SANTHIRAM ENGINEERING COLLEGE :: NANDYAL
(AUTONOMOUS)

Approved by A.I.C.T.E., New Delhi, Permanently Affiliated to JNT University, Ananthapuramu
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-ECE(04)

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 160 credits and secures all 160 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., 160 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 160)	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

i. Total duration of the of B. Tech (Regular) Programme is four academic years.

ii. Each academic year of study is divided into two semesters.

iii. Minimum number of instruction days in each semester is 90 days.

iv. 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.

v. Health/wellness/yoga/sports and NSS /NSS /Scouts & Guides / Community service activities are made mandatory as credit courses for all the under graduate students.

vi. Courses like Environmental Sciences, Indian Constitution, Technical Paper Writing & IPR are offered as non-credit mandatory courses for all the undergraduate students.

vii. Design Thinking for Innovation & Tinkering Labs are made mandatory as credit courses for all the undergraduate students.

viii. Increased flexibility for students through an increase in the elective component of the curriculum, with 05 Professional Elective courses and 04 Open Elective courses.

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

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

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

xii. A pool of 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: (25x0.8) + (20x0.2) = 24

If the student is absent for any one midterm examination, the final mid semester marks shall be arrived at by considering 80% 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: (25x0.8) + (0x0.2) =20

b) End Examination Evaluation:

End examination of theory subjects shall have the following pattern:

i) There shall be 6 questions and all questions are compulsory.

ii) Question I shall 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, a re 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 a 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 12 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 15 credits for award of B.Tech.(Honors) degree from same branch/department/discipline registered for major degree. This is in addition to the credits essential for obtaining the Undergraduate degree in Major Discipline (i.e., 160 credits).

iii) A student is permitted to register for Honors in IV semester after the results of III Semester are declared and students may be allowed to take maximum two subjects per semester pertaining to the Honors from V Semester onwards.

iv) The concerned 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

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

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

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

The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade 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.,

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

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.,

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

Where "S_i" is the SGPA of the i^{th} 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	≥ 6.5 < 7.5
Second Class	≥ 5.5 < 6.5
Pass Class	≥ 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, 120 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 120 credits and secures all 120 credits.

(b) Award of B.Tech. degree with Honors if he/she fulfils the following:

(i) Student secures additional 15 credits fulfilling all the requisites of a B.Tech. program i.e., 120 credits.

(ii) Registering for Honors is optional.

(iii) Honors are to be completed simultaneously with B.Tech. Programme.

2. Students, who fail to fulfil the requirement for the award of the degree within six consecutive academic years from the year of admission, shall 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**
	If the candidate:	
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 inthe 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 inencouraging 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 periodof 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 allthe norms required for the award of Degree.

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I B.Tech I Semester
Course Structure

SANTHIRAM ENGINEERING COLLEGE

(AUTONOMOUS)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

S.No	Subject Code	Course Category	Name of the Subject	Hours/Week				Marks		
				Lecture	Tutorial	Practical	Credits	Internal	External	Total
1	23A92101	BS&H	ENGINEERING PHYSICS	3	0	0	3	30	70	100
2	23A91101	BS&H	LINEAR ALGEBRA & CALCULUS	3	0	0	3	30	70	100
3	23A04101	ES	BASIC ELECTRICAL & ELECTRONICS ENGINEERING	3	0	0	3	30	70	100
4	23A03101	ES	ENGINEERING GRAPHICS	1	0	4	3	30	70	100
5	23A05101	ES	INTRODUCTION TO PROGRAMMING	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	23A05103	ES	COMPUTER PROGRAMMING 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 I Semester Syllabus

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech. I Sem.

L	T	P	C
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 - Newton's 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 - Nicol's 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 dilectric 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 (Eg) 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/aUUzSzg0NXozaDZheVpnMEtnb3lZclAvRWllWmN0VUxxeFpzVURYaUxyWT0
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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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech. I Sem.

L	T	P	C
3	0	0	3

(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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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

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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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech. I Sem.

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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.

SANTHIRAM ENGINEERING COLLEGE

(AUTONOMOUS)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

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.

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. Bhatacharya, 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 ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech. I Sem.

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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 INSTRUMENTTAION

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

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.

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. I 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 and planes inclined to both the planes.
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 Involutes 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.

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.

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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, Charotar Publishing House, 2016.
2. Engineering Drawing,K.L. Narayana &P. Kannaiah,Tata McGraw Hill,2013.

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.
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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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.

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

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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(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

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:

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 Anfins on 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. I 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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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

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. I Sem.

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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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(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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(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.

UNIT I

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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UNIT II

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:

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.

UNIT III

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 on1D array.

iii) The reverse of a 1D integer array

iv) Find 2s 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

UNIT IV

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

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

Lab10 : 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.

UNIT V

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

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

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.

SANTHIRAM ENGINEERING COLLEGE

(AUTONOMOUS)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech. I Sem.

L	T	P	C
0	0	1	0.5

(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 & CareActivities:

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. Organising 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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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

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.

I B.Tech II Semester
Course Structure

SANTHIRAM ENGINEERING COLLEGE

(AUTONOMOUS)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

S.No	Subject Code	Course Category	Name of the Subject	Hours/Week				Marks		
				Lecture	Tutorial	Practical	Credits	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	23A91202	BS&H	DIFFERENTIAL EQUATIONS & VECTOR CALCULUS	3	0	0	3	30	70	100
4	23A03102	ES	BASIC CIVIL AND MECHANICAL ENGINEERING	3	0	0	3	30	70	100
5	23A04203	PC	NETWORK ANALYSIS	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	23A04204	PC	NETWORK ANALYSIS AND SIMULATION LABORATORY	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

I B.Tech II Semester Syllabus

SANTHIRAM ENGINEERING COLLEGE

(AUTONOMOUS)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech. II 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.

SANTHIRAM ENGINEERING COLLEGE

(AUTONOMOUS)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

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:** Readinga 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)

SANTHIRAM ENGINEERING COLLEGE

(AUTONOMOUS)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

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 ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech. II 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 Ψ2 , particle in one dimensional box, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O2 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-oxygenfuel cell–working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC).

SANTHIRAM ENGINEERING COLLEGE

(AUTONOMOUS)

DEPARTMENT OF ELECTRONICS & COMMUNICATION 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.

SANTHIRAM ENGINEERING COLLEGE

(AUTONOMOUS)

DEPARTMENT OF ELECTRONICS & COMMUNICATION 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.

SANTHIRAM ENGINEERING COLLEGE

(AUTONOMOUS)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

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.

SANTHIRAM ENGINEERING COLLEGE

(AUTONOMOUS)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech. II 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.

SANTHIRAM ENGINEERING COLLEGE

(AUTONOMOUS)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

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).

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, Charotor 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.

SANTHIRAM ENGINEERING COLLEGE

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech. II Sem.

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, Cotters 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.

2. A Tear 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. Appuu 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.

SANTHIRAM ENGINEERING COLLEGE

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech. II Sem.

L	T	P	C
3	0	0	3

(23A04203) NETWORK ANALYSIS

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

COURSE OBJECTIVES:

1. To introduce basic laws, mesh & nodal analysis techniques for solving electrical circuits
2. To impart knowledge on applying appropriate theorem for electrical circuit analysis
3. To explain transient behavior of circuits in time and frequency domains
4. To teach concepts of resonance
5. To introduce open circuit, short circuit, transmission, hybrid parameters and their interrelationship.

UNIT-I BASIC ELECTRICAL CIRCUITS & NETWORK THEOREMS

Types of circuit components, Types of Sources and Source Transformations, Kirchhoff's laws, Star- to-Delta and Delta-to-Star Transformations, Mesh analysis and Nodal analysis, problem solving with resistances only including dependent sources also. Super node and Super mesh for DC Excitations, Principal of Duality with examples.

Network Theorems: Thevenin's, Norton's, Milliman's, Reciprocity, Compensation, Substitution, Superposition, Miller Theorem, Max Power Transfer, Tellegens - problem solving using dependent sources also.

UNIT-II TRANSIENTS

Transients: First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, evaluating initial conditions procedure, second order differential equations, homogeneous, non-homogenous, problem-solving using R-L-C elements with DC excitation and AC excitation, Response as related to s-plane rotation of roots.

Laplace transform: introduction, Laplace transformation, basic theorems, problem solving using Laplace transform, partial fraction expansion, Heaviside's expansions, problem solving using Laplace transform.

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UNIT-III STEADY STATE ANALYSIS OF A.C CIRCUITS

Impedance, Admittance concept, phase angle, Instantaneous Power, Average Power, Effective Values of Current and Voltage, Apparent Power, Power Factor, Complex Power, series R-L, R-C, R-L- C circuits problem solving. Complex impedance and phasor notation for R-L, R-C, R-L-C problem solving using mesh and nodal analysis, Star-Delta conversion, problem solving using Laplace transforms also.

UNIT-IV RESONANCE

Introduction, Definition of Q, Series resonance, Bandwidth of series resonance, Parallel resonance, general case-resistance present in both branches, anti-resonance at all frequencies.

Coupled Circuits: Coupled Circuits: Self-inductance, Mutual inductance, Coefficient of coupling, analysis of coupled circuits, Natural current, Dot rule of coupled circuits, conductively coupled equivalent circuits- problem solving.

UNIT-V TWO-PORT NETWORKS

Relationship of two port networks, Z-parameters, Y-parameters, Transmission line parameters, h- parameters, Relationships Between parameter Sets, Parallel & series connection of two port networks, cascading of two port networks, problem solving using dependent sources also.

Image and iterative impedances. Image and iterative transfer constants. Insertion loss. Attenuators and pads. Lattice network and its parameters. Impedance matching networks.

TEXT BOOKS:

1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, revised 3rd Edition, 2019.
2. Engineering Circuit Analysis by William H. Hayt, Jack Kemmerly, Jamie Phillips, Steven M. Durbin, 9th Edition 2020.
3. Network lines and Fields by John. D. Ryder 2nd Edition, PHI

REFERENCE BOOKS:

1. D. Roy Choudhury, Networks and Systems, New Age International Publications, 2013.
2. Joseph Edminister and Mahmood Nahvi, Electric Circuits, Schaum's Outline Series, 7 th Edition, Tata McGraw Hill Publishing Company, New Delhi, 2017
3. Fundamentals of Electric Circuits by Charles K. Alexander and Matthew N. O. Sadiku, McGraw-Hill Education.

COURSE OUTCOMES:

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1. Understand basic electrical circuits with nodal and mesh analysis.
2. Analyse the circuit using network simplification theorems.
3. Find Transient response and Steady state response of a network
4. Analyse electrical networks in the Laplace domain.
5. Compute the parameters of a two-port network.

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I B.Tech. II 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

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. II 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. II 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. Raghuwanshi, 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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I B.Tech. II Sem.

L	T	P	C
0	0	3	1.5

(23A04204) NETWORK ANALYSIS AND SIMULATION LABORATORY

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

COURSE OBJECTIVES:

1. To gain hands on experience in verifying Kirchoff's laws and network theorems
2. To analyze transient behavior of circuits
3. To study resonance characteristics
4. To determine 2-port network parameters

The following experiments need to be performed using both Hardware and simulation Software.

The experiments need to be simulated using software and the same need to be verified using the hardware.

1. Study of components of a circuit and Verification of KCL and KVL.
2. Verification of mesh and nodal analysis for AC circuits
3. Verification of Superposition, Thevenin's & Norton theorems for AC circuits
4. Verification of maximum power transfer theorem for AC circuits
5. Verification of Tellegen's theorem for two networks of the same topology.
6. Study of DC transients in RL, RC and RLC circuits
7. To study frequency response of various 1st order RL & RC networks
8. To study the transient and steady state response of a 2nd order circuit by varying its various parameters and studying their effects on responses
9. Find the Q Factor and Bandwidth of a Series and Parallel Resonance circuit.
10. Determination of open circuit (Z) and short circuit (Y) parameters
11. Determination of hybrid (H) and transmission (ABCD) parameters
12. To measure two port parameters of a twin-T network and study its frequency response.

Hardware Requirements:

Regulated Power supplies, Analog/Digital Function Generators, Digital Multimeters, Decade Resistance Boxes/Rheostats, Decade Capacitance Boxes, Ammeters (Analog or Digital), Voltmeters (Analog or Digital), Active & Passive Electronic Components

Software requirements:

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Multisim/ Pspice/Equivalent simulation software tool, Computer Systems with required specifications

REFERENCE BOOKS:

1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, revised 3rd Edition, 2019.
2. Engineering Circuit Analysis by William H. Hayt, Jack Kemmerly, Jamie Phillips, Steven M. Durbin, 9th Edition 2020.

COURSE OUTCOMES:

1. Verify Kirchoff's laws and network theorems.
2. Measure time constants of RL & RC circuits.
3. Analyze behavior of RLC circuit for different cases.
4. Design resonant circuit for given specifications.
5. Characterize and model the network in terms of all network parameters.

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I B.Tech. II 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.

II B.Tech I Semester
Course Structure

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Course Structure

II B.Tech I Semester						
S.No	**Subject Code**	**Name of the Subject**	**Hours/Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	
1.	23A91303	Probability and Complex Variables	3	0	0	3
2.	23A99303	Universal Human Values -Understanding Harmony and Ethical Human Conduct	2	1	0	3
3.	23A04305	Signals, Systems and Stochastic Processes	3	0	0	3
4.	23A04306	Electronic Devices and Circuits	3	0	0	3
5.	23A04307	Digital Circuits Design	3	0	0	3
6.	23A04308	Electronic Devices and Circuits Lab	0	0	3	1.5
7.	23A04309	Digital Circuits & Signal Simulation Lab	0	0	3	1.5
8.	23A05306	Python Programming	0	1	2	2
9.	23A93303	Environmental Science	2	0	0	0
10.	23A91304	Competitive Ability Course - I	2	0	0	0
11.	23A99304a	Foreign Language Proficiency Certificate Course in French	2	0	0	0
12.	23A99304b	Foreign Language Proficiency Certificate Course in Spanish	2	0	0	0
					Total Credits:	**20**

II B.Tech I Semester Syllabus

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II B.Tech. I Sem.

L	T	P	C
3	0	0	3

(23A91303) PROBABILITY AND COMPLEX VARIABLES

Course Category	Basic Science (BS)

COURSE OBJECTIVES:

UNIT-I PROBABILITY & RANDOM VARIABLE

Probability through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Joint Probability, Conditional Probability, Total Probability, Bayes' Theorem, Independent Events. Random variables (discrete and continuous), probability density functions, properties, mathematical expectation. Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh.

UNIT-II OPERATIONS ON RANDOM VARIABLE

Moments-moments about the origin, Central moments, Variance and Skew, Chebyshev's inequality, moment generating function, characteristic function. Multiple Random Variables: Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density - Point Conditioning, Interval conditioning, Statistical Independence.

UNIT-III OPERATIONS ON MULTIPLE RANDOM VARIABLES

Operations on Multiple Random Variables: Expected Value of a Function of Random Variables, Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties of Gaussian random variables.

UNIT-IV COMPLEX VARIABLE – DIFFERENTIATION

Introduction to functions of complex variable-concept of Limit & continuity-Differentiation, Cauchy-Riemann equations, analytic functions harmonic functions, finding harmonic conjugate-construction of analytic function by Milne Thomson method.

UNIT-V COMPLEX VARIABLE ' INTEGRATION

Line integral-Contour integration, Cauchy's integral theorem (Simple Case), Cauchy Integral formula, Power series expansions: Taylor's series, zeros of analytic functions, singularities, Laurent's series, Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine.

TEXT BOOKS:

1. Peyton Z. Peebles, "Probability, Random Variables & Random Signal Principles", 4th Edition, TMH, 2002.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2017, 44th Edition

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REFERENCE BOOKS:

1. Athanasios Papoulis and S. Unnikrishna Pillai, 'Probability, Random Variables and Stochastic Processes', 4th Edition, PHI, 2002
2. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India
3. Henry Stark and John W.Woods, 'Probability and Random Processes with Application to Signal Processing,' 3rd Edition, Pearson Education, 2002.
4. B.V.Ramana, Higher Engineering Mathematics, Mc Graw Hill publishers.

e-Resources and Digital Material:

1. https://onlinecourses.nptel.ac.in/noc20_ma50/preview
2. https://onlinecourses.nptel.ac.in/noc21_ma66/preview#:~:text=This%20course%20provides% 20random%20variable,and%20simple%20Markovian%20queueing%20models

COURSE OUTCOMES:

1. Understand the concepts of Probability, Random Variables and their characteristics (L2, L3)
2. Learn how to deal with multiple random variables, conditional probability, joint distribution and statistical independence. (L3, L5)
3. Formulate and solve engineering problems involving random variables. (L3)
4. Analyze limit, continuity and differentiation of functions of complex variables and Understand Cauchy-Riemann equations, analytic functions and various properties of analytic functions. (L2, L3)
5. Understand Cauchy theorem, Cauchy integral formulas and apply these to evaluate complex contour integrals. Classify singularities and poles; find residues and evaluate complex integrals using the residue theorem. (L3, L5)

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

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	Basic Science (BS)

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

Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)
Lecture 2: Understanding Value Education
Tutorial 1: Practice Session PS1 Sharing about Oneself
Lecture 3: self-exploration as the Process for Value Education
Lecture4: Continuous Happiness and Prosperity - the Basic Human Aspirations
Tutorial 2: Practice Session PS2 Exploring Human Consciousness
Lecture 5: Happiness and Prosperity - Current Scenario
Lecture 6: Method to Fulfill the Basic Human Aspirations
Tutorial 3: Practice Session PS3 Exploring Natural Acceptance
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

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

UNIT-III HARMONY IN THE FAMILY AND SOCIETY

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

UNIT-IV HARMONY IN THE NATURE/EXISTENCE

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

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UNIT-V IMPLICATIONS OF THE HOLISTIC UNDERSTANDING - A LOOK AT PROFESSIONAL ETHICS

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. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa

e-Resources and Digital Material:

1. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf
2. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf
3. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf
4. https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-S2%20Respect%20July%2023.pdf
5. https://www.studocu.com/in/document/kiet-group-of-institutions/universal-human-values/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385
6. https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

COURSE OUTCOMES:

1. Define the terms like Natural Acceptance, Happiness and Prosperity (L1, L2)

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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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3	0	0	3

(23A04305) SIGNALS, SYSTEMS AND STOCHASTIC PROCESSES

Course Category	Professional Core course (PC)

COURSE OBJECTIVES:

1. Understanding the basics of signals and systems required for ECE courses.
2. To teach concepts of signals and systems and its analysis using different transform techniques.
3. To provide basic understanding of random processes which is essential for the random signals and systems encountered in communications and signal Processing areas.

