, Elements of Solid Waste Management - Integrated Solid Waste Management, Solid Waste Management Rules 2016.

UNIT-II UNIT II

Engineering Systems for Solid Waste Management: Solid Waste Generation; On-Site Handling, Storage and Processing; Collection of Solid Wastes; Stationary Container System and Hauled Container Systems – Route Planning - Transfer and Transport; Processing Techniques;

UNIT-III UNIT III

Engineering Systems for Resource and Energy Recovery: Processing Techniques; Materials Recovery Systems; Recovery of Biological Conversion Products – Composting, Pre and Post Processing, Types of Composting, Critical Parameters, Problems with Composting - Recovery of Thermal Conversion Products; Pyrolysis, Gasification, RDF - Recovery of Energy From Conversion Products; Materials and Energy Recovery Systems.

UNIT-IV UNIT IV

Landfills: Evolution of Landfills – Types and Construction of Landfills – Design Considerations – Life of Landfills- Landfill Problems – Lining of Landfills – Types of Liners – Leachate Pollution and Control – Monitoring Landfills – Landfills Reclamation.



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UNIT-V UNIT V

Hazardous Waste Management: – Sources and Characteristics, Effects On Environment, Risk Assessment – Disposal of Hazardous Wastes – Secured Landfills, Incineration - Monitoring – Biomedical Waste Disposal, E-Waste Management, Nuclear Wastes, Industrial Waste Management

TEXT BOOKS:

1. Tchobanoglous G, Theisen H and Vigil SA 'Integrated Solid Waste Management, Engineering Principles and Management Issues' McGraw-Hill, 1993.
2. Vesilind PA, Worrell W and Reinhart D, 'Solid Waste Engineering' Brooks/Cole Thomson Learning Inc., 2002.

REFERENCE BOOKS:

1. Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, 'Environmental Engineering', McGraw Hill Inc., New York, 1985.
2. Qian X, Koerner RM and Gray DH, 'Geotechnical Aspects of Landfill Design and Construction' Prentice Hall, 2002.

e-Resources and Digital Material:

1. <https://archive.nptel.ac.in/courses/105/103/105103205/>

COURSE OUTCOMES:

1. Understand the types, sources, and characteristics of solid waste, along with regulatory frameworks.
2. Analyze engineering systems for solid waste collection, storage, and transportation.
3. Apply resource and energy recovery techniques for sustainable solid waste management.
4. Evaluate landfill design, construction, and environmental impact mitigation strategies.
5. Assess hazardous waste management techniques, including biomedical and e-waste

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IV B.Tech. I Sem.

L	T	P	C
3	0	0	3

(23A02706) ELECTRIC VEHICLES (OE-IV)

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. Remember and understand the differences between conventional Vehicle and Electric Vehicles, electro mobility and environmental issues of EVs.
2. Analyze various EV configurations, parameters of EV systems and Electric vehicle dynamics.
3. Analyze the basic construction, operation and characteristics of fuel cells and battery charging techniques in HEV systems.
4. Design and analyze the various control structures for Electric vehicle.

UNIT-I INTRODUCTION TO EV SYSTEMS AND ENERGY SOURCES:

Past, Present and Future of EV - EV Concept- EV Technology- State-of-the Art of EVs- EV configuration- EV system- Fixed and Variable gearing- Single and multiple motor drive-In-wheel drives- EV parameters: Weight, size, force and energy, performance parameters. Electro mobility and the environment- History of Electric power trains-Carbon emissions from fuels- green houses and pollutants- Comparison of conventional, battery, hybrid and fuel cell electric systems.

UNIT-II EV PROPULSION AND DYNAMICS:

Choice of electric propulsion system- Block diagram- Concept of EV Motors- Single and multi-motor configurations- Fixed and variable geared transmission- In-wheel motor configuration- Classification - Electric motors used in current vehicle applications - Recent EV Motors- Vehicle load factors- Vehicle acceleration.

UNIT-III FUEL CELLS:

Introduction of fuel cells- Basic operation- Model - Voltage, power and efficiency- Power plant system – Characteristics- Sizing - Example of fuel cell electric vehicle - Introduction to HEV- Brake specific fuel consumption - Comparison of Series-Parallel hybrid systems-Examples.

UNIT-IV BATTERY CHARGING AND CONTROL:

Battery charging: Basic requirements- Charger architecture- Charger functions- Wireless charging- Power factor correction. Control: Introduction- Modeling of electro mechanical system- Feedback controller design approach- PI controller 's designing- Torque-loop, Speed control loop compensation- Acceleration of battery electric vehicle.



