G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous)

(Approved by AICTE | NAAC Accreditation with 'A' Grade |
Accredited by NBA (ECE & EEE) | Affiliated to JNTUA)
Nandikotkur Road, Venkayapalli (V), Kurnool – 518002, Andhra Pradesh, India

www.gpcet.ac.in

CURRICULUM FRAMEWORK

UG - BACHELOR OF TECHNOLOGY

ELECTRONICS AND COMMUNICATION ENGINEERING

Under R23 Regulations

B. Tech. - Regular Four-Year Degree Program
(For batches admitted from the Academic Year 2023 - 2024)
&
B. Tech. - Lateral Entry Scheme
(For batches admitted from the Academic Year 2024 - 2025)

Preliminary Definitions and Nomenclature

AICTE: Means All India Council for Technical Education, New Delhi.

Autonomous Institute: Means an institute designated as Autonomous by University Grants Commission (UGC), New Delhi in concurrence with affiliating University (**Jawaharlal Nehru Technological University Anantapur**).

Academic Autonomy: Means freedom to an institute in all aspects of conducting its academic programs, granted by UGC for Promoting Excellence.

Academic Council: The Academic Council is the highest academic body of the institute and is responsible for the maintenance of standards of instruction, education and examination within the institute. Academic Council is an authority as per UGC regulations and it has the right to take decisions on all academic matters including academic research.

Academic Year: It is the period necessary to complete an actual course of study within a year. It comprises two main semesters i.e., one odd and one even.

Branch: Means specialization in a program like B.Tech degree program in Civil Engineering, B.Tech degree program in Computer Science and Engineering etc.

Board of Studies (BOS): BOS is an authority as defined in UGC regulations, constituted by Head of the Organization for each of the departments separately. They are responsible for curriculum design and updation in respect of all the programs offered by a department.

Backlog Course: A course is considered to be a backlog course, if the student has obtained a failure grade in that course.

Basic Sciences: The courses offered in the areas of Mathematics, Physics, Chemistry etc., are considered to be foundational in nature.

Commission: Means University Grants Commission (UGC), New Delhi.

Choice Based Credit System: The credit-based semester system is one which provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching along with provision of choice for the student in the course selection.

Certificate Course: It is a course that makes a student to have hands-on expertise and skills required for holistic development in a specific area/field.

Compulsory course: Course required to be undertaken for the award of the degree as per the program.

Internal Examination: It is an examination conducted towards sessional assessment.

Core: The courses that are essential constituents of each engineering discipline are categorized as professional core courses for that discipline.

Course: A course is a subject offered by a department for learning in a particular semester.

Course Outcomes: The essential skills that need to be acquired by every student through a course.

Credit: A credit is a unit that gives weight to the value, level or time requirements of an academic course. The number of 'Contact Hours' in a week of a particular course determines its credit value. One credit is equivalent to one lecture/tutorial hour per week.

Credit point: It is the product of grade point and number of credits for a course.

Cumulative Grade Point Average (CGPA): It is a measure of cumulative performance of a student overall the completed semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.

Curriculum: Curriculum incorporates the planned interaction of students with instructional content, materials, resources, and processes for evaluating the attainment of Program Educational Objectives.

Department: An academic entity that conducts relevant curricular and co-curricular activities, involving both teaching and non-teaching staff, and other resources in the process of study for a degree.

Detention in a Semester: Student who does not obtain minimum prescribed attendance in a Semester shall be detained in that particular Semester. Also a Student can also be detained for lack of required number of credits till II-I/III-I at the end of Second year or Third Year respectively

Elective Course: A course that can be chosen from a set of courses. An elective can be Professional Elective and/or Open Elective.

Evaluation: Evaluation is the process of judging the academic performance of the student in her/his courses. It is done through a combination of continuous internal examinations and semester end examinations.

Grade: It is an index of the performance of the students in a said course. Grades are indicated by alphabets.

Grade Point: It is a numerical weight allotted to each letter grade on a 10 - point scale.

Institute: Means G.Pullaiah College of Engineering and Technology, Kurnool unless indicated otherwise by the context.

Massive Open Online Courses (MOOC): MOOCs inculcate the habit of self-learning. MOOCs would be additional choices in all the elective group courses.

Minor: Minor are coherent sequences of courses which may be taken in addition to the courses required for the B.Tech degree.

Pre-requisite: A specific course or subject, the knowledge of which is required to complete before student register another course at the next grade level.

Professional Elective: It indicates a course that is discipline centric. An appropriate choice of minimum number of such electives as specified in the program will lead to a degree with specialization.

Program: Means, UG degree program: Bachelor of Technology (B.Tech); PG degree program: Master of Technology (M.Tech) / Master of Business Administration (MBA).

Program Educational Objectives: The broad career, professional and personal goals that every student will achieve through a strategic and sequential action plan.

Project work: It is a design or research-based work to be taken up by a student during his/her final year to achieve a particular aim. It is a credit-based course and is to be planned carefully by the student.

Registration: Process of enrolling into a set of courses in a semester of a program.

Regulations: The regulations, common to all B.Tech programs offered by Institute, are designated as "GPCET Regulations – R23" and are binding on all the stakeholders.

Semester: It is a period of study consisting of 16 to 18 weeks of academic work equivalent to normally 90 working days. Odd semester commences usually in July and even semester in December of every year.

Semester End Examinations: It is an examination conducted for all courses offered in a semester at the end of the semester.

Program Outcomes: The essential skill sets that need to be acquired by every student during her/his program of study. These skill sets are in the areas of employability, entrepreneurial, social and behavioural.

University: Means Jawaharlal Nehru Technological University Ananthapur (JNTUA), Ananthapuramu.

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Academic Regulations (Scheme -2023) 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 programme of study for not less than four academic years and not more than eight academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would in addition to the maximum period permitted for graduation (Eight years).

II. Registers for 163 credits and secures all 163 credits.

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

I. Secures additional 15 credits fulfilling all the requisites of a B.Tech. programme i.e., 163 credits.

II. Completes the Honors simultaneously with B.Tech programme.

However, registering for Honors is optional

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. programme and their admission stands cancelled. This clause shall be read along with clause 1 (a) (i).

3. Courses of study

The following courses of study are offered at present as specializations for the B. Tech. course

S.No.	Name of the Branch	Branch Code
1.	Civil Engineering	01
2.	Electrical and Electronics Engineering	02
3.	Mechanical Engineering	03
4.	Electronics and Communication Engineering	04
5.	Computer Science and Engineering	05
6.	Computer Science and Engineering -Artificial Intelligence	31

4. Program related terms

(a) 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	1credit
1 Hr. Tutorial (T) per week	1credit
1 Hr. Practical (P) per week	0.5 credit
2 Hrs. Practical (Lab) per week	1credit

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

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

5. Semester/Credits:

a. A semester comprises of 90 working days and an academic year is divided into two semesters.
b. 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.
c. Regular courses may also be completed well in advance through MOOCs satisfying prerequisites

6. Structure of the Undergraduate Programme

All courses offered for the B.Tech programmes are broadly classified as follows

S.No	Category	Breakup of Credits (Total 163)	Percentage of Total Credits	AICTE Recommendation (%)
1	Humanities and Social Science including Management (HM)	13	8%	8-9%
2	Basic Sciences (BS)	20	13%	12-16%
3	Engineering Sciences (ES)	23.5	14%	10-18%
4	Professional Core (PC)	54.5	34%	30-36%
5	Electives – Professional (PE) & Open (OE); Domain Specific Skill Enhancement Courses (SEC)	36	21%	19-23%
6	Internships & Project Work (PR)	16	10%	8-11%
7	Mandatory Course (MC)	Non Credit	Non Credit	

7. Course Classification:

All courses offered for the B.Tech programmes are broadly classified as follows:

S.No	Broad 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	Professional Elective	Includes elective subjects related to the parent

	Courses	Courses (PE)	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 MajorProject
		Internships	Summer Internships – Community based and Industry Internships; Industry oriented Full Semester Internship
5	Audit Courses	Mandatory non-credit courses	Covering subjects for developing desired attitude among the learners

8. Programme Pattern

- ❖ Total duration of the B. Tech (Regular) Programme is four academic years.
- ❖ Each academic year of study is divided into two semesters.
- ❖ There shall be mandatory Student Induction Program for freshers, with three-week duration before the commencement of first semester. The induction program includes Creative Arts, Universal Human Values, Physical activities, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations etc.,
- ❖ Health / Wellness / Yoga / Sports and NSS / Scouts & Guides / Community Service Activities are mandatory as credit courses for all the under graduate programmes.
- ❖ Courses like Environmental Sciences, Indian Constitution, Technical Paper Writing & IPR are offered as non-credit mandatory courses for all the B.Tech Programmes.
- ❖ Design Thinking for Innovation & Tinkering Labs are mandatory credit courses for all the B.Tech Programmes.
- ❖ There shall be Five Professional Elective courses and Four Open Elective courses.
- ❖ Professional Elective Courses, include the elective courses relevant to the chosen specialization/branch. Proper choice of professional elective courses help the students specializing in emerging areas within the chosen field of study.
- ❖ A total of four Open Electives are offered in the curriculum. A student can complete the requirement for B.Tech. Degree with a Minor within the 163 credits by opting for the courses offered through various verticals / tracks under Open Electives.
- ❖ While choosing the electives, students shall ensure that they do not opt for the courses with syllabus contents similar to courses already pursued.
- ❖ A pool of interdisciplinary / job-oriented / domain skill courses which are relevant to the industry are integrated into the curriculum of all B.Tech Programmes. There shall be five skill enhancement 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.
- ❖ 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.

- ❖ There shall also be mandatory full internship in the final semester of the programme along with the project work.
- ❖ B.Tech Degree with Honors is introduced for the students having good academic record.
- ❖ The College shall take measures to implement Virtual Labs (https://www.vlab.co.in) which provide remote access to labs in various B.Tech Programmes and will help students in learning basic and advanced concepts through remote experimentation. Student shall be made to work on virtual lab experiments during the regular labs.
- ❖ The college shall assign a faculty advisor / mentor 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.
- ❖ 25% of course work for the theory courses in every semester shall preferably be conducted in the blended mode of learning.

9. Evaluation Process

The performance of a student in each semester shall be evaluated course wise with a maximum of 100 marks for theory and 100 marks for practical course. Summer Internships shall be evaluated for 100 marks, Full Internship & Project work in final semester shall be evaluated for 100 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.

(a) Theory Courses

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

For theory course, the distribution shall be 30 marks for Continuous Internal Assessment and 70 marks for the End Examination.

For practical course, the distribution shall be 30 marks for Continuous Internal Assessment and 70 marks for the End Examination.

If any course contains two different branch subjects, the syllabus shall be 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.

If any course contains both theory and practical components, they will be evaluated separately as theory course and practical course.

Continuous Internal Assessment

- ❖ For theory courses, during the semester, there shall be two sessional examinations. Each sessional examination shall be evaluated for 30 marks of which 05 marks for objective paper (20 minutes duration), 20 marks for subjective paper (90 minutes duration) and 05 marks for assignment.

- ❖ The Objective paper will be conducted for 10 marks which will be condensed to 05 marks. Similarly the Subjective paper will be conducted for 30 marks which will be condensed to 20 marks.
- ❖ There shall be 3 questions in Subjective paper and all questions are compulsory.
- ❖ In each of the questions from 1 to 3, there shall be either / or type questions of 10 marks each. Student shall answer any one of them.
- ❖ First sessional 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.
- ❖ If a student is absent for the sessional examination, no re-exam shall be conducted and the sessional examination marks for that examination shall be considered as zero.
- ❖ Final sessional marks shall be arrived at by considering the marks secured by the student in both the sessional examinations with 80% weight age given to the better sessional exam and 20% to the other.
- ❖ Assignments shall be in the form of problems, mini projects, design problems, slip tests, etc., depending on the course content.
- ❖ One Assignment before First Sessional examination and other before Second Sessional examination shall be conducted.
- ❖ In the case of Design/Drawing subjects the weightage shall be 20 marks for Sessional examinations and remaining 10 marks shall be for Day to Day class work

End Examination Evaluation:

The question paper for the End examination of theory courses shall have the following pattern:

- ❖ There shall be 6 questions and all questions are compulsory.
- ❖ Question No. 1 shall contain 10 (2 marks each) compulsory short answer questions for a total of 20 marks with 2 short answer questions from each unit.
- ❖ In each of the questions from 2 to 6, there shall be either / or type questions of 10 marks each. Student shall answer any one of them.
- ❖ The questions from 2 to 6 shall be set by covering one unit of the syllabus for each question.
- ❖ The question paper for End examination of theory courses consisting of two parts of different course, for Example: Basic Electrical & Electronics Engineering shall have the following pattern:
  Question paper shall be in two parts viz., Part A and Part B with equal weight age of 35 marks each. In each part, question 1 shall contain 5 (1 mark each) compulsory short answer questions for a total of 5 marks.
  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. The questions from 2 to 4 shall be set by covering one unit of the syllabus for each question.
- ❖ The end examination question paper for courses like Engineering Graphics, shall consists of 5 either or type questions of 14 marks each. There shall be no objective type questions in the end examination.

(b) Practical Courses

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

- For practical courses, there shall be a continuous assessment during the semester for 30 marks and end examination shall be for 70 marks.
- Day-to-day work in the laboratory shall be evaluated for 15 marks by the concerned laboratory teacher based on the day to day work / record, and 15 marks for the internal test.
- The end examination shall be evaluated for 70 marks, conducted by the concerned laboratory teacher and a senior expert/external examiner in the subject
  Procedure: 20 Marks
  Experimental work & Results: 30 marks
  Viva voce: 20 marks.
- In a practical course 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. Internal assessment shall be as above for 30 marks in each part and final internal assessment marks shall be arrived by considering the average of marks obtained in two parts.

There shall be no end 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 assessment. In case, the student fails in the mandatory courses with zero credits, a re-examination shall be conducted for failed candidates for 30 marks

The laboratory records and test papers shall be preserved in the institution for a minimum of 3 years and shall be produced to the Committees of the University / NBA / NAAC etc as and when the same is requested for.

(c) Skill Oriented Courses

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

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.

The student shall be given an option to choose either the skill courses being offered by the college or to choose a certificate course being offered by industries / Professional bodies or any other accredited bodies. If a student chooses to take a Certificate Course offered by external agencies, the credits shall be awarded to the student upon producing the Course Completion Certificate from the agency.

The Head of the Department shall identify a faculty member as coordinator for the course. A committee consisting of the Head of the Department, coordinator and a senior Faculty member nominated by the Head of the Department shall evaluate the grades/marks given for a course by external agencies and convert to the equivalent marks/grades. Marks/grades shall be assigned to the students by the above committee based on their performance.

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 Institution.

For the Skill oriented courses offered by the institution the Continuous assessment and end examination shall be as similar to that of Theory course or practical course based on the nature of Skill oriented course.

(d) Massive Open Online Courses (MOOCs):

The student can pursue 40% of total credits in a semester through MOOCS approved by the Institution.

A student shall register for the course (Minimum of 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 for continuous assessment and end examination (for the specified equivalent credit course only) conducted by the college. Necessary amendments in rules and regulations regarding adoption of MOOC courses would be proposed from time to time.

10. 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 (not exceeding two courses in a semester) being offered in a particular programme i.e., maximum of 32 credits through MOOCs platform.
- ❖ 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.
- ❖ Student registration for the MOOCs shall be only through the respective department of the institution and it is mandatory for the student to share necessary information with the department.
- ❖ Credit transfer policy will be applicable to the Professional & Open Elective / Skill Oriented courses only.
- ❖ The concerned department shall identify the courses permitted for credit transfer.
- ❖ The institution shall notify at the beginning of semester the list of the online learning courses eligible for credit transfer.
- ❖ 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.
- ❖ The institution shall ensure no overlap of MOOC exams with that of the end examination schedule. In case of delay in results, the institution will re-issue the marks sheet for such students.
- ❖ 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.
- ❖ The department shall submit the following to the examination section of the institution:
- ❖ List of students who have passed MOOC courses in the current semester along with the certificate of completion.
- ❖ 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.

11. Academic Bank of Credits (ABC)

The institution shall implement Academic Bank of Credits (ABC) to promote flexibility in curriculum as per NEP 2020 to

- ❖ Provide option of mobility for learners across the institutions / universities of their choice
- ❖ Provide option to gain the credits through MOOCs from approved digital platforms.
- ❖ Facilitate award of certificate/diploma/degree in line with the accumulated credits in ABC
- ❖ Execute Multiple Entry and Exit system with credit count, credit transfer and credit acceptance from students' account.

12. Mandatory Internships

(a) 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% weightage each. It shall be evaluated for 100 marks. 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.

(b) 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 shall be 100 and distribution shall be 30 marks for internal assessment and 70 marks for external evaluation. At the end of the semester, all projects shall be showcased at the department for the benefit of all students and staff. The project work is to be evaluated for 30 marks (including seminar and presentation) by the departmental Project Review Committee consisting of supervisor, a senior faculty and HOD. The external evaluation of Project Work is a Viva-Voce Examination conducted in the presence of internal examiner and external examiner appointed by the Head of the Department and approved by the Principal and shall be evaluated for 60 marks.

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

13. Guidelines for Minor

- ❖ To promote interdisciplinary knowledge among the students, the students admitted into B.Tech. in a major stream / programme are eligible to obtain degree in Minor in another stream.
- ❖ The Minor program requires the completion of 12 credits in Minor stream chosen.
- ❖ Two courses for 06 credits related to a Minor are to be pursued compulsorily for the minor degree, but may be 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.
- ❖ 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.

14. Guidelines for 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. B.Tech (Hons.) is a best choice for academically excellent students having good academic record and interest towards higher studies and research.

- ❖ Honors is introduced in the curriculum of all B. Tech. programs offering a major degree and is applicable to all B. Tech students.
- ❖ 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., 163 credits).
- ❖ 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.
- ❖ The institution shall arrange separate class work and timetable of the courses offered under Honors program.
- ❖ Courses that are used to fulfil the student’s primary major shall not be double counted towards the Honors. Courses with content substantially equivalent to courses in the student's primary Major shall not be counted towards the Honors.
- ❖ Students can complete the courses offered under Honors either in the institution 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.
- ❖ The attendance for the registered courses under Honors and regular courses offered for Major degree in a semester are to be considered separately.
- ❖ A student shall maintain 75% attendance in all registered courses under Honors to be eligible for attending end examination.
- ❖ A student registered for Honors shall pass in all courses 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.

- 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, on request such students shall receive a separate grade sheet mentioning the additional courses completed by them.
- The Honors will be mentioned in the Provisional / Degree certificate as Bachelor of Technology (Honors) in XYZ. For example, B.Tech. (Honors) in Mechanical Engineering.

(b) Enrolment into Honors:

Students of a Department/Discipline are eligible to opt for Honors program

- Offered by the same Department/Discipline
- 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 7.0 CGPA without any backlog subjects will be permitted to register for Honors.
- If a student is detained due to lack of attendance either in Major or in Honors, registration shall be cancelled.
- Transfer of credits from Honors to regular B. Tech degree and vice-versa shall not be permitted.
- Honors is to be completed simultaneously with a Major degree program.

(c) Registration for Honors:

- The eligible and interested students shall apply through the HOD of his/her parent department. The whole process should be completed within Two weeks before the start of every semester. Selected students shall be permitted to register the courses under Honors.
- 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.
- 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.
- There is no fee for registration of subjects for Honors program offered in offline at the institution

15. Attendance Requirements:

- A student shall be eligible to appear for the end examinations if he/she acquires a minimum of 75% of attendance in aggregate of all the subjects.
- Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the Principal.
- Shortage of Attendance below 65% in aggregate shall in NO CASE be condoned.
- A stipulated fee shall be payable towards condonation of shortage of attendance to the Institution.
- Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that semester and their registration shall stand cancelled.
- 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.

- ❖ If any candidate fulfils the attendance requirement in the present semester, he shall not be eligible for readmission into the same semester.
- ❖ 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.
- ❖ For induction programme attendance shall be maintained as per AICTE norms.

16. Promotion Rules:

The following academic requirements must be satisfied in addition to the attendance requirements mentioned in section 15.

- ❖ A student shall be promoted from first year to second year if he/she fulfils the minimum attendance requirement as per the norms.
- ❖ 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 courses that have been studied up to III semester.
- ❖ 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 courses 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.
- ❖ 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.

17. Promotion Criteria

For Promotion to	**Minimum Credits required**	
	For Four Year Regular B.Tech Students	**For Lateral Entry Students**
V Semester	Students should earn 40% of the total credits up to and including III semester before they register for IV semester regular exams	---
VII Semester	Students should earn 40% of the credits up to and including V semester before they register for VI semester regular exams	Students should earn 40% of the total credits of III, IV and V semesters before they register for VI semester regular exams

18. Grading:

The student’s performance shall be measured on a 10-point Absolute Grading System using the following Letter Grades and corresponding percentage of marks shall be followed:

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

Structure of Grading of Academic Performance

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

- ❖ A student obtaining Grade ‘F’ or Grade ‘Ab’ in a subject shall be considered failed and will be required to reappear for that subject when it is offered the next supplementary examination.
- ❖ For non-credit audit courses, “Satisfactory” or “Unsatisfactory” shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA/Percentage.

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

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

$$SGPA= \Sigma(Ci \times Gi)/\Sigma Ci$$

Where, Ci is the number of credits of the ith subject and Gi is the grade point scored by the student in the ith 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.,

$$CGPA= \Sigma(Ci \times Si)/\Sigma Ci$$

Where “Si” is the SGPA of the ith semester and Ci 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 courses 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.

19. Requirement for clearing any course

- ❖ In the theory and practical courses the students have to obtain a minimum of 35% marks in the end examinations and also minimum 40% of marks in the sum of the continuous internal assessment and end examination taken together, otherwise they will be awarded grade-F in that course. F is considered as a Fail grade indicating that the student has to reappear for the end supplementary examination in that course and obtain a non fail grade for clearing that course.
- ❖ To become eligible for the award of degree a student must obtain a minimum CGPA of 4.0

20. Regular and Supplementary Examinations

At the end of every semester Regular Examinations of that semester shall be conducted. During the Odd semester regular examinations of odd semester and supplementary examinations of even semester shall be scheduled. During the even semester, Regular examinations of even semester and supplementary examinations of Odd semester shall be scheduled. Students with backlog subjects shall have to write more than one examination per day.

21. Award of Class:

After a student satisfies 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	≥ 4.0 < 5.5

CGPA to Percentage conversion Formula

(CGPA – 0.5) x 10

22. 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.

23. 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.

- **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
- **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.
- **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, 123 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 Institution/University 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.

24. 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 startups. This period may be extended to two years at the most and these two years would not be counted for the time for the maximum time for graduation. An evaluation committee constituted by the Principal 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

25. Transitory Regulations

Candidates who have been detained for want of attendance/lack of credits or avail temporary withdrawal or avail gap year are eligible for readmission into the respective semester as and when the semester is offered and such students shall be governed by the curriculum and academic regulations in force at the time of re-joining

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 and they will be governed by the academic regulations in force at the time of readmission

26. Minimum Instruction Days:

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

27. Medium of Instruction:

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

28. Student Transfers:

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

29. Award of Degree

After having admitted into the program, B.Tech degree shall be conferred on a student who has satisfied the following conditions.

- ❖ The student joining with Intermediate qualification must have, after admission into the Regular B.Tech program of the college, pursued a regular course of study for not less than four academic years and not more than eight academic years.
- ❖ The student is required to complete the B.Tech Programme of study satisfying the attendance and academic / credit requirements in all the eight semesters of the course within a period of eight academic years (excluding Gap year) from the year of admission, failing which he / she shall be declared ineligible to pursue B.Tech degree programme.

- The student joining under lateral entry scheme with diploma qualification must have, after admission into III Semester B.Tech, pursued a regular course of study for not less than three academic years and not more than six academic years.
- The student joining under lateral entry scheme is required to complete the B.Tech Programme of study satisfying the attendance and academic / credit requirements in all the six semesters of the course within a period of sixacademic years (excluding Gap year) from the year of admission, failing which he / she shall be declared ineligible to pursue B.Tech degree programme.
- Completing the programme shall mean not only satisfying the attendance and academic / credit requirements but also passing of all the courses and earning the credits prescribed in the curriculum with the respective stipulated period.
- A student is required to complete the B.Tech Programme of study satisfying the attendance and academic / credit requirements in all the eight semesters of the course within a period of eight (six in case of lateral entry) academic years (excluding Gap year) from the year of admission, failing which he / she shall be declared ineligible to pursue B.Tech degree programme.
- The student must have satisfied the minimum academic requirements in the respective branch of engineering in each semester.
- Students must register for all the courses and earn the credits specified
- Students who fail to fulfil all the academic requirements for the award of degree within the specified period from the year of their admission shall forfeit their seat in B.Tech and their admission stands cancelled.
- The student shall successfully complete non-credit courses and mandatory Courses.
- The student shall have no dues to the institution, library, hostels etc
- The student shall have no disciplinary action pending against him/her.
- The Degree will be conferred and awarded by Jawaharlal Nehru Technological University Anantapur, Ananthapuramu on recommendations by the Academic council of the college basing on the eligibility

30. With holding of Results

The result of a candidate shall be withheld if:

- He/she has not cleared any dues to the Institution/ Hostel /University
- A case of disciplinary action against him/her is pending disposal.

31. Exam Hall Culture

- Students are not permitted to use mobile phones in the examination halls.
- Any attempt by any student to influence the examiners, faculty and staff or Controller of Examinations for undue favours in the exams, and bribing them either for marks or attendance will be treated as malpractice case and the student can be debarred from the college.
- When a student absents himself/herself, he/she is treated as to have appeared and obtained zero marks in that course(s) and Grading is done accordingly.
- When a student’s answer book is confiscated for any kind of attempted or suspected malpractice, the decision of the examination committee is final.

32. Amendment of Regulations

The college may, from time to time, revise, amend or change the regulations, scheme of examinations and syllabi.

33. Ragging

Ragging of any kind is strictly prohibited. A Student who indulges in ragging shall be punished as per the provisions of the Ragging Act.

34. Rules of Discipline

- ❖ Use of mobile phones with camera on the campus is strictly prohibited.
- ❖ Students shall behave and conduct themselves in a dignified and courteous manner on the campus/Hostels.
- ❖ Students shall not bring outsiders to the institution or hostels.
- ❖ Students shall not steal, deface, damage or cause any loss to the institution property.
- ❖ Students shall not collect money either by request or coercion from others within the campus or hostels.
- ❖ Students shall not resort to plagiarism of any nature/extent. Use of material, ideas, figures, code or data without appropriate acknowledgement or permission of the original source shall be treated as cases of plagiarism. Submission of material, verbatim or paraphrased, that is authored by another person or published earlier by oneself shall also be considered as cases of plagiarism.
- ❖ Use of vehicles by the students inside the campus is prohibited.
- ❖ Any conduct which leads to lowering the esteem of the institution is prohibited.
- ❖ Any student exhibiting prohibited behaviour shall be suspended from the institute. The period of suspension and punishment shall be clearly communicated to the student. The student shall lose the attendance for the suspended period
- ❖ Dress Code

  Boys: All the boy students should wear formal dresses. Wearing T-shirts and other informal dresses on the campus is strictly prohibited.

  Girls: All the girl students shall wear churidhar with dupatta / saree

35. General Instructions:

The academic regulations should be read as a whole for purpose of any interpretation.

Where the words “he”, “him”, “his”, occur in the regulations, they also include “she”, “her”, “hers”, respectively.

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 institution.

In the case of any doubt or ambiguity in the interpretation of the guidelines given, the decision of the Head of the institution is final.

Punishment For Malpractice Cases

S.No	Nature of Malpractice/Improper conduct	Punishment
1.	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 course 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 student which can be used as an aid in the course of the examination)	For Possession of mobile phone: Expulsion from the examination hall and cancellation of the performance in that course only. For possession of any material relevant to the exam: Expulsion from the examination hall and cancellation of the performance in 50% of the subjects.(In case of fraction, the integer part of the number). The subjects for cancellation will be selected in cyclic order starting with the subject in which the candidate is found to resort to malpractice
2.	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 course.
3.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that course and all other courses the candidate has appeared including practical examinations and project work of that semester/year examinations.
4.	Gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phones with any other student 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 course only of all the students involved. In case of an outsider, he will be handed over to the police and a case shall be registered against him.
5.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the course of the examination (theory or practical) in which the student is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses including practical examinations and project work of that semester/year.
6.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses including practical examinations and project work of that semester/year
7.	Smuggles in the answer book or takes out or arranges to send out the question paper during the examination or answer book during or after the examination	Expulsion from the examination hall and cancellation of performance in that course and all the other courses including practical examinations and project work of that semester/year. The student is also debarred for two consecutive semesters from class work and

		all examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
8.	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 officer-in-charge, 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 course and all other courses of that semester/year. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case shall be registered against them.
9.	Leaves the exam hall taking away answer script or intentionally tears up the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses including practical examinations and project work of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all end examinations. The continuation of the program by the candidate is subject to the academic regulations in connection with forfeiture of seat.
10.	Possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses including practical examinations and project work of that semester/year. The student is also debarred and forfeits the seat.
11.	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	For Student of the college: Expulsion from the examination hall and cancellation of the performance in that course and all other courses including practical examinations and project work

	conduct mentioned in S.No. 7 to S.No. 9	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 shall be registered against them
12.	Impersonates any other student in connection with the examination	The student who has impersonated shall be expelled from examination hall. The student is debarred from writing the remaining exams, and rusticated from the college for one academic year during which period the student will not be permitted to write any exam. If the imposter is an outsider, he will be handed over to the police and a case shall be registered against him. The performance of the original student who has been impersonated, shall be cancelled in all the courses of the examination including practicals and project work of that semsester /year. The student is rusticated from the college for two consecutive years during which period the student will not be permitted to write any exam. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
13.	If any malpractice is detected which is not covered in the above S.No. 1 to S.No. 12 items, it shall be reported to the college academic council for further action and award suitable punishment.	
14.	Malpractice cases identified during sessional examinations will be reported to the examination committee to award suitable punishment.	

ACADEMIC REGULATIONS (Scheme 2023) 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

Award of the B.Tech. Degree / B.Tech. Degree with a Minor if he/she fulfils the following:

- ❖ Pursues a programme 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).
- ❖ Registers for 120 credits and secures all 120 credits.

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

- ❖ Student secures additional 15 credits fulfilling all the requisites of a B.Tech. program i.e., 120 credits.
- ❖ Registering for Honors is optional.
- ❖ Honors is 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.1

- ❖ 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 continuous assessment and end examination taken together.
- ❖ 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.

4. Programme Pattern

The entire programme of study is three academic years on semester pattern.

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.

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, and they will be governed by the academic regulations in force at the time of readmission.

All other regulations as applicable for B. Tech. Four-year degree programme (Regular) will hold good for B. Tech. (Lateral Entry Scheme).