UNIT-I SIGNALS & SYSTEMS

Signals & Systems: Basic definitions and classification of Signals and Systems (Continuous time and discrete time), operations on signals, Concepts of Convolution and Correlation of signals, Analogy between vectors and signals-Orthogonality, mean square error,

Fourier series: Trigonometric & Exponential forms of Fourier series, Properties, Concept of discrete spectrum, Illustrative Problems.

UNIT-II FOURIER TRANSFORM

Fourier Transform: Definition, Computation and properties of Fourier transform for different types of signals and systems, Inverse Fourier transform. Sampling: Sampling theorem - Graphical and analytical proof for Band Limited Signals, Reconstruction of signal from its samples, Effect of under sampling -Aliasing. Illustrative Problems.

Laplace Transform: Definition, ROC, Properties, Inverse Laplace transforms, the s-plane and BIBO stability, Transfer functions, System Response to standard signals, Solution of differential equations with initial conditions, Illustrative Problems.

UNIT-III SIGNAL TRANSMISSION THROUGH LINEAR SYSTEMS

Signal Transmission through Linear Systems: Linear system, impulse response, Response of a linear system for different input signals, linear time-invariant (LTI) system, linear time variant (LTV) system, Transfer function of a LTI system. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, System bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between bandwidth and rise time, Energy and Power spectral densities, Illustrative Problems.

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UNIT-IV RANDOM PROCESSES - TEMPORAL CHARACTERISTICS

Random Processes – Temporal Characteristics: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second- Order and Wide-Sense Stationarity, (N-Order) and Strict Sense Stationarity, Time Averages and Ergodicity, Autocorrelation Function and Its Properties, Cross-Correlation Function and Its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process. Random Signal, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output.

UNIT-V RANDOM PROCESSES - SPECTRAL CHARACTERISTICS

Random Processes – Spectral Characteristics: The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross Correlation Function. Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output.'

TEXT BOOKS:

1. Peyton Z. Peebles, 'Probability, Random Variables & Random Signal Principles', 4th Edition, TMH, 2002.
2. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, 'Signals and Systems', 2nd Edition, PHI, 2009.

REFERENCE BOOKS:

1. Signals, Systems & Communications - B.P. Lathi, 2013, BSP.
2. Athanasios Papoulis and S. Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes", 4th Edition, PHI, 2002
3. Simon Haykin and Van Veen, "Signals & Systems", 2nd Edition, Wiley, 2005
4. Matthew Sadiku and Warsame H. Ali, "Signals and Systems A primer with MATLAB", CRC Press, 2016.
5. Hwei Hsu, "Schaum's Outline of Signals and Systems", 4thEdition, TMH, 2019

COURSE OUTCOMES:

1. Understand the mathematical description and representation of continuous-time and discrete-time signals and systems, Also, understand the concepts of various transform techniques and Random Processes (L2)
2. Apply sampling theorem to convert continuous-time signals to discrete-time signals and reconstruct back, different transform techniques to solve signals and system related problems. (L3)
3. Formulate and solve engineering problems involving random processes. (L3)
4. Analyze the frequency spectra of various continuous-time signals using different transform methods. (L4)
5. Classify the systems based on their properties and determine the response of them. (L4)

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(23A04306) ELECTRONIC DEVICES AND CIRCUITS

Course Category	Professional Core course (PC)

COURSE OBJECTIVES:

1. Students will be able understand the basic principles of all semiconductor devices.
2. Able to analyze diode circuits, various biasing and small signal equivalent circuits of amplifiers, compare the performance of BJTs and MOSFETs
3. Able to design rectifier circuits and various amplifier circuits using BJTs and MOSFETs.

UNIT-I PN JUNCTION DIODE

PN junction diode: Review, diode current equation, Diode resistance, Transition and Diffusion Capacitance, effect of temperature on PN junction diode, Quantitative analysis of Half-wave, Full-wave and Bridge Rectifiers with and without Filters, Ripple Factor and Regulation Characteristics, Clipping and Clamping circuits, Illustrative problems. Special Diodes: Construction, operation and VI characteristics of Tunnel Diode, Varactor Diode, LED, LCD, Photo Diode, SCR and UJT.

UNIT-II BIPOLAR JUNCTION TRANSISTORS

Review of Bipolar Junction Transistors, Characteristics, Transistor as an Amplifier and as a Switch, BJT Configurations, Limits of Operation, BJT Specifications. Biasing and Stabilization: Operating Point, DC and AC Load Lines, Importance of Biasing, Fixed Bias, Collector to Base Bias, Self-Bias, Bias Stability, Thermal Runaway, Thermal Stability, Illustrative problems.

UNIT-III BJT SMALL SIGNAL OPERATION AND MODELS

BJT Small Signal Operation and Models- the transconductance, input resistance at the base, input resistance at the emitter, Voltage gain, separating the Signal and the DC Quantities, The Hybrid π Model, the T Model. Single Stage BJT Amplifiers - Common-Emitter (CE) amplifier without and with emitter resistance, Common-Base (CB) amplifier, Common-Collector (CC) amplifier or Emitter Follower, Problem solving.

UNIT-IV JUNCTION FIELD EFFECT TRANSISTOR (FET) & MOS FIELD EFFECT TRANSISTORS

Junction Field Effect Transistor (FET): Construction, Principle of Operation, V-I Characteristics, Comparison of BJT and FET, FET as Voltage Variable Resistor. FET biasing. MOS Field Effect Transistors: Introduction, Device Structure and Physical Operation, CMOS, V - I Characteristics, MOSFET Circuits at DC, MOSFET as an Amplifier and as a Switch. Biasing in MOS Amplifier circuits - biasing by fixing VGS with and without source resistance, biasing using drain to gate feedback resistor, biasing using constant current source, body effect, Problem solving.

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UNIT-V MOSFET SMALL SIGNAL OPERATION MODELS

MOSFET Small Signal Operation Models- the dc bias, separating the DC analysis and the signal analysis, Small signal equivalent circuit models, the transconductance, the T equivalent circuit model, Single stage MOS Amplifiers -common source (CS) amplifier without and with source resistance, common gate (CG) amplifier, source follower, Problem Solving.

TEXT BOOKS:

1. Adel S. Sedra and Kenneth C. Smith, “Microelectronic Circuits – Theory and Applications”, 6th Edition, Oxford Press, 2013.
2. J. Milliman and C Halkias, “Integrated electronics”, 2nd Edition, Tata McGraw Hill, 1991.

REFERENCE BOOKS:

1. Donald A Neamen, ‘Electronic Circuits ‘ analysis and design‘, 3rd Edition, McGraw Hill (India), 2019.
2. Behzad Razavi, ‘Microelectronics‘, Second edition, Wiley, 2013.
3. R.L. Boylestad and Louis Nashelsky, ‘Electronic Devices and Circuits,‘ 9th Edition, Pearson, 2006.
4. Jimmie J Cathey, ‘Electronic Devices and Circuits,‘ Schaum‘s outlines series, 3rd edition, McGraw-Hill (India), 2010

COURSE OUTCOMES:

1. Understand principle of operation, characteristics and applications of semiconductor diodes, special diodes, BJTs, JFET and MOSFETs. (L2)
2. Applying the basic principles solving the problems related to Semiconductor diodes, BJTs, and MOSFETs. (L3)
3. Analyze diode circuits for different applications such as rectifiers, clippers and clampers also analyze biasing circuits of BJTs, and MOSFETs. (L4)
4. Design of diode circuits and amplifiers using BJTs, and MOSFETs. (L4)
5. Compare the performance of various semiconductor devices. (L4)

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3	0	0	3

(23A04307) DIGITAL CIRCUITS DESIGN

Course Category	Professional Core course (PC)

COURSE OBJECTIVES:

1. Understand the properties of Boolean algebra, logic operations, and minimization of Boolean functions.
2. Analyze combinational and analyze sequential logic circuits.
3. Understand the concepts of FSM and compare various Programmable logic devices.
4. Model combinational and sequential circuits using HDLs.

UNIT-I BOOLEAN ALGEBRA, LOGIC OPERATIONS, AND MINIMIZATION OF BOOLEAN FUNCTIONS

Review of Number Systems and Codes, Representation of unsigned and signed integers, Floating Point representation of real numbers, Laws of Boolean Algebra, Theorems of Boolean Algebra, Realization of functions using logic gates, Canonical forms of Boolean Functions, Minimization of Functions using Karnaugh Maps.

UNIT-II COMBINATIONAL LOGIC CIRCUITS

Combinational circuits, Design with basic logic gates, design procedure, adders, subtractors, 4-bit binary adder/ subtractor circuit, BCD adder, carry look- a-head adder, binary multiplier, magnitude comparator, data selectors, priority encoders, decoders, multiplexers, demultiplexers.

UNIT-III HARDWARE DESCRIPTION LANGUAGE

Introduction to Verilog - structural specification of logic circuits, behavioral specification of logic circuits, hierarchical Verilog Code, Verilog for combinational circuits - conditional operator, if-else statement, case statement, for loop using sequential circuits with CAD tools.

UNIT-IV SEQUENTIAL LOGIC CIRCUITS

Basic architectural distinction between combinational and sequential circuits, Design procedure, latches, flip-flops, truth tables and excitation tables, timing and triggering consideration, conversion of flip- flops, design of counters, ripple counters, synchronous counters, ring counter, Johnson counter, registers, shift registers, universal shift register. Verilog constructs for sequential circuits, flip-flop with clear capability, using Verilog constructs for registers and counters.

UNIT-V FINITE STATE MACHINES AND PROGRAMMABLE LOGIC DEVICES

Types of FSM, capabilities and limitations of FSM, state assignment, realization of FSM using flip-flops, Mealy to Moore conversion and vice-versa, reduction of state tables using partition technique, Design of sequence detector. Types of PLD’s: PROM, PAL, PLA, basic structure of CPLD and FPGA, advantages of FPGAs.

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TEXT BOOKS:

1. M. Morris Mano, 'Digital Design', 3rd Edition, PHI. (Unit I to IV)
2. Stephen Brown and ZvonkoVranesic, 'Fundamentals of Digital Logic with Verilog Design', 3rd Edition, McGraw-Hill (Unit V)

REFERENCE BOOKS:

1. Charles H. Roth, Jr, 'Fundamentals of Logic Design', 4th Edition, Jaico Publishers.
2. ZviKohavi and NirajK.Jha, 'Switching and Finite Automata Theory, 3rd Edition, Cambridge University Press, 2010.
3. Samir Palnitkar, 'Verilog HDL: A Guide to Digital Design and Synthesis', 2ndEdition, Prentice Hall PTR.
4. D.P. Leach, A.P. Malvino, 'Digital Principles and Applications', TMH, 7th Edition.

COURSE OUTCOMES:

1. Understand the properties of Boolean algebra, logic operations, concepts of FSM (L2)
2. Apply techniques for minimization of Boolean functions (L3)
3. Analyze combinational and Sequential logic circuits. (L4)
4. Compare various Programmable logic devices. (L4)
5. Design and Model combinational and sequential circuits using HDLs. (L5, L6)

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0	0	3	1.5

(23A04308) ELECTRONIC DEVICES AND CIRCUITS LAB

Course Category	Professional Core course (PC)

COURSE OBJECTIVES:

1. Verify the theoretical concepts practically from all the experiments.
2. Analyse the characteristics of Diodes, BJT, MOSFET, UJT.
3. Design the amplifier circuits from the given specifications.
4. Model the electronic circuits using tools such as PSPICE/Multisim.

1. Verify various clipping and clamper circuits using PN junction diode and draw the suitable graphs.

2. Study and draw the Volt Ampere characteristics of UJT and determine ??, IP, Iv, VP, &Vv from the experiment.

3. Verification of the input and output characteristics of BJT in Common Emitter configuration experimentally and find required parameters from the graphs.

4. Study and draw the input and output characteristics of BJT in Common Base configuration experimentally and determine required parameters from the graphs.

5. Verification of the input and output characteristics of BJT in Common Collector configuration experimentally and find required parameters from the graphs Study and draw the V- I characteristics of JFET experimentally.

6. Study and draw the output and transfer characteristics of MOSFET (Enhance mode) in Common Source Configuration experimentally. Find Threshold voltage (VT), gm, & K from the graphs.

7. Study and draw the output and transfer characteristics of MOSFET (Depletion mode) or JFET in Common Source Configuration experimentally. Find IDSS, gm, & VP from the graphs.

8. Design and analysis of voltage- divider bias/self-bias circuit using BJT.

9. Design and analysis of self-bias circuit using MOSFET.

10. Design a suitable circuit for switch using MOSFET/BJT.

11. Design a small signal amplifier using MOSFET (common source) for the given specifications. Draw the frequency response and find the bandwidth.

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12. Design a small signal amplifier using BJT(common emitter) for the given specifications. Draw the frequency response and find the bandwidth.

COURSE OUTCOMES:

1. Understand the characteristics and applications of basic electronic devices. (L2)
2. Plot the characteristics of electronic devices. (L3)
3. Analyze various biasing circuits and electronic circuits as amplifiers (L4).
4. Design MOSFET / BJT based amplifiers for the given specifications. (L5)
5. Simulate all circuits in PSPICE /Multisim. (L5).

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II B.Tech. I Sem.

L	T	P	C
0	0	3	1.5

(23A04309) DIGITAL CIRCUITS & SIGNAL SIMULATION LAB

Course Category	Professional Core course (PC)

COURSE OBJECTIVES:

1. Verify the truth tables of various logic circuits.
2. Design sequential/combinational circuit using Hardware Description Language and verify their functionality.
3. Simulate various Signals and Systems through MATLAB
4. Analyze the output of a system when it is excited by different types of deterministic and random signals.

PART A

1. Design a simple combinational circuit with four variables and obtain minimal SOP expression and verify the truth table using Digital Trainer Kit.

2. Verification of functional table of 3 to 8-line Decoder /De-multiplexer

3. 4 variable logic function verification using 8 to1 multiplexer.

4. Design full adder circuit and verify its functional table.

5. Design a four-bit ring counter using D Flip-Flops/JK Flip Flop and verify output.

6. Design a four-bit Johnson's counter using D Flip-Flops/JK Flip Flops and verify output

7. Verify the operation of 4-bit Universal Shift Register for different Modes of operation.

8. Draw the circuit diagram of MOD-8 ripple counter and construct a circuit using T-Flip-Flops and Test It with a low frequency clock and sketch the output waveforms.

9. Design MOD-8 synchronous counter using T Flip-Flop and verify the result and sketch the output waveforms.

10. (a) Draw the circuit diagram of a single bit comparator and test the output (b) Construct 7 Segment Display Circuit Using Decoder and7 Segment LED and test it.

Note: Design and verify combinational and sequential circuits using Hardware Description Language

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PART B

1. Write a program to generate various Signals and Sequences: Periodic and Aperiodic, Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc function.

2. Perform operations on Signals and Sequences: Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.

3. Write a program to find the trigonometric & exponential Fourier series coefficients of a rectangular periodic signal. Reconstruct the signal by combining the Fourier series coefficients with appropriate weightings- Plot the discrete spectrum of the signal.

4. Write a program to find Fourier transform of a given signal. Plot its amplitude and phase spectrum.

5. Write a program to convolve two discrete time sequences. Plot all the sequences.

6. Write a program to find autocorrelation and cross correlation of given sequences.

7. Write a program to verify Linearity and Time Invariance properties of a given Continuous System.

8. Write a program to generate discrete time sequence by sampling a continuous time signal. Show that with sampling rates less than Nyquist rate, aliasing occurs while reconstructing the signal.

9. Write a program to find magnitude and phase response of first order low pass and high pass filter. Plot the responses in logarithmic scale.

10. Write a program to generate Complex Gaussian noise and find its mean, variance, Probability Density Function (PDF) and Power Spectral Density (PSD).

11. Generate a Random data (with bipolar) for a given data rate (say 10kbps). Plot the same for a time period of 0.2 sec.