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UNIT-V ENERGY STORAGE TECHNOLOGIES:

Role of Energy Storage Systems- Thermal- Mechanical-Chemical- Electrochemical-Electrical
- Efficiency of energy storage systems- Super Capacitors-Superconducting Magnetic Energy
Storage (SMES)- SOC- SoH -fuel cells - G2V- V2G- Energy storage in Micro-grid and
Smart grid- Energy Management with storage systems- Battery SCADA

TEXT BOOKS:

1. C.C Chan, K.T Chau: Modern Electric Vehicle Technology, Oxford University Press Inc., New York 2001, 1st Edition
2. Ali Emadi, —Advanced Electric Drive Vehicles, CRC Press, 2017, 1st Edition

REFERENCE BOOKS:

1. Electric and Hybrid Vehicles Design Fundamentals, Iqbal Husain, CRC Press 2021, 3rd Edition.
2. Francisco Díaz-González, Andreas Sumper, Oriol Gomis-Bellmunt, Energy Storage in Power Systems, Wiley Publication, ISBN: 978-1-118-97130-7, Mar 2016, 1st Edition
3. A.G.Ter-Gazarian, —Energy Storage for Power Systems, the Institution of Engineering and Technology (IET) Publication, UK, (ISBN – 978-1-84919-219-4), Second Edition, 2011.
4. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, —Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004, 1st Edition
5. James Larminie, John Lowry, —Electric Vehicle Technology Explained, Wiley, 2003, 2nd Edition.

e-Resources and Digital Material:

1. <https://nptel.ac.in/courses/108/102/108102121/>
2. <https://nptel.ac.in/syllabus/108103009>

COURSE OUTCOMES:

1. To understand and differentiate between Conventional Vehicle and Electric Vehicles, electro mobility and environmental issues of EVs. -L2
2. Understand Various dynamics of Electric Vehicles. -L2
3. To remember and understand various configurations in parameters of EV system and dynamic aspects of EV. -L1
4. To analyze fuel cell technologies in EV and HEV systems. -L3
5. To analyze the battery charging and controls required of EVs. -L3

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(23A03708) TOTAL QUALITY MANAGEMENT (OE-IV)

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. Familiarize the basic concepts of Total Quality Management.
2. Expose with various quality issues in Inspection.
3. Gain Knowledge on quality control and its applications to real time..
4. Understand the extent of customer satisfaction by the application of various quality concepts.
5. Demonstrate the importance of Quality standards in Production

UNIT-I INTRODUCTION

Definition of Quality, Dimensions of Quality, Definition of Total quality management, Quality Planning, Quality costs – Analysis, Techniques for Quality costs, Basic concepts of Total Quality Management.

UNIT-II HISTORICAL REVIEW:

Historical Review: Quality council, Quality statements, Strategic Planning, Deming Philosophy, Barriers of TQM Implementation, Benefits of TQM, Characteristics of successful quality leader, Contributions of Gurus of TQM, Case studies.

UNIT-III TQM PRINCIPLES:

Customer Satisfaction Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement Motivation, Empowerment teams, Continuous Process Improvement Juran Trilogy, PDCA Cycle, Kaizen, Supplier Partnership Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures Basic Concepts, Strategy, Performance Measure Case studies.

UNIT-IV TQM TOOLS:

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA, The seven tools of quality, Process capability, Concept of Six Sigma, New Seven management tools, Case studies.



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UNIT-V QUALITY SYSTEMS:

Need for ISO 9000 and Other Quality Systems, ISO 9000: 2000 Quality System Elements, Implementation of Quality System, Documentation, Quality Auditing, QS 9000, ISO 14000 Concept, Requirements and Benefits, Case Studies.

TEXT BOOKS:

1. Dale H Besterfield, Total Quality Management, Fourth Edition, Pearson Education, 2015.
2. Subburaj Ramaswamy, Total Quality Management, Tata Mcgraw Hill Publishing Company Ltd., 2005
3. Joel E.Ross , Total Quality Management, Third Edition, CRC Press, 2017.

REFERENCE BOOKS:

1. Narayana V and Sreenivasan N.S, Quality Management – Concepts and Tasks, New Age International, 1996.
2. Robert L.Flood, Beyond TQM, First Edition, John Wiley & Sons Ltd, 1993
3. Richard S. Leavenworth & Eugene Lodewick Grant, Statistical Quality Control, Seventh Edition, Tata Mcgraw Hill, 2015
4. Samuel Ho , TQM – An Integrated Approach, Kogan Page Ltd, USA, 1995.

e-Resources and Digital Material:

1. <https://www.youtube.com/watchv=VD6tXadibk0>
2. <https://www.investopedia.com/terms/t/total-quality-management-tqm.asp>
3. <https://blog.capterra.com/what-is-total-quality-management/>
4. <https://nptel.ac.in/courses/110/104/110104080/>
5. https://onlinecourses.nptel.ac.in/noc21_mg03/preview
6. <https://nptel.ac.in/courses/110/104/110104085/>

COURSE OUTCOMES:

1. Define and develop on quality Management philosophies and analyze quality costs frameworks.
2. Understanding of the historical development of Total Quality Management (TQM), implementation, and real-world applications through case studies.
3. Evaluate the cost of poor quality, process effectiveness and efficiency to analyze areas for improvement.
4. Apply benchmarking and business process reengineering to improve management processes.
5. Demonstrate the set of indications to evaluate performance excellence of an organization



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L	T	P	C
3	0	0	3

(23A04755) TRANSDUCERS AND SENSORS (OE-IV)

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To understand characteristics of Instrumentation System and the operating principle of motion transducers.
2. To explore working principles, and applications of different temperature transducers and Piezo-electric sensors.
3. To provide knowledge on flow transducers and their applications
4. To study the working principles of pressure transducers
5. To introduce working principle and applications of force and sound transducers.