PROGRAMME CURRICULUM STRUCTURE UNDER R23 REGULATIONS

B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING

INDUCTION PROGRAM

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

PROGRAMME CURRICULUM STRUCTURE UNDER R23 REGULATIONS

B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING

I SEMESTER (I YEAR)									
Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A40003	Engineering Physics	BS&H	3	0	0	3	30	70	100
A40002	Linear Algebra & Calculus	BS&H	3	0	0	3	30	70	100
A40201	Basic Electrical & Electronics Engineering	ES	3	0	0	3	30	70	100
A40301	Engineering Graphics	ES	1	0	4	3	30	70	100
A40501	Introduction to Programming	ES	3	0	0	3	30	70	100
A40503	IT Workshop	ES	0	0	2	1	30	70	100
A40006	Engineering Physics Lab	BS&H	0	0	2	1	30	70	100
A40202	Electrical & Electronics Engineering Workshop	ES	0	0	3	1.5	30	70	100
A40502	Computer Programming Lab	ES	0	0	3	1.5	30	70	100
A40011	NSS/NCC/Scouts & Guides/Community Service	BS&H	-	-	1	0.5	-	-	-
		TOTAL	13	00	15	20.5	270	630	900

II SEMESTER (I YEAR)									
Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A40001	Communicative English	BS&H	2	0	0	2	30	70	100
A40004	Chemistry	BS&H	3	0	0	3	30	70	100
A40009	Differential Equations & Vector Calculus	BS&H	3	0	0	3	30	70	100
A40101	Basic Civil & Mechanical Engineering	ES	3	0	0	3	30	70	100
A40205	Network Analysis	PC	3	0	0	3	30	70	100
A40005	Communicative English Lab	BS&H	0	0	2	1	30	70	100
A40007	Chemistry Lab	BS&H	0	0	2	1	30	70	100
A40302	Engineering Workshop	ES	0	0	3	1.5	30	70	100
A40206	Network Analysis Lab	PC	0	0	3	1.5	30	70	100
A40012	Health and wellness, Yoga and Sports	BS&H	-	-	1	0.5	-	-	-
		TOTAL	14	00	11	19.5	270	630	900

PROGRAMME CURRICULUM STRUCTURE UNDER R23 REGULATIONS

B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING

III SEMESTER (II YEAR)

Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A40016	Probability and Complex Variables	BS	3	0	0	3	30	70	100
A40018	Universal Human Values– Understanding Harmony and Ethical Human Conduct	HSMC	2	1	0	3	30	70	100
A40401	Signals, Systems and Stochastic Processes	ES	3	0	0	3	30	70	100
A40402	Electronic Devices and Circuits	PC	3	0	0	3	30	70	100
A40403	Digital Circuits Design	PC	3	0	0	3	30	70	100
A40404	Electronic Devices and Circuits Lab	PC	0	0	3	1.5	30	70	100
A40405	Digital Circuits & Signal Simulation Lab	PC	0	0	3	1.5	30	70	100
A40510	Python Programming	SEC	0	1	2	2	30	70	100
A40031	Environmental Science	MC	2	0	0	-	100*	-	100*
		TOTAL	16	02	08	20	240	560	800

* The marks for Mandatory Courses are not considered for calculating SGPA

IV SEMESTER (II YEAR)

Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A40022	**Management Course-I** Managerial Economics and Financial Analysis	HSMC	2	0	0	2	30	70	100
A40217	Linear Control Systems	ES	3	0	0	3	30	70	100
A40408	EM Waves and Transmission Lines	PC	3	0	0	3	30	70	100
A40409	Electronic Circuits Analysis	PC	3	0	0	3	30	70	100
A40410	Analog and Digital Communications	PC	3	0	0	3	30	70	100
A40411	Electronic Circuits Analysis Lab	PC	0	0	3	1.5	30	70	100
A40412	Analog and Digital Communications Lab	PC	0	0	3	1.5	30	70	100
A40021	Soft Skills	SEC	0	1	2	2	30	70	100
A40023	Design Thinking and Innovation	ES	1	0	2	2	30	70	100
		TOTAL	15	1	10	21	270	630	900
Mandatory Community Service Project Internship of 08 weeks duration during summer vacation									

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY,KURNOOL

PROGRAMME CURRICULUM STRUCTURE UNDER R23 REGULATIONS

B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING

V SEMESTER (III YEAR)

Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A40414	Analog and Digital IC Applications	PC	3	0	0	3	30	70	100
A40415	Antennas and Wave Propagation	PC	3	0	0	3	30	70	100
A40416	Microprocessors and Microcontrollers	PC	3	0	0	3	30	70	100
A40417a A40417b A40417c A40417d A40417e	**Professional Elective –I** 1. Computer Architecture & Organization 2. Information theory and coding 3. Detection and Estimation Theory 4. Simulation of Communication Systems using MATLAB 5. Introduction to Photonics	PE	3	0	0	3	30	70	100
	Open Elective –I	OE	3	0	0	3	30	70	100
A40418	Analog and Digital IC Applications Lab	PC	0	0	3	1.5	30	70	100
A40419	Microprocessors and Microcontrollers Lab	PC	0	0	3	1.5	30	70	100
A40420	PCB Design and Prototype Development	SEC	0	1	2	2	30	70	100
A40536	Introduction to Quantum Technologies and Applications	SEC	3	0	0	3	30	70	100
A40032	Tinkering Lab	BS&H	0	0	2	1	30	70	100
A40421	Evaluation of Community Service Internship	PW	-	-	-	2	100	-	100
		TOTAL	**18**	**01**	**10**	**26**	**400**	**700**	**1100**

Open Elective – I

Course Code	Title of the Course	L-T-P	Credits	Offered by
A40171	Green Buildings	3-0-0	3	CE
A40172	Construction Technology and Management	3-0-0	3	CE
A40271	Electrical Safety Practices and Standards	3-0-0	3	EEE
A40371	Sustainable Energy Technologies	3-0-0	3	ME
A40571	Programming in Java	3-0-0	3	CSE
A40572	Artificial Intelligence - Concepts and Techniques	3-0-0	3	CSE
A40573	Quantum Technologies & Applications	3-0-0	3	CSE
A40071	Mathematics for Machine Learning and AI	3-0-0	3	H&S
A40072	Materials Characterization Techniques	3-0-0	3	H&S
A40073	Chemistry of Energy Systems	3-0-0	3	H&S
A40074	English for Competitive Examinations	3-0-0	3	H&S
A40075	Entrepreneurship and New Venture Creation	3-0-0	3	H&S
A40090	Mathematics for Machine Learning	3-0-0	3	H&S
A40091	Entrepreneurship	3-0-0	3	H&S

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PROGRAMME CURRICULUM STRUCTURE UNDER R23 REGULATIONS

B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING

VI SEMESTER (III YEAR)

Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A40424	Digital Signal Processing	PC	3	0	0	3	30	70	100
A40425	Microwave and Optical Communications	PC	3	0	0	3	30	70	100
A40426	VLSI Design	PC	3	0	0	3	30	70	100
 A40427a A40427b A40427c A40427d A40427e	**Professional Elective –II** 1. Electronic Measurements and Instrumentation 2. Embedded systems & IOT 3. Speech Processing 4. Transducers for Instrumentation 5. Introduction to Embedded System Design	PE	3	0	0	3	30	70	100
 A40428a A40428b A40428c A40428d A40428e	**Professional Elective –III** 1. Digital Image Processing 2. Artificial Intelligence & Machine learning 3. Satellite Communications 4. Computer Vision And Image Processing - Fundamentals And Applications 5. Spread Spectrum Communications And Jamming	PE	3	0	0	3	30	70	100
	Open Elective –II	OE	3	0	0	3	30	70	100
A40429	Microwave and Optical Communications Lab	PC	0	0	3	1.5	30	70	100
A40430	VLSI Design Lab	PC	0	0	3	1.5	30	70	100
A40431	Machine Learning and DSP	SEC	0	1	2	2	30	70	100
A40033	Technical Paper Writing & IPR	MC	2	0	0	-	100*	-	100*
		TOTAL	**20**	**01**	**08**	**23**	**270**	**630**	**900**
Mandatory Industry Internship of 08 weeks duration during summer vacation									

* The marks for Mandatory Courses are not considered for calculating SGPA

Open Elective – II

Course Code	Title of the Course	L-T-P	Credits	Offered by
A40173	Disaster Management	3-0-0	3	CE
A40174	Sustainability In Engineering Practices	3-0-0	3	CE
A40272	Renewable Energy Sources	3-0-0	3	EEE
A40372	Automation and Robotics	3-0-0	3	ME
A40574	Introduction to Operating Systems	3-0-0	3	CSE
A40575	Introduction to Machine Learning	3-0-0	3	CSE
A40076	Optimization Techniques	3-0-0	3	H&S
A40077	Physics Of Electronic Materials and Devices	3-0-0	3	H&S
A40078	Chemistry Of Polymers and Applications	3-0-0	3	H&S
A40079	Academic Writing and Public Speaking	3-0-0	3	H&S
A40080	Mathematical foundation of quantum technologies	3-0-0	3	H&S

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PROGRAMME CURRICULUM STRUCTURE UNDER R23 REGULATIONS

B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING

VII SEMESTER (IV YEAR)										
Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A40432	Data Communications and Networking	PC	3	0	0	3	30	70	100
A40034 A40035 A40036	**Management Course-II** 1. Business Ethics and Corporate Governance 2. E-Business 3. Management Science	HSMC	2	0	0	2	30	70	100
A40433a A40433b A40433c	**Professional Elective –IV** 1. Radar Engineering 2. DSP Processors & Architectures 3. Cellular & Mobile Communications	PE	3	0	0	3	30	70	100
A40434a A40434b A40434c	**Professional Elective –V** 1. Low Power VLSI Design 2. Wireless Sensor Networks 3. 5G Communications	PE	3	0	0	3	30	70	100
	Open Elective –III	OE	3	0	0	3	30	70	100
	Open Elective –IV	OE	3	0	0	3	30	70	100
A40435a A40435b	1. RF System Design tools 2. Industrial IOT & Automation	SEC	0	1	2	2	30	70	100
A40037	Gender Sensitization	MC	2	0	0	-	100*	-	100*
A40436	Evaluation of Industry Internship	PW	-	-	-	2	100	-	100
		TOTAL	**19**	**01**	**02**	**21**	**310**	**490**	**800**

* The marks for Mandatory Courses are not considered for calculating SGPA

Open Elective – III

Course Code	Title of the Course	L-T-P	Credits	Offered by
A40175	Building Materials and Services	3-0-0	3	CE
A40176	Environmental Impact Assessment	3-0-0	3	CE
A40273	Smart Grid Technologies	3-0-0	3	EEE
A40373	3D Printing Technologies	3-0-0	3	ME
A40576	Fundamentals of Data Base Management Systems	3-0-0	3	CSE
A40577	Cyber Security	3-0-0	3	CSE
A40081	Wavelet transforms and its applications	3-0-0	3	H&S
A40082	Smart Materials and Devices	3-0-0	3	H&S
A40083	Green Chemistry and Catalysis for Sustainable Environment	3-0-0	3	H&S
A40084	Employability Skills	3-0-0	3	H&S
A40085	Introduction to Quantum Mechanics	3-0-0	3	H&S

Open Elective – IV

Course Code	Title of the Course	L-T-P	Credits	Offered by
A40177	Geo-Spatial Technologies	3-0-0	3	CE
A40178	Solid Waste Management	3-0-0	3	CE
A40274	Introduction to Electric Vehicles	3-0-0	3	EEE
A40374	Quality Management	3-0-0	3	ME
A40578	Computer Networks and Applications	3-0-0	3	CSE
A40579	Introduction to Internet of Things	3-0-0	3	CSE
A40580	Quantum Computing	3-0-0	3	CSE
A40086	Financial Mathematics	3-0-0	3	H&S
A40087	Sensors And Actuators for Engineering Applications	3-0-0	3	H&S
A40088	Chemistry of Nanomaterials and Applications	3-0-0	3	H&S
A40089	Literary Vibes	3-0-0	3	H&S

PROGRAMME CURRICULUM STRUCTURE UNDER R23 REGULATIONS

B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING

VIII SEMESTER (IV YEAR)									
Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A40437a	Internship	PW	-	-	-	4	100	-	100
A40437b	Project	PW	-	-	-	8	30	70	100
		TOTAL	-	-	-	12	130	70	200

COURSE STRUCTURE

I – SEMESTER

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PROGRAMME CURRICULUM STRUCTURE UNDER R23 REGULATIONS

B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING

I SEMESTER (I YEAR)									
Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A40003	Engineering Physics	BS&H	3	0	0	3	30	70	100
A40002	Linear Algebra & Calculus	BS&H	3	0	0	3	30	70	100
A40201	Basic Electrical & Electronics Engineering	ES	3	0	0	3	30	70	100
A40301	Engineering Graphics	ES	1	0	4	3	30	70	100
A40501	Introduction to Programming	ES	3	0	0	3	30	70	100
A40503	IT Workshop	ES	0	0	2	1	30	70	100
A40006	Engineering Physics Lab	BS&H	0	0	2	1	30	70	100
A40202	Electrical & Electronics Engineering Workshop	ES	0	0	3	1.5	30	70	100
A40502	Computer Programming Lab	ES	0	0	3	1.5	30	70	100
A40011	NSS/NCC/Scouts & Guides/Community Service	BS&H	-	-	1	0.5	-	-	-
		TOTAL	13	00	15	20.5	270	630	900

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COURSE STRUCTURE

A40003 – ENGINEERING PHYSICS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	48	0	0	3	30	70	100

1. Course Description

Course Overview

The laws of physics play a key role in the development of science, engineering and technology. Sound knowledge of physical principles is of paramount importance in understanding new discoveries, recent trends and latest developments in the field of engineering. To keep in pace with the recent scientific advancements in the areas of emerging technologies, the syllabi of Engineering physics has been thoroughly revised keeping in view of the basic needs of all engineering branches by including the topics like physical optics, properties of dielectric and magnetic materials, determination of crystal structures, fundamentals of Quantum Mechanics semiconductors and superconductors are introduced.

Course Pre/co-requisites

Bridge Course

2. Course Outcomes (COs)

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

- Interpret the properties of light waves and its interaction of energy with the matter
- Apply the concepts of crystallography for the determination of crystal structures
- Identify the suitable dielectric and magnetic material for the Engineering
- Apply the fundamentals of Quantum Mechanics to one dimensional motion of particles
- Determine the type of semiconductor
- Interpret the difference normal conductor and Super conductor

3. Course Syllabus

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 andQuarter 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 - X-ray Diffractometer – crystal structure determination by Laue’s and powder methods

UNIT III

Dielectric and Magnetic Materials

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

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

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 & Superconductors

Semiconductors: Formation of energy bands – classification of crystalline solids – Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – 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.

Superconductors: Superconductors-Properties- Meissner effect-BCS Theory- AC & DC Josephson Effect -Types of Superconductors-High T_c Superconductors-Applications.

4. Books and Materials

Text Book(s):

1.P.K.Palaniswamy, "Engineering Physics" ScitechPublications,2011.

2.B.K.Pandey and S.Chaturvedi, "Engineering Physics",Cengage Learning, 2012.

3.K.Thyagarajan, "Applied Physics", Mc Graw Hill Education(India) Private Limited,2020.

Reference Book(s):

1. ShatendraSharma,Jyotsna Sharma, "Engineering Physics" Pearson Education,2018.

2. M.N. Avadhanulu, P.G.Kshirsagar& TVS Arun Murthy "A Text book of Engineering Physics"- S.Chand Publications,11th Edition 2019.

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COURSE STRUCTURE

A40002 – LINEAR ALGEBRA & CALCULUS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	48	0	0	3	30	70	100

1. Course Description

Engineering mathematics is a branch of applied mathematics concerning mathematical methods and techniques that are typically used in engineering and industry. Along with fields like engineering physics and engineering geology, both of which may belong in the wider category engineering science, engineering mathematics is an interdisciplinary subject motivated by engineers' needs both for practical, theoretical and other considerations outside their specialization, and to deal with constraints to be effective in their work.

Course Pre/co-requisites

Bridge Course

2. Course Outcomes (COs)

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

- Develop and use of matrix algebra techniques that are needed by engineers for practical applications.
- Utilize mean value theorems to real life problems.
- Familiarize with functions of several variables which is useful in optimization.
- Learn important tools of calculus in higher dimensions.
- 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.

3. Course Syllabus

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: 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 theorem.

UNIT IV

Partial differentiation and Applications (Multi variable calculus)

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 functionsof two variables, method of Lagrange multipliers.

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).

4. Books and Materials

Text Book(s):

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

Reference Book(s):

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 ScienceInternational 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, 9thedition
5. Higher Engineering Mathematics, H. K Das, Er. Rajnish Verma, S. Chand Publications,2014, Third Edition (Reprint 2021)

G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40201 – BASIC ELECTRICAL & ELECTRONICS ENGINEERING

(Common to All branches of Engineering)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	48	0	0	3	30	70	100

1. Course Description

Course Overview

This is the fundamental course for engineering students. This course is intended to enhance the technical skills in understanding of the operation and design of basic components like resistor, inductor and capacitor voltage and current sources and finally a complex DC circuits. It is also important to learn about basic principles of operations DC and AC electrical machines with their applications. It is also important to learn about basic principles of Energy Resources and their operations, tariff calculations and equipment safety measures.

Course Pre/co requisites.

1. Basic Mathematics
2. Fundamentals of Physics

PART A: BASIC ELECTRICAL ENGINEERING

2. Course Outcomes (COs)

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

- CO1: Remember the fundamental laws, operating principles of motors, generators, MC and MI instruments.
- CO2: 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.
- CO3: 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.
- CO4: Analyse different electrical circuits, performance of machines and measuring instruments. CO5: Evaluate different circuit configurations, Machine performance and Power systems operation

3. Course Syllabus

UNIT I DC & AC Circuits

DC Circuits: Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.

AC Circuits: A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems)

UNIT II Machines and Measuring Instruments

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

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

UNIT III Energy Resources, Electricity Bill & Safety Measures

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

Electricity bill: Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

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.

4. Books and Materials

Text Book(s)

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

5. Reference Book(s)

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.

Web Resources:

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

PART B: BASIC ELECTRONICS ENGINEERING

1. Course Description

Course Overview

This course covers fundamental topics that are common to a wide variety of electronic engineering devices and systems. The topics include an introduction to semiconductor devices and their applications. The course creates the background in the physics of the compound semiconductor-based electronic devices and also prepares students to learn about oscillators, op-amps and digital electronics.

Course Pre/co requisites.

1. Basic Mathematics
2. Fundamentals of Physics

2 Course Outcomes (COs)

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

CO1: Apply the concept of science and mathematics to understand the working of diodes, transistors, and their applications.
CO2: Explain the characteristics of diodes and transistors.
CO3: Familiarize with the number systems, codes, Boolean algebra and logic gates.
C04: Understand the working mechanism of different combinational, sequential circuits and their role in the digital systems.

3. Course Syllabus

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)

4. Books and Materials

Textbooks:

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.

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COURSE STRUCTURE

A40301-ENGINEERING GRAPHICS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
1	0	4	16	0	64	3	30	70	100

1. Course Description:

This course teaches the practices for accuracy and clarity in presenting the technical information in the form of drawings and the utility of drafting & modelling packages in orthographic and isometric drawings. It enables the student to understand and develop engineering imagination essential for successful design and familiarize how industry communicates technical information.

Course Pre/co-requisites:

This course has no Pre/co-requisites

2. Course Outcomes: (COs)

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

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

3. Course Syllabus:

UNIT -I:

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods. Curves: construction of ellipse, parabola and hyperbola by general, Cycloids, Involutes, Normal and tangent to Curves. Scales: Plain scales, diagonal scales and vernier scales

UNIT II:

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.

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: 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 another plane.

UNIT IV:

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: 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).

4. Books and Materials

Text Book(s) :

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

5. Reference Book(s):

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

G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40501-INTRODUCTION TO PROGRAMMING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	48	0	0	3	30	70	100

1. Course Objectives:

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

2. Course Outcomes:

- A student after completion of the course will be able to
- CO1: Understand basics of computers, the concept of algorithm and algorithmic thinking.
- CO2: Analyze a problem and develop an algorithm to solve it.
- CO3: Implement various algorithms using the C programming language
- CO4: Understand more advanced features of C language.
- CO5: Develop problem-solving skills and the ability to debug and optimize the code.

3. Course Syllabus

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, User-defined data types-Structures and Unions.

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. Scopeand Lifetime of Variables, Basics of File Handling

Note: The syllabus is designed with C Language as the fundamental language ofimplementation**.**

4. Textbooks:

1. "The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice-Hall, 1988
2. Schaum's Outline of Programming with C, Byron S Gottfried, McGraw-Hill Education,1996
3.

5. Reference Books:

1. Computing fundamentals and C Programming, Balagurusamy, E., McGraw-HillEducation, 2008.
2. Programming in C, Rema Theraja, Oxford, 2016, 2nd edition
3. C Programming, A Problem Solving Approach, Forouzan, Gilberg,Prasad, CENGAGE, 3rd edition

G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40503-IT WORKSHOP

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	2	0	0	32	1	30	70	100

1. Course Objectives:

- To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables
- To teach basic command line interface commands on Linux
- To teach the usage of Internet for productivity and self-paced life-long learning
- To introduce Compression, Multimedia and Antivirus tools and Office Tools such as
- Word processors, Spread sheets and Presentation tools.

2. Course Outcomes:

- CO1: Perform Hardware troubleshooting.
- CO2: Understand Hardware components and inter dependencies.
- CO3: Safeguard computer systems from viruses/worms.
- CO4: Document/ Presentation preparation.
- CO5: Perform calculations using spreadsheets

PC Hardware

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 with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Internet & World Wide Web

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

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

Task 3: Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

LaTeX and WORD

Task 1 – Word Orientation: The mentor needs to give an overview of La TeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of La TeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using La TeXand word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 2: Using La TeX and Word to create a project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both La TeX and Word.

Task 3: Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 4: Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

Excel

Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 2 : Calculating GPA - .Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function,

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: Code Generation: Test the model's ability to generate code by giving it partial code snippets and asking it to complete them. You can also ask the model to explain programming concepts or help you debug code.
Ex:Prompt: "Complete the following Python code to swap the values of two variables: \npython\na = 5\nb = 10\ntemp = a\na = b\nb = temp\n"

Task 4: 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?'"

Task 5: Summarization: Provide a long piece of text, such as an article or a blog post, and ask the model to summarize it. Compare the model's summary with the original text to assess its ability to condense information effectively.
Ex: Prompt: "Summarize the article titled 'Ramayanam' in 3-4 sentences."

Task 6: Futuristic Predictions: Have fun by asking the model to predict future technological advancements, societal changes, or even hypothetical scenarios. Compare its responses with your own ideas.

Ex:Prompt: "Predict how artificial intelligence will transform everyday life in the next 20 years."

Task 7: Technical Explanations: Challenge the model with technical questions from different domains. Ask it to explain scientific concepts, mathematical theorems, or complex algorithms in simple terms. Ex:Prompt: "Explain the concept of neural networks in machine learning, including their layers and the process of backpropagation."

3. Reference Books:

1. Comdex Information Technology course tool kit Vikas Gupta, WILEY Dream tech
2. The Complete Computer upgrade and repair book, 3rd edition Cheryl A Schmidt, WILEY Dream tech
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
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 Third Edition by David Anfins on and Ken Quamme. – CISCO Press, Pearson Education.
7. IT Essentials PC Hardware and Software Labs and Study Guide Third Edition by Patrick Regan– CISCO Press, Pearson Education.

G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40006- ENGINEERING PHYSICS LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	2	0	0	32	1	30	70	100

1. Course Description

Course Overview

This course imparts practical and conceptual knowledge of Physics applicable to the domain of civil and mechanical engineering. The laboratory work of the course is aimed to ensure that the student comprehends the concepts of Physics through demonstrable and executable experiments. This course will enable the student to determine the thickness of paper, radius of curvature of plano-convex lens, wavelength of different colors of white light, dispersive power of grating, self -Inductance of the coil, numerical aperture and acceptance angle of an optical fiber, resistivity and energy gap of a semiconductor, study of magnetic field along the axis of a current carrying coil, diffraction of light through single slit and measurement of resistance by varying temperature.

Course Pre/co-requisites:

Engineering Physics

2. Course Outcomes (COs)

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

- Operate optical instruments like Travelling microscope and spectrometer
- Understand the concepts of interference by finding thickness of paper, radius of curvature of Newton's rings
- Interpret the concept of diffraction by the determination of wavelength of different colors of white light and dispersive power of grating
- Plot the intensity of the magnetic field of circular coil carrying current with varying distance and B-H curve
- Evaluate the acceptance angle of an optical fiber and numerical aperture
- Determine the resistivity of the given semiconductor using four probe method, the band gap of a semiconductor

3. Course Syllabus

(Any 12 of the following)

1. Determine the thickness of the paper using wedge shape method
2. Determination of the radius of curvature of the lens by Newton's ring method
3. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
4. Diffraction due to single slit
5. Determination of Dispersive power of a diffraction grating by using spectrometer.
6. Magnetic field along the axis of a circular coil carrying current
7. Study the variation of B versus H by magnetizing the magnetic material (B-H curve)
8. Determination of energy gap of a semiconductor using p-n junction diode.

9. Determination of temperature coefficients of a thermistor.

10. LASER: Determination of wavelength of laser source by using diffraction grating

11. LASER: Determination of Particle size (hair) by using laser source

12. Determination of rigidity modulus of the material of the given wire using Torsional pendulum.

13. Sonometer: Verification of laws of stretched string.

14. Determination of Frequency of electrically maintained tuning fork by Melde's experiment.

15. Determination of Numerical Aperture and Acceptance angle of an optical fiber.

4. Laboratory Equipment/Software/Tools Required

1. Spectrometer
2. Travelling Microscope
3. Stewart-Gee's Apparatus
4. Single slit
5. Melde's Apparatus
6. B-H Curve
7. Torsional pendulum
8. Sonometer
9. Energy gap kit
10. Thermistor

5. Books and Materials

Text Book(s):

S.Balasubramanian, M.N.Srinivasan "*A Text book of Practical Physics*"- S. Chand Publishers, 2017

Reference Book(s)

https://vlab.amrita.edu/index.php?sub=1&brch=194&sim=802&cnt=1.

G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40202- ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP

(Common to All branches of Engineering)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	48	1.5	30	70	100

1. Course Description

Course Overview

This course is designed to provide students with fundamental concepts of Electrical Circuits and Electrical Machines for lab experience. Verification of Thevenin's, Super Position theorems and open and short circuit parameters and determination of efficiency of DC & AC Machines.

This course is designed to provide students with fundamental concepts of Electronic Devices for lab experience. Analysis of V-I characteristics of diodes, BJT and FET.Study of operation of rectifiers with & without filters.

Course Pre/co requisites.

1. Basic Mathematics
2. Fundamentals of Physics

PART A: BASIC ELECTRICAL ENGINEERING

2. Course Outcomes (COs)

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

- CO1: Understand the Electrical circuit design concept; measurement of resistance, power, power factor; concept of wiring and operation of Electrical Machines and Transformer.
- CO2: 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.
- CO3: Apply the theoretical concepts to obtain calculations for the measurement of resistance, power and power factor.
- CO4: Analyse various characteristics of electrical circuits, electrical machines and measuring instruments.
- CO5: Design suitable circuits and methodologies for the measurement of various electrical parameters; Household and commercial wiring.

Activities:

1. Familiarization of commonly used Electrical & Electronic Workshop Tools: Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.
   - Provide some exercises so that hardware tools and instruments are learned to be used by the students.
2. Familiarization of Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.
   - Provide some exercises so that measuring instruments are learned to be used by the students.
3. Components:

- Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, colour coding package, symbol, cost etc.

Testing of components like Resistor, Capacitor, Diode, Transistor, ICs etc. - Compare values of components like resistors, inductors, capacitors etc with the measured values by using instruments

PART A: ELECTRICAL ENGINEERING LAB

List of experiments:

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

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

Note: Minimum Six Experiments to be performed.

PART B: ELECTRONICS ENGINEERING LAB

1. Course Outcomes (COs)

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

CO1: Identify & testing of various electronic components.
CO2: Understand the usage of electronic measuring instruments.
CO3: Plot and discuss the characteristics of various electron devices.
CO4: Explain the operation of a digital circuit.

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.

2. References:

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.

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

G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40502-COMPUTER PROGRAMMING LAB

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	48	1.5	30	70	100

1. Course Objectives:

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

2. Course Outcomes:

- CO1: Read, understand, and trace the execution of programs written in C language. CO2: Select the right control structure for solving the problem.
- CO3: Develop C programs which utilize memory efficiently using programming constructs like pointers.
- CO4: Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.

3. Course Syllabus

UNIT I WEEK 1

Objective: Getting familiar with the programming environment on the computer and writingthe 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 seriesof 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 heron's formulae
iv) Distance travelled by an object

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 2's complement of the given binary number.
v) Eliminate duplicate elements in an array.

WEEK 8:

Objective: Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.

Suggested Experiments/Activities:
Tutorial 8: 2 D arrays, sorting and Strings.

Lab 8: Matrix problems, String operations, Bubble sort

i) Addition of two matrices
ii) Multiplication two matrices
iii) Sort array elements using bubble sort
iv) Concatenate two strings without built-in functions
v) Reverse a string using built-in and without built-in string functions

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. Gainexperience 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 samewithout 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 Eulerstheorem.
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 Euler'smethod

WEEK 12:
Objective: Explore how recursive solutions can be programmed by writing recursive functionsthat 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, Arithmeticoperations 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 othercharacters 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() andfwrite()
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-linearguments.
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.

4. Textbooks:

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

5. 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

G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40011-NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE

(Common to All branches of Engineering)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	1	0	0	16	0.5	-	-	100

1. Course Description

Course Overview

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

Course Pre/co-requisites

Bridge Course

2. Course Outcomes (COs)

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

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

3. Course Syllabus

UNIT I Orientation

General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, careerguidance.

Activities:

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

UNIT II

Nature & Carectivities:

i) Best out of waste competition.
ii) Poster and signs making competition to spread environmental awareness.
iii) Recycling and environmental pollution article writing competition.
iv) Organising Zero-waste day.
v) Digital Environmental awareness activity via various social media platforms.
vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
vii) Write a summary on any book related to environmental issues.

UNIT III Community ServiceActivities:

i) 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- authoritiesexperts-etc.

ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,

iii) Conducting consumer Awareness. Explaining various legal provisions etc.

iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.

v) Any other programmes in collaboration with local charities, NGOs etc.

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.

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, totaling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

COURSE STRUCTURE

II – SEMESTER

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY,KURNOOL

PROGRAMME CURRICULUM STRUCTURE UNDER R23 REGULATIONS

B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING

II SEMESTER (I YEAR)

Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A40001	Communicative English	BS&H	2	0	0	2	30	70	100
A40004	Chemistry	BS&H	3	0	0	3	30	70	100
A40009	Differential Equations & Vector Calculus	BS&H	3	0	0	3	30	70	100
A40101	Basic Civil & Mechanical Engineering	ES	3	0	0	3	30	70	100
A40205	Network Analysis	PC	3	0	0	3	30	70	100
A40005	Communicative English Lab	BS&H	0	0	2	1	30	70	100
A40007	Chemistry Lab	BS&H	0	0	2	1	30	70	100
A40302	Engineering Workshop	ES	0	0	3	1.5	30	70	100
A40206	Network Analysis Lab	PC	0	0	3	1.5	30	70	100
A40012	Health and wellness, Yoga and Sports	BS&H	-	-	1	0.5	-	-	-
		TOTAL	**14**	**00**	**11**	**19.5**	**270**	**630**	**900**

G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40001-COMMUNICATIVE ENGLISH

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	0	32	0	0	2	30	70	100

1. Course Description

Course Objectives:

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

Course Pre/co requisites:

The course has no specific pre/co-requisites

2. Course Outcomes (COs)

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

- Remember the concepts which the student has learnt previously and identifying their connection
- Understand the structure of the sentence.
- Apply grammatically correct structures in oral and written communication.
- Analyze complex technical ideas with precision to interpret facts in a given text.
- Write summaries and essays based on global comprehension of the texts.
- Write Official letters, Resume and E- mails.

UNIT I

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

Listening: Identifying the topic, the context and specific pieces of information by listening to people talk about their past.

Speaking: Asking and answering general questions on familiar topics such as home,family, work, studies and interests; introducing oneself and others. Introducing self, talking about oneself, exchanging personal information, remembering childhood and asking about someone’s childhood

Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information.

Writing: Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.

Grammar: Parts of Speech, Basic Sentence Structures-forming questions

Vocabulary: Synonyms, Antonyms, 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 afterlistening to a description of a transportation system.

Speaking: Discussion in pairs/small groups on specific topics followed by short structuretalks- talking about transportation and transportation problems, evaluating city services, asking for and giving information.

Reading: Identifying sequence of ideas; recognizing verbal techniques that help to linkthe 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.

UNIT III

Lesson: BIOGRAPHY: Elon Musk

Listening: Listening for global comprehension and summarizing (Listening to people talk about capsule hotels.)

Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed. Describing positive and negative features; making comparisons; talking about lifestyle changes.

Reading: Reading a text in detail by making basic inferences -recognizing and interpretingspecific 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. Talking about food,; expressing likes and dislikes; describing a favourite snack; giving step-by-step instructions.

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 ofrelevant questions that test comprehension. (Listening to travel advice.)

Speaking: Formal oral presentations on topics from academic contexts. Describing vacation plans; giving travel advice; planning a vacation

Reading: Reading comprehension.

Writing: Writing structured essays on specific topics.