12. To plot pole-zero diagram in S-plane of given signal/sequence and verify its stability.

Note: Any 10 experiments. All the experiments are to be simulated using MATLAB or equivalent software.

REFERENCE BOOKS:

1. M. Morris Mano, “Digital Design”, 3rd Edition, PHI
2. Stephen J. Chapman, “MATLAB Programming for Engineers”, Cengage, November 2012.

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COURSE OUTCOMES:

1. Verify the truth tables of various logic circuits. (L2)
2. Understand how to simulate different types of signals and system response. (L2)
3. Design sequential and combinational logic circuits and verify their functionality. (L3, L4)
4. Analyze the response of different systems when they are excited by different signals and plot power spectral density of signals. (L4)
5. Generate different random signals for the given specifications. (L5)

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L	T	P	C
0	1	2	2

(23A05306) PYTHON PROGRAMMING

Course Category	Open Elective (OE)

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 Jupyter 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. 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, Frozenset.

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. 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.

Sample Experiments:

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)

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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. Gowri shankar S, Veena A., Introduction to Python Programming, CRC Press.
2. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2nd Edition, 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. Showcase adept command of Python syntax, deftly utilizing variables, data types, control structures, functions, modules, and exception handling to engineer robust and efficient code solutions. (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. 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)

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2	0	0	0

(23A93303) ENVIRONMENTAL SCIENCE

Course Category	Mandatory Course (Non-credit)

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

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

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-sports 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

Environmental Pollution: Definition, Cause, effects and control measures of :
a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

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

UNIT-IV SOCIAL ISSUES AND THE ENVIRONMENT

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

Human Population and the Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, 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, “Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus”, Scitech Publications (India), Pvt. Ltd.

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

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:

SANTHIRAM ENGINEERING COLLEGE

(AUTONOMOUS)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech. I Sem. L T P C

(23A99304) FOREIGN LANGUAGE PROFICIENCY CERTIFICATE COURSE

Course Category	
Course Enrichment Relevance	

COURSE OBJECTIVES:

COURSE OUTCOMES:

SANTHIRAM ENGINEERING COLLEGE

(AUTONOMOUS)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech. I Sem.

L	T	P	C
2	nil	nil	0

(23A91304) COMPETITIVE ABILITY COURSE - I

Course Category	**Basic Science (BS)**
Course Enrichment Relevance	**Employability**

COURSE OBJECTIVES:

1. Understand the basic concepts of quantitative ability.
2. Acquire satisfactory competency in use of Aptitude tests
3. Compete in various competitive exams like CAT, GATE, GRE, GATE, UPSC, etc.

UNIT-I NUMERICAL ABILITY

Number Systems, Number series, Decimal Fractions, Simplification, Square Roots and CubeRoots, LCM and HCF, Average, Problems on Ages.

UNIT-II NUMERICAL COMPUTATION

Surds & Indices, Logarithm, Permutation and Combinations, Probability.

UNIT-III BASIC ARITHEMATIC

Percentages, Area, Partnership, Ratio and Proportion, Mixtures and Allegation

UNIT-IV CONCISE MATHEMATICS

Profit and Loss, Simple and Compound Interest, Time, Speed and Distance.

UNIT-V DATA INTERPRETATION

Data Interpretation, Tables, Column Graphs, Bar Graphs, Line Charts, Pie Chart, Venn Diagrams

TEXT BOOKS:

1. Analytical and Logical reasoning By Sijwali B S.
2. Quantitative aptitude for Competitive examination ByR S Agarwal.

REFERENCE BOOKS:

1. Analytical and Logical reasoning for CAT and other management entrance test By Sijwali B S.

e-Resources and Digital Material:

1. https://www.geeksforgeeks.org/aptitude-questions-and-answers/
2. https://www.indiabix.com/

COURSE OUTCOMES:

1. to understand the numerical systems

2. to understand the numerical calculations
3. to understand the concept of basic arithmetic
4. to understand the concept of concise mathematics
5. to analyze the data interpretations
6. to apply the concepts of aptitude in applications

Remarks:

nil

III B.Tech I Semester Course Structure

SANTHIRAM ENGINEERING COLLEGE

(AUTONOMOUS)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech. I Sem. - Course Structure

S.No	Subject Code	Course Category	Name of the Subject	Hours/Week				Marks		
				Lecture	Tutorial	Practical	Credits	Internal	External	Total
1	23A04517	PC	ANALOG AND DIGITAL IC APPLICATIONS	3	0	0	3	30	70	100
2	23A04518	PC	ANTENNAS & WAVE PROPAGATION	3	0	0	3	30	70	100
3	23A04519	PC	MICROPROCESSORS AND MICROCONTROLLERS	3	0	0	3	30	70	100
4	23A05517	PC	INTRODUCTION TO QUANTUM TECHNOLOGIES AND APPLICATIONS	3	0	0	3	30	70	100
5	23A04520	PE	PE-I:COMPUTER ARCHITECTURE & ORGANIZATION	3	0	0	3	30	70	100
6	23A04521	PE	PE-I:INFORMATION THEORY AND CODING	3	0	0	3	30	70	100
7	23A04522	PE	PE-I:DETECTION AND ESTIMATION THEORY	3	0	0	3	30	70	100
8	23A01501	OE	OE-I:GREEN BUILDINGS	3	0	0	3	30	70	100
9	23A01502	OE	OE-I:CONSTRUCTION TECHNOLOGY AND MANAGEMENT	3	0	0	3	30	70	100
10	23A02503	OE	OE-I:ELECTRICAL SAFETY PRACTICES AND STANDARDS	3	0	0	3	30	70	100
11	23A03504	OE	OE-I:SUSTAINABLE ENERGY TECHNOLOGIES	3	0	0	3	30	70	100
12	23A05518	OE	OE-I:JAVA PROGRAMMING	3	0	0	3	30	70	100
13	23A33504	OE	OE-I:FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE	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
19	23A04523	PC	ANALOG & DIGITAL IC APPLICATIONS LAB	0	0	3	1.5	30	70	100
20	23A04524	PC	MICROPROCESSORS AND MICROCONTROLLERS LAB	0	0	3	1.5	30	70	100
21	23A04525	SC	PCB DESIGN AND PROTOTYPE DEVELOPMENT (SKILL ENHANCEMENT COURSE)	0	1	2	2	30	70	100
22	23A04526	SC	TINKERING LAB	0	0	2	1	30	70	100
23	23A04411	OE	SS-LINEAR CONTROL SYSTEMS	3	0	0	3	30	70	100

III B.Tech I
Semester Syllabus

SANTHIRAM ENGINEERING COLLEGE

(AUTONOMOUS)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech. I Sem.

L	T	P	C
3	0	0	3

(23A04517) ANALOG AND DIGITAL IC APPLICATIONS

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

COURSE OBJECTIVES:

1. To introduce the classification of Integrated Circuits, internal blocks and characteristics of Op-Amp.
2. To analyse linear and non-linear applications of Op-Amp .
3. To gain knowledge on active filters, timers and phased locked loops.
4. To understand the working of Voltage Regulators and Converters.
5. To study about different types of Digital ICs and their applications

UNIT-I INTEGRATED CIRCUITS AND OPERATIONAL AMPLIFIER

Introduction, Classification of IC's, IC chip size and circuit complexity, basic information of Op-Amp IC741 and its features, the ideal Operational amplifier, Op-Amp internal circuit, Op-Amp characteristics - DC and AC, Features of 741 Op-Amp.

UNIT-II APPLICATIONS OF OP- AMP

Linear Applications of Op-Amp: Inverting, non-inverting, Differential amplifiers, adder, sub-tractor, Instrumentation amplifier, AC amplifier, V to I and I to V converters, Integrator and differentiator.

Non-Linear Applications of Op-Amp: Sample and Hold circuit, Log and Antilog amplifier, multiplier and divider, Comparators, Schmitt trigger, Multi vibrators, Triangular and Square waveform generators, Oscillators.

UNIT-III ACTIVE FILTERS AND OTHER ICS

Active Filters: Introduction, Butterworth filters 1st order, 2nd order low pass and high pass filters, band pass, band reject and all pass filters.

Timer and Phase Locked Loops: Introduction to IC 555 timer, description of functional diagram, monostable and astable operations and applications, Schmitt trigger, PLL - introduction, basic principle, phase detector/comparator, voltage controlled oscillator (IC 566), low pass filter, monolithic PLL and applications of PLL.

UNIT-IV VOLTAGE REGULATORS AND CONVERTERS

Voltage Regulator: Introduction, Series Op-Amp regulator, IC Voltage Regulators, IC 723 general purpose regulators, Switching Regulator.

D to A and A to D Converters: Introduction, basic DAC techniques - weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, A to D converters - parallel comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC, DAC and ADC Specifications.

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UNIT-V DIGITAL ICS

CMOS Logic: CMOS logic levels, MOS transistors, Basic CMOS Inverter, Basic Gates, NAND and NOR gates, CMOS AND-OR-INVERT and OR-AND-INVERT gates, implementation of any function using CMOS logic.

Combinational Logic IC's: Specifications and Applications of TTL-74XX & CMOS 40XX Series ICs - Code Converters, Decoders, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Parallel Binary Adder/ Subtractor, Magnitude Comparators.

Sequential Logic IC's: Familiarity with commonly available 74XX & CMOS40XX Series ICs - All Types of Flip-flops, Synchronous Counters, Decade Counters, Shift Registers.

TEXT BOOKS:

1. D. Roy Choudhury, Shail B. Jain, —Linear Integrated Circuit‖, 4th edition (2012), New Age International Pvt.Ltd., New Delhi, India
2. Floyd, Jain, —Digital Fundamentals‖, 8th edition (2009), Pearson Education, New Delhi.
3. Digital Design Principles & Practices – John F. Wakerly, PHI/ Pearson Education Asia, 3rd Ed., 2005.

REFERENCE BOOKS:

1. Ramakant A. Gayakwad, —OP-AMP and Linear Integrated Circuits‖, 4th edition (2012), Prentice Hall / Pearson Education, New Delhi.
2. Sergio Franco (1997), Design with operational amplifiers and analog integrated circuits, McGraw Hill, New Delhi.
3. Gray, Meyer (1995), Analysis and Design of Analog Integrated Circuits, Wiley International, New Delhi.

e-Resources and Digital Material:

1. https://www.youtube.com/watchv=lpXNCwsnxjM&list=PLuv3GM6-gsE3npYPJJDnEF3pdiHZT6Kj3
2. https://www.youtube.com/watchv=CrCfpCzD_wk&list=PLwdnzlV3ogoUdwipmit62VoN9fr1fP9Re
3. https://www.youtube.com/watchv=I8tbRibujcY&list=PLPD7Ds2_Il0ggKZeS7jsx8N7k1DovnjTg

COURSE OUTCOMES:

1. Understand the classification of Integrated Circuits, internal blocks and characteristics of Op-Amp.
2. Design different amplifier and oscillator circuits using op-amp.
3. Construct different active filters using op-amp, timer Circuits using IC555 and phased locked loops.
4. Understand the working of Voltage Regulators and Converters.
5. Design different types of Digital Circuits using Digital ICs.

Remarks:

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech. I Sem.

L	T	P	C
3	0	0	3

(23A04518) ANTENNAS & WAVE PROPAGATION

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

COURSE OBJECTIVES:

1. To learn the antennas basic terminology, radiation mechanism of antennas and dipole antennas.
2. To gain knowledge on HF, VHF & UHF antennas, their operation and applications.
3. Analyze the working and applications of Microwave antennas.
4. Understand different techniques involved in the design of antenna arrays and antenna parameter measurements.
5. To study the various types of radio wave propagation methods.

UNIT-I ANTENNA BASICS & DIPOLE ANTENNAS

Antenna Basics & Dipole antennas: Definition of antenna, Radiation Mechanism single wire, two wire, dipoles, Antenna Parameters - Radiation Patterns, Main Lobe and Side Lobes, Beam widths, Beam Area, Radiation Intensity, Beam Efficiency, Directivity, Gain and Resolution, Aperture Efficiency, Effective Height and length, Antenna Theorems. Radiation Basic Maxwells equations, Retarded potential-Helmholtz Theorem, Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole Current Distributions, Field Components, Radiated power, Radiation Resistance, Beam width, Natural current distributions, far fields and patterns of Thin Linear Center-fed Antennas of different lengths, Illustrative problems.

UNIT-II HF, VHF AND UHF ANTENNAS

HF, VHF and UHF Antennas: Loop Antennas - Introduction, Small Loop, Comparison of far fields of small loop and short dipole, Radiation Resistances and Directives of small and large loops (Qualitative Treatment), Arrays with Parasitic Elements - Yagi - Uda Arrays, Folded Dipoles & their characteristics. Log periodic Antenna, Helical Antennas-Helical Geometry, Helix modes, Practical Design considerations for Monofilar Helical Antenna in Axial and Normal Modes. Horn Antennas- Types, Fermats Principle, Optimum Horns, Design considerations of Pyramidal Horns, Illustrative Problems.

UNIT-III MICROWAVE ANTENNAS

Microwave Antennas: Microstrip Antennas- Introduction, features, advantages and limitations, Rectangular patch antennas- Geometry and parameters, characteristics of Micro strip antennas, Impact of different parameters on characteristics, reflector antennas - Introduction, Flat sheet and corner reflectors, parabola reflectors- geometry, pattern characteristics, Feed Methods, Reflector Types - Related Features, Lens Antennas - Geometry of Non-metallic Dielectric Lenses, Zoning , Tolerances, Applications, Illustrative Problems.

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

UNIT-IV ANTENNA ARRAYS

Antenna Arrays: Point sources - Definition, Patterns, arrays of 2 Isotropic sources-Different cases, Principle of Pattern Multiplication, Uniform Linear Arrays Broadside Arrays, Endfire Arrays, EFA with Increased Directivity, Derivation of their characteristics and comparison, BSAa with Non-uniform Amplitude Distributions - General considerations and Bionomial Arrays, Illustrative problems.

Antenna Measurements: Introduction, Sources of errors, Patterns to be Measured, Pattern Measurement Arrangement, Directivity Measurement, Gain Measurements (by comparison, Absolute and 3-Antenna Methods).

UNIT-V WAVE PROPAGATION

Wave Propagation: Introduction, Definitions, Characterizations and general classifications, different modes of wave propagation, Ray/Mode concepts, Ground wave propagation (Qualitative treatment) - Introduction, Plane earth reflections, Space and surface waves, wave tilt, curved earth reflections, Space wave propagation - Introduction, field strength variation with distance and height, effect of earths curvature, absorption, Super refraction, M-curves and duct propagation, scattering phenomena, tropospheric propagation, fading and path loss calculations, Sky wave propagation - Introduction, structure of Ionosphere, refraction and reflection of sky waves by Ionosphere, Ray path, Critical frequency, MUF, LUF, OF, Virtual height and Skip distance, Relation between MUF and Skip distance, Multi-HOP propagation, Energy loss in Ionosphere, Summary of Wave Characteristics in different frequency ranges, Illustrative problems.

TEXT BOOKS:

1. John D. Kraus, Ronald J. Marhefka and Ahmad S.Khan, Antennas and wave propagation, TMH, New Delhi, 4th Ed., 2010.
2. C.A. Balanis, Antenna Theory- Analysis and Design, John Wiley & Sons, 2nd Edn., 2001.
3. K.D. Prasad and SatyaPrakashan, Antennas and Wave Propagation, New Delhi, Tech. India Publications, 2001.

REFERENCE BOOKS:

1. E.C. Jordan and K.G. Balmain,Electromagnetic Waves and Radiating Systems, 2nd Edition, PHI, 2000.
2. G.S.N Raju, Antenna and Wave Propagation, Pearson Education India, 3rd Edition 2009.
3. R K Shevgaonkar,Electromagnetic Waves. Tata McGraw-Hill, 2006

e-Resources and Digital Material:

1. https://nptel.ac.in/courses/108101092

COURSE OUTCOMES:

1. Understand the antennas basic terminology and radiation mechanism of antennas.

2. Gain knowledge on VHF and UHF antennas, their operation and applications.
3. Design and analyze the working and applications of Microwave antennas.
4. Analyze different techniques involved in the design of antenna arrays and antenna parameter measurements.
5. Gain a comprehensive knowledge about the types of radio wave propagation methods.

SANTHIRAM ENGINEERING COLLEGE

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech. I Sem.

L	T	P	C
3	0	0	3

(23A04519) MICROPROCESSORS AND MICROCONTROLLERS

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

COURSE OBJECTIVES:

1. To learn the fundamental architectural concepts of microprocessors
2. To gain knowledge about assembly language programming concepts.
3. To get familiar about 8086 interfacing.
4. To understand the fundamentals of the 8051 Microcontroller.
5. To learn interfacing with the 8051 Microcontroller.

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

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

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, 3rdEdition,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. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System Design, 2nd edition, Pearson, 2012.
2. Kenneth J. Ayala, The 8051 Microcontroller, 3rd edition, Cengage Learning, 2004.

COURSE OUTCOMES:

1. Learn the fundamental architectural concepts of microprocessors.
2. Gain knowledge about assembly language programming concepts.
3. Understand the concepts of 8086 interfacing.
4. Learn the fundamentals of the 8051 Microcontroller.
5. Know the interfacing with the 8051 Microcontroller.