UNIT-I INTRODUCTION:

General Configuration and Functional Description of measuring instruments, Static and Dynamic Characteristics of Instrumentation System, Errors in Instrumentation System, Active and Passive Transducers and their Classification. **Motion Transducers:** Resistive strain gauge, LVDT, RVDT, Capacitive transducers, Piezo-electric transducers, seismic displacement pick-ups, vibrometers and accelerometers.

UNIT-II TEMPERATURE TRANSDUCERS:

Standards and calibration, fluid expansion and metal expansion type transducers - bimetallic strip, Thermometer, Thermistor, RTD, Thermocouple and their characteristics. Hall effect transducers, Digital transducers, Proximity devices, Bio-sensors, Smart sensors, Piezo electric sensors.

UNIT-III FLOW TRANSDUCERS:

Bernoulli's principle and continuity, Orifice plate, Nozzle plate, Venture tube, Rotameter, Anemometers, Electromagnetic flow meter, Impeller meter and Turbid flow meter.

UNIT-IV PRESSURE TRANSDUCERS:

Standards and calibration, different types of manometers, elastic transducers, diaphragm bellows, bourdon tube, capacitive and resistive pressure transducers, high and low pressure measurement.



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UNIT-V FORCE AND SOUND TRANSDUCERS:

Proving ring, hydraulic and pneumatic load cell, dynamometer and gyroscopes. Sound level meter, sound characteristics, Microphone.

TEXT BOOKS:

1. A.K. Sawhney, "A course in Electrical and Electronics Measurements and Instrumentation", Dhanpat Rai & Co. 3rd edition Delhi, 2010.
2. Rangan C.S, Sarma G.R and Mani V S V, "Instrumentation Devices and Systems", TATA McGraw Hill publications, 2007.

REFERENCE BOOKS:

1. Doebelin. E.O, "Measurement Systems Application and Design", McGraw Hill International, New York, 2004.
2. Nakra B.C and Chaudhary K.K, "Instrumentation Measurement and Analysis", Second Edition, Tata McGraw-Hill Publication Ltd. 2006.

COURSE OUTCOMES:

1. Understand characteristics of Instrumentation System and the operating principle of motion transducers.
2. Explore working principles, and applications of different temperature transducers and Piezo-electric sensors.
3. Gain knowledge on flow transducers and their applications.
4. Learn the working principles of pressure transducers
5. Understand the working principle and applications of force and sound transducers.

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L	T	P	C
3	0	0	3

(23A32611) INTRODUCTION TO QUANTUM COMPUTING (OE-IV)

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To introduce the principles and mathematical foundations of quantum computation.
2. To understand quantum gates, circuits, and computation models.
3. To explore quantum algorithms and their advantages over classical ones.
4. To develop the ability to simulate and write basic quantum programs.
5. To understand real-world applications and the future of quantum computing in AI, cryptography, and optimization.

UNIT-I FUNDAMENTALS OF QUANTUM MECHANICS AND LINEAR ALGEBRA

Classical vs Quantum Computation, Complex Numbers, Vectors, and Matrices, Hilbert Spaces and Dirac Notation, Quantum States and Qubits, Superposition and Measurement, Tensor Products and Multi-Qubit Systems.

UNIT-II QUANTUM GATES AND CIRCUITS

Quantum Logic Gates: Pauli, Hadamard, Phase, Controlled Gates and CNOT, Unitary Operations and Reversibility, Quantum Circuit Representation, Quantum Teleportation, Simulation of Quantum Circuits.

UNIT-III QUANTUM ALGORITHMS AND COMPLEXITY

Quantum Parallelism and Interference, Deutsch and Deutsch-Jozsa Algorithms, Grover's Search Algorithm, Shor's Factoring Algorithm, Quantum Fourier Transform, Complexity Classes: BQP, P, NP, and QMA.

UNIT-IV QUANTUM PROGRAMMING AND SIMULATION PLATFORMS

Introduction to Qiskit and IBM Quantum Experience, Writing Quantum Circuits in Qiskit, Measuring Qubits and Results, Classical-Quantum Hybrid Programs, Noisy Intermediate-Scale Quantum (NISQ) Systems, Limitations and Current State of Quantum Hardware.

UNIT-V APPLICATIONS AND FUTURE OF QUANTUM COMPUTING

Quantum Machine Learning: Basics and Models, Quantum Cryptography and Quantum Key Distribution, Quantum Algorithms in AI and Optimization, Quantum Advantage and Supremacy, Ethical and Societal Impact of Quantum Technologies, Future Trends and Research Directions.

TEXT BOOKS:

1. Michael A. Nielsen, Isaac L. Chuang, Quantum Computation and Quantum Information, Cambridge University Press, 10th Anniversary Edition, 2010.



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2. Eleanor Rieffel and Wolfgang Polak, Quantum Computing: A Gentle Introduction , MIT Press, 2011.
3. Chris Bernhardt, Quantum Computing for Everyone , MIT Press, 2019.