Grammar: Editing short texts –identifying and correcting common errors in grammar andusage (articles, prepositions, tenses, subject verb agreement)

Vocabulary: Technical Jargons

3. Textbooks:

1. Pathfinder: Communicative English for Undergraduate Students, 1st Edition,Orient Black Swan, 2023 (Units 1,2 & 3)
2. Empowering with Language by Cengage Publications, 2023 (Units 4 & 5)
3. Interchange fifth edition by Cambridge University Press, 2021

4. 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 UniversityPress, 2019.
4. Lewis, Norman. Word Power Made Easy- The Complete Handbook for Building aSuperior Vocabulary. Anchor, 2014.

5. Web Resources:

GRAMMAR:

www.bbc.co.uk/learningenglish

https://dictionary.cambridge.org/grammar/british-grammar/

www.eslpod.com/index.html

https://www.learngrammar.net/

https://english4today.com/english-grammar-online-with-quizzes/

https://www.talkenglish.com/grammar/grammar.aspx

VOCABULARY

https://www.youtube.com/c/DailyVideoVocabulary/videos

https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40004-CHEMISTRY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	48	0	0	3	30	70	100

1. Course Description

Course Overview

- To familiarize engineering chemistry and its applications
- To train the students on the principles and applications of electrochemistry and polymers
- To introduce instrumental methods, molecular machines and switches.

Course Pre/co-requisites

Bridge Course

2.Course Outcomes (COs)

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

- **CO1:** Compare the materials of construction for battery and electrochemical sensors.
- **CO2**: Explain the preparation, properties, and applications of thermoplastics & thermosetting & elastomers conducting polymers.
- **CO3**: Explain the principles of spectrometry, slc in separation of solid and liquid mixtures.
- **CO4:** Apply the principle of Band diagrams in the application of conductors and semiconductors.
- **CO5:** Summarize the concepts of Instrumental methods.

UNIT I Structure and Bonding Models:

Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of Ψ and Ψ^2, particle in one dimensional box, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O2 and CO, etc. π-molecular orbitals of butadiene and benzene, calculation of bond order.

UNIT II Modern Engineering materials

Semiconductors – Introduction, basic concept, application Super Conductors-Introduction basic concept, applications.

Supercapacitors: Introduction, Basic Concept-Classification – Applications.

Nano materials: Introduction, classification, properties and applications of Fullerenes, carbon nano tubes and Graphines nanoparticles.

UNIT III Electrochemistry and Applications

Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations).

Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples.

Primary cells – Zinc-air battery, Secondary cells –lithium-ion batteries- working of the batteries including cell reactions; Fuel cells, hydrogen-oxygen fuel cell– working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC).

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-Lambert's law. UV-Visible Spectroscopy, electronic transition, Instrumentation, IR spectroscopies, fundamental modes and selection rules, Instrumentation. Chromatography-Basic Principle, Classification-HPLC:
Principle, Instrumentation and Applications.

3. Textbooks:

Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.
Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

4. Reference Books:

Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
J.D. Lee, Concise Inorganic Chemistry, 5th Edition, Wiley Publications, Feb.2008
Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd Edition

G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40009-DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	48	0	0	3	30	70	100

1. Course Description

Course Overview

Engineering mathematics is a branch of applied mathematics concerning mathematical methods and techniques that are typically used in engineering and industry. Along with fields like engineering physics and engineering geology, both of which may belong in the wider category engineering science, engineering mathematics is an interdisciplinary subject motivated by engineers' needs both for practical, theoretical and other considerations outside their specialization, and to deal with constraints to be effective in their work

Course Pre/co-requisites

Bridge Course

2. Course Outcomes (COs)

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

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

3. Course Syllabus

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: 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, 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 ideties.

UNIT V Vector integration

LWithoutegral-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.

Textbooks:

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

Reference Books:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, 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

G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40101-PART A: BASIC CIVIL ENGINEERING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	48	0	0	3	30	70	100

1. Course Description

Course Overview

- Get familiarized with the scope and importance of Civil Engineering sub-divisions. Introduce the preliminary concepts of surveying.
- Acquire preliminary knowledge on Transportation and its importance in nation’s economy.
- Get familiarized with the importance of quality, conveyance and storage of water.
- Introduction to basic civil engineering materials and construction techniques.

. **Course Pre/co-requisites**
Bridge Course

2.Course Outcomes (COs)

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

- CO1: Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society.
- CO2: Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying.
- CO3: Realize the importance of Transportation in nation's economy and the engineering measures related to Transportation.
- CO4: Understand the importance of Water Storage and Conveyance Structures so that the social responsibilities of water conservation will be appreciated.
- CO5: Understand the basic characteristics of Civil Engineering Materials and attain knowledge on prefabricated technology.

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

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

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

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

Textbooks:

1. Basic Civil Engineering, M.S.Palanisamy, , Tata Mcgraw Hill publications (India) Pvt. Ltd. Fourth Edition.
2. Introduction to Civil Engineering, S.S. Bhavikatti, New Age International Publishers. 2022. First Edition.
3. Basic Civil Engineering, Satheesh Gopi, Pearson Publications, 2009, First Edition.

Reference Books:

1. Surveying, Vol- I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers 2019. Fifth Edition.
2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers, Delhi. 2016
3. Irrigation Engineering and Hydraulic Structures - Santosh Kumar Garg, Khanna Publishers, Delhi 2023. 38^{th} Edition.
4. Highway Engineering, S.K.Khanna, C.E.G. Justo and Veeraraghavan, Nemchand and Brothers Publications 2019. 10^{th} Edition.
5. Indian Standard DRINKING WATER — SPECIFICATION IS 10500-2012.

PART B: BASIC MECHANICAL ENGINEERING

1. Course Description

Course Overview

The students after completing the course are expected to

- Get familiarized with the scope and importance of Mechanical Engineering in different sectors and industries.
- Explain different engineering materials and different manufacturing processes.
- Provide an overview of different thermal and mechanical transmission systems and introduce basics of robotics and its applications.

2.Course Outcomes (COs)

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

- CO1: Understand the different manufacturing processes.
- CO2: Explain the basics of thermal engineering and its applications.
- CO3: Describe the working of different mechanical power transmission systems and power plants.
- CO4: Describe the 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: 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 – working principle of Steam, Diesel, Hydro, Nuclear power plants.
Mechanical Power Transmission - Belt Drives, Chain, Rope drives, 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)

Textbooks:

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

G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40205-NETWORK ANALYSIS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	48	0	0	3	30	70	100

1. Course Objectives:

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

2.Course Outcomes:

At the end of this course students will demonstrate the ability to

- CO1: Understand basic electrical circuits with nodal and mesh analysis.
- CO2: Analyze the circuit using Network simplification theorems.
- CO3: Infer and evaluate Transient response and Steady state response of a network.
- CO4: Analyze electrical networks in the Laplace domain.
- CO5: Compute the parameters of a two-port network.

3. Course Syllabus

UNIT I

Types of circuit components, Types of Sources and Source Transformations, Mesh analysis and Nodal analysis, problem solving with resistances only including dependent sources also. Principal of Duality with examples.

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

UNIT II

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.

UNIT III

Steady State Analysis of A.C Circuits: Impedance concept, phase angle, series R-L, R-C, R-LC 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.

4. Textbooks:

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.

G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40005-COMMUNICATIVE ENGLISH LAB

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	2	0	0	32	1	30	70	100

1. Course Description

Course Overview

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. The students will get trained in basic communication skills and also make them ready to face job interviews

Course Pre/co-requisites

Bridge Course

2. Course Outcomes (COs)

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

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

List of Topics:

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

Suggested Software:

- Walden Infotech
- Young India Films

3. Reference Books:

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

4. Web Resources:

Spoken English:

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
7. https://www.youtube.com/c/ArnelsEverydayEnglish/featured
8. https://www.youtube.com/c/engvidAdam/featured
9. https://www.youtube.com/c/EnglishClass101/featured
10. https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists
11. 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

G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40007-CHEMISTRY LAB

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	2	0	0	32	1	30	70	100

1. Course Description

Course Overview

- Verify the fundamental concepts with experiments

Course Pre/co-requisites

- Bridge Course

2. Course Outcomes (COs)

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

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

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

Reference:

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

G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40302-ENGINEERING WORKSHOP

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	48	1.5	30	70	100

1. Course Description:

This course introduces students to the basic concepts related to Engineering workshop and also imparts the knowledge about usage of the tools. This course familiarizes students with woodworking, welding, sheet metal operations, fitting and electrical house wiring skills. This knowledge enables the students to fabricate, manufacture or work with materials.

Course Pre/co-requisites:

This course has no Pre/co-requisites

2. Course Outcomes: (COs)

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

CO1: Identify workshop tools and their operational capabilities.

CO2: Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding.

CO3: Apply fitting operations in various applications.

CO4: Apply basic electrical engineering knowledge for House Wiring Practice

3. Course Syllabus:

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) Godown 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.

4. Laboratory Equipment/Software/Tools Required:

1. Fitting bench wise
2. Hack saw frame
3. Carpentry benchwise
4. Jack plane
5. Snip tool
6. Nose player
7. Cope & Drag
8. Sprue
9. Welding machine
10. House wiring set up
11. Plumbing Setup

5. Books and Materials

Text Book(s) :

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 Book(s) :

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

G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40206-NETWORK ANALYSIS LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	48	1.5	30	70	100

1. Course Objectives:

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

2. Course Outcomes:

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

- CO1: Verify Kirchoff's laws and network theorems.
- CO2: Measure time constants of RL & RC circuits
- CO3: Analyze behavior of RLC circuit for different cases
- CO4: Design resonant circuit for given specifications
- CO5: Characterize and model the network in terms of all network parameters.

3. Course Syllabus

List of Experiments:

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

4. 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.

G PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40012-HEALTH AND WELLNESS, YOGA AND SPORTS

(Common to All Branches of Engineering)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	1	0	0	16	0.5	-	-	100

1. Course Description

Course Overview

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.

Course Pre/co-requisites

Bridge Course

2. Course Outcomes (COs)

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

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

3. Course Syllabus

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:

i) Organizing health awareness programmes in community
ii) Preparation of health profile
iii) Preparation of chart for balance diet for all age groups

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:

i) 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.

ii) 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

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.

COURSE STRUCTURE

III - SEMESTER

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY,KURNOOL

PROGRAMME CURRICULUM STRUCTURE UNDER R23 REGULATIONS

B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING

III SEMESTER (II YEAR)									
Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A40016	Probability and Complex Variables	BS	3	0	0	3	30	70	100
A40018	Universal Human Values– Understanding Harmony and Ethical Human Conduct	HSMC	2	1	0	3	30	70	100
A40401	Signals, Systems and Stochastic Processes	ES	3	0	0	3	30	70	100
A40402	Electronic Devices and Circuits	PC	3	0	0	3	30	70	100
A40403	Digital Circuits Design	PC	3	0	0	3	30	70	100
A40404	Electronic Devices and Circuits Lab	PC	0	0	3	1.5	30	70	100
A40405	Digital Circuits & Signal Simulation Lab	PC	0	0	3	1.5	30	70	100
A40510	Python Programming	SEC	0	1	2	2	30	70	100
A40031	Environmental Science	MC	2	0	0	-	100*	-	100*
		TOTAL	16	02	08	20	240	560	800

* The marks for Mandatory Courses are not considered for calculating SGPA

COURSE STRUCTURE

A40016-PROBABILITY AND COMPLEX VARIABLES

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The "Probability and Complex Variables" course covers foundational concepts in probability theory and the study of complex variables. Key topics include probability axioms, random variables, probability distributions, expectation, variance, and common probability distributions such as binomial, Poisson, and normal distributions. The complex variables section addresses the algebra of complex numbers, analytic functions, complex integration, Taylor and Laurent series, and residue calculus. This course is essential for students in engineering, mathematics, and sciences, providing critical tools for analyzing random phenomena and understanding the behavior of complex systems in various applications.

Course Objectives:

- Enable students to understand fundamental probability theory, random variables, and probability distributions relevant to engineering and scientific problems.
- Develop the ability to apply the principles of probability and complex variables to model and solve practical engineering and scientific problems.
- Equip students to compute and interpret expectations, variances, and correlations, and to apply these to solve practical problems involving uncertainty.

Course Pre/corequisites

1. A40002 – Linear Algebra & Calculus
2. A40009 – Differential Equations & Vector Calculus

2. Course Outcomes (COs)

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

A40016.1 Understand the concepts of Probability, Random Variables and their characteristics (L2, L3)

A40016.2 Learn how to deal with multiple random variables, conditional probability, joint distribution and statistical independence. (L3, L5)

A40016.3 Formulate and solve engineering problems involving random variables. (L3)

A40016.4 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)

A40016.5 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)

3. Course Syllabus

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.

4. Books and Materials

Textbooks:

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

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.

COURSE STRUCTURE

A40018-UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The "Universal Human Values – Understanding Harmony and Ethical Human Conduct" course explores the foundational principles of human values, focusing on the cultivation of personal and social harmony. It examines concepts such as individual and collective responsibility, ethical behaviour, and the importance of inner peace. Through discussions on self-reflection, relationships, and societal structures, students learn to appreciate the interconnectedness of human life and the environment. The course emphasizes practical applications of these values in everyday life, aiming to foster a more harmonious and ethical society by promoting empathy, respect, and moral integrity.

Course Objectives:

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

Course Pre/corequisites

3. A40003 – Engineering Physics
4. A40201 – Basic Electrical & Electronics Engineering

2. Course Outcomes (COs)

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

A40018.1	Understanding the Concept of Value Education:
A40018.2	Developing Self-Awareness and Inner Harmony:
A40018.3	Fostering Harmony in Relationships and Social Interaction:
A40018.4	Appreciating the Interconnectedness of Humans and Nature:
A40018.5	Recognizing the Role of Holistic Understanding in Professional Life:
A40018.6	Applying Value Education to Real-Life Scenarios:

3. Course Syllabus

UNIT I

Introduction to Value Education: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education), Understanding Value Education, self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic

Human Aspiration Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations.

UNIT II

Harmony in the Human Being: Understanding Human being as the Co-existence of the self and the body, distinguishing between the Needs of the self and the body, the body as an Instrument of the self-Understanding Harmony in the self, Harmony of the self with the body, Programme to ensure self-regulation and Health.

UNIT III

Harmony in the Family and Society: Harmony in the Family – the Basic Unit of Human Interaction,' Trust'– the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society. Vision for the Universal Human Order

UNIT IV

Harmony in the Nature/Existence: Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence.

UNIT V

Implications of the Holistic Understanding – a Look at Professional Ethics: Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession

5. Books and Materials

Textbooks:

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

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

Reference Books

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

COURSE STRUCTURE

A40401-SIGNALS, SYSTEMS AND STOCHASTIC PROCESSES

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The "Signals, Systems, and Stochastic Processes" course provides a comprehensive understanding of the fundamental principles and mathematical techniques used in analyzing and processing signals and systems. It covers the theory and applications of continuous and discrete signals, linear time-invariant systems, and Fourier analysis. The course also delves into stochastic processes, focusing on probabilistic models, random variables, and noise analysis in communication systems. Emphasis is placed on the practical implementation of these concepts in engineering problems, enabling students to develop skills in signal processing, system analysis, and handling uncertainties in real-world applications.

Course Objectives:

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

Course Pre/corequisites

1. A40002-Linear Algebra & Calculus
2. A40016-Probability and Complex Variables

2. Course Outcomes (COs)

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

A40401.1 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)

A40401.2 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)

A40401.3 Formulate and solve engineering problems involving random processes. (L3)

A40401.4 Analyze the frequency spectra of various continuous-time signals using different transform methods. (L4)

A40401.5 Classify the systems based on their properties and determine the response of them. (L4)

3. Course Syllabus

UNIT I

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: 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: 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.

UNIT IV

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: 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.

4. Books and Materials

Textbooks:

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 STRUCTURE
A40402 – ELECTRONIC DEVICES AND CIRCUITS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course explores the fundamentals of electronics and knowledge on discrete range of semiconductor devices, its construction, characteristics, analysis and design of various electronic devices. This course makes the students expertise in analysing the principle of operation of diodes, transistors and their applications. The course then progresses to the analysis and design of basic electronic circuits, including amplifiers, oscillators, and switching circuits. Emphasis is placed on understanding the characteristics and performance of these devices and their role in modern electronic systems.

Course Objectives:

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

Course Pre/corequisites

1. A40003 – Engineering Physics
2. A40201 – Basic Electrical & Electronics Engineering

2. Course Outcomes (COs)

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

A40402.1 Understand principle of operation, characteristics and applications of Semiconductor diodes, Bipolar Junction Transistor and MOSFETs. (L2)
A40402.2 Applying the basic principles on solving the problems related to Semiconductor diodes, BJTs, and MOSFETs. (L3)
A40402.3 Analyze diode circuits for different applications such as rectifiers, clippers and clampers. (L4)
A40402.4 Design and analyze biasing circuits of BJTs, and MOSFETs. (L4)
A40402.5 Compare and analyze the small signal performance of BJTs and MOSFETs. (L4)

3. Course Syllabus

UNIT I

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, 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

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 (MOSFET): Introduction, Device Structure and Physical Operation, MOSFET Types, CMOS, V - I Characteristics, MOSFET as a Switch. Biasing in MOS Amplifier circuits - biasing by fixing V_{GS} with and without source resistance, biasing using drain to gate feedback resistor, biasing using constant current source, body effect, Problem solving.

UNIT IV

BJT Small Signal Operation and Models- Hybrid Models, Single Stage BJT Amplifiers - Common-Emitter (CE) amplifier without and with emitter resistance, Common-Base (CB) amplifier, Common-Collector (CC) amplifier or Emitter Follower, T Model, DC analysis of BJT, Problem solving.

UNIT V

MOSFET Small Signal Operation Models–

MOSFET as an Amplifier, The dc bias, separating the DC analysis and the signal analysis, Small signal equivalent circuit models, Single stage MOS Amplifiers – common source (CS) amplifier without and with source resistance, common gate (CG) amplifier, source follower, the trans conductance, the T equivalent circuit model, Problem Solving.

4. Books and Materials

Textbooks:

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.

References:

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.
5. T.Tirupal, B.Chandra Mohan, S.Srinivas Kumar, P.Bindu Swetha, Electronic Devices and Circuits, Mantech Publications, 1st Edition, 2021.

COURSE STRUCTURE
A40403-DIGITAL CIRCUITS DESIGN

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The "Digital Circuits Design" course delves into the principles and practices of designing digital electronic circuits. It covers the basics of digital logic, including Boolean algebra, logic gates, and truth tables. Students learn to design combinational and sequential circuits such as multiplexers, decoders, flip-flops, counters, and registers. The course also addresses more complex topics like synchronous and asynchronous circuit design, state machines, and programmable logic devices. Practical aspects include the use of simulation tools and hardware description languages (HDLs) for design and verification. This course equips students with the skills to design and analyze digital systems used in computers and other electronic devices.

Course Objectives:

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

Course Pre/corequisites

1. A40201 – Basic Electrical & Electronics Engineering

2. Course Outcomes (COs)

After completing the course, the student should be able to:

A40403.1 Understand the properties of Boolean algebra, logic operations, concepts of FSM (L2)

A40403.2 Apply techniques for minimization of Boolean functions (L3)

A40403.3 Analyze combinational and Sequential logic circuits. (L4)

A40403.4 Compare various Programmable logic devices. (L4)

A40403.5 Design and Model combinational and sequential circuits using HDLs. (L5, L6)

3. Course Syllabus

UNIT I

Boolean algebra, logic operations, and minimization of Boolean functions: 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- ahead adder, binary multiplier, magnitude comparator, data selectors, priority encoders, decoders, multiplexers, and demultiplexer.

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 storage elements with CAD tools-using Verilog constructs for storage elements, flip-flop with clear capability, using Verilog constructs for registers and counters.

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.

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, Design of sequential circuits using ROMs, PLAs, CPLDs and FPGAs.

4. Books and Materials

Textbooks:

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).

References:

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 STRUCTURE

A40404 – ELECTRONIC DEVICES & CIRCUITS LAB

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	30	70	100

1. Course Description

Electronic Circuits Analysis focuses on the principles and methodologies for analyzing and designing electronic circuits. The course covers fundamental circuit elements such as resistors, capacitors, and inductors, as well as semiconductor devices including diodes, transistors, and operational amplifiers. Topics include DC and AC circuit analysis, transient response, frequency response, and feedback systems. Students learn techniques for circuit simplification, network theorems, and practical circuit analysis using software tools and simulation methods. Emphasis is placed on understanding circuit behavior, solving design problems, and applying theoretical concepts to real-world applications in areas such as analog electronics, signal processing, and power electronics.

Course Objectives:

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

2. Course Outcomes:

A40404.1 Understand the characteristics and applications of basic electronic devices. (L2)
A40409.2 Plot the characteristics of electronic devices. (L3)
A40409.3 Analyze various biasing circuits and electronic circuits as amplifiers (L4).
A40409.4 Design MOSFET / BJT based amplifiers for the given specifications. (L5)
A40409.5 Simulate all circuits in PSPICE /Multisim. (L5).

3. Course Syllabus

LIST OF EXPERIMENTS: (Implement/**Execute any 10experiments**).

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 η, IP, Iv, V_P, & 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 graphsStudy 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), g_m, & 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, g_m, & 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.
12. Design a small signal amplifier using BJT(common emitter) for the given specifications. Draw the frequency response and find the bandwidth.

4. Laboratory Equipment/Software/Tools Required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Decade Resistance Boxes, Decade Capacitance Boxes
5. Ammeters (Analog or Digital) , Voltmeters (Analog or Digital), Digital Multimeters
6. Active and passive devices, bread boards
7. Software Tool like Multisim/Pspice or Equivalent

5. Books and Materials Text Book(s):

1. R.L. Boylestad and Louis Nashelsky, Electronic Devices and Circuits, Pearson Publications, 9th Edition, 2006.
2. J.B.Gupta, Electronic Devices and Circuits, 3rd Edition, S.K.Kataria & Sons, 2008.

COURSE STRUCTURE

A40405 - DIGITAL CIRCUITS & SIGNAL SIMULATION LAB

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	30	70	100

1. Course Description

The "Digital Circuits & Signal Simulation Lab" course equips students with practical skills in designing, analyzing, and simulating digital circuits and signals. Students will work with basic digital components such as logic gates, flip-flops, multiplexers, and counters to understand their functions and applications. The lab involves the use of simulation software tools like VHDL, Verilog, and MATLAB to model and verify digital circuits and signal processing algorithms. Through these simulations, students learn to troubleshoot and optimize circuit designs, ensuring they meet desired specifications. The course aims to bridge theoretical knowledge with practical implementation, enhancing proficiency in digital electronics and signal processing.

Course Objectives:

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

2. Course Outcomes:

A40405.1 Verify the truth tables of various logic circuits. (L2)
A40405.2 Understand how to simulate different types of signals and system response. (L2)
A40405.3 Design sequential and combinational logic circuits and verify their functionality. (L3, L4)
A40405.4 Analyze the response of different systems when they are excited by different signals and plot power spectral density of signals. (L4)
A40405.5 Generate different random signals for the given specifications. (L5)

3. Course Syllabus

PART A

List of Experiments:

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

References:

1. M. Morris Mano, "Digital Design", 3rd Edition, PHI

PART B

List of Experiments:

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.

References:

Stephen J. Chapman, "MATLAB Programming for Engineers", Cengage, November 2012.

COURSE STRUCTURE

A40510-PYTHON PROGRAMMING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	1	2	0	14	28	2	30	70	100

1. Course Description

The "Python Programming" course introduces students to the fundamental concepts and techniques of programming using Python. Topics covered include data types, control structures, functions, modules, and file handling. Students will also learn about object-oriented programming, libraries, and frameworks that are essential for developing applications. The course emphasizes problem-solving skills, algorithm development, and code readability. Through practical assignments and projects, students gain hands-on experience in writing efficient, maintainable, and well-documented Python code. This course is designed to build a strong foundation in programming, preparing students for advanced topics in computer science and software development.

Course Objectives:

The main objectives of the course are to

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

2. Course Outcomes:

After completion of the course, students will be able to

A40510.1 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)

A40510.2 Apply Python programming concepts to solve a variety of computational problems (L3)

A40510.3 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)

A40510.4 Proficient in using commonly used Python libraries and frameworks such as JSON, XML, NumPy, pandas (L2)

A40510.5 Exhibit competence in implementing and manipulating fundamental data structures such as lists, tuples, sets, dictionaries (L3)

3. Course Syllabus

UNTI-I:

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

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

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

Sample Experiments:

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

UNIT-II:

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

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) 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.

Online Learning Resources/Virtual Labs:

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

COURSE STRUCTURE

A40031-ENVIRONMENTAL SCIENCE

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	0	28	0	0	0	100	0	100

1. Course Description

Course Overview

The "Environmental Science" course offers an in-depth understanding of the natural world and the impact of human activities on the environment. It covers key topics such as ecosystems, biodiversity, pollution, climate change, and sustainable development. Students learn about the interrelationship between living organisms and their surroundings, environmental policies, and conservation strategies. The course emphasizes critical thinking and problem-solving skills through case studies and projects aimed at addressing real-world environmental issues. By the end of the course, students will be equipped with the knowledge and skills necessary to contribute to environmental protection and sustainability efforts.

Course Objectives:

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

2. Course Outcomes (COs):

A40031.1: Understand the multidisciplinary nature of environmental studies and the sustainable use of natural resources to address environmental challenges.

A40031.2 Analyze the structure, function, and importance of ecosystems and biodiversity, and evaluate strategies for their conservation at global and local levels.

A40031.3 Identify various types of environmental pollution, their causes and effects, and propose effective control measures and disaster management strategies.

A40031.4 Assess the impact of social issues on the environment, including urbanization and climate change, and understand the framework of environmental laws and ethics for sustainable development.

A40031.5 Examine the relationship between population growth, human health, and environmental sustainability, and explore the role of education and technology in addressing these challenges.

3. Course Syllabus

UNIT I

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

Natural Resources : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people –

Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

UNIT II

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

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

Biodiversity and its Conservation : Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-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.

UNIT III

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

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

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

UNIT IV

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

UNIT V

Human Population and the Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health –

Human Rights – Value Education – 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..

4. Books and Materials

Textbooks:

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.

References:

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 STRUCTURE

IV – SEMESTER

PROGRAMME CURRICULUM STRUCTURE UNDER R23 REGULATIONS

B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING

IV SEMESTER (II YEAR)									
Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A40022	**Management Course-I** Managerial Economics and Financial Analysis	HSMC	2	0	0	2	30	70	100
A40217	Linear Control Systems	ES	3	0	0	3	30	70	100
A40408	EM Waves and Transmission Lines	PC	3	0	0	3	30	70	100
A40409	Electronic Circuits Analysis	PC	3	0	0	3	30	70	100
A40410	Analog and Digital Communications	PC	3	0	0	3	30	70	100
A40411	Electronic Circuits Analysis Lab	PC	0	0	3	1.5	30	70	100
A40412	Analog and Digital Communications Lab	PC	0	0	3	1.5	30	70	100
A40021	Soft Skills	SEC	0	1	2	2	30	70	100
A40023	Design Thinking and Innovation	ES	1	0	2	2	30	70	100
		TOTAL	15	1	10	21	270	630	900
Mandatory Community Service Project Internship of 08 weeks duration during summer vacation									

COURSE STRUCTURE

A40022-MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	0	28	0	0	2	30	70	100

1. Course Description

Course Overview

Managerial Economics and Financial Analysis explores the application of economic theory and quantitative methods to solve business problems and make informed managerial decisions. The course covers fundamental concepts such as demand analysis, production and cost analysis, market structure, pricing strategies, and capital budgeting. Students learn to interpret financial statements, evaluate investment projects using time value of money techniques, and understand risk and return in financial decision-making. Emphasis is placed on practical application through case studies and real-world examples, equipping students with analytical tools to optimize resource allocation, maximize profitability, and navigate competitive markets effectively.

Course Objectives:

- To inculcate the basic knowledge of microeconomics and financial accounting
- To make the students learn how demand is estimated for different products, input-output relationship for optimizing production and cost
- To Know the Various types of market structure and pricing methods and strategy
- To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
- To provide fundamental skills on accounting and to explain the process of preparing financial statements.

2. Course Outcomes:

A40022.1 Define the concepts related to Managerial Economics, financial accounting and management(L2)

A40022.2 Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets (L2)

A40022.3 Apply the Concept of Production cost and revenues for effective Business decision (L3)

A40022.4 Analyze how to invest their capital and maximize returns (L4)

A40022.5 Evaluate the capital budgeting techniques. (L5)

3. Course Syllabus

UNIT – I Managerial Economics

Introduction – Nature, meaning, significance, functions, and advantages. Demand-Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting-Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.

UNIT – II Production and Cost Analysis

Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least- cost combination– Short run and long run Production Function- Isoquants and Is costs, Cost & Break-Even Analysis - Cost concepts and Cost behaviour- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems).

UNIT – III Business Organizations and Markets

Introduction – Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises. Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition Monopoly- Monopolistic Competition–Oligopoly-Price-Output Determination - Pricing Methods and Strategies

UNIT – IV Capital Budgeting

Introduction – Nature, meaning, significance. Types of Working Capital, Components, Sources of Short-term and Long-term Capital, Estimating Working capital requirements. Capital Budgeting– Features, Proposals, Methods and Evaluation. Projects – Pay Back Method, Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR) Method (sample problems)

UNIT – V Financial Accounting and Analysis

Introduction – Concepts and Conventions- Double-Entry Bookkeeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Introduction to Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

4. Books and Materials

Textbooks:

1. Varshney & Maheswari: Managerial Economics, Sultan Chand.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH.

Reference Books:

1. Ahuja Hl Managerial economics Schand.
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage.

Online Learning Resources:

- https://www.slideshare.net/123ps/managerial-economics-ppt
- https://www.slideshare.net/rossanz/production-and-cost-45827016
- https://www.slideshare.net/darkyla/business-organizations-19917607
- https://www.slideshare.net/balarajbl/market-and-classification-of-market
- https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
- https://www.slideshare.net/ashu1983/financial-accounting

COURSE STRUCTURE

A40217-LINEAR CONTROL SYSTEMS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

Linear Control Systems introduces the principles and analysis techniques for understanding and designing control systems that govern the behavior of dynamic systems. Topics include modeling of dynamic systems, transfer functions, time-domain and frequency-domain analysis, stability criteria, controller design methods (such as PID controllers), and state-space representation. The course emphasizes practical applications through simulations and experiments, preparing students to analyze and improve the performance of various engineering systems. By mastering these concepts, students gain the ability to design controllers that ensure desired system behaviors, manage disturbances, and achieve robust performance in diverse industrial and technological contexts.

Course Objectives

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

2. Course Outcomes:

After completing the course, the student should be able to:

A40217.1	Summarize the basic principles and applications of control systems. (L2)
A40217.2	Understand the time response and steady state response of the systems. (L2)
A40217.3	Understand the concept of state space, controllability and observability. (L2)
A40217.4	Apply time domain analysis to find solutions to time invariant systems. (L3)
A40217.5	Analyze different aspects of stability analysis of systems in frequency domain. (L4)

3. Course Syllabus

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 Mason's 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 – Routh's stability criterion – Stability and conditional stability - limitations of Routh's 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.

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 it's Properties. System response through State Space models. The concepts of controllability and observability, Duality between controllability and observability.

4. Books and Materials

Textbooks:

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

References:

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 STRUCTURE

A40408-EM WAVES AND TRANSMISSION LINES

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

EM Waves and Transmission Lines explores the fundamentals of electromagnetic waves and their propagation through transmission lines. The course covers Maxwell's equations, wave equations, and boundary conditions governing electromagnetic fields. Topics include wave propagation in free space, conductors, and dielectrics, as well as transmission line theory, impedance matching, and reflection phenomena. Students learn about different types of transmission lines, such as coaxial cables and microstrip lines, and their applications in telecommunications and signal processing. Emphasis is placed on understanding wave behavior, impedance transformations, and practical design considerations for efficient signal transmission in various electronic and communication systems.

Course Objectives:

- To understand and analyze different laws and theorems of electrostatic fields.
- To study and analyze different laws and theorems of magneto static fields.
- Analyzing Maxwell’s equations in different forms.
- To learn the concepts of wave theory and its propagation through various mediums.

To get exposure to the properties of transmission lines.