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

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

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

What is a qubit Conceptual understanding using spin and polarization, Comparison: classical bits vs quantum bits, Quantum systems: trapped ions, superconducting circuits, photons (non-engineering 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

UNIT-III 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, Visionvs reality: what's working and what remains elusive, The role of quantum software in managing theoretical complexities

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

UNIT-IV 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

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.
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. Department of Science & Technology (DST), Government of India, National Mission on Quantum Technologies & Applications – Official Reports and Whitepapers, MeitY/DST Publications, 2020 onward.

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 ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech. I Sem.

L	T	P	C
3	0	0	3

(23A04520) PE-I:COMPUTER ARCHITECTURE & ORGANIZATION

Course Category	**Professional Elective (PE)**
Course Enrichment Relevance	**Employability**

COURSE OBJECTIVES:

1. To learn the design of various functional units of digital computers and performance issues of computer systems.
2. To understand the basic processing unit and their connections.
3. To get familiar with different types of Data representation and Computer Arithmetic operations.
4. To know about different types of memory and their interconnections.
5. To learn the basics of parallel computing and pipelining.

UNIT-I DIGITAL COMPUTERS & REGISTER TRANSFER LANGUAGE AND MICRO OPERATIONS & BASIC COMPUTER ORGANIZATION AND DESIGN

Digital Computers & Register Transfer Language and Micro operations & Basic Computer Organization and Design: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit. Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

UNIT-II MICRO PROGRAMMED CONTROL & CENTRAL PROCESSING UNIT

Micro programmed Control & Central Processing Unit: Control memory, Address sequencing, micro program example, design of control unit. General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.

UNIT-III DATA REPRESENTATION & COMPUTER ARITHMETIC

Data Representation & Computer Arithmetic: Data types, Complements, Fixed Point Representation, Floating Point Representation. Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

UNIT-IV INPUT-OUTPUT ORGANIZATION & MEMORY ORGANIZATION

Input-Output Organization & Memory Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access. Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

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UNIT-V REDUCED INSTRUCTION SET COMPUTER

Reduced Instruction Set Computer: CISC Characteristics, RISC Characteristics. Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processor. Multi Processors: Characteristics of Multiprocessors, Interconnection Structures, Inter-processor arbitration, Inter-processor communication and synchronization, Cache Coherence.

TEXT BOOKS:

1. Computer System Architecture – M. Moris Mano, Third Edition, Pearson/PHI.

REFERENCE BOOKS:

1. Computer Organization – Car Hamacher, ZvonksVranesic, SafeaZaky, Vth Edition, McGraw Hill.
2. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.
3. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition, PHI/Pearson.

e-Resources and Digital Material:

1. https://nptel.ac.in/courses/106105163

COURSE OUTCOMES:

1. Learn the design of various functional units of digital computers and performance issues of computer systems.
2. Understand the basic processing unit and their connections.
3. Know about different types of Data representation and Computer Arithmetic operations.
4. Learn about different types of memory and their interconnections.
5. Understand the basics of parallel computing and pipelining

SANTHIRAM ENGINEERING COLLEGE

(AUTONOMOUS)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech. I Sem.

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(23A04521) PE-I:INFORMATION THEORY AND CODING

Course Category	**Professional Elective (PE)**
Course Enrichment Relevance	**Employability**

COURSE OBJECTIVES:

1. To provide an insight into the concept of information in the context of communication theory and communication receivers.
2. To implement various source coding algorithms and analyze their performance.
3. To gain knowledge about techniques for error detection and error correction.
4. To design linear block codes and cyclic codes.
5. To get familiar with various convolutional codes.

UNIT-I INFORMATION THEORY

:Introduction, Definition of Entropy, Conditional Entropy, Relative Entropy, Basic Properties of Entropy, Mutual Information, Information Inequalities, Problem solving.
Block to Variable length Coding: Prefix-free Code, Coding a single Random Variable, Prefix, Free Code, Kraft Inequality, Bounds on optimal Code length, Coding a Single Random Variable, Rooted Tree with Probabilities, Shanon-Fano Coding, Free fix code, Coding an information Source, Huffman Coding, Example. Variable to Block Length Coding: Proper message set, Assigning probabilities to K-ary rooted tree corresponding to a proper message set, Prefix free Coding of a proper message set, Tunstall message set, Tunstall coding.

UNIT-II ASYMPTOTIC EQUI-PARTITION PROPERTY

Asymptotic Equi-partition Property, Chebyshev inequality, Weak law of large numbers, Typical Sequences, Block to Block Coding of DMS: Consequences of Asymptotic Equipartition Property, Problem solving. Universal Source Coding: Lempel-Ziv Algorithm, LZ -77 Encoding and Decoding, Lempel- Ziv Welch (LZW) Algorithm, LZW Encoding, and Decoding.Coding of Sources with memory, Channel Capacity, Noisy Channel Coding Theorem, Differential Entropy, Gaussian Channel, Rate Distortion Theory, Blahut-Arimoto Algorithm, problem solving.

UNIT-III ERROR CONTROL CODING

:Introduction to Error Control Codes, Error Probability with Repetition in the Binary Symmetric Channel, Parity Check Bit Coding for Error Detection, Block Coding for Error Detection and Correction, The Hamming Distance, The upper bound of the Probability of Error with Coding, Soft Decision Decoding, Hard Decision Decoding.

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UNIT-IV LINEAR BLOCK CODES

Introduction to Linear Block Codes, Syndrome and Error Detection, Encoding Block Codes, Decoding of Block Codes, Single Parity Check bit Code, Repeated Codes, Hadamard Code, Hamming Code, Cyclic Codes, Generator and Parity-Check Matrices of Cyclic Codes, Encoding and Decoding of Cyclic Codes, BCH codes, Reed-Solomon Code.

UNIT-V CONVOLUTIONAL CODING

Convolutional Coding, Code Generation, Decoding Convolutional Code, the Code Tree, Decoding in the presence of Noise, State and Trellis Diagrams, The Viterbi Algorithm, Comparison of Error Rates in Coded and Uncoded Transmission, Turbo Codes, LDPC codes, Hard and Soft Decision Decoding.

TEXT BOOKS:

1. Thomas M.Cover, Joy A. Thomas, Elements of Information Theory, John Wiley & Sons,2nd Edition, 2006.
2. Herbert Taub, Donald L Shilling, Goutam Saha, Principles of Communication Systems, 4th Edition, McGraw Hill, 2017.

REFERENCE BOOKS:

1. Shu Lin, Daniel J. Costello Jr., Error Control Coding, Pearson, Second Edition, 2013.
2. Simon Haykin, Communication Systems, John Wiley, 4th Edition, 2010.

COURSE OUTCOMES:

1. Learn the concepts of information in the context of communication theory and communication receivers.
2. Implement various source coding algorithms and analyze their performance.
3. Gain knowledge about techniques for error detection and error correction.
4. Design linear block codes and cyclic codes.
5. Understand various convolutional codes.

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(23A04522) PE-I:DETECTION AND ESTIMATION THEORY

Course Category	**Professional Elective (PE)**
Course Enrichment Relevance	**Employability**

COURSE OBJECTIVES:

1. To understand the impact of white Gaussian noise on the detection of signals.
2. To analyze the detection of deterministic signals and random signals.
3. To learn about the nonparametric detections.
4. To analyze estimation signal parameter and apply suitable estimation techniques.
5. To understand the signal estimation in Discrete-Time techniques.

UNIT-I STATISTICAL DECISION THEORY

:

Review of Gaussian variables and processes; problem formulation and objective of signal detection and signal parameter estimation in discrete-time domain. Bayesian, minimax, and Neyman-Pearson decision rules, likelihood ratio, receiver operating characteristics, composite hypothesis testing, locally optimum tests, detector comparison techniques, asymptotic relative efficiency.

UNIT-II DETECTION OF DETERMINISTIC SIGNALS

:

Matched filter detector and its performance; generalized matched filter; detection of sinusoid with unknown amplitude, phase, frequency and arrival time, linear model. Detection of Random Signals: Estimator-correlator, linear model, general Gaussian detection, detection of Gaussian random signal with unknown parameters, weak signal detection

UNIT-III NONPARAMETRIC DETECTION

:

Detection in the absence of complete statistical description of observations, sign detector, Wilcoxon detector, detectors based on quantized observations, robustness of detectors.

UNIT-IV ESTIMATION OF SIGNAL PARAMETERS

:

Minimum variance unbiased estimation, Fisher information matrix, Cramer-Rao bound, sufficient statistics, minimum statistics, complete statistics; linear models; best linear unbiased estimation; maximum likelihood estimation, invariance principle; estimation efficiency; Bayesian estimation: philosophy, nuisance parameters, risk functions, minimum mean square error estimation, maximum a posteriori estimation.

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UNIT-V SIGNAL ESTIMATION IN DISCRETE-TIME

:

Linear Bayesian estimation, Weiner filtering, dynamical signal model, discrete Kalman filtering.

TEXT BOOKS:

1. H. L. Van Trees, "Detection, Estimation and Modulation Theory: Part I, II, and III", John Wiley, NY, 1968.
2. H. V. Poor, "An Introduction to Signal Detection and Estimation", Springer, 2/e, 1998.

REFERENCE BOOKS:

1. S. M. Kay, ”Fundamentals of Statistical Signal Processing: Estimation Theory”, Prentice Hall PTR, 1993.
2. S. M. Kay, ”Fundamentals of Statistical Signal Processing: Detection Theory”, Prentice Hall PTR, 1998.

COURSE OUTCOMES:

1. Understand the impact of white Gaussian noise on the detection of signals.
2. Analyze the detection of deterministic signals and random signals.
3. Learn about the nonparametric detections.
4. Analyze estimation signal parameter and apply suitable estim.ation techniques.
5. Understand the signal estimation in Discrete-Time techniques

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(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 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 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 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 AIR CONDITIONING- INTRODUCTION,

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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UNIT-V MATERIAL CONSERVATION

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

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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(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 aspectsin construction management
5. To assess safety management practices, accident prevention strategies, and quality management systemsin construction.

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 ANDPROJECT MANAGEMENT

:

Planning Stages, Construction Schedules and B.Tech.– Electronics & Communication Engineering JNTUAR23Regulations 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 forLabour, 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.

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.

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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. andPlotnick, F.L., CPMin Construction Management, Mcgraw Hill, 2010.
2. Punmia, B.C., andKhandelwal, 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 andOrganisational Behaviour, Wiley Blackwell, 2016.

COURSE OUTCOMES:

1. Understand (Cos)project management fundamentals, organizational structures, and leadership principles in construction.
2. Analyze manpower planning, equipment management, and cost estimationin 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 aspectsin construction management.
5. Assess safety management practices, accident prevention strategies, and quality management systems in construction.

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

Course Category	**Open Elective (OE)**
Course Enrichment Relevance	**Employability**

COURSE OBJECTIVES:

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

UNIT-I INTRODUCTIONTOELECTRICALSAFETY

Fundamentals ofElectricalsafety-ElectricShock-physiologicaleffects of electric current Safetyrequirements–Hazardsofelectricity-Arc-Blast-Causesforelectricalfailure.

UNIT-II SAFETY COMPONENTS

Introduction to conductors and insulators- voltage classification -safety against over voltages- safety Fireextinguishersforelectricalsafety

UNIT-III GROUNDING

General requirements for grounding and bonding- Definitions- System grounding Equipment grounding -The Earth-Earthingpractices-Determiningsafeapproachdistance Determiningarchazardcategory.

UNIT-IV SAFETYPRACTICES

Generalfirstaid-Safetyinhandlinghandheldelectricalappliancestools-Electricalsafetyintrain stations-swimmingpools,externallightinginstallations,medicallocations-Casestudies.

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 electricalinspectorate

TEXT BOOKS:

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

REFERENCE BOOKS:

1. KennethG.Mastrullo, RayA.Jones,TheElectricalSafetyProgramBook,Jones andBartlettPublishers,London, 2nd Edition, 2011.
2. PalmerHickman,ElectricalSafety RelatedWorkPractices,Jones&BartlettPublishers,London,2009
3. FordhamCooper,W.,Electrical Safety Engineering, Butterworth and Company, London,1986.
4. JohnCadick,MaryCapelli SchellpfefferDennisK.Neitzel,ElectricalSafetyHandbook,McGraw Hill,NewYork,USA, 4th edition, 2012.

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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(23A03504) OE-I:SUSTAINABLE ENERGY TECHNOLOGIES

Course Category	**Open Elective (OE)**
Course Enrichment Relevance	**Employability**

COURSE OBJECTIVES:

1. To demonstrate the importance the impact of solar radiation, solar PVmodules
2. To understand the principles of storage in PV systems
3. To discuss solar energy storage systems and their applications.
4. To get knowledge in wind energy and bio-mass
5. To 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 titled 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.

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.

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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 Krieth& 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:

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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(23A05518) OE-I:JAVA PROGRAMMING

Course Category	**Open Elective (OE)**
Course Enrichment Relevance	**Employability**

COURSE OBJECTIVES:

1. Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
2. Learn how to extend Java classes with inheritance and dynamic binding and how to use exception
3. Handling in Java applications
4. Understand how to design applications with threads in Java
5. Understand how to use Java apisfor 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 printf() 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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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 ClassObject 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 Autounboxing, 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.

REFERENCE BOOKS:

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

COURSE OUTCOMES:

1. Analyze problems, design solutions using OOP principles, and implement them efficiently in Java.
2. Design and implement classes to model real-world entities, with a focus on attributes, behaviors, and relationships between objects
3. Demonstrate an understanding of inheritance hierarchies and polymorphic behaviour, including method overriding and dynamic method dispatch.
4. Apply Competence in handling exceptions and errors to write robust and fault-tolerant code.
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

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(23A33504) OE-I:FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE

Course Category	**Open Elective (OE)**
Course Enrichment Relevance	**Employability**

COURSE OBJECTIVES:

1. To learn the distinction between optimal reasoning Vs. human like reasoning.
2. To understand the concepts of state space representation, exhaustive search, heuristic
3. search together with the time and space complexities.
4. To learn different knowledge representation techniques.
5. To understand the applications of AI, namely game playing, theorem proving, and machine learning.

UNIT-I INTRODUCTION TO AI ,SEARCHING FOR SOLUTIONS

Introduction to AI ,Searching for Solutions: Intelligent Agents, Problem-Solving Agents, Breadth-first search, Depth-first search, Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces.

UNIT-II GAMES ,LOGIC

Games, logic: Optimal Decisions in Games, Alpha–Beta Pruning, Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Knowledge-Based Agents, Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses.

UNIT-III FIRST-ORDER LOGIC ,KNOWLEDGE REPRESENTATION

First-Order Logic ,Knowledge Representation: Syntax and Semantics of First-Order Logic, Using First Order Logic, Knowledge Engineering in First-Order Logic. Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification, Forward Chaining, Backward Chaining, Resolution .Ontological Engineering, Categories and Objects, Events.

UNIT-IV PLANNING

Planning: Definition of Classical Planning, Algorithms for Planning with State Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches. Hierarchical Planning.

UNIT-V PROBABILISTIC REASONING

Probabilistic Reasoning: Acting under Uncertainty, Basic Probability Notation Bayes' Rule and Its Use, Probabilistic Reasoning, Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First- Order Probability.

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TEXT BOOKS:

1. Artificial Intelligence: A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.

REFERENCE BOOKS:

1. Artificial Intelligence, 3rd Edn., E. Rich and K. Knight (TMH)
2. Artificial Intelligence, 3rd Edn., Patrick Henny Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education.

COURSE OUTCOMES:

1. Learn the distinction between optimal reasoning Vs human like reasoning and formulate an efficient problem space for a problem expressed in natural language. Also select a search algorithm for a problem and estimate its time and space complexities.
2. Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.
3. Learn different knowledge representation techniques.
4. Understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
5. Comprehend the applications of Probabilistic Reasoning and Bayesian Networks.
6. Analyze Supervised Learning Vs. Learning Decision Trees UNIT - I Introduction to AI - Intelligent Agents, Problem-Solving Agents,

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(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 analysing 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 Learningby 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.

COURSE OUTCOMES:

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

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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, Braggs 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 BanwellandElaine 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

COURSE OUTCOMES:

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

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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.

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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.

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
3	0	0	3

(23A94505) OE-I:ENGLISH 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

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

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

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.

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REFERENCE BOOKS:

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.

COURSE OUTCOMES:

1. Identify the basics of English grammar and its importance
2. Explain the use of grammatical structures in sentences
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.
5. Choose the appropriate form of verbs in framing sentences
6. Develop speed reading and comprehending ability thereby perform better in competitive exams

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III B.Tech. I Sem.

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 – 16industries 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 analysing 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 - Analysing 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.

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 customer's 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 if 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 – Lean 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 analysing 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 investors ready pitch

TEXT BOOKS:

1. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha . Entrepreneurship, McGrawHill, 11th Edition.(2020)

2. Osterwalder, A., & Pigneur, Y. Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. John Wiley & Sons. (2010).

REFERENCE BOOKS:

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

e-Resources and Digital Material:

1. Learning resource- Ignite 5.0 Course Wadhwani platform (Includes 200+ components of custom created modular content + 500+ components of the most relevant curated content)

COURSE OUTCOMES:

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

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III B.Tech. I Sem.