REFERENCE BOOKS:

1. David McMahon, Quantum Computing Explained , Wiley, 2008.
2. Phillip Kaye, Raymond Laflamme, Michele Mosca, An Introduction to Quantum Computing , Oxford University Press, 2007.
3. Scott Aaronson, Quantum Computing Since Democritus , Cambridge University Press, 2013.

e-Resources and Digital Material:

1. IBM Quantum Experience and Qiskit Tutorials
2. Coursera – Quantum Mechanics and Quantum Computation by UC Berkeley
3. edX – The Quantum Internet and Quantum Computers
4. YouTube – Quantum Computing for the Determined by Michael Nielsen
5. Qiskit Textbook – IBM Quantum

COURSE OUTCOMES:

1. Explain the fundamental concepts of quantum mechanics used in computing.
2. Construct and analyze quantum circuits using standard gates.
3. Apply quantum algorithms like Deutsch-Jozsa, Grover's, and Shor's.
4. Develop simple quantum programs using Qiskit or similar platforms.
5. Analyze applications and challenges of quantum computing in real-world domains.

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L	T	P	C
3	0	0	3

(23A91715) FINANCIAL MATHEMATICS (OE-IV)

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To provide mathematical foundations for financial modelling, risk assessment and asset pricing.
2. To introduce stochastic models and their applications in pricing derivatives and interest rate modelling.
3. To develop analytical skills for fixed-income securities, credit risk, and investment strategies.
4. To equip students with computational techniques for pricing financial derivatives.

UNIT-I ASSET PRICING AND RISK MANAGEMENT

Fundamental financial concepts: Returns, arbitrage, valuation, and pricing. Asset/Liability management, investment income, capital budgeting, and contingent cash flows. One-period model: Securities, payoffs, and the no-arbitrage principle. Option contracts: Speculation and hedging strategies, CAP Model, Efficient market hypothesis

UNIT-II STOCHASTIC MODELS IN FINANCE

Random Walks and Brownian Motion. Introduction to Stochastic Differential Equations (SDEs): Drift and diffusion. Ito calculus: Ito's Lemma, Ito Integral, and Ito Isometry.

UNIT-III INTEREST RATE AND CREDIT MODELLING

Interest rate models and bond markets. Short-rate models: Vasicek, Cox-Ingersoll-Ross (CIR), Hull & White models, Credit risk modelling: Hazard function and hazard rate.

UNIT-IV FIXED-INCOME SECURITIES AND BOND PRICING

Characteristics of fixed-income products: Yield, duration, and convexity. Yield curves, forward rates, and zero-coupon bonds. Stochastic interest rate models and bond pricing PDE. Yield curve fitting and calibration techniques, Mortgage-Backed Securities.

UNIT-V EXOTIC OPTIONS AND COMPUTATIONAL FINANCE

Stochastic volatility models and the Feynman-Kac theorem. Exotic options: Barriers, Asians, and Look backs. Monte Carlo methods for derivative pricing, Black-Scholes-Merton model: Derivation and applications.

TEXT BOOKS:

1. Ales Cerny, Mathematical Techniques in Finance: Tools for Incomplete Markets, Princeton University Press.
2. S.R. Pliska, Introduction to Mathematical Finance: Discrete-Time Models, Cambridge University Press.



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REFERENCE BOOKS:

1. Ioannis Karatzas & Steven E. Shreve, Methods of Mathematical Finance, Springer, New York.
2. John C. Hull, Options, Futures, and Other Derivatives, Pearson.

e-Resources and Digital Material:

1. MIT – Mathematics for Machine Learning <https://ocw.mit.edu>
2. Coursera – Financial Engineering and Risk Management (Columbia University) <https://www.coursera.org/>
3. National Stock Exchange (NSE) India – Financial Derivatives <https://www.nseindia.com>

COURSE OUTCOMES:

1. Explain fundamental financial concepts, including arbitrage, valuation, and risk. L2 (Understand)
2. Apply stochastic models, including Brownian motion and Stochastic Differential Equations (SDEs), in financial contexts. L3 (Apply)
3. Analyze mathematical techniques for pricing options and financial derivatives. L4 (Analyze)
4. Evaluate interest rate models and bond pricing methodologies. L5 (Evaluate)
5. Utilize computational techniques such as Monte Carlo simulations for financial modeling. L3 (Apply)



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L	T	P	C
3	0	0	3

(23A92707) SENSORS AND ACTUATORS FOR ENGINEERING APPLICATIONS (OE-IV)

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To provide exposure to various kinds of sensors and actuators and their engineering applications.
2. To impart knowledge on the basic laws and phenomenon behind the working of sensors and actuators
3. To explain the operating principles of various sensors and actuators
4. To educate the fabrication of sensors
5. To explain the required sensor and actuator for interdisciplinary application

UNIT-I INTRODUCTION TO SENSORS AND ACTUATORS

Sensors: Types of sensors: temperature, pressure, strain, active and passive sensors, General characteristics of sensors (Principles only), Deposition: Chemical Vapor Deposition, Pattern: photolithography and Etching: Dry and Wet Etching. Actuators: Functional diagram of actuators, Types of actuators and their basic principle of working: Pneumatic, Electromagnetic, Piezo-electric and Piezo-resistive actuators, Applications of Actuators.