Course Pre/corequisites

1. **A40002**– Linear Algebra & Calculus

2. Course Outcomes (COs)

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

A40408.1 Learn the concepts of wave theory and its propagation through various mediums. (L2)

A40408.2 Understand the properties of transmission lines and their applications. (L2)

A40408.3 Apply the laws & theorems of electrostatic fields to solve the related problems (L3)

A40408.4 Gain proficiency in the analysis and application of magnetostatic laws and theorems (L4).

A40408.5 Analyze Maxwell’s equations in different forms. (L4)

3. Course Syllabus

UNIT I Review of Co-ordinate Systems, Electrostatics: Coulomb’s Law, Electric Field Intensity, Electric Flux Density, Gauss Law and Applications, Electric Potential, Maxwell’s Two Equations for Electrostatic Fields, Energy Density, Illustrative Problems. Convection and Conduction Currents, Dielectric Constant, Poisson’s and Laplace’s Equations; Capacitance – Parallel Plate, Coaxial Capacitors, Illustrative Problems.

UNIT II

Magnetostatics: Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector, Potentials, Forces due to Magnetic Fields, Ampere's Force Law, Inductances and Magnetic Energy, Illustrative Problems**.**

Maxwell's Equations (Time Varying Fields): Faraday's Law and Transformer EMF, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements, Conditions at a Boundary Surface, Illustrative Problems.

UNIT III

EM Wave Characteristics: Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations Between E & H, Sinusoidal Variations, Wave Propagation in Lossy dielectrics, lossless dielectrics, free space, wave propagation in good conductors, skin depth, Polarization & Types, Illustrative Problems.

Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector and Poynting Theorem, Illustrative Problems.

UNIT IV

Transmission Lines - I: Types, Parameters, T & π Equivalent Circuits, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line, Lossless lines, distortion less lines, Illustrative Problems.

UNIT V

Transmission Lines – II: Input Impedance Relations, Reflection Coefficient, VSWR, Average Power, Shorted Lines, Open Circuited Lines, and Matched Lines, Low loss radio frequency and UHF Transmission lines, UHF Lines as Circuit Elements, Smith Chart – Construction and Applications, Quarter wave transformer, Single Stub Matching, Illustrative Problems.

4. Books and Materials

Textbooks:

1. Elements of Electromagnetics, Matthew N.O. Sadiku, 4th Edition, Oxford University Press, 2008.
2. Electromagnetic Waves and Radiating Systems, E.C. Jordan and K.G. Balmain, 2nd Edition, PHI, 2000.

References:

1. Electromagnetic Field Theory and Transmission Lines, G. S. N. Raju, 2nd Edition, Pearson Education, 2013.
2. Engineering Electromagnetics, William H. Hayt Jr. and John A. Buck, 7th Edition, Tata McGraw Hill, 2006.
3. Electromagnetics, John D. Krauss, 3rd Edition, McGraw Hill, 1988.
4. Networks, Lines, and Fields, John D. Ryder,2nd Edition, PHI publications, 2012.

COURSE STRUCTURE

A40409 – ELECTRONIC CIRCUITS ANALYSIS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Electronic Circuits Analysis focuses on the principles and methodologies for analyzing and designing electronic circuits. The course covers fundamental circuit elements such as resistors, capacitors, and inductors, as well as semiconductor devices including diodes, transistors, and operational amplifiers. Topics include DC and AC circuit analysis, transient response, frequency response, and feedback systems. Students learn techniques for circuit simplification, network theorems, and practical circuit analysis using software tools and simulation methods. Emphasis is placed on understanding circuit behavior, solving design problems, and applying theoretical concepts to real-world applications in areas such as analog electronics, signal processing, and power electronics.

Course Objectives:

- Understand the characteristics of Differential amplifiers, feedback and power amplifiers.
- Analyze the response of tuned amplifiers
- Categorize different oscillator circuits based on the application
- Design the electronic circuits for the given specifications and for a given application.

2. Course Outcomes:

A40409.1 Examine the frequency response of amplifier circuits using BJT & MOSFETs at low and high frequencies. (L3)
A40409.2 Design multistage amplifiers for the given application. (L6)
A40409.3 Derive the expressions for frequency of oscillation and condition for oscillation of RC, LC oscillator circuits and Multivibrators. (L4)
A40409.4 Understand the characteristics of feedback and power amplifiers. (L2)
A40409.5 Evaluate the performance of different tuned amplifiers. (L5)

3. Course Syllabus

UNIT – I Frequency Response
Logarithm, Decibels, Low-Frequency response of CE and CS amplifier, The Hybrid π Model, The transconductance, input resistance at the base, input resistance and output resistance, Internal Capacitive Effects, High-Frequency Model of the BJT and the MOSFET, High-Frequency response of CE, Emitter follower, CS, CD, f_β, f_T and gain bandwidth product.

UNIT – II Multistage Amplifiers
Multistage & Differential Amplifiers: Introduction, Classification of Amplifiers, Distortion in amplifiers, Coupling Schemes, RC Coupled Amplifier using BJT, Cascaded RC Coupled BJT Amplifiers, Cascode amplifier, Darlington pair, the MOS Differential Pair, Small-Signal Operation of the MOS Differential Pair, The BJT Differential Pair, and other Nonideal Characteristics of the Differential Amplifier.

UNIT – III Feedback Amplifiers

Feedback Amplifiers: Introduction, The general feedback structure, Characteristics of negative feedback amplifiers, feedback topologies, series-shunt, series-series, shunt-shunt, shunt-series.

Oscillators: Barkhausen criteria, RC oscillators – phase shift oscillator, Wien-bridge oscillator, LC oscillators, Relaxation oscillator, Crystal oscillator, illustrative problems.

UNIT – IV Power Amplifiers

Power Amplifiers: Introduction, Class A amplifiers (Series fed, Transformer coupled, Push pull), Second Harmonic distortion, Class B amplifiers (Push pull, Complementary symmetry), Cross over distortion and Class AB operation, Class C amplifiers, Power BJTs, MOS power transistors.

UNIT – V Tuned Amplifiers and Multivibrators

Tuned Amplifiers: Introduction, Single Tuned Amplifiers – Q factor, frequency response, Double Tuned Amplifiers – frequency response, concept of stagger tuning and synchronous tuning.

Multivibrators: Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger using Transistors.

4. Textbooks:

1. J. Millman, C. Halkias, "Integrated Electronics", 4thEdition, McGraw Hill Education (India) Private Ltd., 2015.
2. Adel. S. Sedra and Kenneth C. Smith, "Micro Electronic Circuits," 6th Edition, Oxford University Press, 2011.

References:

1. Behzad Razavi, "Fundamentals of Micro Electronics", Wiley, 2010.
2. Donald A Neamen, "Electronic Circuits – Analysis and Design," 3rdEdition, McGraw Hill (India), 2019.
3. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuits Theory", 9th Edition, Pearson/Prentice Hall, 2006.

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COURSE STRUCTURE

A40410-Analog and Digital Communications

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Analog and Digital Communications explores the principles and technologies underlying the transmission and reception of information through analog and digital signals. The course covers modulation techniques (AM, FM, PM, ASK, FSK, PSK), multiplexing, noise analysis, and channel capacity. Topics include analog communication systems such as AM and FM radio, and digital communication systems including baseband and passband transmission, error detection and correction codes, and data compression. Students learn about the design and performance evaluation of communication systems, emphasizing practical applications in modern telecommunications networks, satellite communications, and digital broadcasting. The course also addresses emerging technologies and trends in communication engineering.

Course Objectives:

- Introduce various modulation and demodulation techniques of analog and digital communication systems.
- Analyze different parameters of analog and digital communication techniques.
- Understand function of various stages of AM, FM transmitters and Know characteristics of AM &FM receivers.
- Analyze the performance of various digital modulation techniques in the presence of AWGN.

Course Pre/corequisites

1. A40202 - Electrical & Electronics Engineering Workshop
2. A40401 - Signals, Systems and Stochastic Processes

2. Course Outcomes:

A40402.1 Recognize the basic terminology used in analog and digital communication technique for transmission of information/data. (L1)

A40402.2 Explain the basic operation of different analog and digital communication systems at baseband and passband level. (L2)

A40402.3 Compute various parameters of baseband and passband transmission schemes by applying basic engineering knowledge. (L3)

A40402.4 Analyze the performance of different modulation & demodulation techniques to solve complex problems in the presence of noise. (L4)

A40402.5 Evaluate the performance of all analog and digital modulation techniques to know the merits and demerits of each one of them in terms of bandwidth and power efficiency. (L5)

3. Course Syllabus

UNIT I Continuous Wave Modulation

Introduction: The communication Process, Communication Channels, Baseband and Passband Signals, Analog vs Digital Communications, Need for the modulation.

Amplitude Modulation (AM): AM and its modifications – DSB, SSB, VSB. Frequency Translation, Frequency Division Multiplexing (FDM).

Angle Modulation: Frequency Modulation (FM), Phase Modulation, PLL, Nonlinear Effects in FM, Super heterodyne Receivers.

UNIT II Noise and Pulse Modulation

Introduction to Noise: Types of Noise, Receiver Model, Noise in AM, DSB, SSB, and FM Receivers, Pre-Emphasis and De-emphasis in FM.

Introduction to Pulse Modulation: The Sampling Process, PAM, TDM, Bandwidth-Noise Trade off, Quantization process, PCM, Noise considerations in PCM systems, Delta Modulation, DPCM.

UNIT III Baseband Pulse Transmission

Introduction, Matched Filter, Properties of Matched Filter, Error rate due to noise, Inter Symbol Interference (ISI), Nyquist Criterion for distortion less baseband binary transmission, Correlative level coding, Baseband M-ary PAM transmission, QAM, MAP and ML decoding, Equalization, Eye pattern.

UNIT IV Digital Passband Transmission

Introduction, Passband Transmission Model, Gram-Schmidt Orthogonalization Procedure, Geometric Interpretation of Signals, Response of bank of correlators in noise, Correlation receiver, Probability of Error.

UNIT V Digital Modulation Schemes

Coherent Digital Modulation Schemes – ASK, BPSK, BFSK, QPSK, Non-coherent BFSK, DPSK. M-ary Modulation Techniques, Power Spectra, Bandwidth Efficiency.

Information theory: Entropy, Mutual Information and Channel capacity theorem.

4. Textbooks:

1. Simon Haykin, "Communication Systems", JohnWiley& Sons, 4th Edition, 2004.
2. B. P. Lathi, Zhi Ding "Modern Digital and Analog Communication Systems", Oxford press, 2011.

References:

1.Sam Shanmugam, "Digital and Analog Communication Systems", JohnWiley& Sons, 1999.
2. Bernard Sklar, F. J. harris "Digial Communications: Fundamentals and Applications", Pearson Publications, 2020.

COURSE STRUCTURE

A40411 – ELECTRONIC CIRCUITS ANALYSIS LAB

Hours Per			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	30	70	100

1. Course Description

Dive into the world of electronics! This lab-focused course complements your understanding of electronic circuits. Through hands-on experiments, you'll analyze circuit behavior using theorems, build circuits using real components, and verify theoretical concepts with practical measurements. Gain valuable skills in troubleshooting, data analysis, and interpreting circuit performance.

Course Objectives:

- Plot the characteristics of Differential amplifiers, feedback and power amplifiers.
- Analyze the response of tuned amplifiers and Multivibrators.
- Categorize different oscillator circuits based on the application.
- Design the electronic circuits for the given specifications and for a given application.

2. Course Outcomes:

A40411.1 Know about the usage of equipment/components/software tools used to conduct experiments in analog circuits. (L2)

A40411.2 Conduct the experiment based on the knowledge acquired in the theory about various analog circuits using BJT/MOSFETs to find the important parameters of the circuit experimentally. (L3)

A40411.3 Analyze the given analog circuit to find required important metrics of it theoretically. (L4)

A40411.4 Compare the experimental results with that of theoretical ones and infer the conclusions. (L4)

A40411.5 Design the circuit for the given specifications. (L6)

3. Course Syllabus

List of Experiments

1. Design and Analysis of Darlington pair.
2. Frequency response of CE – CC multistage Amplifier
3. Design and Analysis of Cascode Amplifier.
4. Frequency Response of Differential Amplifier
5. Design and Analysis of any two topologies of feedback amplifies and find the frequency response of it.
6. Design and Analysis of Class A power amplifier.
7. Design and Analysis of Class AB amplifier.
8. Design and Analysis of RC phase shift oscillator.
9. Design and Analysis of LC Oscillator
10. Frequency Response of Single Tuned amplifier

11. Design a Bistable Multivibrator and analyze the effect of commutating capacitors and draw the wave forms at base and collector of transistors.
12. Design an Astable Multivibrator and draw the wave forms at base and collector of transistors.
13. Design a Monostable Multivibrator and draw the input and output waveforms.
14. Draw the response of Schmitt trigger for gain of greater than and less than one.

4. Laboratory Equipment/Software/Tools Required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Active and passive devices, bread boards
5. Computers installed with operating system
6. Multisim/Equivalent simulation software tool

5. Books and Materials Text Book(s):

1. R.L. Boylestad and Louis Nashelsky, Electronic Devices and Circuits, Pearson Publications, 9th Edition, 2006.
2. J.B.Gupta, Electronic Devices and Circuits, 3rd Edition, S.K.Kataria & Sons, 2008.

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COURSE STRUCTURE

A40412-ANALOG AND DIGITAL COMMUNICATIONS LAB

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	30	70	100

1. Course Description

The Analog and Digital Communications Lab provides hands-on experience with communication systems. Students explore the principles of analog modulation techniques such as AM, FM, and PM, along with digital modulation methods including ASK, FSK, PSK, and QAM. The lab covers signal sampling, quantization, encoding, and error detection. Utilizing oscilloscopes, spectrum analyzers, and signal generators, students gain practical skills in designing and analyzing communication circuits. Emphasis is placed on understanding signal transmission, noise effects, and bandwidth considerations. This course prepares students for real-world applications in telecommunications, broadcasting, and data transmission systems, fostering a strong foundation in both theoretical and practical aspects of communication technology.

Course Objectives:

- Understand the basics of analog and digital modulation techniques.
- Integrate theory with experiments so that the students appreciate the knowledge gained from the theory course.
- Design and implement different modulation and demodulation techniques and their applications.
- Develop cognitive and behavioral skills for performance analysis of various modulation techniques.

2. Course Outcomes:

A40412.1 Know about the usage of equipment/components/software tools used to conduct experiments in analog and digital modulation techniques. (L1)

A40412.2 Conduct the experiment based on the knowledge acquired in the theory about modulation and demodulation schemes to find the important metrics of the communication system experimentally. (L2)

A40412.3 Analyse the performance of a given modulation scheme to find the important metrics of the system theoretically. (L3)

A40412.4 Design and simulate basic digital communication systems involving both sampling and TDM, and critically evaluate the performance. (L4)

A40412.5 Compare the experimental results with that of theoretical ones and infer the conclusions. (L5)

3. Course Syllabus

List of Experiments:

Design the circuits and verify the following experiments taking minimum of six from each section shown below.

Section-A

1. AM Modulation and Demodulation
2. DSB-SC Modulation and Demodulation
3. Frequency Division Multiplexing
4. FM Modulation and Demodulation
5. Radio receiver measurements
6. PAM Modulation and Demodulation
7. PWM Modulation and Demodulation
8. PPM Modulation and Demodulation

Section-B

1. Sampling Theorem.
2. Time Division Multiplexing
3. Delta Modulation and Demodulation
4. PCM Modulation and Demodulation
5. BPSK Modulation and Demodulation
6. BFSK Modulation and Demodulation
7. QPSK Modulation and Demodulation
8. DPSK Modulation and Demodulation

4. Laboratory Equipment/Software/Tools Required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Analog and Digital Modulation and Demodulation Kits
5. Software Tool- MATLAB

5. Books and Materials Text Book(s):

1. Simon Haykin, “Communication Systems”, 5th Edition, Wiley, 2009.
2. Widely used for analog and digital modulation, multiplexing, receivers, and sampling.
3. B.P. Lathi, “Modern Digital and Analog Communication Systems”, 4th Edition, Oxford University Press, 2010.

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COURSE STRUCTURE

A40021-SOFT SKILLS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	1	2	0	14	28	2	30	70	100

1. Course Description

The Soft Skills course focuses on developing essential interpersonal and professional skills needed in today's workplace. Students learn effective communication, teamwork, problem-solving, time management, and leadership techniques. The course emphasizes emotional intelligence, adaptability, conflict resolution, and networking abilities. Through interactive activities, role-playing, and real-life scenarios, students practice and enhance their presentation and negotiation skills. This course aims to build confidence, improve workplace etiquette, and prepare students for successful careers by fostering a positive attitude and professional demeanor. Graduates of this course will be equipped to navigate diverse work environments and collaborate effectively with colleagues and clients.

Course Objectives:

- To encourage all round development of the students by focusing on soft skills
- To make the students aware of critical thinking and problem-solving skills
- To enhance healthy relationship and understanding within and outside an organization
- To function effectively with heterogeneous teams

2. Course Outcomes

A40021.1	List out various elements of soft skills (L1, L2)
A40021.2	Describe methods for building professional image (L1, L2)
A40021.3	Apply critical thinking skills in problem solving (L3)
A40021.4	Analyse the needs of an individual and team for well-being and assess the situation and take necessary decisions (L4, L5)
A40021.5	Create a productive workplace atmosphere using social and work-life skills ensuring personal and emotional well-being (L6)

3. Course Syllabus

UNIT I Soft Skills & Communication Skills

Soft Skills - Introduction, Need - Mastering Techniques of Soft Skills – Communication Skills - Significance, process, types - Barriers of communication - Improving techniques.

Activities:

Intrapersonal Skills- Narration about self- strengths and weaknesses- clarity of thought – self-expression – articulating with felicity.

(The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes and literary sources)

Interpersonal Skills- Group Discussion – Debate – Team Tasks - Book and film Reviews by groups - Group leader presenting views (non- controversial and secular) on contemporary issues or on a given topic.

Verbal Communication- Oral Presentations- Extempore- brief addresses and speeches- convincing- negotiating- agreeing and disagreeing with professional grace.
Non-verbal communication – Public speaking – Mock interviews – presentations with an objective to identify non- verbal clues and remedy the lapses on observation.

UNIT II Critical Thinking

Active Listening – Observation – Curiosity – Introspection – Analytical Thinking – Open-mindedness – Creative Thinking - Positive thinking - Reflection

Activities:

Gathering information and statistics on a topic - sequencing – assorting – reasoning – critiquing issues –placing the problem – finding the root cause - seeking viable solution – judging with rationale – evaluating the views of others - Case Study, Story Analysis

UNIT III Problem Solving & Decision Making

Meaning & features of Problem Solving – Managing Conflict – Conflict resolution – Team building - Effective decision making in teams – Methods & Styles

Activities:

Placing a problem which involves conflict of interests, choice and views – formulating the problem – exploring solutions by proper reasoning – Discussion on important professional, career and organizational decisions and initiate debate on the appropriateness of the decision.
Case Study & Group Discussion

UNIT IV Emotional Intelligence & Stress Management

Managing Emotions – Thinking before Reacting – Empathy for Others – Self-awareness – Self-Regulation – Stress factors – Controlling Stress – Tips

Activities:

Providing situations for the participants to express emotions such as happiness, enthusiasm, gratitude, sympathy, and confidence, compassion in the form of written or oral presentations.
Providing opportunities for the participants to narrate certain crisis and stress –ridden situations caused by failure, anger, jealousy, resentment and frustration in the form of written and oral presentation, Organizing Debates

UNIT V Corporate Etiquette

Etiquette- Introduction, concept, significance - Corporate etiquette - meaning, modern etiquette, benefits - Global and local culture sensitivity - Gender Sensitivity - Etiquette in interaction- Cell phone etiquette - Dining etiquette - Netiquette - Job interview etiquette - Corporate grooming tips -Overcoming challenges

Activities

Providing situations to take part in the Role Plays where the students will learn about bad and good manners and etiquette - Group Activities to showcase gender sensitivity, dining etiquette etc. - Conducting mock job interviews - Case Study - Business Etiquette Games

NOTE-:

1. The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes, epics, scriptures, autobiographies and literary sources which bear true relevance to the prescribed skill.
2. Case studies may be given wherever feasible for example for Decision Making- The decision of King Lear.

Prescribed Books:

1. Mitra Barun K, Personality Development and Soft Skills, Oxford University Press, Pap/Cdr edition 2012
2. Dr Shikha Kapoor, Personality Development and Soft Skills: Preparing for Tomorrow, I K International Publishing House, 2018

Reference Books

1. Sharma, Prashant, Soft Skills: Personality Development for Life Success, BPB Publications 2018.
2. Alex K, Soft Skills S.Chand & Co, 2012 (Revised edition)
3. Gajendra Singh Chauhan & Sangeetha Sharma, Soft Skills: An Integrated Approach to Maximise Personality Published by Wiley, 2013
4. Pillai, Sabina & Fernandez Agna, Soft Skills and Employability Skills, Cambridge University Press, 2018
5. Soft Skills for a Big Impact (English, Paperback, Renu Shorey) Publisher: Notion Press
6. Dr. Rajiv Kumar Jain, Dr. Usha Jain, Life Skills (Paperback English) Publisher: Vayu Education of India, 2014

Online Learning Resources:

1. https://youtu.be/DUlsNJtg2L8?list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q
2. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ
3. https://youtu.be/-Y-R9hDl7lU
4. https://youtu.be/gkLsn4ddmTs
5. https://youtu.be/2bf9K2rRWwo
6. https://youtu.be/FchfE3c2jzc
7. https://www.businesstrainingworks.com/training-resource/five-free-business-etiquette-training-games/
8. https://onlinecourses.nptel.ac.in/noc24_hs15/preview
9. https://onlinecourses.nptel.ac.in/noc21_hs76/preview

COURSE STRUCTURE

A40023 – DESIGN THINKING AND INNOVATION

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
1	0	2	14	0	28	2	30	70	100

1. Course Description

Course Overview

The Design Thinking and Innovation course immerses students in a creative problem-solving methodology used to develop innovative solutions. Students learn to empathize with users, define problems, ideate, prototype, and test solutions through hands-on projects and collaborative activities. The course emphasizes user-centered design, rapid prototyping, and iterative testing. By exploring real-world challenges, students develop skills in critical thinking, creativity, and strategic planning. This course prepares students to approach complex problems with a holistic perspective, fostering an innovative mindset applicable to various industries. Graduates will be equipped to drive innovation and implement effective solutions in dynamic environments.

Course Objectives:

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

2. Course Outcomes (COs)

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

A40023.1 Define the concepts related to design thinking. (L1, L2)
A40023.2 Explain the fundamentals of Design Thinking and innovation (L1, L2)
A40023.3 Apply the design thinking techniques for solving problems in various sectors. (L3)
A40023.4 Analyse to work in a multidisciplinary environment (L4)
A40023.5 Evaluate the value of creativity and formulate specific problem statements of real time issues (L3, L5, L6)

3. Course Syllabus

UNIT I

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

UNIT II

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

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

UNIT III

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

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

UNIT IV

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

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

UNIT V

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

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

4. Books and Materials

Textbooks:

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

References:

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

COURSE STRUCTURE

V – SEMESTER

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY,KURNOOL

PROGRAMME CURRICULUM STRUCTURE UNDER R23 REGULATIONS

B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING

V SEMESTER (III YEAR)

Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A40414	Analog and Digital IC Applications	PC	3	0	0	3	30	70	100
A40415	Antennas and Wave Propagation	PC	3	0	0	3	30	70	100
A40416	Microprocessors and Microcontrollers	PC	3	0	0	3	30	70	100
A40417a A40417b A40417c A40417d A40417e	**Professional Elective –I** 1. Computer Architecture & Organization 2. Information theory and coding 3. Detection and Estimation Theory 4. Simulation of Communication Systems using MATLAB 5. Introduction to Photonics	PE	3	0	0	3	30	70	100
	Open Elective –I	OE	3	0	0	3	30	70	100
A40418	Analog and Digital IC Applications Lab	PC	0	0	3	1.5	30	70	100
A40419	Microprocessors and Microcontrollers Lab	PC	0	0	3	1.5	30	70	100
A40420	PCB Design and Prototype Development	SEC	0	1	2	2	30	70	100
A40536	Introduction to Quantum Technologies and Applications	SEC	3	0	0	3	30	70	100
A40032	Tinkering Lab	BS&H	0	0	2	1	30	70	100
A40421	Evaluation of Community Service Internship	PW	-	-	-	2	100	-	100
		TOTAL	**18**	**01**	**10**	**26**	**400**	**700**	**1100**

Open Elective – I

Course Code	Title of the Course	L-T-P	Credits	Offered by
A40171	Green Buildings	3-0-0	3	CE
A40172	Construction Technology and Management	3-0-0	3	CE
A40271	Electrical Safety Practices and Standards	3-0-0	3	EEE
A40371	Sustainable Energy Technologies	3-0-0	3	ME
A40571	Programming in Java	3-0-0	3	CSE
A40572	Artificial Intelligence - Concepts and Techniques	3-0-0	3	CSE
A40573	Quantum Technologies & Applications	3-0-0	3	CSE
A40071	Mathematics for Machine Learning and AI	3-0-0	3	H&S
A40072	Materials Characterization Techniques	3-0-0	3	H&S
A40073	Chemistry of Energy Systems	3-0-0	3	H&S
A40074	English for Competitive Examinations	3-0-0	3	H&S
A40075	Entrepreneurship and New Venture Creation	3-0-0	3	H&S
A40090	Mathematics for Machine Learning	3-0-0	3	H&S
A40091	Entrepreneurship	3-0-0	3	H&S

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40414 – ANALOG & DIGITAL IC APPLICATIONS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The **Analog and Digital IC Applications** course introduces the fundamentals and practical applications of integrated circuits (ICs), focusing on both analog and digital domains. Students learn about the classification and internal structure of operational amplifiers (Op-Amps), and analyze their linear and non-linear applications. The course covers the design and implementation of active filters, 555 timers, phase-locked loops (PLLs), voltage regulators, and digital-to-analog and analog-to-digital converters. Additionally, it explores digital ICs from TTL and CMOS families, including logic gates, multiplexers, counters, and flip-flops. By the end, students will have a solid understanding of how analog and digital ICs function and are utilized in real-time electronic circuits and systems, preparing them for advanced electronics and embedded design.

Course Objectives:

- Understand the structure, characteristics, and applications of operational amplifiers and analog ICs.
- Analyze and design signal processing circuits using filters, timers, PLLs, and voltage regulators.
- Explore and implement digital IC applications using TTL and CMOS families.

Course Pre/corequisites

1. A40402 – Electronic Devices and Circuits
2. A40403 – Digital Circuit Design
3. A40201 – Basic Electrical & Electronics Engineering

2. Course Outcomes (COs)

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

A40414.1 Understand the classification of Integrated Circuits, internal blocks and characteristics of Op-Amp (L2)
A40414.2 Analyse linear and non-linear applications of Op-Amp. (L4)
A40414.3 Gain knowledge on active filters, timers and phased locked loops. (L3)
A40414.4 Understand the working of Voltage Regulators and Converters. (L2)
A40414.5 Know about different types of Digital ICs and their applications. (L1)

3. Course Syllabus

UNIT I ICs and OP- AMPS

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, subtractor, 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 a stable 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.

UNIT V Digital ICs

CMOS Logic: CMOS logic levels, MOS transistors, Basic CMOS Inverter, 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.

Books and Materials

Textbooks:

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.

References:

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.

COURSE STRUCTURE
A40415 – ANTENNAS & WAVE PROPAGATION

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course provides a comprehensive introduction to antenna fundamentals, covering basic definitions, radiation mechanisms, and essential antenna parameters such as gain, directivity, and beamwidth. It explores radiation characteristics of different dipole configurations and small antennas, including current distributions and field patterns. HF, VHF, and UHF antennas such as loop, helical, and horn antennas are analyzed with design considerations. Microwave antennas like microstrip and reflector types are examined in terms of structure, performance, and applications. Antenna arrays are studied with emphasis on pattern multiplication, linear arrays, and amplitude distributions. The course also includes antenna measurement techniques for directivity and gain. Finally, wave propagation modes—ground, space, and sky—are discussed with practical models and calculations.

Course Objectives:

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

Course Pre/corequisites

1. A40408 – Electromagnetics and transmission lines

2. Course Outcomes (COs)

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

A40415.1 Understand the antennas basic terminology and radiation mechanism of antennas. (L2)
A40415.2 Gain knowledge on VHF and UHF antennas, their operation and applications.(L3)
A40415.3 Design and analyse the working and applications of Microwave antennas. (L4)
A40415.4 Analyse different techniques involved in the design of antenna arrays and antenna parameter measurements. (L4)
A40415.5 Gain a comprehensive knowledge about the types of radio wave propagation methods. (L4)

3. Course Syllabus

UNIT I

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. Radiation – 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: 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), Helical Antennas-Helical Geometry, Helix modes, Practical Design considerations for Monofilar Helical Antenna in Axial and Normal Modes. Horn Antennas- Types, Fermat's Principle, Optimum Horns, Design considerations of Pyramidal Horns, Illustrative Problems.

UNIT III

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, Applications, Illustrative Problems.

UNIT IV

Antenna Arrays: Point sources - Definition, Patterns, arrays of 2 Isotropic sources- Different cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, End fire Arrays, BSA with Non-uniform Amplitude Distributions - General considerations and Binomial 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: Introduction, Definitions, Characterizations and general classifications, different modes of wave propagation, 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 earth's curvature, M-curves and duct propagation, fading and path loss calculations.

Sky wave propagation - Introduction, structure of Ionosphere, refraction and reflection of sky waves by Ionosphere, Critical frequency, MUF, Virtual height and Skip distance, Relation between MUF and Skip distance, Multi-HOP propagation, Summary of Wave Characteristics in different frequency ranges, Illustrative problems.

Books and Materials

Textbooks:

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 Satya Prakashan, —Antennas and Wave Propagation‖, New Delhi, Tech. India Publications, 2001.

References:

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.

COURSE STRUCTURE
A40416 – MICROPROCESSORS AND MICROCONTROLLERS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course covers the architecture and features of the 8086 microprocessors, including its pin configuration, internal units, and system modes. It introduces 8086 assembly programming, addressing modes, and development tools. Interfacing concepts are explored through memory, I/O devices, and peripheral controllers like 8255, 8251, 8237A, and 8259. The course then shifts to the 8051 microcontrollers, covering its architecture, instruction set, and SFRs. It also includes interfacing of 8051 with timers, serial ports, interrupts, LCDs, keyboards, sensors, and external memory. A comparison of microprocessors, microcontrollers, PIC, and ARM processors concludes the course.

Course Objectives:

Students will be able to

- Comprehend the architecture, operation and configurations of the 8086 microprocessors.
- Get familiar with 8086 programming concepts, instruction set, and assembly language development tools.
- Study the interfacing of 8086 with memory, peripherals, and controllers for various applications.
- Learn the architecture, instruction set, and programming of the 8051 microcontrollers.
- Understand microcontroller interfacing techniques, peripheral programming, and processor comparisons.

Course Pre/corequisites

1. A40403 – Digital Circuit Design
2. A40502 – Introduction to Programming

2. Course Outcomes (COs)

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

A40416.1	Gain knowledge on the architecture, operation, and configurations of the 8086 microprocessors.
A40416.2	Get familiar with 8086 programming concepts, instruction set, and assembly language development tools.
A40416.3	Know the interfacing of 8086 with memory, peripherals, and controllers for various applications.
A40416.4	Learn the architecture, instruction set, and programming of the 8051 microcontrollers.
A40416.5	Understand microcontroller interfacing techniques, peripheral programming, and processor comparisons.

3. Course Syllabus

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.

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

4. Books and Materials

Textbooks:

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

References:

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

COURSE STRUCTURE

A40417a - COMPUTER ARCHITECTURE & ORGANIZATION

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course provides students with a solid foundation in the principles, design, and operational concepts of computer systems. It covers how a computer's hardware components are organized, how they operate internally, how they manage data processing and control operations, how they interact, and how instructions are executed efficiently. Students gain insight into the internal workings of CPUs, hardware design aspects, data representation, arithmetic operations, memory, input-output systems, and modern architectural features like pipelining and multiprocessing.