L	T	P	C
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(23A04523) ANALOG & DIGITAL IC APPLICATIONS LAB

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

COURSE OBJECTIVES:

1. To design an Inverting and Non-inverting Amplifier using an Op Amp.
2. To demonstrate the Linear and Non-Linear Applications using IC 741.
3. To design Astable and Monostable Multivibrator using timer ICs.
4. To analyse the DAC and ADC converter.
5. To design Counters and Registers using digital ICs.

1. Design an Inverting and Non-inverting Amplifier using Op Amp and calculate gain.

2. Design Adder and Subtractor using Op Amp and verify addition and subtraction process.

3. Design a Comparator using Op Amp and draw the comparison results of A=B, A>B, A<B

4. Design a Integrator and Differentiator Circuits using IC741 and derive the required condition

practically.

5. Design a Active LPF, HPF cutoff frequency of 2 KHZ and find the roll off of it.

6. Design a Circuit using IC741 to generate sine/square/triangular wave with period of 1KHZ

and draw the output waveform.

7. Construct Mono-stable Multivibrator using IC555 and draw its output waveform.

8. Construct Astable Multivibrator using IC555 and draw its output waveform and also find its

duty cycle.

9. Design a Schmitt Trigger Circuit and find its LTP and UTP.

10. Design Voltage Regulator usingIC723, IC 7805/7809/7912 and find its load regulation

factor.

11. Design R-2R ladder DAC and find its resolution and write a truth table with respective

voltages.

12. Design Parallel comparator type/ counter type/ successive approximation ADC and find its

efficiency.

13. Design a 8x1 multiplexer using digital ICs.

14. Design a 4-bit Adder/Subtractor using digital ICs

15. Design a Decade counter and verify its truth table and draw respective waveforms.

16. Design a Up/down counter usingIC74163 and draw read/write waveforms.

17. Design a Universal shift register using IC 74194/195 and verify its shifting operation.

18. Design a 8x3 encoder/3x8 decoder and verify its truth table.

TEXT BOOKS:

1. D. Roy Choudhury, Shail B. Jain, —Linear Integrated Circuit‖, 4th edition (2012), New Age International Pvt.Ltd., New Delhi, India
2. Floyd, Jain, —Digital Fundamentals‖, 8th edition (2009), Pearson Education, New Delhi.

REFERENCE BOOKS:

1. Ramakant A. Gayakwad, —OP-AMP and Linear Integrated Circuits‖, 4th edition (2012), Prentice Hall / Pearson Education, New Delhi.
2. Sergio Franco (1997), Design with operational amplifiers and analog integrated circuits, McGraw Hill, New Delhi.
3. Gray, Meyer (1995), Analysis and Design of Analog Integrated Circuits, Wiley International, New Delhi.

e-Resources and Digital Material:

1. https://www.youtube.com/watch?v=R8yJERhDNIc&list=PLPD7Ds2_Il0ggKZeS7jsx8N7k1DovnjTg&index=2
2. https://www.youtube.com/watch?v=CrCfpCzD_wk&list=PLwdnzlV3ogoUdwipmit62VoN9fr1fP9Re

COURSE OUTCOMES:

1. Design an Inverting and Non-inverting Amplifier using an Op Amp.
2. Demonstrate the Linear and Non-Linear Applications using IC 741.

3. Design Astable and Monostable Multivibrator using timer ICs.
4. Analyse the DAC and ADC converter.
5. Design Counters and Registers using digital ICs.

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L	T	P	C
0	0	3	1.5

(23A04524) MICROPROCESSORS AND MICROCONTROLLERS LAB

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

COURSE OBJECTIVES:

1. To become skilled in 8086 Assembly Language programming.
2. To understand the detailed software and hardware structure of the microprocessor.
3. Train their practical knowledge through laboratory experiments.
4. To understand and learn 8051 Microcontroller.
5. To acquire knowledge on microprocessors and microcontrollers, interfacing various peripherals, and configuring.

List of Experiments: (Any TEN of the experiments are to be conducted)

1. Programs for 16 Bit Arithmetic Operations (Using various addressing modes)

a) Write an ALP to Perform Addition and Subtraction of Multi precision numbers.

b) Write an ALP to Perform Multiplication and division of signed and unsigned Hexadecimal numbers.

c) Write an ALP to find square, cube and factorial of a given number.

2. Programs Involving Bit Manipulation Instructions

a) Write an ALP to find the given data is positive or negative.

b) Write an ALP to find the given data is odd or even.

c) Write an ALP to find Logical ones and zeros in a given data.

3. Programs on Arrays for 8086

a) Write an ALP to find Addition/subtraction of N no_s.

b) Write an ALP for finding largest/smallest no.

c) Write an ALP to sort given array in Ascending/descending order.

4. Programs on String Manipulations for 8086

a) Write an ALP to find String length.

b) Write an ALP for Displaying the given String.

c) Write an ALP for Comparing two Strings.

d) Write an ALP to reverse String and Checking for palindrome.

5. Programs for Digital Clock Design Using 8086

a) Write an ALP for Designing clock using INT 21H Interrupt.

b) Write an ALP for Designing clock using DOS Interrupt Functions.

c) Write an ALP for Designing clock by reading system time.

6. Interfacing Stepper Motor with 8086

a) Write an ALP to 8086 processor to Interface a stepper motor and operate it in clockwise by choosing variable step-size.

b) Write an ALP to 8086 processor to Interface a stepper motor and operate it in Anti-clockwise by choosing variable step-size.

7. Interfacing ADC/DAC with 8086

a) Write an ALP to 8086 processor to Interface ADC.

b) Write an ALP to 8086 processor to Interface DAC and generate Square Wave/Triangular Wave/Step signal.

8. Communication between Two Microprocessors

a) Write an ALP to have Parallel communication between two microprocessors using 8255

b) Write an ALP to have Serial communication between two microprocessor kits using 8251.

9. Programs using Arithmetic and Logical Instructions for 8051

a) Write an ALP to 8051 Microcontroller to perform Arithmetic operations like addition, subtraction,

b) Write an ALP to 8051 Microcontroller to perform Arithmetic operations like Multiplication and Division.

c) Write an ALP to 8051 Microcontroller to perform Logical operations like AND, OR and

XOR.

d) Programs related to Register Banks.

10. Programs to Verify Timers/Counters of 8051

a) Write a program to create a delay of 25msec using Timer0 in mode 1 and blink all the Pins of P0.

b) Write a program to create a delay of 50 µsec using Timer1 in mode 0 and blink all the Pins of P2.

c) Write a program to create a delay of 75msec using counter0 in mode 2 and blink all the Pins of P1.

d) Write a program to create a delay of 80 µsec using counter1 in mode 1 and blink all the Pins of P3.

11. UART Operation in 8051

a) Write a program to transfer a character serially with a baud rate of 9600 using UART.

b) Write a program to transfer a character serially with a baud rate of 4800 using UART.

c) Write a program to transfer a character serially with a baud rate of 2400 using UART.

12. Interfacing LCD with 8051

a) Develop and execute the program to interface16*2 LCD to 8051.

b) Develop and execute the program to interface LCD to 8051 in 4-bit or 8-bit mode.

REFERENCE BOOKS:

1. Kenneth.J.Ayala. The 8051 microcontroller, 3rd edition, Cengage learning,2010.
2. Advanced microprocessors and peripherals-A.K ray and K.M.Bhurchandani, TMH, 2nd edition2006.
3. The 8051 Microcontroller and Embedded Systems: Using Assembly and C by Muhammad AliMazidi, Janice GillispieMazidi, Second Edition.

COURSE OUTCOMES:

1. Formulate a program and implement algorithms using Assembly language.
2. Describe an Assembly language program for the 8086 Microprocessor.
3. Develop programs for different applications in the 8086 Microprocessor.
4. Interface peripheral devices with 8086 and 8051.

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5. Use an Assembly/Embedded C programming approach for solving real-world problems.

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0	1	2	2

(23A04525) PCB DESIGN AND PROTOTYPE DEVELOPMENT (SKILL ENHANCEMENT COURSE)

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

COURSE OBJECTIVES:

1. Identifying Electronic Components Symbols & Footprints.
2. To analyse the capability to produce PCBs of their circuit.
3. To effectively use the design rules & interfacing between schematic & PCB.

UNIT I Fundamental of basic electronics: Component identification, Component symbols & their footprints, understand schematic, Creating new PCB, Browsing footprints libraries, Setting up the PCB layers, Design rule checking, Track width selection, Component selection, Routing and completion of the design

UNIT II Introduction to PCB: Definition and Need/Relevance of PCB, Background and History of PCB, Types of PCB, Classes of PCB Design, Terminology in PCB Design, Different Electronic design automation (EDA)tools and comparison.

UNIT III PCB Design Process: PCB Design Flow, Placement and routing, Steps involved in layout design, Artwork generation Methods - manual and CAD, General design factors for digital and analogue circuits, Layout and Artwork making for Single-side, double-side and Multilayer Boards, Design for manufacturability, Design-specification standards

1. Practice following PCB Design steps

Schematic Design: Familiarization of the Schematic Editor, Schematiccreation, Annotation, Netlist generation.

Layout Design: Familiarization of Footprint Editor, Mapping of components, Creation of PCB layout Schematic.

Create new schematic components.

Create new component footprints.

2. Regulator circuit using 7805

3. Inverting Amplifier or Summing Amplifier using op-amp

4. Full-wave Rectifier

5. Astable multivibrator using IC555

6. Monostable multivibrator using IC555

7. RCPhase-shifter oscillator using transistor.

8. Wein-bridge Oscillator using op- amp

9. Full-Adder using half-adders.

10. 4-bit binary /MOD N counter using D-Flip flops.

11. One open-ended (analog/ digital/mixed circuit) experiments of similar nature and magnitude to the above are to be assigned by the teacher (Student is expected to solve and execute/simulate independently).

12. Design an 8051 Development board having Power section consisting of IC7805, capacitor, resistor, headers, LED.

13. Design an 8051 Development board having Serial communication section consisting of MAX 232, Capacitors, DB9connector, Jumper, LEDs

14. Design an 8051 Development board having Reset & Input/output sections consisting of 89C51 Microcontroller, Electrolytic Capacitor, Resistor, Jumper, Crystal Oscillator, Capacitors

15. Fabricate a single-sided PCB, mount the components and assemble them in a cabinet for any one of the circuits mentioned in the above exercises.

TEXT BOOKS:

1. Jon Varteresian, Fabricating Printed Circuit Boards, z, 2002
2. R. Tummala, Fundamentals of Microsystems Packaging, McGraw-Hill 2001
3. C. Robertson. PCB Designers Reference. Prentice Hall, 2003

e-Resources and Digital Material:

1. https://www.wikihow.com/Create-Printed-Circuit-Boards
2. http://www.siongboon.com/projects/2005-09-07_home_pcb_fabrication/
3. http://reprap.org/wiki/MakePCBInstructions#Making_PCBs_yourself
4. https://www.youtube.com/watch?v=imQTCW1yWkg

COURSE OUTCOMES:

1. Students can design a schematic of their circuit.

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2. Students can design PCB layout of their design
3. Detailed description and practical of PCB designing.

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III B.Tech. I Sem.

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. Encourage Innovation and Creativity
2. Provide Hands-on Learning and Impart Skill Development
3. Foster Collaboration and Teamwork
4. Enable Interdisciplinary Learning, Prepare for Industry and Entrepreneurship
5. Impart Problem-Solving mind-set

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

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

COURSE OUTCOMES:

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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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III B.Tech. I Sem. L T P C

(23A99507) EVALUATION OF COMMUNITY SERVICE INTERNSHIP

Course Category	
Course Enrichment Relevance	

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

COURSE OUTCOMES:

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III B.Tech. I Sem.

L	T	P	C
3	0	0	3

(23A04411) SS-LINEAR CONTROL SYSTEMS

Course Category	**Open Elective (OE)**
Course Enrichment Relevance	**Employability**

COURSE OBJECTIVES:

1. Introduce the basic principles and applications of control systems
2. Learn the time response and steady state response of the systems.
3. Know the time domain analysis and solutions to time invariant systems
4. Understand different aspects of stability analysis of systems in frequency domain.
5. Understand the concept of state space, controllability and observability

UNIT-I CONTROL SYSTEMS CONCEPTS

Open loop and closed loop control systems and their differences- Examples of control systems- Classification of control systems, Feedback characteristics, Effects of positive and negative feedback, Mathematical models Differential equations of translational and rotational mechanical systems and electrical systems, Analogous Systems, Block diagram reduction methods Signal flow graphs - Reduction using Masons gain formula. Controller components, DC Servomotor and AC Servomotor- their transfer functions, Synchros.

UNIT-II TIME RESPONSE ANALYSIS

Step Response - Impulse Response - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants, Study of effects and Design of P, PI, PD and PID Controllers on second order system.

UNIT-III STABILITY ANALYSIS IN TIME DOMAIN

The concept of stability Rouths stability criterion Stability and conditional stability - limitations of Rouths stability. The Root locus concept - construction of root loci-effects of adding poles and zeros to G(s) H(s) on the root loci.

UNIT-IV FREQUENCY RESPONSE ANALYSIS

Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram - Stability Analysis from Bode Plots. Polar Plots- Nyquist Plots- Phase margin and Gain margin-Stability Analysis. Compensation techniques – Study of Effects and Design of Lag, Lead, Lag-Lead Compensator design in frequency Domain on a second order system

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UNIT-V STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS

Concepts of state, state variables and state model - differential equations & Transfer function models - Block diagrams. Diagonalization, Transfer function from state model, solving the Time invariant state Equations- State Transition Matrix and its Properties. System response through State Space models. The concepts of controllability and observability,

TEXT BOOKS:

1. Modern Control Engineering by Katsuhiko Ogata, Prentice Hall of India Pvt. Ltd., 5thedition, 2010.
2. Control Systems Engineering by I. J. Nagrath and M. Gopal, New Age International (P) Limited Publishers, 5th edition, 2007

REFERENCE BOOKS:

1. Control Systems Principles & Design by M.Gopal, 4th Edition, McGraw Hill Education,2012.
2. Automatic Control Systems by B. C. Kuo and Farid Golnaraghi, John wiley and sons, 8th edition,2003
3. Feedback and Control Systems, Joseph J Distefano III, Allen R Stubberud & Ivan J Williams, 2nd Edition, Schaum's outlines, McGraw Hill Education,2013.
4. Control System Design by Graham C. Goodwin, Stefan F. Graebe and Mario E. Salgado, Pearson, 2000
5. Feedback Control of Dynamic Systems by Gene F. Franklin, J.D. Powell and Abbas Emami- Naeini, 6th Edition, Pearson,2010.

COURSE OUTCOMES:

1. Summarize the basic principles and applications of control systems.
2. Understand the time response and steady state response of the systems.
3. Understand the concept of state space, controllability and observability.
4. Apply time domain analysis to find solutions to time invariant systems.
5. Analyze different aspects of stability analysis of systems in frequency domain.

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III B.Tech. I Sem. L T P C

(23A33504S) FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE

Course Category	
Course Enrichment Relevance	

COURSE OBJECTIVES:

Concepts of state, state variables and state model - differential equations & Transfer function models - Block diagrams. Diagonalization, Transfer function from state model, solving the Time invariant state Equations- State Transition Matrix and its Properties. System response through State Space models. The concepts of controllability and observability,

COURSE OUTCOMES:

III B.Tech
II Semester
Course
Structure

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech. II Sem. - Course Structure

S.No	Subject Code	Course Category	Name of the Subject	Hours/Week				Marks		
				Lecture	Tutorial	Practical	Credits	Internal	External	Total
1	23A04628	CC	DIGITAL SIGNAL PROCESSING	3	0	0	3	30	70	100
2	23A04629	MC(C)	MICROWAVE AND OPTICAL COMMUNICATIONS	3	0	0	3	30	70	100
3	23A04630	PC	VLSI DESIGN	3	0	0	3	30	70	100
4	23A04631	PE	ELECTRONIC MEASUREMENTS AND INSTRUMENTATION (PE-II)	3	0	0	3	30	70	100
5	23A04632	PE	EMBEDDED SYSTEMS & IOT (PE-II)	3	0	0	3	30	70	100
6	23A04633	PE	SPEECH PROCESSING (PE-II)	3	0	0	3	30	70	100
7	23A04634	PE	DIGITAL IMAGE PROCESSING (PE-III)	3	0	0	3	30	70	100
8	23A33613	PE	ARTIFICIAL INTELLIGENCE & MACHINE LEARNING (PE-III)	3	0	0	3	30	70	100
9	23A04635	PE	SATELLITE COMMUNICATIONS (PE-III)	3	0	0	3	30	70	100
10	23A04636	MC(C)	MICROWAVE AND OPTICAL COMMUNICATIONS LAB	0	0	3	1.5	30	70	100
11	23A04637	PC	VLSI DESIGN LAB	0	0	3	1.5	30	70	100
12	23A04638	SC	MACHINE LEARNING AND DSP	-	1	2	2	30	70	100
13	23A99608	MC(NC)	TECHNICAL PAPER WRITING & IPR	2	0	0	0	40	0	40
14	23A01603	OE	DISASTER MANAGEMENT (OE-II)	3	0	0	3	30	70	100
15	23A03605	OE	SUSTAINABILITY IN ENGINEERING PRACTICES (OE-II)	3	0	0	3	30	70	100
16	23A02604	OE	RENEWABLE ENERGY SOURCES (OE-II)	3	0	0	3	30	70	100
17	23A03606	OE	AUTOMATION AND ROBOTICS (OE-II)	3	0	0	3	30	70	100
18	23A05411	OE	OPERATING SYSTEMS (OE-II)	3	0	0	3	30	70	100
19	23A33402	OE	MACHINE LEARNING (OE-II)	3	0	0	3	30	70	100
20	23A91614	OE	OPTIMIZATION TECHNIQUES FOR ENGINEERS (OE-II)	3	0	0	3	30	70	100

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21	23A91609	OE	MATHEMATICAL FOUNDATION OF QUANTUM TECHNOLOGIES (OE-II)	3	0	0	3	30	70	100
22	23A92604	OE	PHYSICS OF ELECTRONIC MATERIALS AND DEVICES (OE-II)	3	0	0	3	30	70	100
23	23A93605	OE	CHEMISTRY OF POLYMERS AND APPLICATIONS (OE-II)	3	0	0	3	30	70	100
24	23A94607	OE	ACADEMIC WRITING AND PUBLIC SPEAKING (OE-II)	3	0	0	3	30	70	100
25	23A99609	PC	MINI PROJECT	0	0	0	0	50	0	50
26	23A04642	PE	EMBEDDED SYSTEMS AND REAL TIME OPERATING SYSTEMS (PE-II)	3	0	0	3	30	70	100
										Total Credits:23

III-B.Tech
II-Semester
Syllabus

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III B.Tech. II Sem.