UNIT-II TEMPERATURE AND MECHANICAL SENSORS

Temperature Sensors: Types of temperature sensors and their basic principle of working: Thermo resistive sensors: Thermistors, Thermo-electric sensors: Thermocouples, PN junction temperature sensors Mechanical Sensors: Types of Mechanical sensors and their basic principle of working: Force sensors: Strain gauges, Tactile sensors, Pressure sensors: Piezoresistive, Variable Reluctance Sensor (VRP).

UNIT-III OPTICAL AND ACOUSTIC SENSORS

Optical Sensors: Basic principle and working of: Photodiodes, Phototransistors and Photo resistors-based sensors, Photomultipliers, Infrared sensors: thermal, Passive Infra-Red, Fiber based sensors and Thermopiles Acoustic Sensors: Principle and working of Ultrasonic sensors, Piezo-electric resonators, Microphones

UNIT-IV MAGNETIC AND ELECTROMAGNETIC SENSORS

Motors as actuators (linear, rotational, stepping motors), magnetic valves, inductive sensors (LVDT, RVDT, and Proximity), Hall Effect sensors, Magneto-resistive sensors, Magnetostrictive sensors and actuators.



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT-V CHEMICAL AND RADIATION SENSORS

Chemical Sensors: Principle and working of Electro-chemical, Thermo-chemical, Gas, pH, Humidity and moisture sensors. Radiation Sensors: Principle and working of Ionization detectors, Scintillation detectors, Semiconductor radiation detectors and Microwave sensors (resonant, reflection, transmission)

TEXT BOOKS:

1. Sensors and Actuators – Clarence W. de Silva, CRC Press, 2nd Edition, 2015
2. Sensors and Actuators, D.A.Hall and C.E.Millar, CRC Press, 1999

REFERENCE BOOKS:

1. Sensors and Transducers- D.Patranabis, Prentice Hall of India (Pvt) Ltd. 2003
2. Measurement, Instrumentation, and Sensors Handbook-John G.Webster, CRC press 1999
3. Sensors – A Comprehensive Sensors- Henry Bolte, John Wiley.
4. Handbook of modern sensors, Springer, Stefan Johann Rupitsch.

COURSE OUTCOMES:

1. Classify different types of Sensors and Actuators along with their characteristics L1,L2
2. Summarize various types of Temperature and Mechanical sensors L1,L2
3. Illustrates various types of optical and mechanical sensors L1,L2
4. Analyze various types of Optical and Acoustic Sensors L1,L2, L3
5. Interpret the importance of smart materials in various devices L1,L2

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IV B.Tech. I Sem.

L	T	P	C
3	0	0	3

**(23A93707) CHEMISTRY OF NANOMATERIALS AND APPLICATIONS
(OE-IV)**

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To understand basics and characterization of nanomaterials.
2. To understand synthetic methods of nanomaterials.
3. To apply various techniques for characterization of nanomaterials.
4. To understand Studies of Nano-structured Materials
5. To enumerate the applications of advanced nanomaterials in engineering

UNIT-I BASICS AND CHARACTERIZATION OF NANOMATERIALS:

Introduction, Scope of nanoscience and nanotechnology, nanoscience in nature, classification of nanostructured materials, importance of nanomaterials.

UNIT-II SYNTHESIS OF NANOMATERIALS:

Top-Down approach, Inert gas condensation, arc discharge method, aerosol synthesis, plasma arc technique, ion sputtering, laser ablation, laser pyrolysis, and chemical vapour deposition method, electrodeposition method, highenergy ball milling method. Synthetic Methods: Bottom-Up approach, Sol-gel synthesis, microemulsions or reverse micelles, co precipitation method, solvothermal synthesis, hydrothermal synthesis, microwave heating synthesis and sonochemical synthesis.

UNIT-III TECHNIQUES FOR CHARACTERIZATION:

Diffraction technique, spectroscopy techniques, electron microscopy techniques for the characterization of nanomaterials, BET method for surface area analysis, dynamic light scattering for particle size determination.

UNIT-IV STUDIES OF NANO-STRUCTURED MATERIALS:

Synthesis, properties and applications of the following nanomaterials -fullerenes, carbon nanotubes, 2D-nanomaterial (Graphene), core-shell, magnetic nanoparticles, thermoelectric materials, non-linear optical materials.



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UNIT-V ADVANCED ENGINEERING APPLICATIONS OF NANOMATERIALS

Applications of Nano Particle, nanorods, nano wires, Water treatment, sensors, electronic devices, medical domain, civil engineering, chemical engineering, metallurgy and mechanical engineering, food science, agriculture, pollutants degradation.

TEXT BOOKS:

1. NANO: The Essentials: T Pradeep, MaGraw-Hill, 2007.
2. Textbook of Nanoscience and nanotechnology: B S Murty, P Shankar, BaldevRai, BB Rath and James Murday, Univ. Press, 2012.