Course Objectives:

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

Course Pre/corequisites

1. A40403 - Digital Circuits Design
2. A40302 - Engineering Workshop

2. Course Outcomes (COs)

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

A40417a.1 Learn the design of various functional units of digital computers and performance issues of computer systems. (L1)
A40417a.2 Understand the basic processing unit and their connections. (L2)
A40417a.3 Know about different types of Data representation and Computer Arithmetic operations. (L3)
A40417a.4 Learn about different types of memory and their interconnections. (L4)
A40417a.5 Understand the basics of parallel computing and pipelining. (L4)

3. Course Syllabus

UNIT I

Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture.

Register Transfer Language and Micro operations: Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic microoperations, shift microoperations, Arithmetic logic shift unit.

Basic Computer Organization and Design: Instruction codes, Computer Registers

Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

UNIT II

Micro programmed Control: Control memory, Address sequencing, micro program example, design of control unit.

Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.

UNIT III

Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation.

Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

UNIT IV

Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

UNIT V

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.

4. Books and Materials

Textbooks:

1. Computer System Architecture – M. Moris Mano, Third Edition, Pearson/PHI.
2. Computer Organization and Design: The Hardware/Software Interface – David A. Patterson, John L. Hennessy, Fifth Edition, Elsevier/Morgan Kaufmann

References:

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.

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COURSE STRUCTURE

A40417b -INFORMATION THEORY AND CODING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course provides a comprehensive understanding of information theory and coding techniques essential for reliable and efficient data transmission. It begins with foundational concepts such as entropy, mutual information, and various coding methods including Shannon-Fano and Huffman coding. Advanced topics cover source coding, asymptotic properties, and universal compression algorithms like Lempel-Ziv, along with channel capacity and rate-distortion theory. The course then delves into error control techniques, including block and linear codes such as Hamming, BCH, and Reed-Solomon codes, emphasizing encoding and decoding strategies. Finally, it explores convolutional codes, the Viterbi algorithm, and modern error correction methods like Turbo and LDPC codes for robust communication systems.

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.

Course Pre/corequisites

1. A30405 – Signals and Systems
2. A30426 – Digital Communication Systems

2. Course Outcomes:

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

A40417b.1 Learn the concepts of information in the context of communication theory and communication receivers.

A40417b.2 Implement various source coding algorithms and analyze their performance.

A40417b.3 Gain knowledge about techniques for error detection and error correction.

A40417b.4 Design linear block codes and cyclic codes.

A40417b.5 Understand various convolutional codes.

3. Course Syllabus

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, 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.

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, 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.

4. Books and Materials

Textbooks:

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.

References:

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 STRUCTURE

A40417c – DETECTION AND ESTIMATION THEORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course provides a comprehensive introduction to statistical signal processing, focusing on signal detection and parameter estimation in the discrete-time domain. It covers fundamental decision theory frameworks, including Bayesian, minimax, and Neyman-Pearson criteria, and explores both deterministic and random signal detection methods. Advanced topics include nonparametric detection techniques and robust detection strategies when statistical models are incomplete or unknown. Students will learn key estimation principles such as maximum likelihood, Bayesian estimation, and linear filtering techniques including Wiener and Kalman filters. The course emphasizes practical applications in communications, radar, and biomedical signal analysis.

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.
5. To analyze estimation signal parameter and apply suitable estimation techniques.
6. To understand the signal estimation in Discrete-Time techniques.

Course Pre/Corequisites:

1. A30015- Transform Techniques and Complex Variables
2. A30405 – Signals and Systems
3. A30426 – Digital Communication Systems

2. Course Outcomes:

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

A40417c.1 Understand the impact of white Gaussian noise on the detection of signals.
A40417c.2 Analyze the detection of deterministic signals and random signals.
A40417c.3 Learn about the nonparametric detections.
A40417c.4 Analyze estimation signal parameter and apply suitable estimation techniques.
A40417c.5 Understand the signal estimation in Discrete-Time techniques

3. Course Syllabus:

UNIT 1

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 2

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 3

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 4

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.

UNIT 5

Signal Estimation in Discrete-Time: Linear Bayesian estimation, Weiner filtering, dynamical signal model, discrete Kalman filtering.

4. Books and Materials

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 STRUCTURE

A40417d– SIMULATION OF COMMUNICATION SYSTEM USING MATLAB

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course teaches the basics of communication systems and MATLAB. It is meant to introduce students to the idea of modelling and simulating communication systems while also showing how these systems behave in a random way. The main goals of this course are twofold: to show students how important Monte Carlo methods are for studying how communication systems behave, and to get them to model and study random systems around them. By the end of the course, students will be able to confidently program in MATLAB and create programming models for simulating communication systems.

Course objective:

- Learn how to use MATLAB to work with data, do matrix operations, and control script flows.
- Use Monte Carlo methods and random process theory to model and study systems that have a chance of happening.
- Use AWGN and channel models to understand and measure how well communication systems work when there is noise and fading.
- For communication analysis, use AR processes, Yule-Walker equations, and Markov chains to model stochastic systems.
- Look at how current wireless communication systems use signal detection, modulation methods, and queuing theory.

Course Pre/corequisites

1. A40401 Signals, Systems and stochastic process
2. A40016 Probability and Complex variable

2. Course Outcomes (COs)

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

A40417d.1	Basic of implementing digital communications systems using MATLAB.
A40417d.2	Interpret the systems using Monte Carlo methods by having knowledge of probability.
A40417d.3	Understanding the concepts of Modeling and simulation of AWGN communication systems.
A40417d.4	Understanding the fading channels and concepts of MIMO Systems
A40417d.5	Understanding Markov Chains and the Viterbi Algorithm

3. Course Syllabus

Unit I

Introduction: Basics of Matlab, Data types, Floating point numbers, Scripting of flow of control.

Matlab programming: Arrays, Indexing, Matrix multiplication, Complex inversion, matrix inversion.

UNIT-II

Monte Carlo methods: Signals and Convolution, Probability, Random variables, Bayes theorem.

Random Process: Random numbers, Random distribution, Histogram, Functions and generating of random variables and distribution.

Unit III

Information source and Quantization: Properties of Random process, Power Spectra, Signal and Noise.

Modeling and Simulation of AWGN Communication Systems: Stochastic model, The AR-1 process, Yule Walker equations, Markov chains-1, fading channel. Markov chains-II, Markov chains-III, k mean and correlation.

UNIT-IV

Fading channels and MIMO: pre coding, image compression, Transform Domine compression.

Makov chain and Vertibi Algorithm: Low pass and band pass signals, signal spaces, PAM and detection, Effect of AWGN.

Queueing-I: ML detection, ML detection II, The union Bond, Symbol error rate.

UNIT-V

Queueing II: Choosing constellations, Orthogonal Signaling, Non Coherent-I, Non coherent -II, DPSK.

Optical Filtering and Stochastic Gradient Descent: DPSK-II, Introduction to wireless communication, Conclusion

4. Books and Materials

Text Book(s)

1. Rudra Pratap. Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers. Oxford University Press, Inc., USA, 2009.

2. Sheldon M. Ross, Introduction to Probability Models, (Twelfth Edition), Academic Press, 2019.

Reference Book(s):

1. Proakis, J.G., Salehi, M., Bauch, G., Contemporary Communication Systems Using MATLAB, Third edition, Cengage Learning, 2012.
2. Haykin, Simon S, Adaptive Filter Theory, Fifth Edition, Pearson, 2014.

COURSE STRUCTURE
A40417e – INTRODUCTION TO PHOTONICS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course provides a comprehensive foundation in Photonics, covering the behavior and interaction of light with matter. It introduces wave optics phenomena such as interference, diffraction, and coherence, then advances to electromagnetic and quantum descriptions of light. Students will explore the operation of interferometers, fiber optics, photon interactions, lasers, optical amplifiers, and semiconductor devices. The course also incorporates practical lab demonstrations to reinforce theoretical concepts, with applications in modern photonic systems like communications, sensors, and imaging.

Course Objectives:

Students will be able to

- Understand the basic principles of photonics and wave optics.
- Analyze interference, diffraction, and coherence phenomena in optical systems.
- Examine the principles and characteristics of lasers, optical amplifiers, and fiber optics.
- Explore semiconductor light sources and detectors, and their operating mechanisms.
- Investigate nonlinear optical effects and methods of light manipulation.

Course Pre/corequisites

2. A40003 – Engineering Physics
3. A40408 – EM Waves and Transmission Lines

2. Course Outcomes (COs)

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

A40417e.1	Explain the fundamentals of photonics, diffraction, interference, and coherence. (L2)
A40417e.2	Apply wave optics principles to analyze and interpret behavior in interferometers and optical devices. (L3)
A40417e.3	Analyze the operation and characteristics of lasers, optical amplifiers, and fiber optics. (L4)
A40417e.4	Compare and evaluate the performance of various semiconductor light sources and detectors. (L4)
A40417e.5	Demonstrate understanding through hands-on lab experiments with real-world photonics equipment and applications. (L3)

3. Course Syllabus

UNIT I

Fundamentals of Photonics and Wave Optics: Introduction to Photonics, Diffraction & Interference, Ray Optics and Wave Optics, Interferometers, Coherence: Spatial & Temporal.

UNIT II

Electromagnetic Optics and Photon Interaction: Electromagnetic Optics, Fiber Optics, Photon Properties, Photon Optics, Photon Interaction, Fiber Modes, NA and MFD.

UNIT III

Optical Amplifiers and Laser Systems: Optical Amplification, Three-Level and Four-Level Laser Systems, EDFA Introduction and Characterization, Laser Principles.

UNIT IV

Semiconductor Light Sources and Detectors: Band Structure of Semiconductor Light Sources & Detectors, Light Emission and LED Characteristics, Laser Characteristics, Semiconductor Detectors.

UNIT V

Light Manipulation and Nonlinear Optics: Light Manipulation: Malus' Law, Birefringence, Faraday Rotation, Nonlinear Optics: Pockels Effect, Kerr Effect, Stimulated Brillouin and Raman Scattering, Electro-Optic Modulator.

4. Books and Materials

Textbooks:

1. Bahaa E. A. Saleh, Malvin Carl Teich, "Fundamentals of Photonics", John Wiley & Sons, 1991
2. J.Wilson and J.F.B.Hawkes "Lasers: Principles and applications", Prentice-Hall of India, New Delhi, 1996.
3. W.T.Silfvast, "Laser fundamentals", Foundation books, New Delhi, 1999.
4. P. Bhattacharya "Semiconductor opto electronics devices" Prentice-Hall of India, New Delhi, 1995

References:

4. John M. Senior "Optical fiber communications", Prentice-Hall of India, New Delhi, 2001.
5. Joseph C. Palais, "Fibre Optic Communication", Pearson Education Asia, India, 2001.

COURSE STRUCTURE

A40571 – PROGRAMMING IN JAVA

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course introduces the fundamentals of Object-Oriented Programming (OOP) using Java. It covers core concepts such as classes, objects, inheritance, polymorphism, and interfaces. Students will learn to write efficient programs using control structures, arrays, exception handling, and file I/O. The course also includes advanced topics like multithreading, JDBC for database connectivity, and GUI development using JavaFX. By the end, learners will be able to design and implement real-world Java applications with modular and reusable code.

Course Objectives: The main objective of the course is to Identify Java language components and how they work together in applications

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

Course Pre/corequisites

1. A40501 – Introduction to Programming
2. A40510 – Python Programming

2. Course Outcomes (COs)

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

A40571.1 Analyze problems, design solutions using OOP principles, and implement them efficiently in Java.

A40571.2 Design and implement classes to model real-world entities, with a focus on attributes, behaviors, and relationships between objects.

A40571.3 Demonstrate an understanding of inheritance hierarchies and polymorphic behaviour, including method overriding and dynamic method dispatch.

A40571.4 Apply Competence in handling exceptions and errors to write robust and fault-tolerant code.

A40571.5 Perform file input/output operations, including reading from and writing to files using Java I/O classes, graphical user interface (GUI) programming using JavaFX.

3. Course Syllabus

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.

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, Result Set 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)

4. Books and Materials

Textbooks:

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

References:

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

Online Learning Resources:

1. https://nptel.ac.in/courses/106/105/106105191/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347 _shared/overview

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40418 – ANALOG AND DIGITAL IC APPLICATIONS LAB

Hours Per			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	2	0	0	45	1.5	30	70	100

1. Course Description

This lab course introduces students to the practical design and analysis of analog and digital integrated circuits. Students will gain hands-on experience with operational amplifiers (Op-Amps) for building amplifiers, filters, and waveform generators. The course covers linear and non-linear applications of IC 741. Timer ICs (like IC 555) are used to construct multivibrators and waveform circuits. Digital experiments include design of adders, counters, multiplexers, decoders, and registers using standard digital ICs. Students will also work with DACs and ADCs for analog-digital interfacing. The lab strengthens circuit analysis, design, and troubleshooting skills essential for real-world electronics applications

Course Objectives:

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

3. Course Outcomes:

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

A40418.1	Design an Inverting and Non-inverting Amplifier using an Op Amp. (L3)
A40418.2	Demonstrate the Linear and Non-Linear Applications using IC 741. (L3)
A40418.3	Design Astable and Monostable Multivibrator using timer ICs. (L3)
A40418.4	Analyse the DAC and ADC converter. (L4)
A40418.5	Design Counters and Registers using digital ICs. (L3)

3. Course Syllabus

LIST OF EXPERIMENTS: (Implement/**Execute any 10experiments**).

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

4. Laboratory Equipment/Software/Tools Required:

1. Breadboards and Connecting Wires
2. Dual Power Supply (±15V, 0–30V)
3. Digital Storage Oscilloscope (DSO)
4. Function Generator (1Hz to 1MHz)
5. Analog and Digital ICs: IC 741, IC 555, IC 7805/7809/7912, IC 723, IC 74163, IC 74194/195, MUX, Decoder, ADCs/DACs
6. Multimeter and Logic Probe
7. Simulation Software: Multisim / PSpice / Proteus (for optional simulation support)

5. Books and Materials Text Book(s):

1. D. Roy Choudhury & Shail B. Jain, *Linear Integrated Circuits*, New Age International Publishers
2. Ramakanth A. Gayakwad, *Op-Amps and Linear Integrated Circuits*, Pearson Education
3. R.P. Jain, *Modern Digital Electronics*, Tata McGraw Hill
4. D. V. Hall, *Digital Circuits and Systems*, Tata McGraw Hill
5. Sedra & Smith, *Microelectronic Circuits*, Oxford University Press

COURSE STRUCTURE
A40419 –MICROPROCESSORS AND MICROCONTROLLERS LAB

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	30	70	100

1. Course Description

Course Overview

This lab course provides hands-on experience with the 8086 microprocessor and 8051 microcontrollers, focusing on programming in Assembly and Embedded C. It emphasizes both theoretical understanding and practical implementation including arithmetic operations, interfacing, communication protocols, timers, counters, and peripheral devices. Students develop skills to solve real-world problems using microprocessor/microcontroller-based systems.

Course Objectives:

- Become skilled in 8086 Assembly Language programming.
- Understand the detailed software and hardware structure of the microprocessor.
- Train their practical knowledge through laboratory experiments.
- Understand and learn 8051 Microcontroller.
- Acquire knowledge on microprocessors and microcontrollers, interfacing various peripherals, and configuring.

Course Pre/corequisites

1. A40405 – Digital Circuits & Signal Simulation Lab
2. A40502 – Computer Programming Lab

2. Course Outcomes (COs)

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

A40419.1	Formulate a program and implement algorithms using Assembly language. (L3)
A40419.2	Describe an Assembly language program for the 8086 Microprocessor. (L2)
A40419.3	Develop programs for different applications in the 8086 Microprocessor. (L6)
A40419.4	Interface peripheral devices with 8086 and 8051. (L4)
A40419.5	Use an Assembly/Embedded C programming approach for solving real-world problems. (L5)

3. Course Syllabus

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) 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.

4. Laboratory Equipment/Software/Tools Required:

1. Computers installed with operating systems
2. EMU 8086 Software
3. Keil Micro-Vision Software
4. 8086 Trainer Kits along with interfacing Modules
5. 8051 Trainer Kits along with interfacing Modules

5. Books and Materials

Textbooks:

1. A. K Ray and K.M.Bhurchandani, "Advanced microprocessors and peripherals"- TMH, 2nd edition2006.
2. Kenneth.J.Ayala, "The 8051 microcontroller", 3rd edition, Cengage learning,2010.
3. Muhammad AliMazidi, Janice GillispieMazid, "The 8051 Microcontroller and Embedded Systems" Second Edition.

References:

1. Douglas V Hall, SSSP Rao, "Microprocessors and Interfacing – Programming and Hardware" Tata McGraw Hill Education Private Limited, 3rd Edition,1994.
2. Raj Kamal, " Microcontrollers: Architecture, Programming, Interfacing and System Design", 2nd edition, Pearson, 2012.

COURSE STRUCTURE

A40420 – PCB DESIGN AND PROTOTYPE DEVELOPMENT

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	1	2	0	14	28	2	30	70	100

1. Course Description

Course Overview

This course introduces principles, tools, and processes for designing Printed Circuit Boards (PCBs) and developing electronic prototypes. Students will learn both theoretical concepts and practical skills from schematic design to PCB assembly. The course emphasizes understanding components, symbols, and footprints, along with using EDA tools like KiCad. Students will practice designing, simulating, and fabricating analog, digital, and mixed-signal circuits. Microcontroller development board design is included. By course end, students can independently develop and prototype single-sided PCBs.

Course Objectives:

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

Course Pre/corequisites

3. A40201 – Basic Electrical & Electronics Engineering
4. A40402 – Electronic Devices and Circuits

2. Course Outcomes (COs)

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

A40420.1 Design a schematic of their circuit.

A40420.2 Design PCB layout of their design.

A40420.3 Give detailed description and practical of PCB designing.

3. Course Syllabus

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.

Practice Exercises: Any twelve experiments are to be done

1. Practice following PCB Design steps
   a) **Schematic Design:** Familiarization of the Schematic Editor, Schematic creation, Annotation, Netlist generation.
   b) **Layout Design:** Familiarization of Footprint Editor, Mapping of components, Creation of PCB layout Schematic.
   c) Create new schematic components.
   d) 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. RC Phase-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 89C51Microcontroller, 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.

4. Books and Materials

Textbooks:

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

References:

1. Open-source EDA Tool KiCad Tutorial: http://kicad-pcb.org/help/tutorials/
2. PCB Fabrication user guide page: http://www.wikihow.com/Create-Printed-Circuit-Boards http://www.siongboon.com/projects/2005-09-07_home_pcb_fabrication/
3. PCB Fabrication at home (video): https://www.youtube.com/watch?v=mv7Y0A9YeUc, https://www.youtube.com/watch?v=imQTCW1yWkg.

COURSE STRUCTURE
A40536 – INTRODUCTION TO QUANTUM TECHNOLOGIES AND APPLICATIONS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

Course Objectives (COBJ):

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

Course Outcomes (CO):

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

Unit 1: 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 2: 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 3: Building a Quantum Computer – Theoretical Challenges and Requirements

What is required to build a quantum computer (conceptual overview), Fragility of quantum systems: decoherence, noise, and control, Conditions for a functional quantum system: Isolation, Error management, Scalability, Stability, Theoretical barriers:

Why maintaining entanglement is difficult, Error correction as a theoretical necessity, Quantum hardware platforms (brief conceptual comparison), Superconducting circuits, Trapped ions, Photonics, Vision vs reality: what's working and what remains elusive, The role of quantum software in managing theoretical complexities

Unit 4: 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 5: 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

Textbooks:

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. **Bruce Rosenblum, Fred Kuttner**, *Quantum Enigma: Physics Encounters Consciousness*, Oxford University Press, 2nd Edition, 2011.
8. **Giuliano Benenti, GiulioCasati, Giuliano Strini**, *Principles of Quantum Computation and Information, Volume I: Basic Concepts*, World Scientific Publishing, 2004.
9. **K.B. Whaley et al.**, *Quantum Technologies and Industrial Applications: European Roadmap and Strategy Document*, Quantum Flagship, European Commission, 2020.
10. **Department of Science & Technology (DST), Government of India**, *National Mission on Quantum Technologies & Applications – Official Reports and Whitepapers*, MeitY/DST Publications, 2020 onward.

Online Learning Resources:

- IBM Quantum Experience and Qiskit Tutorials
- Coursera – Quantum Mechanics and Quantum Computation by UC Berkeley
- edX – The Quantum Internet and Quantum Computers
- YouTube – Quantum Computing for the Determined by Michael Nielsen
- Qiskit Textbook – IBM Quantum

COURSE STRUCTURE

A40032 –TINKERING LAB

Hours Per			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	2	0	0	28	1	30	70	100

1. Course Description

Course Overview

The aim of tinkering lab for engineering students is to provide a hands-on learning environment where students can explore, experiment, and innovate by building and testing prototypes. These labs are designed to demonstrate practical skills that complement theoretical knowledge. These labs bridge the gap between academia and industry, providing students with the practical experience. Some students may also develop entrepreneurial skills, potentially leading to start- ups or innovation-driven careers. Tinkering labs aim to cultivate the next generation of engineers by giving them the tools, space, and mind-set to experiment, innovate, and solve real-world challenges.

Course Objectives:

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

2. Course Outcomes:

- A40032.1 Experiment, innovate, and solve real-world challenges
- A40032.2 Enhance their 3D thinking, design skills as well as their creativity
- A40032.3 Collaborate in teams effectively
- A40032.4 Integrate interdisciplinary knowledge into problem-solving
- A40032.5 Exhibit readiness for Entrepreneurship and industry roles

3. Course Syllabus

LIST OF EXPERIMENTS:

1) Make your own parallel and series circuits using breadboard for any application of your choice.
2) Demonstrate a traffic light circuit using breadboard.
3) Build and demonstrate automatic Street Light using LDR.
4) Simulate the Arduino LED blinking activity in Tinkercad.
5) Build and demonstrate an Arduino LED blinking activity using Arduino IDE.
6) Interfacing IR Sensor and Servo Motor with Arduino.
7) Blink LED using ESP32.

8) LDR Interfacing with ESP32.
9) Control an LED using Mobile App.
10) Design and 3D print a Walking Robot
11) Design and 3D Print a Rocket.
12) Build a live soil moisture monitoring project, and monitor soil moisture levels of a remote plan in your computer dashboard.
13) Demonstrate all the steps in design thinking to redesign a motor bike.
14) Mini-project-1

4. Laboratory Equipment/Software/Tools Required:

- Breadboard
- Resistor: 330Ω , 1K, 10K (each 100 quantity)
- Jumper Wires cables kit multi colored : 120 no.s each : 3 sets
- Breadboard power supply module
- LED Traffic Lights Signal Module
- LDR module
- LEDs- RED , WHITE (each 100 pcs)
- Arduino Uno + USB cable
- IR Sensor Module
- SG90 Servo Motor(180degrees)
- ESP32 + cable
- Multimeters
- 9V Adapters
- Soil Moisture Sensor
- Arduino CC software
- Tinkercad software

5. Books /Materials Text Book(s)/ Links:

1) https://aim.gov.in/pdf/equipment-manual-pdf.pdf
2) https://atl.aim.gov.in/ATL-Equipment-Manual/
3) https://aim.gov.in/pdf/Level-1.pdf
4) https://aim.gov.in/pdf/Level-2.pdf
5) https://aim.gov.in/pdf/Level-3.pdf
6) https://www.tinkercad.com
7) https://www.tinkercad.com/blog/official-guide-to-tinkercad-circuits
8) https://www.vla.org/assets/Conference_Session_Docs_Slideshows/2017_VLAAnnual/PresenterMaterials/tinkering%20with%20tinkercad%20-%20a%20beginners_%20guide%20to%20creating%203d%20printer%20designs%20-%20michael%20hibben.pdf
9) https://www.arduino.cc/

OPEN ELECTIVES – I

V – SEMESTER

COURSE STRUCTURE

A40171– Green Buildings

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course introduces the fundamentals and importance of green buildings, focusing on sustainable materials, technologies, and design strategies. It explores the growth of the green building movement in India, including key organizations, rating systems like LEED India, and associated benefits. Emphasis is placed on energy-efficient design, renewable energy integration, and reducing environmental impact. The course also covers advanced HVAC systems and energy modelling techniques for sustainable buildings. Finally, it addresses material conservation, waste management, and indoor environmental quality to promote health and sustainability.

Course Pre/corequisites

There are no pre/corequisites

2. Course Outcomes (COs)

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

A40171.1 Understanding the Fundamentals of Electrical Safety -L2

A40171.2 Identifying and Applying Safety Components -L3

A40171.3 Analyzing Grounding Practices and Electrical Bonding

A40171.4 Applying Safety Practices in Electrical Installations and Environments- L4

A40171.5 Evaluating Electrical Safety Standards and Regulatory Compliance -L5.

3. Course Syllabus

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, 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.

UNIT – V

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

Books and Materials

Text Book(s)

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 Book(s)

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

Online Learning Resources:

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

COURSE STRUCTURE

A40172– CONSTRUCTION TECHNOLOGY AND MANAGEMENT

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course provides an overview of construction management, covering project forms, organizational structure, and the roles and responsibilities of construction managers. It emphasizes manpower and equipment management, including recruitment, training, motivation, and cost-effective use of civil engineering machinery. Students learn project planning and scheduling techniques such as CPM and PERT for effective project control and execution. The course also addresses different types of contracts, legal aspects, and the use of software tools for project management. Finally, it highlights construction safety management, accident prevention, quality systems like ISO 9000, and the importance of occupational health and ergonomics.

Course Pre/corequisites

There are no pre/corequisites

2. Course Outcomes (COs)

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

A40172.1 Understand (Cos)project management fundamentals, organizational structures, and leadership principles in construction.

A40172.2 Analyze manpower planning, equipment management, and cost estimation in civil engineering projects.

A40172.3 Apply planning, scheduling, and project management techniques such as CPM and PERT.

A40172.4 Evaluate various contract types, contract formation, and legal aspects in construction management.

A40172.5 Assess safety management practices, accident prevention strategies, and quality management systems in construction.

3. Course Syllabus

UNIT I

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

UNIT II

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

Estimation.

UNIT III

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

UNIT IV

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

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.

4. Books and Materials

Text Book(s)

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.

Reference Book(s)

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

Online Learning Resources:

https://archive.nptel.ac.in/courses/105/104/105104161/
https://archive.nptel.ac.in/courses/105/103/105103093/

COURSE STRUCTURE

A40271– ELECTRICAL SAFETY PRACTICES AND STANDARDS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

Understand the sources, classification, and effects of air pollution on humans and the environment. Analyze meteorological factors influencing air pollution and dispersion modeling, Design and evaluate control measures for particulate pollutants, apply techniques for controlling gaseous pollutants through chemical and physical processes, assess vehicular and indoor air pollution and propose control strategies.

Course Pre/corequisites

There are no pre/corequisites

2. Course Outcomes (COs)

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

A40271.1	Understanding the Fundamentals of Electrical Safety -L2
A40271.2	Identifying and Applying Safety Components -L3
A40271.3	Analyzing Grounding Practices and Electrical Bonding
A40271.4	Applying Safety Practices in Electrical Installations and Environments-L4
A40271.5	Evaluating Electrical Safety Standards and Regulatory Compliance -L5.

3. Course Syllabus

UNIT I

Introduction To Electrical Safety:

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

UNIT II

Safety Components:

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

UNIT III

Grounding:

General requirements for grounding and bonding- Definitions- System grounding- Equipment grounding - The Earth - Earthing practices- Determining safe approach distance-Determining arc hazard category.

UNIT IV

Safety Practices:

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

UNIT V

Standards For Electrical Safety:

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

4. Books and Materials

Text Book(s)

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

Reference Book(s)

1. Kenneth G.Mastrullo, Ray A. Jones, —The Electrical Safety Program Book, Jones and Bartlett Publishers, London, 2nd Edition, 2011.
2. Palmer Hickman, —Electrical Safety-Related Work Practices, Jones & Bartlett Publishers, London, 2009.
3. Fordham Cooper, W., —Electrical Safety Engineering, Butterworth and Company, London, 1986.
4. John Cadick, Mary Capelli-Schellpfeffer, Dennis K. Neitzel, —Electrical Safety Hand book, McGraw-Hill, New York, USA, 4th edition, 2012.

COURSE STRUCTURE
A40371 – SUSTAINABLE ENERGY TECHNOLOGIES

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course introduces various renewable energy sources, with a focus on solar energy, covering solar radiation principles, PV module design, and off-grid solar power systems. It explores energy storage in PV systems, particularly battery types, parameters, selection, and maintenance for solar applications. Students learn about solar energy collection and storage methods, including flat plate and concentrating collectors, and practical solar applications such as heating, cooking, and distillation. The course also examines wind and biomass energy technologies, their working principles, and economic aspects. Finally, it covers geothermal and ocean energy systems along with fuel cell technologies, emphasizing their types, applications, and environmental considerations.

Course Objectives:

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

Course Pre/corequisites

There are no pre/corequisites

2. Course Outcomes (COs)

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

A40371.1 Illustrate the importance of solar radiation and solar PV modules.
A40371.2 Discuss the storage methods in PV systems
A40371.3 Explain the solar energy storage for different applications
A40371.4 Understand the principles of wind energy, and bio-mass energy.
A40371.5 Attain knowledge in geothermal energy, ocean energy and fuel cells.

3. Course Syllabus

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.

UNIT V

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

OCEAN ENERGY: Ocean Thermal Energy; Open Cycle & Closed Cycle TEC 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.

4. Books and Materials

Text Book(s)

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 Book(s)

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) d
3. Renewable Energy Technologies -Ramesh & Kumar /Narosa
4. Non-conventional Energy Source- G.D Roy/Standard Publishers

Online Learning Resources:

https://nptel.ac.in/courses/112106318

https://youtube.com/playlist?list=PLyqSpQzTE6M-ZgdjYukayF6QevPv7WE-r&si=-mwla2X- SuSiNy13

https://youtube.com/playlist?list=PLyqSpQzTE6M-ZgdjYukayF6QevPv7WE-r&si=Apfjx6oDfz1Rb_N3

https://youtu.be/zx04Kl8y4dE?si=VmOvp_OgqisILTAF

COURSE STRUCTURE
A40571 – PROGRAMMING IN JAVA

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries. Learn how to extend Java classes with inheritance and dynamic binding and how to use exception. Handling in Java applications Understand how to design applications with threads in Java Understand how to use Java apis for program development.

Course Pre/corequisites

There are no pre/corequisites

2. Course Outcomes (COs)

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

A40571.1	Analyze problems, design solutions using OOP principles, and implement them efficiently In Java.
A40571.2	Design and implement classes to model real-world entities, with a focus on attributes, behaviors, and relationships between objects.
A40571.3	Demonstrate an understanding of inheritance hierarchies and polymorphic behavior, including method overriding and dynamic method dispatch.
A40571.4	Apply Competence in handling exceptions and errors to write robust and fault-tolerant code.
A40571.5	Perform file input/output operations, including reading from and writing to files using Java I/O classes, graphical user interface (GUI) programming using JavaFX.

3. Course Syllabus

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.

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)

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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

COURSE STRUCTURE

A40572 – ARTIFICIAL INTELLIGENCE - CONCEPTS AND TECHNIQUES

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

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

Course Objectives

- This course aims to introduce the fundamentals of Artificial Intelligence, including intelligent agents and various problem-solving and search strategies.
- It covers game theory, constraint satisfaction problems, and logical reasoning using propositional and first-order logic.
- Students will learn knowledge representation techniques and inference mechanisms essential for building intelligent systems.
- The course also delves into classical and hierarchical planning methods for automated decision-making. Finally, it addresses probabilistic reasoning under uncertainty, including Bayesian networks and approximate inference techniques.

Course Pre/corequisites

There are no pre/corequisites

2. Course Outcomes (COs)

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

A40572.1 Learn the distinction between optimal reasoning Vs human like reasoning and formulate and efficient problem space for a problem expressed in natural language. Also select a search algorithm for a problem and estimate its time and space.

A40572.2 Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.

A40572.3 Learn different knowledge representation techniques

A40572.4 Understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space A40572mplexities.

A40572.5	Comprehend the applications of Probabilistic Reasoning and Bayesian Networks.

3. Course Syllabus

UNIT I

Introduction to AI

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

UNIT II

Games

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

UNIT III

First-Order Logic

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. Knowledge Representation: Ontological Engineering, Categories and Objects, Events.

UNIT IV

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:

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.