L	T	P	C
3	0	0	3

(23A04628) DIGITAL SIGNAL PROCESSING

Course Category	**Core Course (CC)**
Course Enrichment Relevance	**Employability**

COURSE OBJECTIVES:

1. To get familiar with the properties of discrete time signals, systems and z-transform.
2. To learn the importance of FFT algorithm for computation of Discrete Fourier Transform and Fast Fourier Transform with decimations.
3. To understand the implementations of digital filter structures.
4. To analyse the FIR filter design using Fourier series and windowing methods.
5. To gain the knowledge on Programmable DSP Devices.

UNIT-I INTRODUCTION TO DISCRETE TIME SIGNALS AND SYSTEMS &Z-TRANSFORM

Introduction to digital signal processing, Review of discrete-time signals and systems, Analysis of discrete-time linear time invariant systems, frequency domain representation of discrete time signals and systems. Definition, ROC, Properties, Poles and Zeros in Z-plane, the inverse ZTransform, System analysis, Transfer function, BIBO stability, System Response to standard signals, Solution of difference equations with initial conditions, Illustrative Problems, analysis of linear time-invariant systems in the z-domain, pole-zero stability.

UNIT-II DISCRETE FOURIER TRANSFORM & FAST FOURIER TRANSFORM

Introduction, Discrete Fourier Series, properties of DFS, Discrete Fourier Transform, Inverse DFT, properties of DFT, Linear and Circular convolution, convolution using DFT, sampling, Quantization effects. Introduction, Fast Fourier Transform, Radix-2 Decimation in time and Decimation in frequency FFT, Inverse FFT (Radix-2).

UNIT-III IIR FILTERS

Introduction to digital filters, Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital filters from analog filters by Impulse invariant and bilinear transformation methods, Frequency transformations, Basic structures of IIR Filters - Direct formI, Direct form-II, Cascade form and Parallel form realizations.

UNIT-IV FIR FILTERS

Introduction, Characteristics of FIR filters with linear phase, Frequency response of linear phase FIR filters, Design of FIR filters using Fourier series and windowing methods (Rectangular, Triangular, Raised Cosine, Hanging, Hamming, Blackman), Comparison of IIR & FIR filters, Basic structures of FIR Filters – Direct form, Cascade form, Linear phase realizations.

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

UNIT-V ARCHITECTURES FOR PROGRAMMABLE DSP DEVICES

Architecture of TMS320C5X: Introduction, Bus Structure, Central Arithmetic Logic Unit, Auxiliary Register ALU, Index Register, Block Move Address Register, Parallel Logic Unit, Memory mapped registers, program controller, some flags in the status registers, On- chip memory, On-chip peripherals.

TEXT BOOKS:

1. John G. Proakis, Dimitris G. Manolakis, Digital Signal Processing, Principles, Algorithms, and Applications, Pearson Education, 2007
2. A.V.Oppenheim and R.W. Schaffer, Discrete Time Signal Processing ,PHI.

REFERENCE BOOKS:

1. S.K.Mitra, Digital Signal Processing – A practical approach , 2nd Edition, Pearson Education, New Delhi, 2004.
2. MH Hayes, Digital Signal Processing, Schaum‘s Outline series, TATA Mc-Graw Hill, 2007.
3. Robert J. Schilling, Sandra L. Harris, Fundamentals of Digital Signal Processing using Matlab, Thomson, 2007.

COURSE OUTCOMES:

1. Familiar with the properties of discrete time signals, systems and z-transform.
2. Learn the importance of FFT algorithm for computation of Discrete Fourier Transform and Fast Fourier Transform with decimations.
3. Understand the implementations of digital filter structures.
4. Analyse the FIR filter design using Fourier series and windowing methods.
5. Gain the knowledge on Programmable DSP Devices.

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech. II Sem.

L	T	P	C
3	0	0	3

(23A04629) MICROWAVE AND OPTICAL COMMUNICATIONS

Course Category	**Mandatory Course (credit)**
Course Enrichment Relevance	**Employability**

COURSE OBJECTIVES:

1. To analyse different modes of operation in rectangular wave guides, circular wave guides and resonators.
2. To study and analyse various microwave components and microwave sources.
3. To gain knowledge on different microwave semiconductor devices and microwave measurements procedures.
4. To analyse different optical fiber modes and to study different types of distortions and losses in optical communication
5. To study various optical sources, optical detectors and to analyze various optical links

UNIT-I WAVEGUIDES

Waveguides: Introduction, Rectangular waveguides, Field expressions for TE and TM modes, Wave propagation in the guide, Phase and group velocities, Power transmission and attenuation, Waveguide current and mode excitation, Circular waveguide ??? TE and TM modes(Qualitative treatment only), Wave propagation, Cavity resonators (Qualitative treatment only).

UNIT-II PASSIVE MICROWAVE DEVICES

Introduction to scattering parameters and their properties, Terminations, Variable short circuit, Attenuators, Phase shifters, Hybrid Tees (H-plane, E-plane, Magic Tees), Directional Couplers Bethe hole and Two hole Couplers, Deriving Scattering matrix for Microwave passive devices. Microwave propagation in Ferrites, Gyrator, Isolator, Circulator.

Microwave Amplifiers and Oscillators: Microwave Tubes: Linear Beam Tubes Two cavity Klystron amplifier -velocity modulation, bunching process, output power, Reflex Klystron oscillator, power output and efficiency, Travelling Wave Tube (TWT) Bunching process and amplification process (Qualitative treatment only). Crossed Field Tubes Magnetron oscillator, pi-mode operation, power output and efficiency, Hartree Condition.

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

UNIT-III MICROWAVE SEMICONDUCTOR DEVICES

Gunn Oscillator Principle of operation, Characteristics, Two valley model, IMPATT, TRAPATT diodes. Microwave Measurements: Description of Microwave bench-different blocks and their features, errors and precautions, Microwave power measurements, Measurement of attenuation, frequency, VSWR (low, medium, high), Measurement of Q of a cavity, Impedance measurements.

UNIT-IV INTRODUCTION TO OPTICAL FIBERS AND TRANSMISSION CHARACTERISTICS

The propagation of light in optical waveguides – Classification of optical fibers – Numerical aperture, Step index and Graded index fiber – Modes in cylindrical fiber – Linearly polarized modes, Attenuation: Absorption, Scattering, Bending losses. Modal dispersion and chromatic dispersion – Single mode fiber - waveguide dispersion– MFD – PMD

UNIT-V OPTICAL TRANSMITTERS AND RECEIVERS

Optical Sources: - Light source materials -LED homo and hetero structures - surface and edge emitters -Quantum efficiency - Injection Laser Diode - Modes and threshold condition -Structures and Radiation Pattern. Optical detectors: -Physical principles -PIN and APD diodes - Photo detector noise Optical Link Design: Point- to- point links -System considerations - Link Power budget -Rise time budget.

TEXT BOOKS:

1. David M. Pozar,‖ Microwave Engineering‖ John Wiley & Sons, Inc. 4th edition, 2012
2. Samuel Y. Liao, —Microwave Devices and Circuits‖, PHI publications, Third Edition, 1997.
3. Gerd Keiser, —Optical Fiber Communications‖, McGraw Hill, Third Edition, 2000.

REFERENCE BOOKS:

1. R. E. Collin, —Foundations for Microwave Engineering‖, Wiley Student Edition, Second Edition, 2009.
2. Om. P. Gandhi, —Microwave: Engineering and Applications‖, Kai Fa Book Company, 1981.
3. Reich H. J., et al, —Microwave Principles‖, MIT Press, 1972.
4. F E Terman, —Electronic and Radio Engineering‖, McGraw Hill, 4th Edition, 1984

e-Resources and Digital Material:

1. https://nptel.ac.in/courses/108103141
2. https://nptel.ac.in/courses/108101092

COURSE OUTCOMES:

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1. Analyze different modes of operation in rectangular wave guides, circular wave guides and resonators.
2. Understand andanalyze various microwave components and microwave sources.
3. Gain knowledge on different microwave semiconductor devices and microwave measurements procedures
4. Analyze different optical fiber modes and to study different types of distortions and losses in optical communication.
5. Understand study various optical sources, optical detectors and to analyze various optical links.

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III B.Tech. II Sem.

L	T	P	C
3	0	0	3

(23A04630) VLSI DESIGN

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

COURSE OBJECTIVES:

1. To understand the steps involved in fabrication of ICs using MOS transistor technology.
2. To learn about the VLSI design processes, Stick diagrams and Layouts.
3. To gain knowledge on the Gate Level Design concepts.
4. To learn the design of various subsystems with different VLSI Design styles.
5. To get familiar with CMOS testing techniques.

UNIT-I INTRODUCTION

Introduction: Brief Introduction to IC technology MOS, PMOS, NMOS, CMOS & BiCMOS Technologies. Basic Electrical Properties of MOS and BiCMOS Circuits: IDS - VDS relationships, MOS transistor Threshold Voltage, figure of merit, Transconductance, Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

UNIT-II VLSI CIRCUIT DESIGN PROCESSES

VLSI Circuit Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, Lambda(λ)-based design rules for wires, contacts and Transistors, Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits, Limitations of Scaling.

UNIT-III GATE LEVEL DESIGN AND BASIC CIRCUIT CONCEPTS

Gate level Design: Logic gates and other complex gates, Switch logic, Alternate gate circuits. Basic Circuit Concepts: Sheet Resistance Rs and its concepts to MOS, Area Capacitances calculations, Inverter Delays, Driving large Capacitive Loads, Wiring Capacitances, Fan-in and fan-out

UNIT-IV SUBSYSTEM DESIGN AND VLSI DESIGN STYLES

Subsystem Design: Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Counters. VLSI Design styles: Full-custom, Standard Cells, Gate-arrays, FPGAs, CPLDs and Design Approach for Full-custom and Semi-custom devices, parameters influencing low power design.

UNIT-V CMOS TESTING

CMOS Testing: Need for testing, Design for testability - built in self-test (BIST) – testing combinational logic –testing sequential logic – practical design for test guide lines – scan design techniques.

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TEXT BOOKS:

1. Essentials of VLSI Circuits and Systems, Kamran Eshraghian, EshraghianDougles, A. Pucknell, 2005, PHI.
2. Modern VLSI Design – Wayne Wolf, 3 Ed., 1997, Pearson Education.

REFERENCE BOOKS:

1. CMOS VLSI Design-A Circuits and Systems Perspective, Neil H.E Weste, David Harris, Ayan Banerjee, 3rd Edn, Pearson, 2009.
2. BehzadRazavi , —Design of Analog CMOS Integrated Circuits‖, McGraw Hill, 2003.
3. Jan M. Rabaey, —Digital Integrated Circuits‖, AnanthaChandrakasan and Borivoje Nikolic, Prentice-Hall of India Pvt.Ltd, 2nd edition, 2009.

COURSE OUTCOMES:

1. Understand the steps involved in fabrication of ICs using MOS transistor technology.
2. Learn about the VLSI design processes, Stick diagrams and Layouts.
3. Gain knowledge on the Gate Level Design concepts.
4. Learn the design of various subsystems with different VLSI Design styles.
5. Familiar with CMOS testing techniques.

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III B.Tech. II Sem.

L	T	P	C
3	0	0	3

(23A04631) ELECTRONIC MEASUREMENTS AND INSTRUMENTATION (PE-II)

Course Category	**Professional Elective (PE)**
Course Enrichment Relevance	**Employability**

COURSE OBJECTIVES:

1. To know about the performance characteristics of instruments and measurement of electrical quantities
2. To understand the construction, working and applications of different types of CRO‘s.
3. To analyze the working of different types of bridges
4. To study the working of signal & function generators and analyzers.
5. To analyze the working of sensors and transducers in measuring physical parameters

UNIT-I PERFORMANCE CHARACTERISTICS OF INSTRUMENTS

:

Static characteristics, Accuracy, Precision, Resolution, Sensitivity, static and dynamic calibration, Errors in Measurement, and their statistical analysis, dynamic characteristics-speed of Response, fidelity, Lag and dynamic error. DC ammeters, DC voltmeters-multirange, range extension/solid state and differential voltmeters, AC voltmeters–multirange, range extension. Thermocouple type RF ammeter, ohm meters, series type, shunt type, multimeter for voltage, current and resistance measurements.

UNIT-II OSCILLOSCOPES

:

Introduction, Basic Principle, Standard specifications of CRO,CRT features, vertical and horizontal amplifiers, horizontal and vertical deflection systems, sweep trigger pulse, delay line, sync selector circuits, probes for CRO – active, passive, and attenuator type, triggered sweep CRO, and Delayed sweep, dual trace/beam CRO, Measurement of amplitude, frequency and phase (Lissajous method). Principles of sampling oscilloscope, storage oscilloscope, and digital storage oscilloscope, Digital frequency counters, time & Period measurements.

UNIT-III BRIDGES

:

DC Bridges for Measurement of resistance: Wheat stone bridge, Kelvin‘s Bridge, AC Bridges for Measurement of inductance- Maxwell‘s bridge, Hay‘s Bridge, Anderson bridge. Measurement of capacitance- Schearing Bridge, Wien Bridge. Errors and precautions in using bridges.

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UNIT-IV SIGNAL GENERATORS

:

Signal generator-fixed and variable, AF oscillators, function generators, pulse, random noise, sweep, and arbitrary waveform generators, their standards, specifications and principles of working (Block diagram approach).Wave analyzers, Harmonic distortion analyzers, Spectrum analyzers, and Logic analyzers.

UNIT-V SENSORS AND TRANSDUCERS -

Active and passive transducers: Measurement of displacement (Resistance, capacitance, inductance; LVDT) Force (strain gauges) Pressure (piezoelectric transducers) Temperature (resistance thermometers, thermocouples and thermistors), Velocity, Acceleration, Vibration, pH measurement Signal Conditioning Circuits

TEXT BOOKS:

1. A.D. Helfrick and W.D. Cooper, —Modern Electronic Instrumentation and Measurement Techniques‖, 5th Edition, PHI, 2002.
2. H.S.Kalsi, —Electronic Instrumentation‖, 2nd edition, Tata McGraw Hill, 2004.

REFERENCE BOOKS:

1. David A. Bell, —Electronic Instrumentation & Measurements‖, 2nd Edition, PHI, 2003.
2. K. Lal Kishore, —Electronic Measurements & Instrumentations‖, Pearson Education, 2009.

COURSE OUTCOMES:

1. Learn about the performance characteristics of instruments and measurement of electrical quantities.
2. Understand the construction, working and applications of different types of CRO‘s.
3. Compare the working of different types of bridges
4. Know the working of signal & function generators and analyzers.
5. Grasp the working of sensors and transducers in measuring physical parameters

SANTHIRAM ENGINEERING COLLEGE

(AUTONOMOUS)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech. II Sem.

L	T	P	C
3	0	0	3

(23A04632) EMBEDDED SYSTEMS & IOT (PE-II)

Course Category	**Professional Elective (PE)**
Course Enrichment Relevance	**Employability**

COURSE OBJECTIVES:

1. To understand the Architecture, Development & Design of Embedded Systems and IoT
2. To learn the architecture and programming of ARM Microcontroller
3. To be able to work with Raspberry Pi using Python Programming
4. To know about the loT standards, communication technologies and protocols for IoT devices.
5. To implement case studies and applications using the tools and techniques of IoT Platform.

UNIT-I INTRODUCTION TO EMBEDDED SYSTEMS AND INTERNET OF THINGS (IOT)

Introduction, Hardware & Software Architecture of Embedded Systems, Embedded Systems Development process, Architecture of Internet of Things, Physical Design & Logical Design of IoT, IoT Enabling Technologies, IoT Levels & Deployment Tools, Applications of Embedded Systems and IoT, Design Methodology for IOT Products

UNIT-II ARM MICROCONTROLLERS ARCHITECTURE AND PROGRAMMING

Architecture, Pin Diagram, Register Set & Modes, Memory Organization, Instruction set, Programming ports, Timer/Counter, Serial communication, I/O System, Development Tools, interrupts in C, Introduction ARM mBed platform.