REFERENCE BOOKS:

1. Concepts of Nano chemistry; LudovicoCademrtiri and Geoffrey A. Ozin& Geoffrey A. Ozin, Wiley-VCH, 2011.
2. Nanostructures & Nanomaterials; Synthesis, Properties & Applications: Guozhong Cao, Imperial College Press, 2007. Nanomaterials

COURSE OUTCOMES:

1. Classify the nanostructure materials; describe scope of nanoscience and importance technology. CO3 CO4
2. Describe the top-down approach, explain aerosol synthesis and plasma arc technique, differentiate chemical vapor deposition method and electrode position method, Discuss about highenergy ball milling.
3. Discuss different technique for characterization of nanomaterial, explain electron microscopy techniques for characterization of nanomaterial, Describe BET method for surface area analysis.
4. Explain synthesis and properties and applications of nanaomaterials, discuss about fullerenes and carbon nanotubes, Differentiate nanomagnetic materials and thermoelectric materials, nonlinear optical materials.
5. Illustrate advance engineering applications of Water treatment, sensors, electronic devices, medical domain, civil engineering, chemical engineering, metallurgy and mechanical engineering, food science, agriculture, pollutants degradation.

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L	T	P	C
3	0	0	3

(23A95712) LITERARY VIBES (OE-IV)

Course Category	Open Elective (OE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To inculcate passion for aesthetic sense and reading skills
2. To encourage respecting others 'experiences and creative writing
3. To explore emotions, communication skills and critical thinking
4. To educate how books serve as the reflection of history and society
5. To provide practical wisdom and duty of responding to events of the times

UNIT-I POETRY

1. Ulysses- Alfred Lord Tennyson
2. Ain't I woman-Sojourner Truth
3. The Second Coming-W.B. Yeats
4. Where the Mind is Without Fear-Rabindranath Tagore

UNIT-II DRAMA

Twelfth Night- William Shakespeare:

1. Shakespeare -life and works
1. Plot & sub-plot and Historical background of the play
2. Themes and Criticism
3. Style and literary elements
4. Characters and characterization

UNIT-III SHORT STORY

1. The Luncheon - Somerset Maugham
2. The Happy Prince-Oscar Wilde
3. Three Questions – Leo Tolstoy
4. Grief –Antony Chekov

UNIT-IV PROSE

Essay and Autobiography:

1. My struggle for an Education-Booker T Washington
2. The Essentials of Education-Richard Livingston
3. The story of My Life-Helen Keller
4. Student Mobs-JB Priestly



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UNIT-V NOVEL

Hard Times- Charles Dickens:

1. Charles Dickens-Life and works
2. Plot and Historical background of the novel
3. Themes and criticism
4. Style and literary elements
5. Characters and characterization

TEXT BOOKS:

1. Charles Dickens.Hard Times. (Sangam Abridged Texts) Vantage Press, 1983
2. DENT JC.William Shakespeare. Twelfth Night. Oxford University Press,2016.

REFERENCE BOOKS:

1. WJ Long,History of English Literature, Rupa Publications India; First Edition (4 October 2015)
2. RK Kaushik And SC Bhatia. Essays, Short Stories and One Act Plays, Oxford University Press .2018.
3. Dhanvel, SP. English and Soft Skills, Orient Blackswan,2017.
4. New Horizon, Pearson publications, New Delhi 2014
5. Vimala Ramarao, Explorations Volume-II, Prasaraanga Bangalore University,2014.
6. Dev Neira, Anjana & Co. Creative Writing: A Beginner's Manual.Pearson India, 2008.

e-Resources and Digital Material:

1. <https://www.litcharts.com/poetry/alfred-lord-tennyson/ulysses>
2. <https://www.litcharts.com/lit/ain-t-i-a-woman/summary-and-analysis>
3. <https://www.litcharts.com/lit/ain-t-i-a-woman/summary-and-analysis> https://englishliterature.education/articles/poetry-analysis/the-second-coming-by-w-b-yeats-critical-analysis-summary-and-line-by-line-explanation/#google_vignette
4. <https://sirjitutorials.com/where-the-mind-is-without-fear-poem-notes-explanation/>
5. <https://www.litcharts.com/lit/twelfth-night/themes>
6. <https://smartenglishnotes.com/2021/11/28/the-luncheon-summary-characters-themes-and-irony/>

COURSE OUTCOMES:

1. Identify genres, literary techniques and creative uses of language in literary texts.
2. Explain the relevance of themes found in literary texts to contemporary, personal and cultural values and to historical forces
3. Apply knowledge and understanding of literary texts when responding to others 'problems and their own and make evidence-based arguments
4. Analyze the underlying meanings of the text by using the elements of literary texts
5. Evaluate their own work and that of others critically
6. Develop as creative, effective, independent and reflective students who are able to make informed choices in process and performance

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L	T	P	C
0	1	2	2

(23A05750) PROMPT ENGINEERING (SEC)

Course Category	Skill Oriented Course (SC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. This course delves into prompt engineering principles, strategies, and best practices, a crucial aspect in shaping AI models' behavior and performance. Understanding Prompt Engineering is a comprehensive course designed to equip learners with the knowledge and skills to effectively generate and utilize prompts in natural language processing (NLP) and machine learning (ML) applications. This course delves into prompt engineering principles, strategies, and best practices, a crucial aspect in shaping AI models' behavior and performance.