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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 STRUCTURE
A40573 – QUANTUM TECHNOLOGIES & APPLICATIONS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course introduces the foundational principles of quantum mechanics, including wavefunctions, quantum states, and the behavior of qubits. It explores quantum computing concepts such as quantum gates, circuits, and key algorithms like Deutsch-Jozsa and Shor's. Students learn quantum communication protocols and cryptographic techniques, including teleportation and the BB84 protocol. The course also covers quantum sensing technologies and their applications in precision measurement. Finally, it examines quantum materials, emerging quantum devices, global quantum initiatives, and career opportunities in the quantum industry.

Course Objectives

- To introduce the fundamentals of quantum mechanics relevant to quantum technologies
- To explain key quantum phenomena and their role in enabling novel technologies.
- To explore applications in quantum computing, communication, and sensing.
- To encourage understanding of emerging quantum-based technologies and innovations.

Course Pre/corequisites

There are no pre/corequisites

2. Course Outcomes (COs)

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

A405721: Understand key quantum mechanical concepts and phenomena.

A405722: Comprehend the structure and function of quantum algorithms and circuits.

A405723: Explore applications in quantum communication and cryptography

A405724: Appreciate the role of quantum technologies in modern engineering systems.

3. Course Syllabus

UNIT I

Fundamentals of Quantum Mechanics

Classical vs Quantum Paradigm, Postulates of Quantum Mechanics, Postulates of Quantum Mechanics, Wavefunction and Schrödinger Equation (Time-independent), Quantum states, Superposition, Qubits, Measurement, Operators, and Observables, Entanglement and Non-locality

UNIT II

Quantum Computing

Qubits and Bloch Sphere, Quantum Logic Gates: Pauli, Hadamard, CNOT, and Universal Gates, Quantum Circuits, Basic Algorithms: Deutsch-Jozsa. Gover’s, Shor’s (conceptual), Error Correction and Decoherence

UNIT III

Quantum Communication and Cryptography

Teleportation & No-Cloning, BB84 Protocol, Quantum Networks & Repeaters, Classical vs Quantum Cryptography, Challenges in Implementation.

UNIT IV

Quantum Sensors and Metrology

Quantum Sensing: Principles and Technologies, Quantum-enhanced Measurements, Atomic Clocks, Gravimeters, Magnetometers, NV Centers, Industrial Applications.

UNIT V

Quantum Materials and Emerging Technologies

Quantum Materials: Superconductors, Topological Insulators, Quantum Devices: Qubits, Josephson Junctions, Quantum Devices: Qubits, Josephson Junctions, National Quantum Missions (India, EU, USA, China), Quantum Careers and Industry Initiatives.

4. Books and Materials

Text Book(s)

1. Quantum Computation and Quantum Information" by Michael A. Nielsen and Isaac L. Chuang (Cambridge University Press **).**
2. Quantum Mechanics: The Theoretical Minimum" by Leonard Susskind and Art Friedman (Basic Books.

Reference Book(s)

1. Quantum Computing for Everyone" by Chris Bernhardt (MIT Press)
2. “Quantum Physics: A Beginner’s Guide" by Alastair I.M. Rae
3. “An Introduction to Quantum Computing" by Phillip Kaye, Raymond Laflamme, and Michele Mosca

COURSE STRUCTURE

A40071 – MATHEMATICS FOR MACHINE LEARNING AND AI

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

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

Course Pre/corequisites

There are no pre/corequisites

2. Course Outcomes (COs)

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

A40071.1 Apply linear algebra concepts to ML techniques like PCA and regression.

A40071.2 Analyze probabilistic models and statistical methods for AI applications.

A40071.3 Implement optimization techniques for machine learning algorithms.

A40071.4 Utilize vector calculus and transformations in AI-based models.

A40071.5 Develop graph-based AI models using mathematical representations.

3. Course Syllabus

UNIT I

Linear Algebra for Machine Learning

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

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

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

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

UNIT V

Graph Theory for AI

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

4. Books and Materials

Text Book(s)

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.

Reference Book(s)

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 STRUCTURE

A40072 – MATERIALS CHARACTERIZATION TECHNIQUES

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

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

Course Pre/corequisites

There are no pre/corequisites

2. Course Outcomes (COs)

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

A40072.1 Analyze the crystal structure and crystallite size by various methods.

A40072.2 Analyze the morphology of the sample by using a Scanning Electron Microscope.

A40072.3 Analyze the morphology and crystal structure of the sample by using Transmission electron microscope

A40072.4 Explain the principle and experimental arrangement of various spectroscopic techniques.

A40072.5 Identify the construction and working principle of various Electrical & Magnetic Characterization technique.

3. Course Syllabus

UNIT I

Structure analysis by Powder X-Ray Diffraction

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

UNIT II

Microscopy technique -1 –Scanning Electron Microscopy (SEM)

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

UNIT III

Microscopy technique -2 – Transmission Electron Microscopy (TEM)

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

UNIT IV

Spectroscopy techniques

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

UNIT V

Electrical & Magnetic Characterization techniques

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

4. Books and Materials

Text Book(s)

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 Book(s)

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

COURSE STRUCTURE

A40073 – CHEMISTRY OF ENERGY SYSTEMS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

To make the student understand basic electrochemical principles such as standard electrode potentials, emf and applications of electrochemical principles in the design of batteries. To understand the basic concepts of processing and limitations of Fuel cells & their applications. To impart knowledge to the students about fundamental concepts of photochemical cells, reactions and applications.

Course Pre/corequisites

There are no pre/corequisites

2. Course Outcomes (COs)

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

A40073.1 Solve the problems based on electrode potential, Describe the Galvanic Cell.

A40073.2 Describe the working Principle of Fuel cell, Explain the efficiency of the fuel cell.

A40073.3 Interpret advantages of photoelectron catalytic conversion

A40073.4 Illustrate the Solar cells, Discuss about concentrated solar power.

A40073.5 Discuss the metal organic frame work, Illustrate the carbon and metal oxide porous structures.

3. Course Syllabus

UNIT I

Electrochemical Systems:

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

UNIT II

Fuel Cells:

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

UNIT III

Photo and Photo electrochemical Conversions:

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

UNIT IV

Solar Energy:

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

UNIT V

Hydrogen Storage:

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

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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 STRUCTURE

A40074 – ENGLISH FOR COMPETITIVE EXAMINATIONS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

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

Course Pre/corequisites

There are no pre/corequisites

2. Course Outcomes (COs)

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

A40074.1 Identify the basics of English grammar and its importance.

A40074.2 Explain the use of grammatical structures in sentences.

A40074.3 Analyze an unknown passage and reach conclusions about it.

A40074.4 Choose the appropriate form of verbs in framing sentences.

A40074.5 Demonstrate the ability to use various concepts in grammar and vocabulary.

3. Course Syllabus

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.

4. Books and Materials

Text Book(s)

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

Reference Book(s)

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 STRUCTURE

A40075– ENTREPRENEURSHIP AND NEW VENTURE CREATION

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

To foster an entrepreneurial mind-set for venture creation and intrapreneurial leadership. To encourage creativity and innovation. To enable them to learn pitching and presentation skills. To make the students understand MVP development and validation techniques. To enhance the ability of analyzing Customer and Market segmentation.

Course Pre/corequisites

There are no pre/corequisites

2. Course Outcomes (COs)

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

A40075.1: Develop an entrepreneurial mindset and appreciate the concept of entrepreneurship.

A40075.2: Comprehend the process of problem-opportunity identification through design thinking.

A40075.3: Analyze and refine business models to ensure sustainability and profitability.

A40075.4: Build Prototype for Proof of Concept and validate MVP of their practice venture idea.

A40075.5: Create business plan, conduct financial analysis and feasibility analysis to assess the financial viability of a venture.

3. Course Syllabus

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.

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.

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.

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.

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.

4. Books and Materials

Text Book(s)

1. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha . Entrepreneurship, McGrawHill, 11th Edition.(2020)
2. Ries, E. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Crown Business,(2011).
3. Osterwalder, A., & Pigneur, Y. Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. John Wiley & Sons. (2010).

Reference Book(s)

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..

COURSE STRUCTURE

VI - SEMESTER

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY,KURNOOL

PROGRAMME CURRICULUM STRUCTURE UNDER R23 REGULATIONS

B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING

VI SEMESTER (III YEAR)

Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A40424	Digital Signal Processing	PC	3	0	0	3	30	70	100
A40425	Microwave and Optical Communications	PC	3	0	0	3	30	70	100
A40426	VLSI Design	PC	3	0	0	3	30	70	100
 A40427a A40427b A40427c A40427d A40427e	**Professional Elective –II** 1. Electronic Measurements and Instrumentation 2. Embedded systems & IOT 3. Speech Processing 4. Transducers for Instrumentation 5. Introduction to Embedded System Design	PE	3	0	0	3	30	70	100
 A40428a A40428b A40428c A40428d A40428e	**Professional Elective –III** 1. Digital Image Processing 2. Artificial Intelligence & Machine learning 3. Satellite Communications 4. Computer Vision And Image Processing - Fundamentals And Applications 5. Spread Spectrum Communications And Jamming	PE	3	0	0	3	30	70	100
	Open Elective –II	OE	3	0	0	3	30	70	100
A40429	Microwave and Optical Communications Lab	PC	0	0	3	1.5	30	70	100
A40430	VLSI Design Lab	PC	0	0	3	1.5	30	70	100
A40431	Machine Learning and DSP	SEC	0	1	2	2	30	70	100
A40033	Technical Paper Writing & IPR	MC	2	0	0	-	100*	-	100*
		TOTAL	**20**	**01**	**08**	**23**	**270**	**630**	**900**
Mandatory Industry Internship of 08 weeks duration during summer vacation									

* The marks for Mandatory Courses are not considered for calculating SGPA

Open Elective – II

Course Code	Title of the Course	L-T-P	Credits	Offered by
A40173	Disaster Management	3-0-0	3	CE
A40174	Sustainability In Engineering Practices	3-0-0	3	CE
A40272	Renewable Energy Sources	3-0-0	3	EEE
A40372	Automation and Robotics	3-0-0	3	ME
A40574	Introduction to Operating Systems	3-0-0	3	CSE
A40575	Introduction to Machine Learning	3-0-0	3	CSE
A40076	Optimization Techniques	3-0-0	3	H&S
A40077	Physics Of Electronic Materials and Devices	3-0-0	3	H&S
A40078	Chemistry Of Polymers and Applications	3-0-0	3	H&S
A40079	Academic Writing and Public Speaking	3-0-0	3	H&S
A40080	Mathematical foundation of quantum technologies	3-0-0	3	H&S

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40424– DIGITAL SIGNAL PROCESSING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course teaches the basics of Digital Signal Processing (DSP) with an emphasis on discrete-time signals and systems. It talks about frequency domain analysis methods like the z-transform, discrete Fourier transform (DFT), and fast Fourier transform (FFT). Different methodologies and realizations are used to look at how to design and build both IIR and FIR digital filters. The course also covers the architecture of programmable DSP devices like the TMS320C5X, which gives an overview of DSP hardware. System analysis, stability, filter design methodologies, and real-world uses are all important topics that build a strong base for more advanced DSP topics and real-time signal processing implementations.

Course Objectives:

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

Course Pre/corequisites

1. A40401– Signals and Systems

2. Course Outcomes (COs)

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

A40424.1. Familiar with the properties of discrete time signals, systems and z-transform.

A40424.2. Learn the importance of FFT algorithm for computation of Discrete Fourier Transform and Fast Fourier Transform with decimations.

A40424.3. Understand the implementations of digital filter structures.

A40424.4. Analyse the FIR filter design using Fourier series and windowing methods.

A40424.5. Gain the knowledge on Programmable DSP Devices.

3. Course Syllabus

UNIT I

Introduction to discrete time signals and systems: 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
Z–Transform: Definition, ROC, Properties, Poles and Zeros in Z-plane, the inverse Z-Transform, 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: 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.
Fast Fourier Transform: 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 form- I, 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.

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.

4. Books and Materials

Textbooks:

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.

References:

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 STRUCTURE

A40425– MICROWAVE AND OPTICAL COMMUNICATIONS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course teaches the basics of Digital Signal Processing (DSP) with an emphasis on discrete-time signals and systems. It talks about frequency domain analysis methods like the z-transform, discrete Fourier transform (DFT), and fast Fourier transform (FFT). Different methodologies and realizations are used to look at how to design and build both IIR and FIR digital filters. The course also covers the architecture of programmable DSP devices like the TMS320C5X, which gives an overview of DSP hardware. System analysis, stability, filter design methodologies, and real-world uses are all important topics that build a strong base for more advanced DSP topics and real-time signal processing implementations.

Course Objectives:

- To analyse different modes of operation in rectangular wave guides, circular wave guides and resonators.
- To study and analyse various microwave components and microwave sources.
- To gain knowledge on different microwave semiconductor devices and microwave measurements procedures.
- To analyse different optical fiber modes and to study different types of distortions and losses in optical communication.

  To study various optical sources, optical detectors and to analyze various optical links.

Course Pre/corequisites

2. Course Outcomes (COs)

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

A40425.1 Analyze different modes of operation in rectangular wave guides, circular wave guides and resonators

A40425.2 Understand and analyze various microwave components and microwave sources

A40425.3 Gain knowledge on different microwave semiconductor devices and microwave measurements procedures

A40425.4 Analyze different optical fiber modes and to study different types of distortions and losses in optical communication

A40425.5 Understand study various optical sources, optical detectors and to analyze various optical links.

3. Course Syllabus

UNIT I

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.

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.

4. Books and Materials

Textbooks:

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.

References:

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

COURSE STRUCTURE

A40426– VLSI DESIGN

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course introduces IC technologies including MOS, CMOS, and BiCMOS, and covers their electrical characteristics and basic circuit design. It explains the VLSI design process, including layout design, stick diagrams, and scaling limitations. Students learn gate-level design and key circuit concepts like sheet resistance, capacitance, and delay analysis. The course also focuses on subsystem design such as adders, multipliers, and introduces different VLSI design styles including FPGAs and CPLDs. Finally, it addresses CMOS testing methodologies, including DFT, BIST, and scan techniques for reliable circuit validation.

Course Objectives:

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

Course Pre/corequisites

- **Prerequisites:** Basic knowledge of Digital Electronics, Semiconductor Devices, and Logic Design.
- **Corequisites:** Knowledge of Electronic Circuits and familiarity with basic programming or HDL (e.g., Verilog or VHDL) is beneficial.

2. Course Outcomes (COs)

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

A40426.1	Understand the steps involved in fabrication of ICs using MOS transistor technology.
A40426.2	Learn about the VLSI design processes, Stick diagrams and Layouts.
A40426.3	Gain knowledge on the Gate Level Design concepts.
A40426.4	Learn the design of various subsystems with different VLSI Design styles.
A40426.5	Familiar with CMOS testing techniques.

3. Course Syllabus

UNIT I

Introduction: Brief Introduction to IC technology MOS, PMOS, NMOS, CMOS & BiCMOS Technologies. Basic Electrical Properties of MOS and BiCMOS Circuits: I_{DS} - V_{DS} 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 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: 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: 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: 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.

4. Books and Materials

Textbooks:

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

References:

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, 2^{nd} edition, 2009.

COURSE STRUCTURE

A40427a– ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course provides an understanding of the performance characteristics of electrical and electronic measuring instruments, including accuracy, precision, and error analysis. It covers the working principles and applications of oscilloscopes, their components, and measurement techniques using CROs and digital storage devices. Students learn about DC and AC bridges for measuring resistance, inductance, and capacitance, along with associated errors and precautions. The course also introduces various signal generators, waveform analyzers, and measurement equipment for signal analysis. Finally, it covers sensors and transducers for measuring physical parameters like displacement, force, pressure, temperature, and vibration, along with signal conditioning techniques.

Course Objectives:

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

Course Pre/corequisites

- **Prerequisites:** Basic Electrical Engineering, Electronic Devices and Circuits.
- **Corequisites:** Analog Electronics, Basic Instrumentation (optional but helpful).

2. Course Outcomes (COs)

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

A40427a.1	Learn about the performance characteristics of instruments and measurement of electrical quantities.
A40427a.2	Understand the construction, working and applications of different types of CRO’s.
A40427a.3	Compare the working of different types of bridges.
A40427a.4	Know the working of signal & function generators and analyzers.
A40427a.5	Grasp the working of sensors and transducers in measuring physical

parameters.

3. Course Syllabus

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.

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.

4. Books and Materials

Textbooks:

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.

References:

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

COURSE STRUCTURE

A40427b– ELMBEDDED SYSTEMS & IOT

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course provides an understanding of the performance characteristics of electrical and electronic measuring instruments, including accuracy, precision, and error analysis. It covers the working principles and applications of oscilloscopes, their components, and measurement techniques using CROs and digital storage devices. Students learn about DC and AC bridges for measuring resistance, inductance, and capacitance, along with associated errors and precautions. The course also introduces various signal generators, waveform analyzers, and measurement equipment for signal analysis. Finally, it covers sensors and transducers for measuring physical parameters like displacement, force, pressure, temperature, and vibration, along with signal conditioning techniques.

Course Objectives:

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

Course Pre/corequisites

2. Course Outcomes:

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

A40427b.1 Understand the Architecture, Development & Design of Embedded Systems and IoT.

A40427b.2 Learn the architecture and programming of ARM Microcontroller.

A40427b.3 Work with Raspberry Pi using Python Programming.

A40427b.4 Know about the IoT standards, communication technologies and protocols for IoT devices.

A40427b.5 Implement case studies and applications using the tools and techniques of IoT Platform.

3. Course Syllabus

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

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

4. Books and Materials

Textbooks:

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

References:

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 STRUCTURE

A40427c– SPEECH PROCESSING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course introduces the fundamentals of digital speech processing, covering the anatomy of speech organs and digital modeling of speech production. It explores time-domain techniques for analyzing speech signals, including zero-crossing and pitch estimation methods. Students learn frequency-domain approaches such as Fourier and spectrographic analysis for extracting key speech features like formants and pitch. The course also covers Linear Predictive Coding (LPC) for speech parameter estimation and formant analysis. Finally, it examines homomorphic processing using complex cepstrum and discusses applications like speech recognition, synthesis, enhancement, and speaker verification.

Course Objectives:

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

Course Pre/corequisites

Prerequisites: Signals and Systems, Digital Signal Processing.

Corequisites: Probability and Random Processes (recommended), basic programming skills for implementation.

2. Course Outcomes:

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

A40427c.1	Gain knowledge on anatomy and physiology of speech organs and the process of Speech Production.
A40427c.2	Understand the methods for extracting of speech using Time domain parameters.
A40427c.3	Learn the Frequency Domain Methods for Speech Processing.

A40427c.4	Interpret and analyze LPC Parameters for Speech Processing.
A40427c.5	Grasp the concepts of homomorphic Speech Processing.

3. Course Syllabus

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.

4. Books and Materials

Textbooks:

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.

References:

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 STRUCTURE

A40428a– DIGITAL IMAGE PROCESSSING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course introduces the fundamental concepts and techniques in digital image processing, including image acquisition, sampling, quantization, and various image transforms such as DFT, DCT, and wavelets. It covers intensity transformations, spatial and frequency domain filtering methods for image enhancement. Students learn image restoration techniques using spatial and frequency domain approaches, along with mathematical models for degradation and noise reduction. The course also explores image compression algorithms and multiresolution analysis using wavelets. Finally, it includes image segmentation, morphological processing, and color image processing techniques used in real-world applications.

Course Objectives:

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

2. Course Outcomes (COs)

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

A40428a.1	Learn the fundamentals of Image Processing with different Transforms.
A40428a.2	Understand the functions of Intensity Transformations and working fundamentals of Spatial Filters
A40428a.3	Implement various models of Restoring and Reconstruction of Images from filtering projections.
A40428a.4	Grasp the concepts of image compression using different coding &Wavelets and Multiresolution Processes.
A40428a.5	Design the image processing systems using Segmentation techniques for Morphological & Color Images.

3. Course Syllabus

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

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, sub band coding, Multiresolution expansions, wavelet transforms in one dimensions & two dimensions, Wavelet coding.

UNIT V

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.

4. Books and Materials

Textbooks:

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:

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

Online Learning Resources:

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

COURSE STRUCTURE

A40428b– ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course provides a comprehensive introduction to Artificial Intelligence, covering its foundations, history, and the concept of intelligent agents and rational behavior. It explores problem-solving methods using both uninformed and heuristic search strategies, including optimization and nondeterministic actions. Students learn knowledge representation through propositional logic, ontologies, and reasoning systems. The course introduces core machine learning principles, including concept learning, hypothesis search, and inductive bias. It concludes with decision tree learning, discussing algorithmic representation, hypothesis space, and practical issues in applying decision trees.

Course Objectives:

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

2. Course Outcomes (COs)

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

A40428b.1	To learn the basics and problems of Artificial Intelligence with rationality and structure of agents.
A40428b.2	To describe the search for solutions using various search strategies & algorithms for optimization.
A40428b.3	To evaluate the representation of Agents with Propositional Logic in Shopping World.
A40428b.4	To understand the concepts of Machine Learning with different Perspectives.
A40428b.5	To analyze Decision Tree Representation with different problems& issues.

3. Course Syllabus

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: Well-Posed Learning Problem, Designing a Learning system, Perspectives and Issues in Machine Learning.

Concept Learning and The General-to-Specific Ordering: 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 Candidate-Elimination, Inductive Bias

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.

4. Books and Materials

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 STRUCTURE

A40428c– SATELLITE COMMUNICATIONS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course introduces the fundamental principles of satellite communication systems, including orbital mechanics, satellite design, multiple access methods, satellite link and earth station design, and satellite broadcasting. It provides an in-depth understanding of how satellites are launched, tracked, and controlled, while focusing on the architecture of satellite-based communication links and services.

Course Objectives

- To learn the principles of orbital mechanics and satellite launch systems with performance parameters.
- To describe the elements of communication satellite design for matching reliability.
- To know the working concepts of various multiple access techniques and onboard processing.
- To analyze the satellite links design with communication links.
- To evaluate the working of earth station design with satellite broadcasting.

2. Course Outcomes (COs)

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

A40428c.1	Learn the principles of orbital mechanics and satellite launch system with performance parameters.
A40428c.2	Describe the elements of communication satellite design for matching reliability.
A40428c.3	Gain knowledge on various multiple access techniques and onboard processing.
A40428c.4	Analyze the satellite links design with communication links.
A40428c.5	Evaluate the working of earth station design with satellite broadcasting.

Course Pre/Corequisites

- Prerequisites: A40206 – Analog and Digital Communications
- Corequisites: None

3. Course Syllabus

UNIT I – Orbital Mechanics and Launch Systems

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 – Communication Satellite Design

Elements of communication satellite design, spacecraft subsystems, reliability considerations, spacecraft integration.

UNIT III – Multiple Access Techniques and Onboard Processing

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 and Broadcasting

Earth station design, configurations, antenna and tracking systems. Satellite broadcasting.

4. Books and Materials

Textbooks

1. D. Roddy, Satellite Communications, 4th Edition, McGraw-Hill, 2009.
2. T. Pratt & C.W. Bostian, Satellite Communications, Wiley, 2000.

References

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

COURSE STRUCTURE
A40429 – MICROWAVE AND OPTICAL COMMUNICATIONS LAB

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	30	70	100

1. Course Description

Course Overview

This laboratory course provides hands-on experience with microwave and optical communication components, focusing on the characteristics and behaviour of microwave sources such as reflex klystrons and Gunn diodes. Students perform experiments to measure attenuation, VSWR, impedance, scattering parameters, and antenna radiation patterns. The course also explores the performance of optical components including LEDs, laser diodes, and optical fibers. It includes experiments related to modulation, data rate measurement, numerical aperture, and loss analysis in optical links. Through practical work, students gain a deeper understanding of both microwave and fiber optic communication systems.

Course Objectives:

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

Course Prerequisites/Corequisites:

- **Prerequisites: Analog and Digital Communications, Electromagnetic Waves and Transmission Lines**
- **Corequisites: Microwave Engineering, Optical Communications (can be studied in parallel)**

2. Course Outcomes (COs)

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

A40429.1	Understand the working of microwave bench set up and characteristics of microwave sources.
A40429.2	Verify the characteristics of various microwave components and to draw the radiation pattern of antennas.
A40429.3	Verify the characteristics of optical sources & detectors and to study about losses in optical fiber.

3. Course Syllabus

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: 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

COURSE STRUCTURE
A40430 – VLSI DESIGN LAB

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	30	70	100

1. Course Description

Course Overview

This laboratory course offers hands-on experience in designing and analyzing CMOS digital and analog circuits using 180 nm technology with industry-standard EDA tools. Students implement and evaluate basic logic gates, combinational circuits, amplifiers, and differential amplifiers through schematic design, simulation, and layout generation. The experiments emphasize DC/AC analysis, parametric sweeps, layout verification (LVS), and design rule checks (DRC). The course enhances practical understanding of custom and semi-custom IC design methodologies. By the end, students gain proficiency in CMOS circuit design flow, from schematic to layout, using tools like Cadence, Mentor Graphics, or Synopsys.

Course Objectives:

- To design a logic circuit using CMOS transistor using 180 nm technology in terms of schematic, symbol, test bench, DC and AC analysis.
- To evaluate different schematics &output responses for AOI logic by using different software tools.
- To design CMOS circuits using Full & Semi custom IC designs for analyzation.
- To design different layouts using different software tools for analog circuits.

Course Pre/corequisites

1. A40201 – Basic Electrical & Electronics Engineering
2. A40402 – Electronic Devices and Circuits

2. Course Outcomes (COs)

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

A40430.1	Design a logic circuit using CMOS transistor using 180 nm technology in terms of schematic, symbol, test bench, DC and AC analysis.
A40430.2	Evaluate different schematics &output responses for AOI logic by using different software tools.
A40430.3	Design CMOS circuits using Full & Semi custom IC designs for analyzation.
A40430.4	Design different layouts using different software tools for analog circuits.

3. Course Syllabus

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

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 differential amplifier using FET/BJT**

    a) Design differential amplifier using FET/BJT 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 differential amplifier.

d) Check the performance of 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

The students are required to design the schematic diagrams using CMOS logic and to draw the layout diagrams to perform the experiments with the Industry standard EDA Tools.

Software Required: i. Mentor Graphics/ Synopsis/ Cadence / Equivalent Industry Standard Software. ii. Personal computer system with necessary software to run the programs and to implement.

COURSE STRUCTURE

A40431 – MACHINE LEARNING AND DSP

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	1	2	0	14	28	2	30	70	100

1. Course Description

Course Overview

This integrated lab course offers practical exposure to key concepts in Machine Learning and Digital Signal Processing (DSP) using Python and MATLAB-based environments. In the ML section, students implement foundational models such as regression, clustering, classification, dimensionality reduction, and neural networks with real-world applications like digit recognition, image classification, and biomedical signal analysis. The DSP section emphasizes signal generation, convolution, correlation, frequency analysis, filter design, and real-time audio signal processing. Through these experiments, students gain hands-on experience in algorithm development, model evaluation, and system implementation. The course enhances the ability to analyze and apply advanced computational techniques in machine intelligence and signal systems.

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.

Course Prerequisites/Corequisites:

- **Prerequisites: Probability and Statistics, Linear Algebra, Signals and Systems, Python Programming**

Corequisites: Machine Learning, Digital Signal Processing (theory)

Course Outcomes:

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

A40431.1	Understand the modules and dependencies for machine learning corresponding to different applications.
A40431.2	Learn a range of machine learning regression techniques & clustering along with their datasets.
A40431.3	Write the programs and implement k-Nearest Neighbor algorithm to classify the iris data sets, images & CNN.
A40431.4	Simulate the basic signal processing operations like convolution and correlation.

A40431.5 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. **Image Classification using CNN:** Classify cats and dogs using CNN from the given dataset
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).
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, 3
3. Digital Signal Processing: Alon V. Oppenhelm, PHI
4. Digital Signal processing(II-Edition): S.K. Mitra, TMH Edition

COURSE STRUCTURE
A40033 – TECHNICAL PAPER WRITING & IPR

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	0	28	0	0	-	100*	-	100*

1. Course Description

Course Overview

Course Objectives:·

- To enable the students to practice the basic skills of research paper writing
- To make the students understand the importance of IP and to educate them on the basic concepts of Intellectual Property Rights.
- To practice the basic skills of performing quality literature review
- To help them in knowing the significance of real life practice and procedure of Patents.
- To enable them learn the procedure of obtaining Patents, Copyrights, & Trade Marks

2. Course Outcomes (COs)

A40033.1 Identify key secondary literature related to their proposed technical paper writing.

A40033.2 Explain various principles and styles in technical writing

A40033.3 Use the acquired knowledge in writing a research/technical paper

A40033.4 Analyse rights and responsibilities of holder of Patent, Copyright, trademark, International Trademark etc.

A40033.5 Evaluate different forms of IPR available at national & international level

A40033.6 Develop skill of making search of various forms of IPR by using modern tools and techniques.

3. Course Syllabus

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, ncies and treaties, importance of intellectual property rights de Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting 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.

Textbooks:

1. Deborah. E. Bouchoux, *Intellectual Property Rights*, Cengage Learning India, 2013
2. Meenakshi Raman, Sangeeta Sharma. *Technical Communication: Principles and practices.* Oxford.

Reference Books:

1. R. Myneni, Law of Intellectual Property, 9th Ed, Asia law House, 2019.
2. Prabuddha Ganguli, Intellectual Property Rights Tata Mcgraw Hill, 2001
3. P.Naryan, Intellectual Property Law, 3rd Ed ,Eastern Law House, 2007.
4. Adrian Wallwork. English for Writing Research Papers Second Edition. Springer Cham Heidelberg New York ,2016
5. Dan Jones, Sam Dragga, Technical Writing Style

Online Resources

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/**
7. **https://www.extension.purdue.edu/extmedia/ec/ec-723.pdf**

OPEN ELECTIVE – II

VI – SEMESTER

COURSE STRUCTURE
A400173– DISASTER MANAGEMENT

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course provides a foundational understanding of the transformation theory and the original formulation of quantum mechanics, emphasizing their equivalence through Hilbert space concepts. It then delves into the abstract structure of Hilbert space, exploring its geometry, operator theory, and eigenvalue problems essential for quantum analysis. The course advances to the statistical interpretation of quantum mechanics, including uncertainty principles, measurement theory, and radiation phenomena. Further, it presents a deductive approach to the statistical framework, connecting theoretical constructs with experimental results, thermodynamic principles, and macroscopic behavior. Finally, the course concludes with an in-depth analysis of the quantum measurement process, discussing composite systems and the complexities involved in observation and system interaction.

Course Objective

- To understand the fundamental concepts of natural disasters, their occurrence, and disaster risk reduction strategies.
- To analyze the impact of cyclones on structures and explore retrofitting techniques for adaptive reconstruction.
- To apply wind engineering principles and computational techniques in designing wind-resistant structures.
- To evaluate earthquake effects on buildings and develop strategies for seismic retrofitting.
- To assess seismic safety planning, design considerations, and innovative construction materials for disaster-resistant structures

Course Pre/corequisites

There are no pre/corequisites

2. Course Outcomes (COs)

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

A40173.1	Understand the fundamental concepts of natural disasters, their occurrence, and disaster risk reduction strategies.
A40173.2	Analyze the impact of cyclones on structures and explore retrofitting techniques for adaptive reconstruction.
A40173.3	Apply wind engineering principles and computational techniques in designing wind-resistant structures.

A40173.4	Evaluate earthquake effects on buildings and develop strategies for seismic retrofitting.
A40173.5	Assess seismic safety planning, design considerations, and innovative construction materials for disaster-resistant structures.

3. Course Syllabus

UNIT I

Introductory Considerations

The origin of the Transformation Theory, The Original Formulation of Quantum Mechanics, The Equivalence of the two Theories: (i) The Transformation Theory, (ii) Hilbert Space.

UNIT II

Abstract Hilbert Space

The definition of Hilbert space, The Geometry of Hilbert space, Degression on the Conditions A-E, Closed linear Manifolds, Operators in Hilbert space, The Eigen Value Problem, Continuation, Initial Consideration concerning the Eigenvalue Problem, Degression on the Existence and Uniqueness of solutions of the Eigenvalue Problems, Cumulative operators, The Trace.

UNIT III

The Quantum Statistics

The statistical assertions of quantum mechanics, the statistical interpretation, Simultaneous Measurability and Measurability in General, Uncertainty Relations, Projections as Propositions, Radiation Theory.