UNIT-III FUNDAMENTALS OF PYTHON PROGRAMMING & RASPBERRY PI

:

Introduction to python programming, Data Types & Data Structures, working with functions, Modules & Packages, File Handling, classes, REST full Web Services, Client Libraries, Introduction & programming Raspberry Pi3, Interfaces, Integrating Input Output devices with Raspberry Pi3

UNIT-IV IOT TECHNOLOGIES, STANDARDS, TOOLS & M2M NETWORK

Fundamental characteristics and high level requirements of IoT, IoT Reference models; Introduction to Communication Technologies & Protocols of IoT: BLE, Wi-Fi, LoRA, 3G/4G Technologies and HTTP, MQTT, CoAP protocols; Relevant Practicals on above technologies, M2M Network, SDN (Software Defined Networking) & NFV (Network Function Virtualization) for IoT

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UNIT-V IOT PLATFORM, CLOUD COMPUTING PLATFORMS & DATA ANALYTICS FOR IOT DEVELOPMENT

:

IOT Platform Architecture (IBM Internet of Things & Watson Platforms); API Endpoints for Platform Services; Devices Creation and Data Transmission; Introduction to NODE-RED and Application deployment, Introduction to Data Analytics, Apache Hadoop, Apache Oozie, Spark & Storm

TEXT BOOKS:

1. ArsheepBahga , Vijay Madisetti , —Internet of Things: A Hands-On Approach‖, 1st Edition, VPT, 2014.
2. K.V.K.K.Prasad, —Embedded Real Time Systems: Concepts, Design and Programming‖, 1st Edition, Dreamtech Publication, 2014.
3. Adrian McEwen, Hakim Cassimally, —Designing the Internet of Things‖, Wiley Publications, 2013

REFERENCE BOOKS:

1. Jonathan W Valvano, —Embedded Microcomputer Systems: Real-Time Interfacing‖, 3rd Edition, Thomson Engineering, 2012
2. Olivier Hersent, David Boswarthick, Omar Elloumi, —The Internet of Things: Key applications and Protocols‖, 2nd Edition, Wiley Publications, 2012.
3. Rene Beuchat , Andrea Guerrieri & Sahand Kashani —Fundamentals of System-on-Chip Design on Arm Cortex-M Microcontrollers‖ Paperback, 2 August 2021.

COURSE OUTCOMES:

1. Understand the Architecture, Development & Design of Embedded Systems and IoT
2. Learn the architecture and programming of ARM Microcontroller.
3. Work with Raspberry Pi using Python Programming.
4. Know about the loT standards, communication technologies and protocols for IoT devices.
5. Implement case studies and applications using the tools and techniques of IoT Platform.

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(23A04633) SPEECH PROCESSING (PE-II)

Course Category	**Professional Elective (PE)**
Course Enrichment Relevance	**Employability**

COURSE OBJECTIVES:

1. To impart knowledge on anatomy and physiology of speech organs and the process of Speech Production
2. To understand the methods for extracting of speech using Time domain parameters
3. To learn the Frequency Domain Methods for Speech Processing.
4. To interpret and analyze LPC Parameters for Speech Processing
5. To introduce the concepts of homomorphic Speech Processing

UNIT-I FUNDAMENTALS OF DIGITAL SPEECH PROCESSING

:

Anatomy & Physiology of Speech Organs, The process of Speech Production, The Acoustic Theory of Speech Production – Uniform lossless tube model, effect of losses in vocal tract and radiation at lips, Digital models for speech signals.

UNIT-II TIME DOMAIN METHODS FOR SPEECH PROCESSING

:

Time domain parameters of speech, methods for extracting the parameters: Zero crossings, Auto-correlation function, pitch estimation.

UNIT-III FREQUENCY DOMAIN METHODS FOR SPEECH PROCESSING

:

Short time Fourier analysis, Filter bank analysis, Spectrographic analysis, Formant extraction, Pitch extraction.

UNIT-IV LINEAR PREDICTIVE CODING (LPC) FOR SPEECH

:

Formulation of linear prediction problem in time domain, solution of normal equations, Interpretation of linear prediction in auto correlation and spectral domains, Method of Solution of the LPC Parameters: Pitch Detection using LPC Parameters, Formant Analysis using LPC Parameters

UNIT-V HOMOMORPHIC SPEECH PROCESSING

:

Introduction Homomorphic Systems for Convolution: Properties of the Complex Cepstrum, Computational Considerations, The Complex Cepstrum of Speech, pitch Detection and Formant Estimation; Applications of speech processing – Speech Enhancement, Speech recognition, Speech synthesis and Speaker Verification.

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

TEXT BOOKS:

1. L.R. Rabiner and S. W. Schafer, Digital Processing of Speech Signals, Pearson Education.
2. Douglas O' Shaughnessy, Speech Communications: Human &Machine, 2nd Ed., Wiley-IEEE Press.

REFERENCE BOOKS:

1. Thomas F. Quatieri, Discrete Time Speech Signal Processing: Principles and Practice, 1st Ed., Pearson Education.
2. Ben Gold & Nelson Morgan, Speech and Audio Signal Processing: Processing and Perception of Speech and Music ,1st Ed., Wiley.

COURSE OUTCOMES:

1. Gain knowledge on anatomy and physiology of speech organs and the process of Speech Production.
2. Understand the methods for extracting of speech using Time domain parameters.
3. Learn the Frequency Domain Methods for Speech Processing.
4. Interpret and analyze LPC Parametersfor Speech Processing
5. Grasp the concepts of homomorphic Speech Processing.

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech. II Sem.

L	T	P	C
3	0	0	3

(23A04634) DIGITAL IMAGE PROCESSING (PE-III)

Course Category	**Professional Elective (PE)**
Course Enrichment Relevance	**Employability**

COURSE OBJECTIVES:

1. To learn the fundamentals of Image Processing with different Transforms.
2. To understand functions of Intensity Transformations and working fundamentals of Spatial Filters
3. To implement various models of Restoring and Reconstruction of Images from filtering projections.
4. To study the concepts of image compression using different coding &Wavelets and Multiresolution Processes.
5. To design image processing systems using Segmentation techniques for Morphological & Color Images.

UNIT-I INTRODUCTION

Introduction to Image Processing, Fundamental steps in digital image processing, components of an image processing system, image sensing and acquisition, image sampling and quantization, some basic relationships between pixels, an introduction to the mathematical tools used in digital image processing. Image Transforms: Need for image transforms, Discrete Fourier transform (DFT) of one variable, Extension to functions of two variables, some properties of the 2-D Discrete Fourier transform, Importance of Phase, Walsh Transform. Hadamard transform, Haar Transform, Slant transform, Discrete Cosine transform, KL Transform, SVD and Radon Transform, Comparison of different image transforms.

UNIT-II INTENSITY TRANSFORMATIONS AND SPATIAL FILTERING

Background, Some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters , sharpening spatial filters, Combining spatial enhancement methods Filtering in the Frequency Domain: Preliminary concepts, The Basics of filtering in the frequency domain, image smoothing using frequency domain filters, Image Sharpening using frequency domain filters, Selective filtering.

UNIT-III IMAGE RESTORATION AND RECONSTRUCTION

A model of the image degradation / Restoration process, Noise models, restoration in the presence of noise only-Spatial Filtering, Periodic Noise Reduction by frequency domain filtering, Linear, Position –Invariant Degradations, Estimating the degradation function, Inverse filtering, Minimum mean square error (Wiener) filtering, constrained least squares filtering, geometric mean filter ,image reconstruction from projections.

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

UNIT-IV IMAGE COMPRESSION

Fundamentals, Basic compression methods: Huffman coding, Golomb coding, Arithmetic coding, LZW coding, Run-Length coding, Symbol-Based coding, Bit-Plane coding, Block Transform coding, Predictive coding Wavelets and Multiresolution Processing: Image pyramids, subband coding, Multiresolution expansions, wavelet transforms in one dimensions & two dimensions, Wavelet coding.

UNIT-V IMAGE SEGMENTATION AND COLOR IMAGE PROCESSING

Image segmentation: Fundamentals, point, line, edge detection, thresholding, region –based segmentation. Morphological Image Processing: Preliminaries, Erosion and dilation, opening and closing, basic morphological algorithms for boundary extraction, thinning, gray-scale morphology, Segmentation using morphological watersheds. Color image processing: color fundamentals, color models, pseudo color image processing, basics of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise in color images, color image compression.

TEXT BOOKS:

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.
2. Jayaraman, S. Esakkirajan, and T. Veerakumar,‖ Digital Image Processing‖, Tata McGraw-Hill Education, 2011.

REFERENCE BOOKS:

1. Anil K.Jain, —Fundamentals of Digital Image Processing‖, Prentice Hall of India, 9th Edition, Indian Reprint, 2002.
2. B.Chanda, D.DuttaMajumder, —Digital Image Processing and Analysis‖, PHI, 2009

e-Resources and Digital Material:

1. https://nptel.ac.in/courses/117105079
2. https://nptel.ac.in/courses/117105135

COURSE OUTCOMES:

1. Learn the fundamentals of Image Processing with different Transforms.
2. Uunderstand the functions of Intensity Transformations and working fundamentals of Spatial Filters
3. Implement various models of Restoring and Reconstruction of Images from filtering projections.
4. Grasp the concepts of image compression using different coding &Wavelets and Multiresolution Processes.
5. Design the image processing systems using Segmentation techniques for Morphological & Color Images.

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III B.Tech. II Sem.

L	T	P	C
3	0	0	3

(23A33613) ARTIFICIAL INTELLIGENCE & MACHINE LEARNING (PE-III)

Course Category	**Professional Elective (PE)**
Course Enrichment Relevance	**Employability**

COURSE OBJECTIVES:

1. To learnthe basics and problems of Artificial Intelligence with rationality and structure of agents
2. To describe the search for solutions using various search strategies & algorithms for optimization
3. To evaluate the representation of Agents with Propositional Logic in Shopping World
4. To understand the concepts of Machine Learning with different Perspectives
5. To analyze Decision Tree Representation with different problems& issues

UNIT-I INTRODUCTION

:

What Is AI, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art, Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

UNIT-II PROBLEM SOLVING

Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, informed (Heuristic) Search Strategies, Local Search Algorithms and Optimization Problems, Searching with Nondeterministic Actions.

UNIT-III KNOWLEDGE REPRESENTATION

Knowledge-Based Agents, Logic, Propositional Logic: A Very Simple Logic, Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, The Internet Shopping World

UNIT-IV INTRODUCTION TO MACHINE LEARNING&CONCEPT LEARNING AND THE GENERAL-TO-SPECIFIC ORDERING

Well-Posed Learning Problem, Designing a Learning system, Perspectives and Issues in Machine Learning ,Introduction, A Concept Learning Task, Concept Learning as Search, FIND-S: Finding a Maximally Specific Hypothesis, Version Spaces and the Candidate Elimination Algorithm, Remarks on Version spaces and CandidateElimination, Inductive Bias

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UNIT-V DECISION TREE LEARNING

Introduction, Decision Tree Representation, Appropriate Problems for Decision Tree Learning, The Basic Decision Tree Learning Algorithm, Hypothesis Space Search in Decision Tree Learning, Inductive Bias in Decision Tree Learning, Issues in Decision Tree Learning.

TEXT BOOKS:

1. Stuart Russell and Peter Norvig, —Artificial Intelligence: A Modern Approach‖ , 3rd Edition, Pearson
2. Tom M. Mitchell, Machine Learning, McGraw Hill Edition, 2013

REFERENCE BOOKS:

1. Saroj Kaushik, —Artificial Intelligence‖, Cengage Learning India, 2011
2. Elaine Rich and Kevin Knight, —Artificial Intelligence‖, Tata McGraw Hill
3. David Poole and Alan Mackworth, —Artificial Intelligence: Foundations for Computational Agents‖, Cambridge University Press 2010
4. Trivedi, M.C., —A Classical Approach to Artifical Intelligence‖, Khanna Publishing House, Delhi.
5. Christopher Bishop, Pattern Recognition and Machine Learning (PRML) , Springer, 2007
6. ShaiShalev-Shwartz and Shai Ben-David, Understanding Machine Learning: From Theory to Algorithms (UML) , Cambridge University Press, 2014.

COURSE OUTCOMES:

1. To learnthe basics and problems of Artificial Intelligence with rationality and structure of agents
2. To describe the search for solutions using various search strategies & algorithms for optimization
3. To evaluate the representation of Agents with Propositional Logic in Shopping World.
4. To understand the concepts of Machine Learning with different Perspectives.
5. To analyze Decision Tree Representation with different problems& issues.

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3	0	0	3

(23A04635) SATELLITE COMMUNICATIONS (PE-III)

Course Category	**Professional Elective (PE)**
Course Enrichment Relevance	**Employability**

COURSE OBJECTIVES:

1. To learn the principles of orbital mechanics& satellite launch system with performance parameters.
2. To describe the elements of communication satellite design for matching reliability
3. To know the working concepts of various multiple access techniques and Onboard processing
4. To analyze the satellite links design with communication links
5. To evaluate the working of earth station design with satellite broadcasting

UNIT-I ELEMENTS OF ORBITAL MECHANICS

Equations of motion. Tracking and orbit determination. Orbital correction/control. Satellite launch systems. Multistage rocket launchers and their performance

UNIT-II ELEMENTS OF COMMUNICATION SATELLITE DESIGN.

Elements of communication satellite design. Spacecraft subsystems. Reliability considerations. Spacecraft integration

UNIT-III MULTIPLE ACCESS TECHNIQUES.

FDMA, TDMA,CDMA. Random access techniques. Satellite onboard processing

UNIT-IV SATELLITE LINK DESIGN

:

Performance requirements and standards. Design of satellite links – DOMSAT, INSAT, INTELSAT and INMARSAT. Satellite - based personal communication. links

UNIT-V EARTH STATION DESIGN

Configurations. Antenna and tracking systems. Satellite broadcasting.

TEXT BOOKS:

1. D. Roddy, Satellite Communication (4/e), McGraw- Hill, 2009.
2. T. Pratt & C.W. Bostain, Satellite Communication, Wiley 2000.

REFERENCE BOOKS:

1. B.N. Agrawal, Design of Geosynchrons Spacecraft, Prentice- Hall,1986.

COURSE OUTCOMES:

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(AUTONOMOUS)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

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1. Learn the principles of orbital mechanics& satellite launch system with performance parameters.
2. Describe the elements of communication satellite design for matching reliability
3. Gain knowledge on various multiple access techniques and Onboard processing
4. Analyze the satellite links design with communication links
5. Evaluate the working of earth station design with satellite broadcasting

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III B.Tech. II Sem.

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0	0	3	1.5

(23A04636) MICROWAVE AND OPTICAL COMMUNICATIONS LAB

Course Category	**Mandatory Course (credit)**
Course Enrichment Relevance	**Employability**

COURSE OBJECTIVES:

1. To understand the working of microwave bench set up and characteristics of microwave sources.
2. To verify the characteristics of various microwave components and to draw radiation pattern of antennas.
3. To verify the characteristics of optical sources & detectors and to study about losses in optical fiber.

PART-A:

Microwave Lab - Any Seven (7) Experiments

1. Reflex Klystron Characteristics

2. Gunn Diode Characteristics

3. Attenuation Measurement

4. Directional Coupler Characteristics

5. VSWR Measurement

6. Impedance Measurements

7. Frequency and Wavelength measurement

8. Scattering Parameters of Directional coupler

9. Scattering Parameters of Magic TEE

10. Radiation pattern measurement of a Antenna

11. Antenna gain measurement

Part B:

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Optical Fiber Lab - Any five (5) Experiments

1. Characterization of LED

2. Characterization of Laser Diode

3. Intensity Modulation of Laser output through Optical fiber

4. Measurement of data rate for digital Optical link

5. Measurement of Numerical Aperture.

6. Measurement of Losses for Analog optical link

TEXT BOOKS:

1. David M. Pozar,‖ Microwave Engineering‖ John Wiley & Sons, Inc. 4th edition, 2012
2. Samuel Y. Liao, —Microwave Devices and Circuits‖, PHI publications, Third Edition, 1997.
3. Gerd Keiser, —Optical Fiber Communications‖, McGraw Hill, Third Edition, 2000.

REFERENCE BOOKS:

1. R. E. Collin, —Foundations for Microwave Engineering‖, Wiley Student Edition, Second Edition, 2009.
2. Om. P. Gandhi, —Microwave: Engineering and Applications‖, Kai Fa Book Company, 1981.
3. Reich H. J., et al, —Microwave Principles‖, MIT Press, 1972.
4. F E Terman, —Electronic and Radio Engineering‖, McGraw Hill, 4th Edition, 1984

e-Resources and Digital Material:

1. https://nptel.ac.in/courses/108103141
2. https://nptel.ac.in/courses/108101092

COURSE OUTCOMES:

1. Understand the working of microwave bench set up.
2. Understand the characteristics of microwave sources.
3. Verify the characteristics of various microwave components.
4. Verify the radiation pattern of antennas.
5. Verify the characteristics of optical sources & detectors and to study about losses in optical fiber.