Module 1: Introduction to Prompt Engineering**Lesson 1:** Foundations of Prompt Engineering

- o. Overview of prompt engineering and its significance in NLP and ML.
- o. Historical context and evolution of prompt-based approaches.

Module 2: Types of Prompts and Their Applications**Lesson 2:** Closed-Ended Prompts

- o Understanding and creating prompts for specific answers.
- o Applications in question- answering systems

Lesson 3: Open-Ended Prompts

- o Crafting prompts for creative responses.
- o Applications in language generation models.

Module 3: Strategies for Effective Prompting**Lesson 4:** Probing Prompts

- o Designing prompts to reveal model biases.
- o Ethical considerations in using probing prompts.



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Lesson 5: Adversarial Prompts

- o Creating prompts to stress-test models.
- o Enhancing robustness through adversarial prompting.

Module 4: Fine-Tuning and Optimizing with Prompts

Lesson 6: Fine-Tuning Models with Prompts

- o Techniques for incorporating prompts during model training.
- o Balancing prompt influence and generalization

Lesson 7: Optimizing Prompt Selection

- o Methods for selecting optimal prompts for specific tasks.
- o Customizing prompts based on model behavior.

Module 5: Evaluation and Bias Mitigation

Lesson 8: Evaluating Prompt Performance

- o Metrics and methodologies for assessing model performance with prompts.
- o Interpreting and analyzing results.

Lesson 9: Bias Mitigation in Prompt Engineering

- o Strategies to identify and address biases introduced by prompts.
- o Ensuring fairness and inclusivity in prompt-based models.

Module 6: Real-World Applications and Case Studies

Lesson 10: Case Studies in Prompt Engineering

Exploration of successful implementations and challenges in real-world scenarios. Guest lectures from industry experts sharing their experiences.

TEXT BOOKS:

1. "Prompt Engineering in Action" – Danny D. Sullivan
2. "The Art of Prompt Engineering with Chat GPT: A Hands-On Guide" – Nathan Hunter.



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REFERENCE BOOKS:

1. " Prompt Engineering in Practice" – Michael F. Lewis
2. " Mastering AI Prompt Engineering: The Ultimate Guide for Chat GPT Users" – Adriano Damiao
3. " Writing AI Prompts for Dummies" – Stephanie Diamond and Jeffrey Allan
4. " Prompt Engineering Guide" (Online Resource) – promptingguide.ai

e-Resources and Digital Material:

1. <https://www.udemy.com/course/understanding-prompt-engineering/?couponCode=NVDINCTA35TRT>

COURSE OUTCOMES:

1. Understanding the fundamentals and evolution of prompt engineering.
2. Gaining the ability to craft effective closed-ended, open-ended, and role-based prompts.
3. Learning to probe and stress-test AI models for bias and robustness.
4. Applying prompt optimization techniques and performance evaluation methods.
5. Mitigating bias and promoting ethical prompting practices in NLP/ML systems.

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IV B.Tech. I Sem.

L	T	P	C
2	0	0	0

(23A95713) GENDER SENSITIZATION (AC)

Course Category	Mandatory Course (Non-credit)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To enable students to understand the gender related issues, vulnerability of women and men
2. To familiarize them about constitutional safeguard for gender equality
3. To expose the students to debates on the politics and economics of work
4. To help students reflect critically on gender violence
5. To make them understand that gender identities and gender relations are part of culture as they shape the way daily life is lived in the family as well as wider community and the workplace.

UNIT-I UNDERSTANDING GENDER

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood. Growing up Male. First lessons in Caste.

UNIT-II GENDER ROLES AND RELATIONS

Two or Many -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles- Gender Roles and Relationships Matrix-Missing Women-Sex Selection and its Consequences- Declining Sex Ratio- Demographic Consequences-Gender Spectrum -

UNIT-III GENDER AND LABOUR

Division and Valuation of Labour-Housework: The Invisible Labor- My Mother doesn't Work. I Share the Load. I-Work: Its Politics and Economics -Fact and Fiction-Unrecognized and Unaccounted work -Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

UNIT-IV GENDER-BASED VIOLENCE

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment - Domestic Violence - Different forms of violence against women - Causes of violence, impact of violence against women - Consequences of gender-based violence

UNIT-V GENDER AND CULTURE

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language- Just Relationships

TEXT BOOKS:



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1. A.Suneetha, Uma Bhargubanda, et al. Towards a World of Equals: A Bilingual Textbook on Gender, Telugu Akademi, Telangana, 2015.
2. Butler, Judith. Gender Trouble: Feminism and the Subversion of Identity. UK Paperback Edn. March 1990

REFERENCE BOOKS:

1. Wtatt, Robin and Massood, Nazia, Broken Mirrors: The dowry Problems in India, London : Sage Publications, 2011
2. Datt, R. and Kornberg, J.(eds), Women in Developing Countries, Assessing Strategies for Empowerment, London: Lynne Rienner Publishers, 2002
3. Brush, Lisa D., Gender and Governance, New Delhi, Rawat Publication, 2007
4. Singh, Direeti, Women and Politics World Wide, New Delhi, Axis Publications, 2010
5. Raj Pal Singh, Anupama Sihag, Gender Sensitization: Issues and Challenges (English, Hardcover), Raj Publications, 2019
6. A.Revathy& Murali, Nandini, A Life in Trans Activism(Lakshmi Narayan Tripathi). The University of Chicago Press, 2016

e-Resources and Digital Material:

1. Understanding Gender extension://kdpelmjpfafjppnhbloffcjpeomlnpah/<https://www.arvindguptatoys.com/arvindgupta/kamla-gender1.pdf> https://onlinecourses.swayam2.ac.in/nou24_hs53/preview
2. Gender Roles and Relations <https://www.plannedparenthood.org/learn/gender-identity/sex-gender-identity/what-are-gender-roles-and-stereotypes> <https://www.verywellmind.com/understanding-gender-roles-and-their-effect-on-our-relationships-7499408> https://onlinecourses.swayam2.ac.in/cec23_hs29/preview
3. Gender and Labour <https://www.economicsobservatory.com/what-explains-the-gender-division-of-labour-and-how-can-it-be-redressed> https://onlinecourses.nptel.ac.in/noc23_mg67/preview
4. GENDER-BASED VIOLENCE https://eige.europa.eu/gender-based-violence/what-is-gender-based-violence?language_content_entity=en <https://www.worldbank.org/en/topic/socialsustainability/brief/violence-against-women-and-girls> https://onlinecourses.swayam2.ac.in/nou25_ge38/preview
5. GENDER AND CULTURE <https://gender.study/psychology-of-gender/culture-impact-gender-roles-identities/> <https://sociology.iresearchnet.com/sociology-of-culture/gender-and-culture/> <https://archive.nptel.ac.in/courses/109/106/109106136/>

COURSE OUTCOMES:

1. Understand the basic concepts of gender and its related terminology
2. Identify the biological, sociological, psychological and legal aspects of gender.
3. Use the knowledge in understanding how gender discrimination works in our society and how to counter it.
4. Analyze the gendered division of labour and its relation to politics and economics.
5. Appraise how gender-role beliefs and sharing behaviour are associated with more well-being in all culture and gender groups
6. Develop students 'sensitivity' with regard to issues of gender in contemporary India



SANTHIRAM ENGINEERING COLLEGE

(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV B.Tech. I Sem.

L T P C

(23A05751) EVALUATION OF INDUSTRY INTERNSHIP

Course Category	
Course Enrichment Relevance	

COURSE OBJECTIVES:

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language- Just Relationships

**SANTHIRAM ENGINEERING COLLEGE****(AUTONOMOUS)****DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**

IV B.Tech II Semester Course Structure

S.No	Subject Code	Course Category	Name of the Subject	Hours/Week			Credits	Marks		
				Lecture	Tutorial	Practical		Internal	External	Total
01	23A05852	--	Internship	--	--	--	4			
02	23A05853	--	Project	--	--	--	8	60	140	200
TOTAL							12			

IV B.Tech II Semester

S.NO.	Course Code	Title	Category	L	T	P	Credits
01	23A05852	Internship	--	-	-	-	4
02	23A05853	Project	--	-	-	-	8
Total							12

SANTHIRAM ENGINEERING COLLEGE::NANDYAL (AUTONOMOUS)

Highlights of the College

- Received Autonomous Status.
- Accredited by NBA for the Departments of ECE and CSE.
- Accredited by NAAC with Grade-A (3.2 score)
- Recognized as Q-Mentor College by APSCHE, for guiding HEIs for accreditation.
- Listed as one of the Best Engineering College with AA+ Grade by Career 360 in the year 2023.
- Recognized in GOLD CATEGORY by AICTE-CII Survey for the years 2017 & 2018 and also in PLATINUM CATEGORY in the year 2020.
- Received TWO University Gold Medals from JNTUA, Ananthapuramu.
- Received NINE Prathibha Awards from the Govt of A.P.
- SIX Patents were granted and SIX patents were approved under AICTE-KAPILA Scheme.
- Received around 50 Lakhs worth of funding projects under various schemes of UGC, AICTE, IEEE, IE and etc.

VISION

To become a nucleus for pursuing technical education and pool industrial research and developmental activities with social-conscious and global standards.

MISION

- To provide Advanced Educational Programs and prepare students to achieve success and take leading roles in their chosen fields of specialization by arising a self-sustained University.
- To establish postgraduate programs in the current and Advanced Technologies.
- To establish an R&D Consultancy through developing Industry Institute Interaction, building up exceptional infrastructure.
- To propel every individual, realize and act for the technical development of the society.

MOTTO

Education for Peace and Progress

website: www.srecnandyal.edu.in

NH-40, NANDYAL-518501(DT), A.P, INDIA.