UNIT IV

Deductive development of the Theory and general considerations

The fundamental basis of the statistical theory, Conclusions from Experiments. Measurement and reversibility, Thermodynamics Considerations, Reversibility and equilibrium problems, The Macroscopic Measurement.

UNIT V

The measuring Process

Formulation of the problems, Composite systems, discussion of the Measuring process.

4. Books and Materials

Text Book(s)

1. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha . Entrepreneurship, McGrawHill, 11th Edition.(2020)
2. Ries, E. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Crown Business,(2011).
3. Osterwalder, A., & Pigneur, Y. Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. John Wiley & Sons. (2010).

Reference Book(s)

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..

COURSE STRUCTURE

A40174– SUSTAINABILITY IN ENGINEERING PRACTICES

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course introduces the concept of sustainability in construction, highlighting the carbon cycle and the environmental impact of key materials like cement and steel. It explores sustainable construction materials, such as low/no cement concrete and recycled aggregates, while emphasizing indoor air quality, durability, and life cycle assessment. The course covers energy calculations, focusing on embodied and operational energy in buildings and their significance in life cycle energy use. It then provides insights into green building practices, including energy codes (like ECBC), LEED/TERI–GRIHA ratings, insulation strategies, and the concept of zero energy buildings. Finally, the course examines the environmental effects of energy use, discussing the impact of non-renewable resources, global warming, acid rain, and regional climate changes.

Course Objective

- To understand the fundamentals of sustainability, the carbon cycle, and the environmental impact of construction materials.
- To analyze sustainable construction materials, their durability, and life cycle assessment.
- To apply energy calculations in construction materials and assess their embodied energy.
- To evaluate green building standards, energy codes, and performance ratings.
- To assess the environmental effects of energy use, climate change, and global warming.

Course Pre/corequisites

There are no pre/corequisites

2. Course Outcomes (COs)

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

A40174.1	Understand the fundamentals of sustainability, the carbon cycle, and the environmental impact of construction materials.
A40174.2	Analyze sustainable construction materials, their durability, and life cycle assessment.
A40174.3	Apply energy calculations in construction materials and assess their embodied energy.
A40174.4	Evaluate green building standards, energy codes, and performance ratings.

A40174.5 Assess the environmental effects of energy use, climate change, and global warming.

3. Course Syllabus

UNIT – I

INTRODUCTION

Introduction and Definition of Sustainability - Carbon Cycle - Role of Construction Material: Concrete and Steel, Etc. - CO_2Contribution 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.

4. Books and Materials

Textbooks:

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.

Refrencebooks:

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.

Online Learning Resources:

https://archive.nptel.ac.in/courses/105/105/105105157/

COURSE STRUCTURE

A40272– RENEWABLE ENERGY SOURCES

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course begins with an understanding of solar energy, covering solar radiation principles, angle calculations, and the design and functioning of flat plate and concentrating collectors along with thermal storage methods. It then explores photovoltaic (PV) energy systems, including the PV effect, module design, electrical characteristics, and the configurations of stand-alone and grid-connected systems. The focus shifts to wind energy, detailing wind turbine components, types, aerodynamic force analysis, and considerations for site selection and energy estimation. Geothermal energy is then studied, covering different geothermal sources, their characteristics, applications, and potential in India. The course concludes with miscellaneous renewable technologies such as tidal, wave, biomass, and fuel cell systems, emphasizing their working principles, advantages, limitations, and applications in sustainable energy generation.

Course Objective

- To provide a strong mathematical foundation for understanding Quantum Mechanics.
- To equip students with fundamental basis of the statistical theory, Conclusions from Experiments, Measurement, and reversibility.
- To enhance the ability to apply the concept in Thermodynamics, Reversibility and equilibrium problems and Macroscopic Measurement.
- To develop critical problem-solving skills for composite system and measuring process.

Course Pre/corequisites

There are no pre/corequisites

2. Course Outcomes (COs)

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

A4272.1 Understand principle operation of various renewable energy sources. L1

A4272.2: Identify site selection of various renewable energy sources. L2

A4272.3 Analyze various factors affecting on solar energy measurements, wind energy conversion techniques, Geothermal, Biomasss, Tidal Wave and Fuel cell energies L3

A4272. 4 Design of Solar PV modules and considerations of horizontal and vertical axis Wind energy systems. L5

A4272.5 Apply the concepts of Geo Thermal Energy, Ocean Energy, Bio mass and Fuel Cells for generation of power. L4

3. Course Syllabus

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, geo-pressured 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.

Online Learning Resources:

1. https://nptel.ac.in/courses/103103206
2. https://nptel.ac.in/courses/108108078

COURSE STRUCTURE

A40372– AUTOMATION AND ROBOTICS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course introduces the fundamentals of automation, its necessity, types, levels, and strategies in manufacturing, along with key hardware components like feeders and insertion devices. It then covers automated flow lines, discussing part transfer mechanisms, buffer storage systems, and quantitative analysis, including assembly line balancing techniques and flexible assembly line designs. The course proceeds to industrial robotics, explaining robot classifications, configurations, actuators, sensors, and essential components like arms and grippers. Advanced concepts such as manipulator kinematics and dynamics are addressed through transformation models, Jacobians, and trajectory planning for motion and obstacle avoidance. Finally, the course explores robot programming methods and their applications in manufacturing processes such as material handling, welding, painting, assembly, and inspection.

Course Objective

Fundamentals of industrial automation, production types, automation strategies, and hardware elements used in modern manufacturing processes.

Understanding of automated manufacturing systems, and strategies for improving productivity and flexibility in industrial automation.

Knowledge of industrial automation and robotics, sensors, and end-effector design for modern manufacturing environments.

- Explain industrial automation and robotics, and trajectory planning for intelligent and efficient manufacturing applications.
- Familiarity of industrial automation and robotics, and practical applications in manufacturing processes.

Course Pre/corequisites

There are no pre/corequisites

2. Course Outcomes (COs)

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

A40372.1	Understand and analyze the structure and functions of automated manufacturing systems, and evaluate hardware components for efficient production.
A40372.2	Analyze and design automated flow lines with or without buffer storage, perform quantitative evaluations, apply assembly line balancing techniques.

A40372.3	Classify robot configurations, select suitable actuators and sensors, analyze and apply automation and robotics principles to optimize production efficiency and flexibility.
A40372.4	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.
A40372.5	Design, program, and implement robotic systems, understand and apply robotics technology to manufacturing tasks.

3. Course Syllabus

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.

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.

4. Books and Materials

Text Books:

1. Automation , Production systems and CIM,M.P. Groover /Pearson Edu.
2. Industrial Robotics - M.P. Groover, TMH.

References:

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.

Online Learning Resources:

1. https://www.youtube.com/watch?v=yxZm9WQJUA0&list=PLRLB5WCqU54UJG45UnazSYmnmhl-gt76o
2. https://www.youtube.com/watch?v=6f3bvIhSWyM&list=PLRLB5WCqU54X5Vy4DwjfSODT3ZJgwEjyE

COURSE STRUCTURE

A40574– OPERATING SYSTEMS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

Course Objectives

- Understand the fundamental principles of operating systems and their role in managing hardware and software resources.
- Explore process management techniques, including scheduling algorithms, multithreading, and inter-process communication mechanisms.
- Analyze memory management strategies such as paging, segmentation, and virtual memory to optimize system performance.
- Evaluate deadlock conditions and file system structures, including resource allocation, disk scheduling, and RAID technologies.
- Implement security and protection mechanisms to safeguard computer systems from threats and unauthorized access

Course Pre/co-requisites

No Pre/co-requisites.

2. Course Outcomes (COs)

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

A40574.1 Explain core operating system functions such as process, memory, file, and device management.

A40574.2 Analyze scheduling algorithms and IPC mechanisms to enhance process efficiency.

A40574.3 Apply memory management techniques to improve system performance.

A40574.4 Assess deadlock conditions and propose solutions for resource management.

A40574.5 Design security strategies to protect systems using cryptographic methods and firewalling techniques.

3. Course Syllabus

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.

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.

5. Books and Materials

Textbooks:

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

Online Learning Resources:

https://nptel.ac.in/courses/106/106/106106144/

http://peterindia.net/OperatingSystems.html

COURSE STRUCTURE

A40575– MACHINE LEARNING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

Course Objectives: The objectives of the course are

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

Course Pre/co-requisites

No Pre/co-requisites.

2. Course Outcomes (COs)

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

A40575.1	Identify machine learning techniques suitable for a given problem. (L3)
A40575.2	Solve real-world problems using various machine learning techniques. (L3)
A40575.3	Apply Dimensionality reduction techniques for data preprocessing. (L3)
A40575.4	Explain what is learning and why it is essential in the design of intelligent machines. (L2)
A40575.5	Evaluate Advanced learning models for language, vision, speech, decision making etc. (L5)

3. Course Syllabus

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

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

UNIT-III: Models Based on Decision Trees: Decision Trees for Classification, Impurity Measures, Properties, Regression Based on Decision Trees, Bias–Variance Trade-off, Random Forests for Classification and Regression.

The Bayes Classifier: Introduction to the Bayes Classifier, Bayes' Rule and Inference, The Bayes Classifier and its Optimality, Multi-Class Classification | Class Conditional Independence and Naive Bayes Classifier (NBC)

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

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

Textbooks:

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.

Online Learning Resources:

1. Andrew Ng, "Machine Learning Begining"
2. https://www.deeplearning.ai/machine-learning- Begining/
3. Shai Shalev-Shwartz, Shai Ben-David, "Understanding Machine Learning: From Theory to Algorithms", Cambridge University Press.
4. https://www.cse.huji.ac.il/~shais/UnderstandingMachineLearning/index.html

COURSE STRUCTURE

A40076– OPTIMIZATION TECHNIQUES FOR ENGINEERS

Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

Course Objectives

- Understand the meaning, purpose, tools of Operations Research and linear programming in solving practical problems in industry.
- Interpret the transportation models' solutions and infer solutions to the real-world problems.
- Develop mathematical skills to analyze and solve nonlinear programming models arising from a wide range of applications.
- Apply the concept of non-linear programming for solving the problems involving non-linear constraints and objectives
- Apply the concept of unconstrained geometric programming for solving the problems involving non-linear constraints and objectives.

Course Pre/co-requisites

No Pre/co-requisites.

2. Course Outcomes (COs)

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

A40076.1 Understand the meaning, purpose, tools of Operations Research and linear programming in solving practical problems in industry.

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A40076.2 Interpret the transportation models' solutions and infer solutions to the real-world problems.

A40076.3 Develop mathematical skills to analyze and solve nonlinear programming models arising from a wide range of applications.

A40076.4 Apply the concept of non-linear programming for solving the problems involving non-linear constraints and objectives

A40076.5 Apply the concept of unconstrained geometric programming for solving the problems involving non-linear constraints and objectives.

3. Course Syllabus

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 BOOK:

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.

REFERENCES:

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.

Web Reference:

- https://onlinecourses.nptel.ac.in/noc24_ee122/preview
- https://archive.nptel.ac.in/courses/111/105/111105039/
- https://onlinecourses.nptel.ac.in/noc21_ce60/preview

COURSE STRUCTURE

A40077– PHYSICS OF ELECTRONIC MATERIALS AND DEVICES

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

Course Objectives

To make the students to understand the concept of crystal growth, defects in crystals and thin films.

To provide insight into various semiconducting materials and their properties.

To develop a strong foundation in semiconductor physics and device engineering.

To elucidate excitonic and luminescent processes in solid-state materials.

To understand the principles, technologies, and applications of modern display systems.

Course Pre/co-requisites

No Pre/co-requisites.

2. Course Outcomes (COs)

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

A40077.1	Understand crystal growth and thin film preparation
A40077.2	Summarize the basic concepts of semiconductors
A40077.3	Illustrate the working of various semiconductor devices
A40077.4	Analyze various luminescent phenomena and the devices based on these concepts
A40077.5	Explain the working of different display devices

3. Course Syllabus

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.

Textbooks:

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

NPTEL course links:

https://nptel.ac.in/courses/113/106/113106062/

https://onlinecourses.nptel.ac.in/noc20_ph24/preview

COURSE STRUCTURE

A40078– CHEMISRY OF POLYMERS AND APPLICATIONS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

Course Objectives

- To make the students to understand the concept of crystal growth, defects in crystals and thin films.
- To provide insight into various semiconducting materials and their properties.
- To develop a strong foundation in semiconductor physics and device engineering.
- To elucidate excitonic and luminescent processes in solid-state materials.
- To understand the principles, technologies, and applications of modern display systems.

Course Pre/co-requisites

No Pre/co-requisites.

2. Course Outcomes (COs)

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

A40078.1	Understand crystal growth and thin film preparation
A40078.2	Summarize the basic concepts of semiconductors
A40078.3	Illustrate the working of various semiconductor devices
A40078.4	Analyze various luminescent phenomena and the devices based on these concepts
A40078.5	Explain the working of different display devices

3. Course Syllabus

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.

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

References 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 STRUCTURE

A40079– ACADEMIC WRITING AND PUBLIC SPEAKING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

Course Objective

- To encourage all round development of the students by focusing on writing skills
- To make the students aware of non-verbal skills
- To develop analytical skills
- To deliver effective public speeches

Course Pre/corequisites

There are no pre/corequisites

2. Course Outcomes (COs)

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

A40079.1	Understand various elements of Academic Writing
A40079.2	Identify sources and avoid plagiarism
A40079.3	Demonstrate the knowledge in writing a Research paper
A40079.4	Analyse different types of essays
A40079.5	Assess the speeches of others and know the positive strengths of speakers
A40079.6	Build confidence in giving an impactful presentation to the audience

3. Course Syllabus

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

considerations

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

Books and Materials

Text Book(s)

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 Book(s)

1. Alice Savage, Masoud Shafiei Effective Academic Writing,**2Ed.,**2014 Oxford University .Press
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*
6. Online Learning Resources:
7. https://youtu.be/NNhTIT81nH8
8. phttps://www.youtube.com/watch?v=478ccrWKY-A
9. https://www.youtube.com/watch?v=nzGo5ZC1gMw
10. https://www.youtube.com/watch?v=Qve0ZBmJMh4
11. https://courses.lumenlearning.com/publicspeakingprinciples/chapter/chapter-12-nonverbal-aspects-of-delivery/
12. https://onlinecourses.nptel.ac.in/noc21_hs76/preview
13. https://archive.nptel.ac.in/courses/109/107/109107172/#
14. https://archive.nptel.ac.in/courses/109/104/109104107/

COURSE STRUCTURE

A40080– MATHEMATICAL FOUNDATION OF QUANTUM TECHNOLOGIES

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course explores the foundational frameworks of quantum mechanics, focusing on the transformation theory and its equivalence with the Hilbert space formulation. It provides a deep understanding of abstract Hilbert space, including its geometry, operators, and the eigenvalue problem. Students examine quantum statistics, covering measurement theory, uncertainty principles, and radiation theory. The course presents a deductive development of quantum statistical theory, addressing measurement, reversibility, and thermodynamic considerations. Finally, it investigates the quantum measurement process in composite systems and its implications on theory and experimentation.

Course Objective

- To provide a strong mathematical foundation for understanding Quantum Mechanics.
- To equip students with fundamental basis of the statistical theory, Conclusions from Experiments, Measurement, and reversibility.
- To enhance the ability to apply the concept in Thermodynamics, Reversibility and equilibrium problems and Macroscopic Measurement.
- To develop critical problem-solving skills for composite system and measuring process.

Course Pre/corequisites

There are no pre/corequisites

2. Course Outcomes (COs)

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

A40080.1: Understand the Transformation theory and Hilbert space.

A40080.2: Analyze the properties and operators of Hilbert space and apply Eigen values to it.

A40080.3: Apply statistics to measure theory, uncertainty relations and radiation theory.

A40080.4: Evaluate problems on reversibility, equilibrium and macroscopic measurements

A40080.5: Formulate problems of composite system and measuring process

3. Course Syllabus

UNIT I

Introductory Considerations

The origin of the Transformation Theory, The Original Formulation of Quantum Mechanics, The Equivalence of the two Theories: (i) The Transformation Theory, (ii) Hilbert Space.

UNIT II

Abstract Hilbert Space

The definition of Hilbert space, The Geometry of Hilbert space, Degression on the Conditions A-E, Closed linear Manifolds, Operators in Hilbert space, The Eigen Value Problem, Continuation, Initial Consideration concerning the Eigenvalue Problem, Degression on the Existence and Uniqueness of solutions of the Eigenvalue Problems, Cumulative operators, The Trace.

UNIT III

The Quantum Statistics

The statistical assertions of quantum mechanics, the statistical interpretation, Simultaneous Measurability and Measurability in General, Uncertainty Relations, Projections as Propositions, Radiation Theory.

UNIT IV

Deductive development of the Theory and general considerations

The fundamental basis of the statistical theory, Conclusions from Experiments. Measurement and reversibility, Thermodynamics Considerations, Reversibility and equilibrium problems, The Macroscopic Measurement.

UNIT V

The measuring Process

Formulation of the problems, Composite systems, discussion of the Measuring process.

Books and Materials

Text Book(s)

1. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha . Entrepreneurship, McGrawHill, 11th Edition.(2020)
2. Ries, E. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Crown Business,(2011).
3. Osterwalder, A., & Pigneur, Y. Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. John Wiley & Sons. (2010).

Reference Book(s)

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..

COURSE STRUCTURE
VII – SEMESTER

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY,KURNOOL

PROGRAMME CURRICULUM STRUCTURE UNDER R23 REGULATIONS

B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING

VII SEMESTER (IV YEAR)									
Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A40432	Data Communications and Networking	PC	3	0	0	3	30	70	100
A40034 A40035 A40036	**Management Course-II** 1. Business Ethics and Corporate Governance 2. E-Business 3. Management Science	HSMC	2	0	0	2	30	70	100
A40433a A40433b A40433c	**Professional Elective –IV** 1. Radar Engineering 2. DSP Processors & Architectures 3. Cellular & Mobile Communications	PE	3	0	0	3	30	70	100
A40434a A40434b A40434c	**Professional Elective –V** 1. Low Power VLSI Design 2. Wireless Sensor Networks 3. 5G Communications	PE	3	0	0	3	30	70	100
	Open Elective –III	OE	3	0	0	3	30	70	100
	Open Elective –IV	OE	3	0	0	3	30	70	100
A40435a A40435b	1. RF System Design tools 2. Industrial IOT & Automation	SEC	0	1	2	2	30	70	100
A40037	Gender Sensitization	MC	2	0	0	-	100*	-	100*
A40436	Evaluation of Industry Internship	PW	-	-	-	2	100	-	100
		TOTAL	19	01	02	21	310	490	800

* The marks for Mandatory Courses are not considered for calculating SGPA

Open Elective – III

Course Code	Title of the Course	L-T-P	Credits	Offered by
A40175	Building Materials and Services	3-0-0	3	CE
A40176	Environmental Impact Assessment	3-0-0	3	CE
A40273	Smart Grid Technologies	3-0-0	3	EEE
A40373	3D Printing Technologies	3-0-0	3	ME
A40576	Fundamentals of Data Base Management Systems	3-0-0	3	CSE
A40577	Cyber Security	3-0-0	3	CSE
A40081	Wavelet transforms and its applications	3-0-0	3	H&S
A40082	Smart Materials and Devices	3-0-0	3	H&S
A40083	Green Chemistry and Catalysis for Sustainable Environment	3-0-0	3	H&S
A40084	Employability Skills	3-0-0	3	H&S
A40085	Introduction to Quantum Mechanics	3-0-0	3	H&S

Open Elective – IV

Course Code	Title of the Course	L-T-P	Credits	Offered by
A40177	Geo-Spatial Technologies	3-0-0	3	CE
A40178	Solid Waste Management	3-0-0	3	CE
A40274	Introduction to Electric Vehicles	3-0-0	3	EEE
A40374	Quality Management	3-0-0	3	ME
A40578	Computer Networks and Applications	3-0-0	3	CSE
A40579	Introduction to Internet of Things	3-0-0	3	CSE
A40580	Quantum Computing	3-0-0	3	CSE
A40086	Financial Mathematics	3-0-0	3	H&S
A40087	Sensors And Actuators for Engineering Applications	3-0-0	3	H&S
A40088	Chemistry of Nanomaterials and Applications	3-0-0	3	H&S
A40089	Literary Vibes	3-0-0	3	H&S

COURSE STRUCTURE

A40432 – DATA COMMUNICATIONS AND NETWORKING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course introduces the principles of data communication and computer networking. It covers essential topics such as transmission media, network devices, protocols, and standards. Students will learn about network architectures, including the OSI and TCP/IP models. The course also focuses on both wired and wireless communication, addressing real-world applications and security aspects.

Course Objectives:

- To provide a conceptual understanding of the fundamentals of data communications and computer networks.
- To explore different network architectures, models, and transmission media used in data communication.
- To analyze error detection and correction methods, data link protocols, and medium access techniques.
- To understand the functioning of network and transport layer protocols, including addressing, routing, and congestion control.
- To study application layer protocols, network security mechanisms, and techniques to ensure data integrity.

2. Course Outcomes (COs)

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

A40432.1 Understand Understand of the fundamentals of data communications and computer networks.

A40432.2 Learn different network architectures, models, and transmission media used in data communication.

A40432.3 Analyze error detection and correction methods, data link protocols, and medium access techniques.

A40432.4 Design Grasp the functioning of network and transport layer protocols including addressing, routing, and congestion control.

A40432.5 Gain knowledge on application layer protocols, network security mechanisms, and techniques to ensure data integrity.

3. Course Syllabus

UNIT I

Overview of Data Communication and Networking: Introduction; Data communications: components, direction of data flow; network criteria, physical structure, categories of network (LAN, MAN, WAN); Internet: brief history, Protocols and standards; Reference models: OSI reference model, TCP/IP reference model, their comparative study.

UNIT II

Physical Layer: Overview of data (analog & digital), signal (analog & digital), transmission (analog & digital) & transmission media (guided & unguided), queuing theory, its applications in data communication, Data Encoding Techniques, Circuit switching, time division & space division switching.

UNIT III

Data link Layer: Types of errors, framing (character and bit stuffing), error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, Go-Back- N ARQ, Selective repeat ARQ, HDLC

Medium Access sub layer: Point to Point Protocol, Token Ring; Reservation, Polling, Multiple access protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA Traditional Ethernet, fast Ethernet.

UNIT IV

Network layer: Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing: IP addressing, subnetting; Routing: techniques, static vs. dynamic routing, Unicast Routing Protocols: RIP, OSPF, BGP; Other Protocols: ARP, IP, ICMP, IPV6.

Transport layer: Process to Process delivery; UDP; TCP; Congestion Control: Open Loop, Closed Loop choke packets; Quality of service: techniques to improve QoS: Leaky bucket algorithm, Token bucket algorithm.

UNIT V

Application Layer: Introduction to DNS, SMTP, SNMP, FTP, HTTP & WWW; Security: Cryptography (Public, Private Key based), Digital Signature, Firewalls.

4. Books and Materials

Textbooks:

1. B. A. Forouzan – Data Communications and Networking (3rd Ed.) – TMH
2. A.S. Tanenbaum – Computer Networks (4th Ed.)|| – Pearson Education/PHI

References:

1. W. Stallings – Data and Computer Communications (5th Ed.)|| – PHI/ Pearson Education.
2. Kurose and Rose – Computer Networking -A top down approach featuring the internet – Pearson Education.
3. Leon, Garica, Widjaja – Communication Networks – TMH.

COURSE STRUCTURE

A40034 – BUSINESS ETHICS AND CORPORATE GOVERNANCE

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	0	28	0	0	2	30	70	100

1. Course Description

Course Overview

This course introduces the principles of ethical practices and corporate governance in business organizations. It covers ethical decision-making, social responsibility, and the role of corporate governance in sustainable development. Students learn about ethical dilemmas, stakeholder management, and regulatory frameworks. The course emphasizes transparency, accountability, and good governance practices. It prepares students to handle ethical challenges and promote integrity in business environments.

Course Objectives:

- To make the student understand the principles of business ethics.
- To enable them in knowing about the ethics in management
- To facilitate the student' role in corporate culture
- To impart knowledge about the fair-trade practices
- To encourage the student in knowing about the corporate governance

2. Course Outcomes (COs)

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

A40034.1 Understand the Ethics and different types of Ethics. (L2)
A40034.2 Understand business ethics and ethical practices in management. (L2)
A40034.3 Understand the role of ethics in management. (L2)
A40034.4 Apply the knowledge of professional ethics & technical ethics. (L3)
A40034.5 Analyze corporate law, ethics, codes & principles. (L4)
A40034.6 Evaluate corporate governance & corporate scams. (L5)

3. Course Syllabus

UNIT I Ethics

Introduction – Meaning – Nature, Scope, significance, Loyalty, and ethical behavior.. Value systems - Business Ethics - Types, Characteristics, Factors, Contradictions and Ethical Practices in Management -Corporate Social Responsibility – Issues of Management – Crisis Management.

LEARNING OUTCOMES:- After completion of this unit student will

- Understand the meaning of loyalty and ethical Behavior
- Explain various types of Ethics
- Analyze issues & crisis of management

UNIT II

ETHICS IN MANAGEMENT

Introduction- Ethics in production, finance, Human resource management and Marketing Management - The Ethical Value System – Universalism, Utilitarianism, Distributive Justice, Social Contracts, Individual Freedom of Choice, Professional Codes; Culture and Ethics – Ethical Values in different Cultures - Culture and Individual Ethics – professional ethics and technical ethics.

LEARNING OUTCOMES:- After completion of this unit student will

- Understand the meaning of Ethics in various areas of management
- Compare and contrast professional ethics and technical ethics

- Develop ethical values in self and organization

UNIT III

CORPORATE CULTURE

Introduction - Meaning, definition, Nature, and significance – Key elements of corporate culture, shared values, beliefs and norms, rituals, symbols and language - Types of corporate culture, hierarchical culture, market driven culture – Organization leadership and corporate culture, leadership styles and their impact on culture, transformational leadership and culture change.

LEARNING OUTCOMES:- After completion of this unit student will

- Define corporate culture
- Understand the key elements of corporate culture
- Analyze organization leadership and corporate culture

UNIT IV

LEGAL FRAME WORK

Law and Ethics -Agencies enforcing Ethical Business Behavior - Legal Impact – Environmental Protection, Fair Trade Practices, legal Compliances, Safeguarding Health and wellbeing of Customers – Corporate law, Securities and financial regulations, corporate governance codes and principles.

LEARNING OUTCOMES:- After completion of this unit student will

- Understand Law and Ethics
- Analyze Different fair trade practices
- Make use of Environmental Protection and Fair Trade Practices

UNIT V: CORPORATE GOVERNANCE

Introduction - Meaning – Corporate governance code, transparency & disclosure -Role of auditors, board of directors and shareholders. Global issues, accounting and regulatory frame work - Corporate scams - Committees in India and abroad, corporate social responsibility. BoDs composition, Cadbury Committee - Various committees - Reports - Benefits and Limitations.

LEARNING OUTCOMES:- After completion of this unit student will

- Understand corporate governance code
- Analyze role of auditors, board of directors and shareholders in corporate governance
- Implementing corporate social responsibility in India.

4. Books and Materials

Textbooks:

1. Murthy CSV: Business Ethics and Corporate Governance, HPH July 2017
2. Bholananth Dutta, S.K. Podder – Corporation Governance, VBH. June 2010

References:

1. Dr. K. Nirmala, KarunakaraReaddy. *Business Ethics and Corporate Governance*, HPH
2. H.R.Machiraju: *Corporate Governance*, HPH, 2013
3. K. Venkataramana, *Corporate Governance*, SHBP.
4. N.M.Khandelwal. *Indian Ethos and Values for Managers*

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_mg46/
2. https://archive.nptel.ac.in/courses/110/105/110105138/
3. https://onlinecourses.nptel.ac.in/noc21_mg54/
4. https://onlinecourses.nptel.ac.in/noc22_mg54/
5. https://archive.nptel.ac.in/courses/109/106/109106117/

COURSE STRUCTURE

A40035 – E-BUSINESS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	0	28	0	0	2	30	70	100

1. Course Description

Course Overview

This course provides an overview of electronic business concepts, models, and technologies. It covers e-commerce fundamentals, online transaction processes, and digital marketing strategies. Students learn about e-business infrastructure, payment systems, and security issues. The course emphasizes how technology transforms business operations and customer interactions. It prepares students to develop, manage, and innovate digital business solutions.

Course Objectives:

- To provide knowledge on emerging concept on E-Business related aspect.
- To understand various electronic markets & business models.
- To impart the information about electronic payment systems & banking.
- To create awareness on security risks and challenges in E-commerce
- To the students aware on different e-marketing channels & strategies

2. Course Outcomes (COs)

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

A40035.1 Remember E-Business & its nature, scope and functions. (L1)
A40035.2 Understand E-market-Models which are practicing by the organizations. (L2)
A40035.3 Apply the concepts of E-Commerce in the present globalized world .(L3)
A40035.4 Analyze the various E-payment systems & importance of net banking. (L4)
A40035.5 Evaluate market research strategies & E-advertisements. (L5)
A40035.6 Understand importance of E-security & control. (L2)

3. Course Syllabus

UNIT I

Electronic Business

Introduction – Nature, meaning, significance, functions and advantages - Definition of Electronic Business - Functions of Electronic Commerce (EC)-Advantages & Disadvantages of E- Commerce –E-Commerce and E-Business, Internet Services, Online Shopping- E-Commerce Opportunities for Industries.

Learning Outcomes: -After completion of this unit student

- Understand the concept of E-Business
- Contrast and compare E-Commerce & E-Business
- Evaluate opportunities of E-commerce for industry

UNIT II

Electronic Markets and Business Models

Introduction – E-Shops-E-Malls E-Groceries - Portals - Vertical Portals-Horizontal Portals - Advantages of Portals -Business Models- Business to Business (B2B)-Business to Customers(B2C) - Business to Government(B2G)-Auctions-B2B Portals in India

Learning Outcomes: -After completion of this unit student will

- Understand the concept of business models
- Contrast and compare Vertical portal and Horizontal portals
- Analyze the B2B,B2C and B2G model

UNIT III

Electronic Payment Systems:

Introduction to electronic payment systems (EPS) -Types of electronic payments - Credit/debit cards, e-wallets, UPI, and crypto currencies -Smart cards and digital wallets: Features and usage-Electronic Fund Transfer (EFT): Role in business transactions - Infrastructure requirements and regulatory aspects of e-payments

Learning Outcomes: -After completion of this unit student will

- Understand the Electronic payment system
- Contrast and compare EFT and smart cards
- Analyze debit card and credit cards

UNIT IV

Security

Security risks and challenges in electronic commerce - Cyber threats - Phishing, hacking, identity theft, and malware - Digital Signatures & Certificates - Security protocols over public networks (HTTP, SSL, TLS) -Firewalls in securing e-business platforms.

Learning Outcomes: -After completion of this unit student will

- Understand E-Security
- Contrast and compare security protocols and public network
- Evaluate on Digital signature

UNIT V

Marketing:

Introduction – Online Marketing – Advantages of Online Marketing – Internet Advertisement – Advertisement Methods – Conducting Online Market Research– E-marketing planning: Online branding, social media marketing, and email marketing - E-business strategies: Digital advertising, content marketing, and analytics – E-Customer Relationship Management (eCRM) E-supply chain management (e-SCM)

Learning Outcomes: -After completion of this unit student will

- Understand the concept of online marketing
- Apply the knowledge of online marketing
- Compare e-CRM and e-SCM

4. Books and Materials

Textbooks:

1. Arati Oturkar&Sunil Khilari. *E-Business*. Everest Publishing House, 2022
2. P.T.S Joseph. *E-Commerce*, Fourth Edition, Prentice Hall of India, 2011

References:

1. Debjani, Kamalesh K Bajaj. *E-Commerce*, Second Edition Tata McGraw-Hill‘s, 2005
2. Dave Chaffey.*E-Commerce E-Management,* Second Edition, Pearson, 2012.
3. Henry Chan. *E-Commerce Fundamentals and Application,* RaymondLeathamWiley India2007
4. S. Jaiswal. *E-Commerce* GalgotiaPublication Pvt Ltd., 2003.