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III B.Tech. II Sem.

L	T	P	C
0	0	3	1.5

(23A04637) VLSI DESIGN LAB

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

COURSE OBJECTIVES:

1. Design any logic circuit using CMOS transistor.
2. Use different software tools for analysis of circuits.
3. Design layouts to the CMOS circuits.
4. Use different software tools for analog layout

1. Design and analysis of CMOS Inverter

a) Implement CMOS inverter schematic using 180 nm technology and design its symbol.

b) Implement test bench for CMOS Inverter and check its output response.

c) Perform DC and AC analysis for CMOS inverter.

d) Check the performance of CMOS inverter using parametric sweep.

2. Design and analysis of NAND and NOR Logic gates

a) Implement NAND/NOR schematic using 180 nm technology and design its symbol.

b) Implement test bench for NAND/NOR and check its output response.

c) Perform DC and AC analysis for NAND/NOR.

d) Check the performance of NAND/NOR using parametric sweep.

3. Design and analysis of XOR and XNOR Logic gates

a) Implement XOR/XNOR schematic using 180 nm technology and design its symbol.

b) Implement test bench for XOR/XNOR and check its output response.

c) Perform DC and AC analysis for XOR/XNOR.

d) Check the performance of XOR/XNOR using parametric sweep.

4. Design of AOI logic

a) Design Schematic for AB+C'D and check its output response.

b) Design Schematic for AB'+C'D and check its output response.

c) Design Schematic for (A+B')(C+D) and check its output response.

d) Design Schematic for (A+B')(C'+D) and check its output response.

5. Design and analysis of Full adder

a) Design full adder using Full custom IC design.

b) Design full adder using Semi custom IC design.

6. Analysis of NMOS and PMOS characteristics

a) Implement test bench for NMOS/PMOS transistor.

b) Perform DC and AC analysis for NMOS/PMOS transistor

c) Check the performance of NMOS/PMOS transistor using parametric sweep.

7. Design and analysis of Common source amplifier

a) Implement CS amplifier schematic using 180 nm technology and design its symbol.

b) Implement test bench for CS amplifier and check its output response.

c) Perform DC and AC analysis for CS amplifier.

d) Check the performance of CS amplifier using parametric sweep.

8. Design and analysis of Common drain amplifier

a) Implement CD amplifier schematic using 180 nm technology and design its symbol.

b) Implement test bench for CD amplifier and check its output response.

c) Perform DC and AC analysis for CD amplifier.

d) Check the performance of CD amplifier using parametric sweep.

9. Design of MOS differential amplifier

a) Design differential amplifier schematic using 180 nm technology and its symbol.

b) Implement test bench for differential amplifier and check its output response.

c) Perform DC and AC analysis for differential amplifier.

d) Check the performance of differential amplifier using parametric sweep.

10. Design of two stage differential amplifier

a) Design two stage differential amplifier schematic using 180 nm technology and its symbol.

b) Implement test bench for two stage differential amplifier and check its output response.

c) Perform DC and AC analysis for two stage differential amplifier.

d) Check the performance of two stage differential amplifier using parametric sweep.

11. Design of Inverter Layout

a) Design and implement inverter schematic.

b) Design the layout for inverter using 180 nm tech file.

c) Perform LVS for schematic and layout d) Check and remove all DRC violations.

e) Extract parasitic R and C in layout.

12. Design of NAND/NOR Layout

a) Design and implement NAND/NOR schematic.

b) Design the layout for inverter using 180 nm tech file.

c) Perform LVS for schematic and layout.

d) Check and remove all DRC violations.

e) Extract parasitic R and C in layout.

COURSE OUTCOMES:

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III B.Tech. II Sem.

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(23A04638) MACHINE LEARNING AND DSP

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

COURSE OBJECTIVES:

1. To understand the modules and dependencies for machine learning corresponding to different applications.
2. To understand a range of machine learning regression techniques & clustering along with their datasets.
3. To write the programs and implement k-Nearest Neighbor algorithm to classify the iris data sets, images & CNN.
4. To simulate the basic signal processing operations like convolution and correlation.
5. To simulate the DSP operations like DFT, FFT & implement IIR and FIR filters using simulation software and verify their frequency responses.

MACHINE LEARNING (Implement any six concepts)

Implementthefollowingconceptsusingpythonwithsupportingapplications.

1. Familiarizing with Anaconda and Jupyter for importing modules and dependencies for ML Familiarization with NumPy, Panda and Matplotlib by Loading Dataset in Python

2. Linear regression: Predict the profit of a company/House price from a dataset using the concept of linear regression. Implement the speech recognition model (NLP) from a speech/audio dataset using the concept of linear regression

3. Logistic regression:

a) Identify whether the patient has diabetes or not from diabetes dataset using Logistic regression

b) Implement the speech to text model (NLP- Speech recognitions system) from a speech dataset using the concept of linear regression

4. Polynomial regression : a. Determine the quality of wine using wine dataset with the help of polynomial regression b. Implement the speech recognition model (NLP) from a speech / audio data set using the concept of polynomial regression.

5. K-means clustering: Apply the concept of K-means clustering for image segmentation problem (Brain tumor and Lung images)/Color quantization

6. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set to demonstrate the working of the decision tree based ID3 algorithm.

7. Write a program to implement the k-Nearest Neighbor algorithm for image classification and distance metric learning for large margin with image classification applications using k nearest neighbor.

8. PCA/LDA: Reduce the dimensionality of a dataset for Face recognition system 9. Design an Artificial neural network for Digit classification using Back Propagation Algorithm for MNIST Data set. Train MLP using Gradient descent algorithm by applying Linear, Sigmoid, tanh, and ReLu activation functions

10. Digit recognition using CNN: Identify the digit s 0-9 from MNIST data and CIFR 10 set using CNN

11. ImageClassificationusingCNN:ClassifycatsanddogsusingCNNfromthegivendataset

12. LSTM (Long Short-Term Memory Networks)/ARIMA--- Implementation biomedical signals (like EEG, ECG, EMG) classifications and disease prediction.

DIGITAL SIGNAL PROCESSING (Implement any six concepts)

1. Generate the following standard discrete time signals. i) Unit Impulse ii) Unit step iii) Ramp iv) Exponential v) Sawtooth

2. Generate sum of two sinusoidal signals and find the frequency response (magnitude and phase).

3. Implement and verify linear and circular convolution between two given signals.

4. Implement and verify autocorrelation for the given sequence and cross correlation between two given signals.

5. Compute and implement the N-point DFT of a given sequence and compute the power density spectrum of the sequence.

6. Implement and verify N-point DIT-FFT of a given sequence and find the frequency response (magnitude and phase).

7. Implement and verify N-point IFFT of a given sequence.

8. Design IIR Butterworth filter and compare their performances with different orders (Low Pass Filter /High Pass Filter)

9. Design IIR Chebyshev filter and compare their performances with different orders (Low Pass Filter /High Pass Filter).

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10. Design FIR filter (Low Pass Filter /High Pass Filter) using windowing technique. i. Using rectangular window, ii. Using hamming window , iii. Using Kaiser window

11. Design and verify Filter (IIR and FIR) frequency response by using Filter design and Analysis Tool.

12. Compute the Decimation and Interpolation for the given signal.

13. Real time implementation of an audio signal using a digital signal processor.

REFERENCE BOOKS:

1. S..N.SivanandamandS.N.Deepa,IntroductiontoneuralnetworksusingMatlab,2006.
2. SimonHaykin,NeuralNetworksandLearningMachines,PHI,2008, 3rdEdition
3. Digital Signal Processing: Alon V. Oppenhelm, PHI
4. Digital Signal processing(II-Edition): S.K. Mitra, TMH

COURSE OUTCOMES:

1. Understand the modules and dependencies for machine learning corresponding to different applications.
2. Learn a range of machine learning regression techniques & clustering along with their datasets.
3. Write the programs and implement k-Nearest Neighbor algorithm to classify the iris data sets, images & CNN.
4. Simulate the basic signal processing operations like convolution and correlation.
5. Simulate the DSP operations like DFT, FFT & implement IIR and FIR filters using simulation software and verify their frequency responses.

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III B.Tech. II Sem.

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2	0	0	0

(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 life practice 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:

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 PapersSecond 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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(23A01603) DISASTER MANAGEMENT (OE-II)

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 windresistant 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.

TEXT BOOKS:

1. David Alexander, Natural Disasters, 1st Edition, CRC Press, 2017

REFERENCE BOOKS:

1. Ben Wisner, J.C. Gaillard, andIlanKelman (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. BimalKanti 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 windresistant structures.

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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 (OE-II)

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. - CO2Contribution 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.

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 Practicesin 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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(23A02604) RENEWABLE ENERGY SOURCES (OE-II)

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, geopressured 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.

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. Sukhatme, 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 (OE-II)

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. To get familiar with the properties of discrete time signals, systems and z-transform.
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 KINEMATICS

:

Manipulator Kinematics, Homogenous transformations as applicable to rotation and transition - 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 , Fu K S, McGraw Hill, 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 R K &Nagrath I J , TMH.

e-Resources and Digital Material:

1. https://www.youtube.com/watch?v=yxZm9WQJUA0&list=PLRLB5WCqU54UJG45UnazSYmnmh l-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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(23A05411) OPERATING SYSTEMS (OE-II)

Course Category	**Open Elective (OE)**
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, SYSTEM STRUCTURES

Operating Systems Overview: Introduction, Operating system functions, Operating systems operations, Computing environments, Open-Source Operating Systems System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, Operating system Design and Implementation, Operating system structure, Operating system debugging, System Boot.

UNIT-II PROCESS CONCEPT, MULTITHREADED PROGRAMMING, PROCESS SCHEDULING, INTER PROCESS COMMUNICATION

Process Concept: Process scheduling, Operations on processes, Inter-process communication, Communication in client server systems. Multithreaded Programming: Multithreading models, Thread libraries, Threading issues, Examples. Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Thread scheduling, Examples. Inter-process Communication: Race conditions, Critical Regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Barriers, Classical IPC Problems - Dining philosophers problem, Readers and writers problem.

UNIT-III MEMORY-MANAGEMENT STRATEGIES, VIRTUAL MEMORY MANAGEMENT

Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation, Examples. Virtual Memory Management: Introduction, Demand paging, Copy on-write, Page replacement, Frame allocation, Thrashing, Memory-mapped files, Kernel memory allocation, Examples.

UNIT-IV DEADLOCKS, FILE SYSTEMS

Deadlocks: Resources, Conditions for resource deadlocks, Ostrich algorithm, Deadlock detection And recovery, Deadlock avoidance, Deadlock prevention. File Systems: Files, Directories, File system implementation, management and optimization. Secondary-Storage Structure: Overview of disk structure, and attachment, Disk scheduling, RAID structure, Stable storage implementation.

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UNIT-V SYSTEM PROTECTION, SYSTEM SECURITY

System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights. System Security: Introduction, Program threats, System and network threats, Cryptography as a security, User authentication, implementing security defenses, firewalling to protect systems and networks, Computer security classification. Case Studies: Linux, Microsoft Windows.

TEXT BOOKS:

1. Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2016.
2. . Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (Topics: Inter-process Communication and File systems.)

REFERENCE BOOKS:

1. Tanenbaum A S, Woodhull A S, Operating Systems Design and Implementation, 3rd edition, PHI, 2006.
2. Dhamdhere D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw Hill, 2012.
3. Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009
4. Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004

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) ???Analyze the memory management and its allocation policies. (L4)
5. Able to design and implement file systems, focusing on file access methods, directory structure, free space management, and also explore various protection mechanisms,

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(23A33402) MACHINE LEARNING (OE-II)

Course Category	**Open Elective (OE)**
Course Enrichment Relevance	**Skill Development**

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 NonSeparable Case, Non-linear SVM, Kernel Trick, Logistic Regression, Linear Regression, Multi-Layer Perceptrons (MLPs), Backpropagation for Training an MLP.

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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 MaximizationBased 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 Stenbach, Vipin Kumar, 7th Edition, 2019

COURSE OUTCOMES:

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

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(23A91614) OPTIMIZATION TECHNIQUES FOR ENGINEERS (OE-II)

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:

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 (OE-II)

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 infinitedimensional 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 (R^2, 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
2. 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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(23A92604) PHYSICS OF ELECTRONIC MATERIALS AND DEVICES (OE-II)

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. Electro-luminescence : 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.

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

TEXT BOOKS:

1. Principles of Electronic Materials and Devices-S.O. Kasap, McGraw-Hill Education (India) Pvt. Ltd.,4thedition, 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, DhanpatRai 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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III B.Tech. II Sem.

L	T	P	C
3	0	0	3

(23A93605) CHEMISTRY OF POLYMERS AND APPLICATIONS (OE-II)

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 hydogel 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 cellulosics: 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 cellulosics.
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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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech. II Sem.

L	T	P	C
3	0	0	3

(23A94607) ACADEMIC WRITING AND PUBLIC SPEAKING (OE-II)

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 – Oculesics – Proxemics – Haptics – Chronomics -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 LanguageRHUS Publishers, 2016

REFERENCE BOOKS:

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

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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. phttps://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
2. Identify sources and avoid plagiarism
3. Demonstrate the knowledge in writing a Research paper
4. Analyse different types of essays
5. Assess the speeches of others and know the positive strengths of speakers
6. Build confidence in giving an impactful presentation to the audience

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech. II Sem. L T P C

(23A04641) WORKSHOP

Course Category	
Course Enrichment Relevance	

COURSE OBJECTIVES:

Body Language – Facial Expressions-Kinesics – Oculesics – Proxemics – Haptics – Chronomics -Paralanguage - Signs

COURSE OUTCOMES:

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech. II Sem.

L	T	P	C
0	0	0	0

(23A99609) MINI PROJECT

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

COURSE OBJECTIVES:

COURSE OUTCOMES:

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III B.Tech. II Sem.

L	T	P	C
3	0	0	3

(23A04642) EMBEDDED SYSTEMS AND REAL TIME OPERATING SYSTEMS (PE-II)

Course Category	**Professional Elective (PE)**
Course Enrichment Relevance	**Employability**

COURSE OBJECTIVES:

1. Provide fundamental knowledge of embedded systems, their design process, characteristics, and applications.
2. Enable students to understand and compare various on-board and external communication interfaces used in embedded systems.
3. Introduce the concepts of Real-Time Operating Systems (RTOS) including task scheduling, inter-task communication, and synchronization.
4. Familiarize students with the architecture, features, and programming aspects of ARM and PIC microcontrollers.
5. Develop an understanding of sensors and actuators and their integration in real-time embedded applications.

UNIT-I INTRODUCTION TO EMBEDDED SYSTEM

Embedded system definition, classification of embedded systems, embedded system design process, characteristics of embedded systems, applications of embedded systems.

UNIT-II COMMUNICATION INTERFACES

On-board communication interfaces: I2C, SPI, CAN,
External communication interfaces: RS-232, RS-485, USB, Bluetooth, Wi-Fi, ZigBee, GPRS, GSM.

UNIT-III 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

UNIT-IV MICROCONTROLLERS

Introduction to ARM Microcontroller, ARM Microcontroller ARCHITECTURES, Features of ARM Microcontroller, Technical Features of ARM Microcontroller, Register Modes ARM Microcontroller, , The PIC16F887Architecture , Features, Special function registers , Input/Output ports, Timer modes

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

UNIT-V SENSORS AND ACTUATORS

Sensor classification, electrical sensors (resistive, inductive, capacitive), thermal sensors (RTD, thermocouple), actuating devices (stepper motor, servo motor, solenoids), I/O devices (relay, switch, LED, LCD).

TEXT BOOKS:

1. Introduction to Embedded Systems - shibu k v, Mc Graw Hill Education.
2. ARM System-on-Chip Architecture ??? Steve Furber.
3. PIC Microcontroller and Embedded Systems ??? Mazidi, Naimi, Naimi.

REFERENCE BOOKS:

1. Embedded Systems: Architecture, Programming and Design – Raj Kamal, Tata McGraw Hill.
2. Embedded Systems: Real-Time Operating Systems for ARM Cortex-M Microcontrollers – Jonathan W. Valvano.

e-Resources and Digital Material:

1. https://www.theengineeringknowledge.com/introduction-to-arm-microcontroller
2. https://microcontrollerslab.com/pic16f887-microcontroller

COURSE OUTCOMES:

1. Understand the fundamentals, design process, characteristics, and applications of embedded systems.
2. Explain and compare various on-board and external communication interfaces used in embedded systems.
3. Apply concepts of RTOS including tasks, processes, scheduling, inter-task communication, and synchronization.
4. Describe the architecture, features, and operational modes of ARM and PIC microcontrollers.
5. Classify different sensors and actuators, and understand their role in embedded system applications.

Remarks:

This course equips students with theoretical foundations insights into embedded systems and RTOS-based design. It bridges the gap between hardware and software, enabling learners to design efficient, real-time embedded solutions using modern microcontrollers, communication protocols, and sensing/actuating devices. The course supports core competencies required in industries such as automation, IoT, robotics, automotive, and consumer electronics.

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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 woth 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.

MISSION

- 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

B.TECH-ECE(04)

website: www.srecnandyal.edu.in