Online Resources:

https://www.slideshare.net/fatimahAlkreem/e-businessppt-67935771
https://www.slideshare.net/VikramNani/e-commerce-business-models
https://www.slideshare.net/RiteshGoyal/electronic-payment-system
https://www.slideshare.net/WelingkarDLP/electronic-security
https://www.slideshare.net/Ankitha2404/emarketing-ppt

COURSE STRUCTURE

A40036 – MANAGEMENT SCIENCE

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	0	28	0	0	2	30	70	100

1. Course Description

Course Overview

This course introduces scientific and analytical approaches to managerial decision-making. It covers concepts like Operations Research, Project Management, and resource optimization. Students learn quantitative techniques to solve business and operational problems. The course enhances strategic planning, productivity, and efficiency. It prepares students to apply management tools for real-world organizational challenges.

Course Objectives:

- To provide fundamental knowledge on Management, Administration, Organization & its concepts.
- To make the students understand the role of management in Production.
- To impart the concept of HRM in order to have an idea on Recruitment, Selection, Training & Development, job evaluation and Merit rating concepts.
- To create awareness on identify Strategic Management areas & the PERT/CPM for better Project Management.
- To make the students aware of the contemporary issues in modern management.

2. Course Outcomes (COs)

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

A40036.1 Remember the concepts & principles of management and designs of organization in a practical world.

A40036.2 Understand the knowledge of Work-study principles & Quality Control techniques in industry.

A40036.3 Analyze the concepts of HRM & different training methods.

A40036.4 Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project & to analyze the business through SWOT

A40036.5 Create awareness on contemporary issues in modern management & technology.

3. Course Syllabus

UNIT I

INTRODUCTION TO MANAGEMENT:

Management - Concept and meaning - Nature-Functions - Management as a Science and Art and both. Schools of Management Thought - Taylor's Scientific Theory-Henry Fayol's principles - Elton Mayo's Human relations - **Organizational Designs** - Line organization - Line & Staff Organization - Functional Organization - Matrix Organization - Project Organization - Committee form of Organization - Social responsibilities of Management.

LEARNING OUTCOMES: At the end of the Unit, the students will be able to

- Understand the concept of management and organization
- Apply the concepts & principles of management in real life industry.
- Analyze the organization chart & structure of an enterprise.

UNIT II

OPERATIONS MANAGEMENT

Principles and Types of Plant Layout - Methods of Production (Job, batch and Mass Production), Work Study - Statistical Quality Control- **Material Management -** Objectives – Inventory- Functions - Types, Inventory Techniques - EOQ-ABC Analysis - **Marketing Management -** Concept - Meaning - Nature-Functions of Marketing - Marketing Mix – Channels of Distribution - Advertisement and Sales Promotion - Marketing Strategies based on Product Life Cycle.

LEARNING OUTCOMES: At the end of the Unit, the students will be able to

- Understand the core concepts of Operations Management
- Apply the knowledge of Quality Control, Work-study principles in real life industry.
- Evaluate Materials departments & Determine EOQ
- Analyze Marketing Mix Strategies for an enterprise.
- Create and design advertising and sales promotion

UNIT – III

HUMAN RESOURCES MANAGEMENT (HRM)

HRM - Definition and Meaning – Nature - Managerial and Operative functions - Job Analysis - Human Resource Planning(HRP) - Employee Recruitment-Sources of Recruitment - Employee Selection - Process - Employee Training and Development - methods - Performance Appraisal Concept - Methods of Performance Appraisal – Placement - Employee Induction - Wage and Salary Administration.

LEARNING OUTCOMES: At the end if the Unit, the students will be able to

- Understand the concepts of HRM, Recruitment, Selection, Training & Development
- Analyze the need of training
- Evaluate performance appraisal
- Design the basic structure of salaries and wages

UNIT - IV

STRATEGIC & PROJECT MANAGEMENT

Definition& Meaning - Setting of Vision - Mission - Goals - Corporate Planning Process - Environmental Scanning - Steps in Strategy Formulation and Implementation - SWOT Analysis - **Project Management -** Network Analysis - Programme Evaluation and Review Technique (PERT) - Critical Path Method (CPM) Identifying Critical Path - Probability of Completing the project within given time - Project Cost- Analysis - Project Crashing (Simple problems).

LEARNING OUTCOMES: At the end of the Unit, the students will be able to

- Understand Mission, Objectives, Goals & strategies for an enterprise
- Apply SWOT Analysis to strengthen the project
- Analyze Strategy formulation and implementation
- Evaluate PERT and CPM Techniques

UNIT - V

CONTEMPORARY ISSUES IN MANAGEMENT

Customer Relations Management(CRM) - Total Quality Management (TQM) - Six Sigma Concept - Supply Chain Management(SCM) - Enterprise Resource Planning (ERP) - Performance Management – employee engagement and retention - Business Process Re-engineering and Bench Marking - Knowledge Management – change management – sustainability and corporate social responsibility.

LEARNING OUTCOMES At the end if the Unit, the students will be able to

- Understand modern management techniques

- Apply Knowledge in Understanding in TQM, SCM
- Analyze CRM, BPR
- Evaluate change management & sustainability

4. Text Books:

1. Frederick S. Hillier, Mark S. Hillier. *Introduction to Management Science*, October 26, 2023
2. A.R Aryasri, *Management Science*, TMH, 2019

References:

1. Stoner, Freeman, Gilbert.*Management*, Pearson Education, New Delhi, 2019.
2. Koontz & Weihrich, *Essentials of Management*, 6/e, TMH, 2005.
3. Thomas N.Duening & John M.Ivancevich, *Management Principles and Guidelines*, Biztantra.
4. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2004.
5. Samuel C.Certo, *Modern Management*, 9/e, PHI, 2005

ONLINE RESOUECES:

1. https://www.slideshare.net/slideshow/introduction-to-management-and-organization-231308043/231308043
2. https://nptel.ac.in/courses/112107238
3. https://archive.nptel.ac.in/courses/110/104/110104068/
4. https://archive.nptel.ac.in/courses/110/105/110105069/
5. https://onlinecourses.nptel.ac.in/noc24_mg112/

COURSE STRUCTURE

A40433a – RADAR ENGINEERING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

Radar Engineering introduces the principles, operation, and applications of radar systems. The course covers radar fundamentals, types, and performance parameters. Students learn about detection, tracking, and measurement of targets using radar. It emphasizes concepts like Doppler effect, clutter, and radar signal processing. The course prepares students for careers in defense, aviation, and communication sectors.

Course Objectives:

- To understand the basic working principle of Radar and target detection procedure.
- To learn about the working and applications of CW and Frequency modulated Radar.
- To comprehend the working and applications of MTI and Pulse Doppler Radar.
- To understand different methods of tracking a target and their limitations.
- To analyze the effect of noise at the receiver and uses of phased array antennas and navigational aids.

2. Course Outcomes (COs)

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

A40433a.1 Learn the basic working principle of Radar and target detection procedure.
A40433a.2 Know the working and applications of CW and Frequency modulated Radar.
A40433a.3 Gain the knowledge of about MTI and Pulse Doppler Radar.
A40433a.4 Understand different methods of tracking a target and their limitations.
A40433a.5 Analyze the effect of noise at the receiver and uses of phased array antennas and navigational aids.

3. Course Syllabus

UNIT I

Basics of Radar: Introduction, Maximum Unambiguous Range, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications, Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Modified Radar Range Equation, Illustrative Problems. Radar Equation: SNR, Envelope Detector, False Alarm Time and Probability, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets - sphere, cone-sphere), Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment), Display types, Illustrative Problems.

UNIT II

CW and Frequency Modulated Radar: Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar, Illustrative Problems.FM-CW Radar, Range and Doppler Measurement, Block Diagram and Characteristics (Approaching/ Receding Targets), FM-CW altimeter, Multiple Frequency CW Radar.

UNIT - III

MTI and Pulse Doppler Radar: Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, And Staggered PRFs. Range Gated Doppler Filters, MTI Radar Parameters, Limitations to MTI Performance, MTI versus Pulse Doppler radar.

UNIT - IV

Tracking Radar: Tracking with Radar, Sequential Lobing, Conical Scan, Monopulse Tracking Radar – Amplitude Comparison Monopulse (one- and two-coordinates), Phase Comparison Monopulse, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.

UNIT - V

Detection of Radar Signals in Noise: Introduction, Noise Figure and Noise Temperature, Matched Filter Receiver – Response Characteristics and Derivation, Correlation detection, Detection criteria, Detector Characteristics, Automatic Detection, Constant False Alarm Rate Receiver. Introduction to Software Defined Radio, Introduction to Stealth technology.

Radar Receivers: Introduction to Phased Array Antennas- Basic Concepts, Electronically Steered Phased Array Antennas, Phase Shifters, Frequency – scan Arrays, Radiation for Phased Array, Architecture for Phased Arrays. Radiation Pattern. Beam Steering and Beam Width changes. Navigational Aids: Direction Finder, VOR, ILS and Loran.

Text Books:

1. Merrill I. Skolnik, ―Introduction to Radar Systems‖, 2nd Edition, TMH Special Indian Edition, 2007.
2. Byron Edde, ―Radar Principals, Technology, Applications‖, Pearson Education, 1992.

References:

1. Peebles, ―Radar Principles, Wiley, New York, 1998.
2. G.S.N.Raju, ― Radar Engineering and Fundamentals of Navigational Aids, I. K. International Pvt. Ltd.
3. G. SasiBhushan Rao, ― Microwave and Radar Engineering‖, Pearson Education, 2014

COURSE STRUCTURE

A40433b – DSP PROCESSORS & ARCHITECTURES

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course focuses on the architecture and functioning of Digital Signal Processors (DSPs) and their applications. It covers features of DSP hardware, instruction sets, and programming techniques. Students learn about real-time signal processing, memory architectures, and interfacing. The course emphasizes processor selection for embedded and signal processing applications. It equips students with skills for implementing DSP-based systems in industry.

Course Objectives:

- To describe the unique features and significance of Digital Signal Processing (DSP).
- To demonstrate various computational parameters and accuracy considerations in DSP systems.
- To introduce architectural improvements in programmable DSP devices and their execution models.
- To expose students to basic DSP algorithms, including filtering, FFT, and adaptive processing.
- To outline DSP processor applications and their interfacing with memory and I/O peripherals.

2. Course Outcomes (COs)

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

A40433b.1 Summarize the fundamental features and role of Digital Signal Processing in real-world applications.

A40433b.2 Evaluate dynamic range, precision, and error sources in DSP implementations.

A40433b.3 Explain the architectural features of DSP processors and their computational efficiency.

A40433b.4 Analyze the performance of DSP algorithms on programmable DSP platforms for specific applications.

A40433b.5 Select and implement DSP processors for real-time applications, including memory and peripheral interfacing.

3. Course Syllabus

UNIT I

Introduction to Digital Signal Processing: Introduction, a Digital signal-processing system, the sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), linear time-invariant systems, Digital filters, Decimation and interpolation, Analysis and Design tool for DSP Systems MATLAB, DSP using MATLAB.

Computational Accuracy in DSP Implementations: Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT II

Architectures for Programmable DSP Devices: Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing

Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues, Features for External interfacing.

Execution Control and Pipelining: Hardware looping, Interrupts, Stacks, Relative Branch support, Pipelining and Performance, Pipeline Depth, Interlocking, Branching effects, Interrupt effects, Pipeline Programming models.

UNIT - III

Programmable Digital Signal Processors: Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On- Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors.

UNIT - IV

Implementations of Basic DSP Algorithms: The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, PID Controller, Adaptive Filters, 2-D Signal Processing.

Implementation of FFT Algorithms: An FFT Algorithm for DFT Computation, A Butterfly Computation, Overflow and scaling, Bit-Reversed index generation, An 8-Point FFT implementation on the TMS320C54XX, Computation of the signal spectrum.

UNIT - V

Interfacing Memory and I/O Peripherals to Programmable DSP Devices: Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA). A Multichannel buffered serial port (McBSP), McBSP Programming, a CODEC interface circuit, CODEC programming, A CODEC-DSP interface example.

Text Books:

1. Avtar Singh and S. Srinivasan, –Digital Signal Processing Implementation, 1st Edition, Cengage Learning, 2004.
2. Lapsley et al. S. Chand and Co, –DSP Processor Fundamentals, Architectures & Features, 2000.

References:

1. B. Venkata Ramani and M. Bhaskar, –Digital Signal Processors, Architecture, Programming and Applications, TMH, 2004.
2. Jonatham Stein, –Digital Signal Processing: A Computer Science Perspective, John Wiley, 2000.

COURSE STRUCTURE

A40433c – CELLULAR & MOBILE COMMUNICATION

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course provides an understanding of cellular and mobile communication principles and technologies. It covers cellular system architecture, frequency reuse, handoff strategies, and mobile signal propagation. Students learn about multiple access techniques, mobile standards, and wireless networks. The course emphasizes mobile communication evolution and system design. It prepares students for careers in wireless, telecom, and mobile technology sectors.

Course Objectives:

- To explain the basic cellular system and its working.
- To understand the impact of multipath fading channels and techniques to mitigate fading effects in cellular communication.
- To explore frequency management, channel assignment strategies, and different types of handoffs in cellular networks.
- To analyze the performance of mobile antennas, interference issues, and cellular system design principles.
- To evaluate system performance metrics such as dropped call rates, handoff strategies, and spectrum efficiency.

2. Course Outcomes (COs)

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

A40433c.1 Understand the basic cellular system and its working.

A40433c.2 Explain the impairments caused by multipath fading and methods to mitigate fading effects in mobile communication

A40433c.3 Apply concepts of cellular communication to solve problems related to mobile antennas and system design.

A40433c.4 Analyze co-channel and non-co-channel interferences, different types of handoffs, and dropped call rates.

A40433c.5 Evaluate the performance of cellular systems, including signal reception, handoff efficiency, and spectrum utilization

3. Course Syllabus

UNIT I

Cellular Mobile Radio Systems: Introduction to Cellular Mobile system, basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, Hexagonal shaped cells, Analog and Digital Cellular systems.

UNIT II

Elements of Cellular Radio System Design: General description of the problem, concept of frequency channels, Co-channel Interference Reduction Factor, desired C/I from a normal case in a Omni directional Antenna system, Cell splitting, consideration of the components of cellular system.

Interference: Introduction to Co-channel interference, real time co-channel interference, Co- channel measurement, design of Antenna system, Antenna parameters and their effects, diversity receiver, non-co-channel interference-different types.

UNIT - III

Cell Coverage for Signal and Traffic: Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, constant standard deviation, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long-distance propagation antenna height gain, form of a point-to-point model.

UNIT - IV

Cell Site and Mobile Antennas: Sum and difference patterns and their synthesis, Omni directional antennas, directional antennas for interference reduction, space diversity antennas, umbrella pattern antennas, minimum separation of cell site antennas, high gain antennas.

Frequency Management and Channel Assignment: Numbering and grouping, setup access and paging channels channel assignments to cell sites and mobile units, channel sharing and borrowing, sectorization, overlaid cells, non-fixed channel assignment.

UNIT - V

Handoff: Handoff, dropped calls and cell splitting, types of handoffs, handoff invitation, delaying handoff, forced handoff, mobile assigned handoff. Intersystem handoff, cell splitting, micro cells, vehicle locating methods, dropped call rates and their evaluation.

System Evaluations: Performance evaluation, Signal evaluation, Measurement of average received level and level crossings, Spectrum efficiency evaluation.

Text Books:

1. W .C. Y. Lee, –Mobile cellular telecommunications, Tata Mc-Graw Hill, 2nd Edition, 2006.
2. Theodore. S. Rapport, –Wireless communications, Pearson Education, 2nd Edn., 2002.

References:

1. Gordon L. Stuber – Principles of Mobile communications, Springer International 2ndEdition, 2007.
2. Lee , –Wireless and Mobile Communications, Mc Graw Hills, 3rd Edition, 2006.
3. Jon W.Mark and WeihuaZhqung, –Wireless communications and Networking, PHI, 2005.
4. R.Blake, –Wireless communication Technology||, Thompson Asia Pvt.Ltd., 2004.

COURSE STRUCTURE

A40434a – LOW POWER VLSI DESIGN

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course focuses on techniques for designing energy-efficient Very-Large-Scale Integration (VLSI) circuits. It covers low-power design methodologies at circuit, logic, and system levels. Students learn about power dissipation sources, optimization strategies, and modern CMOS design for minimal power consumption. The course emphasizes low-power applications in portable and high-performance devices. It prepares students to address power challenges in advanced VLSI design.

Course Objectives:

- To understand the need for low-power circuit design and analyze different power dissipation mechanisms in VLSI circuits.
- To explore various low-power design approaches at the system, circuit, and mask levels.
- To study low-power adder architectures and their role in power-efficient computing.
- To examine different low-power multiplier architectures and their impact on digital design.
- To gain knowledge of low-power memory technologies and their future developments.

2. Course Outcomes (COs)

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

A40434a.1 Understand the need for low-power circuit design and analyze different power dissipation mechanisms in VLSI circuits.

A40434a.2 Learn various low-power design approaches at the system, circuit, and mask Levels.

A40434a.3 Gain knowledge on low-power adder architectures and their role in power-efficient computing.

A40434a.4 Examine different low-power multiplier architectures and their impact on digital design.

A40434a.5 Grasp knowledge of low-power memory technologies and their future developments.

3. Course Syllabus

UNIT I

Fundamentals: Need for Low Power Circuit Design, Sources of Power Dissipation – Static and Dynamic Power Dissipation, Short Circuit Power Dissipation, Glitching Power Dissipation, Short Channel Effects –Drain Induced Barrier Lowering and Punch Through, Surface Scattering, Velocity Saturation, Impact Ionization, Hot Electron Effect.

UNIT II

Low-Power Design Approaches: Low-Power Design through Voltage Scaling – VTCMOS circuits, MTCMOS circuits, Architectural Level Approach –Pipelining and Parallel Processing Approaches. Switched Capacitance Minimization Approaches: System Level Measures, Circuit Level Measures, Mask level Measures

UNIT - III

Low-Voltage Low-Power Adders: Introduction, Standard Adder Cells, CMOS Adder's Architectures – Ripple Carry Adders, Carry Look Ahead Adders, Carry Select Adders, Carry Save Adders, Low-Voltage Low-Power Design Techniques – Trends of Technology and Power Supply Voltage, Low-Voltage Low-Power Logic Styles.

UNIT - IV

Low-Voltage Low-Power Multipliers: Introduction, Overview of Multiplication, Types of Multiplier Architectures, Braun Multiplier, Baugh Wooley Multiplier, Booth Multiplier, Introduction to Wallace Tree Multiplier.

UNIT - V

Low-Voltage Low-Power Memories: Basics of ROM, Low-Power ROM Technology, Future Trend and Development of ROMs, Basics of SRAM, Memory Cell, Precharge and Equalization Circuit, Low-Power SRAM Technologies, Basics of DRAM, Self-Refresh Circuit, Future Trend and Development of DRAM.

Text Books:

1. CMOS Digital Integrated Circuits – Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 2011.
2. Low-Voltage, Low-Power VLSI Subsystems – Kiat-Seng Yeo, Kaushik Roy, TMH Professional Engineering.

References:

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011.
2. Low Power CMOS Design – AnanthaChandrakasan, IEEE Press/Wiley International, 1998.
3. Low Power CMOS VLSI Circuit Design – Kaushik Roy, Sharat C. Prasad, John Wiley & Sons, 2000.

COURSE STRUCTURE

A40434b – WIRELESS SENSOR NETWORKS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course introduces the fundamentals and applications of Wireless Sensor Networks (WSNs). It covers network architecture, sensor node design, communication protocols, and energy-efficient techniques. Students learn about routing, data aggregation, and deployment strategies for WSNs. The course emphasizes real-time monitoring, environmental sensing, and IoT applications. It prepares students to design and implement sensor networks for diverse engineering solutions.

Course Objectives:

- To introduce the fundamental concepts and architecture of wireless sensor networks.
- To explore various network architectures, optimization techniques, and design principles for wireless sensor networks.
- To study MAC protocols, routing techniques, and addressing mechanisms for efficient sensor network communication
- To understand the infrastructure establishment of sensor networks, including topology control and synchronization.
- To provide knowledge on sensor network platforms, programming challenges, and simulation tools.

2. Course Outcomes (COs)

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

A40434b.1 Learn the fundamental concepts and architecture of wireless sensor networks.

A40434b.2 Explore various network architectures, optimization techniques, and design principles for wireless sensor networks.

A40434b.3 Gain knowledge of MAC protocols, routing techniques, and addressing mechanisms for efficient sensor network communication.

A40434b.4 Understand the infrastructure establishment of sensor networks, including topology control and synchronization.

A40434b.5 Grasp the knowledge on sensor network platforms, programming challenges, and simulation tools.

3. Course Syllabus

UNIT I

Overview of Wireless Sensor Networks: Single-Node Architecture - Hardware Components- Network Characteristics- unique constraints and challenges, Enabling Technologies for Wireless Sensor Networks- Types of wireless sensor networks.

UNIT II

Architectures: Network Architecture- Sensor Networks-Scenarios- Design Principle, Physical Layer and Transceiver Design Considerations, Optimization Goals and Figures of Merit, Gateway Concepts.

UNIT - III

Networking Sensors: MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols and Wakeup Concepts - SMAC, - B-MAC Protocol, IEEE 802.15.4 standard and ZigBee, the Mediation Device Protocol, Wakeup Radio Concepts, Address and Name

Management, Assignment of MAC Addresses, Routing Protocols Energy-Efficient Routing, Geographic Routing.

UNIT - IV

Infrastructure Establishment: Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

UNIT - V

Sensor Network Platforms and Tools: Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node level Simulators, State-centric programming.

4. Text Books/References:

Text Books:

1. Holger Karl & Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks, John Wiley, 2005.
2. Feng Zhao & Leonidas J.Guibas, ―Wireless Sensor Networks-An Information Processing Approach", Elsevier, 2007

References:

1. Waltenegus Dargie, Christian Poellabauer, ‐ Fundamentals Of Wireless Sensor Networks, Theory And Practice, By John Wiley & Sons Publications, 2011
2. KazemSohraby, Daniel Minoli, &TaiebZnati, ‐Wireless Sensor Networks-Technology, Protocols, and Applications, John Wiley, 2007.
3. Anna Hac, ‐Wireless Sensor Network Designs, John Wiley, 2003

COURSE STRUCTURE

A40434c – 5G COMMUNICATIONS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course provides an overview of Fifth Generation (5G) mobile communication technologies and standards. It covers 5G architecture, key technologies like Massive MIMO, mmWave, and network slicing. Students learn about enhanced mobile broadband, ultra-reliable low-latency communication, and IoT integration. The course emphasizes system design, challenges, and future trends in 5G. It prepares students for careers in next-generation wireless communication industries.

Course Objectives:

- To introduce the fundamental concepts of 5G spectrum, radio access technologies, and system requirements.
- To understand the architecture and physical layer aspects of 5G networks, including MIMO and beam forming.
- To explore advanced 5G radio-access technologies and their role in multi-user communication.
- To study network slicing, SDN, NFV, and their applications in vehicular communications.
- To analyze mobility management, interference control, and dynamic network reconfiguration in 5G.

2. Course Outcomes (COs)

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

A40434c.1 Understand the 5G radio spectrum and channel models, including spectrum sharing and propagation challenges.

A40434c.2 Analyze the 5G network architecture, including the core network, RAN, and physical layer procedures.

A40434c.3 Evaluate different 5G radio-access technologies, including new waveforms and non-orthogonal multiple access schemes.

A40434c.4 Apply network slicing concepts and vehicular communication techniques for efficient 5G network deployment.

A40434c.5 Develop strategies for mobility and handoff management to optimize network performance and minimize interference.

3. Course Syllabus

UNIT I

5G Radio Spectrum: 5G spectrum landscape and requirements, Spectrum access modes and sharing scenarios, 5G spectrum technologies.

5G Channel Model: The 5G wireless Propagation Channels: Channel modelling requirements, propagation scenarios and challenges in the 5G modelling.

5G Use Cases and System Concept: Use cases and requirements, 5G system concept.

UNIT II

Radio Interface Architecture: 5G architecture options, core network architecture, RAN architecture. 5G PHYSICAL LAYER: Physical channels and signals, 5G frame structure, physical layer procedures (MIMO, Power control, link adaptation, beam forming).

UNIT - III

5G Radio-Access Technologies: Access design principles for multi-user communications, multi-carrier with filtering: a new waveform, non-orthogonal schemes for efficient multiple access.

UNIT - IV

Introduction to 5G Network Slicing: Network Slicing, E2E Slicing, SDN and NFV Slicing

Vehicular Communications: From V2V to AV2X, key standards, VC architectures, V2X Use cases

UNIT - V

Mobility and Handoff Management in 5G: Network deployment types, Interference management in 5G, Mobility management in 5G, Dynamic network reconfiguration in 5G.

Text Books:

1. Afif Osseiran, Jose F Monserrat, Patrick Marsch, ‒5G Mobile and Wireless Communications Technology, Cambridge University Press, 2016
3. Saad Z. Asif, ‒5G Mobile Communications Concepts and Technologies, CRC Press, Taylor& Francis Group, First Edition, 2018
4. HarriHolma, Antti Toskala, Takehiro Nakamura, ‒5G Technology 3GPP NEW RADIO, John Wiley & Sons First Edition, 2020.

References:

1. Gordon L. Stuber, ‒Principles of Mobile Communication, KLUWER ACADEMIC PUBLISHERS, 2nd Edition, 2002.
2. Joseph C. Liberti, Theodore S. Rappaport, ‒Smart Antennas for Wireless Communications, Prentice Hall PTR, 1999.
3. Ying Zhang, ‒Network Function Virtualization Concepts and Applicability in 5G Networks, John Wiley & Sons, 2018.

COURSE STRUCTURE

A40435a – RF SYSTEM DESIGN TOOLS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	1	2	0	14	28	2	30	70	100

1. Course Description

Course Overview

This course focuses on the design and simulation tools used for Radio Frequency (RF) systems. It covers RF circuit design, simulation techniques, and modeling of passive and active RF components. Students learn to use industry-standard tools for designing antennas, filters, amplifiers, and matching networks. The course emphasizes practical skills in RF design validation and optimization. It prepares students for careers in RF, wireless, and communication system development.

Course Objectives:

- To introduce RF design software and tools for designing and simulating RF systems.
- To understand impedance matching techniques and the role of scattering parameters in RF circuit design.
- To explore the design of RF power amplifiers, filters, oscillators, mixers, and voltage- controlled oscillators (VCOs).
- To analyze microstrip transmission lines, their discontinuities, and their applications in RF systems.
- To study the design, simulation, and measurement of antennas and microwave integrated circuits.

2. Course Outcomes (COs)

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

A40435a.1 Utilize RF design software and tools to simulate and analyze RF circuits and Components.

A40435a.2 Design and implement impedance matching networks such as L-match, Pi match, and T- match circuits.

A40435a.3 Develop and evaluate RF amplifiers, filters, oscillators, and mixers for high frequency applications.

A40435a.4 Analyze microstrip transmission lines and measure their characteristics using S-parameters and Smith charts.

A40435a.5 Design and simulate various types of antennas, including microstrip patch antennas, Yagi-Uda antennas, and horn antennas.

Basic Concepts in RF Design: Introduce any RF design software and orient students with the tools of the laboratory. Practice the tool to use it for significant design.Introduction to RF Design, Time Variance and Nonlinearity, Effects of nonlinearity, Passive impedance transformation, Scattering parameters, impedance matching, L match,Pi match, T match, Passive IC Components- Resistors, capacitors Inductors, Schottky Diode, RF Switch.

RF Power Amplifiers and Filters: RF Power amplifier design examples, Gain equalizers, Voltage controlled oscillators, Phase locked loops, Linearized PLL models, PLL design examples, High frequency oscillators, Loop filters, lumped filter. LPF, HPF and BPF.

LNA, VCO and Mixers: General considerations, Problem of input matching, Low Noise Amplifiers design in various topologies, Gain Switching, Band Switching, Voltage Controlled Oscillators, Mixers-General considerations, Passive down conversion mixers, Active down conversion mixers, Up conversion mixers.

Microstrip transmission lines and discontinuities: S parameters of a Microstrip Transmission Line, Smith Chart, Analysis of Microstrip Transmission Line standing wave patterns at various frequencies, Different types of Transmission lines like CPW, Microstrip and Co-axial cable. Different types of Microstrip discontinuities like Bend, T, Via, Gap etc., Microstrip Ring Resonator.

Antennas and Microwave Integrated Circuits: Radiation Pattern, Gain, S Parameters, Return loss and VSWR. Design considerations of Microstrip Patch Antenna and Microstrip Array, Yagi Uda Antenna and Horn Antenna. Hybrid Microwave Integrated Circuits, Monolithic Microwave Integrated Circuits, Microwave Integrated Circuits: MMIC Amplifier.

Any twelve experiments are to be done:

1. Design and simulate Impedance matching circuits like L-Matching, Pi Matching and T-Matching.
2. Design and Simulate a Schottky Diode and RF Switch.
3. Design and simulate a RF BJT Amplifier and LNA.
4. Design and simulate a Power Amplifier and Gain Equalizer.
5. Analyse and measure the gain of a Power Amplifier and equalise its gain using an Equalizer.
6. Design and simulate a High Frequency Oscillator and Lumped Filter.
7. Measurement of insertion loss, -3dB Cut of frequency of LPF, HPF and BPF.
8. Design and Simulate a VCO and RF Mixer.
9. Measure the S parameters of a Micro strip Transmission Line and plot the normalised impedance on a smith chart
10. Analysis of Microstrip Transmission Line standing wave pattern at various frequencies.
11. Study of different types of Transmission lines like CPW, Microstrip and Co-axial and find/measure its Insertion Loss (S21 and S12)
12. Study of different types of Microstrip discontinuities like Bend, T, Via , Gap etc and find/measure its Insertion loss.
13. Determine the Bandwidth and Quality Factor of a Microstrip Ring Resonator.
14. Design and simulate the Radiation Pattern,gain, $S_{11}$and VSWRof a Microstrip Patch Antenna and Microstrip Array.
15. Design and simulate the Radiation Pattern, gain, $S_{11}$and VSWR of a Yagi Uda Antenna and Horn Antenna.
16. Design and Simulate a MMIC Amplifier.

Equipment Required

1. RF Circuit Design and Simulation Software
2. RF Training System
3. Antenna Measurement System with Antenna Design Software.

COURSE STRUCTURE

A40435b – INDUSTRIAL IOT & AUTOMATION

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	1	2	0	14	28	2	30	70	100

1. Course Description

Course Overview

This course introduces the concepts and applications of Industrial Internet of Things (IIoT) and automation technologies. It covers smart sensors, industrial networks, data acquisition, and real-time monitoring systems. Students learn about IIoT architecture, communication protocols, and automation in manufacturing processes. The course emphasizes integration of IoT with industrial control systems for enhanced productivity and efficiency. It prepares students for smart industry and Industry 4.0 solutions.

Course Objectives:

- To introduce the fundamentals of Industrial IoT (IIoT), its architecture, and its differences from traditional IoT.
- To understand the components of IIoT, including sensors, actuators, and control systems, and their integration with embedded platforms.
- To explore communication technologies such as ZigBee, Bluetooth, NFC, RFID, and MQTT for IIoT applications.
- To study data visualization techniques, dashboard creation, and web-based connectivity for IIoT systems.
- To learn data retrieval techniques, machine-to-machine (M2M) communication, and cloud integration for IIoT applications.
- To implement automation using PLCs, SCADA, and real-time control systems for industrial applications.

2. Course Outcomes (COs)

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

A40435b.1 Explain the fundamental concepts of IIoT, its architecture, and the challenges associated with industrial automation.

A40435b.2 Demonstrate the integration of sensors and actuators with Raspberry Pi/NodeMCU for real-time monitoring and control.

A40435b.3 Implement communication protocols such as MQTT, ZigBee, and Bluetooth to enable seamless IIoT connectivity.

A40435b.4 Develop web-based dashboards for real-time visualization and remote monitoring of IIoT devices.

A40435b.5 Retrieve, analyze, and transmit industrial data using web-based interactions and M2M communication.

A40435b.6 Implement PLC-based automation, ladder logic programming, and SCADA for supervisory control in industrial environments.

(All the modules need to be conducted and minimum one project to be done)

MODULE 1: Introduction & Architecture

What is IIoT and connected world? The difference between IoT and IIoT, Architecture of IIoT, IOT node, Challenges of IIOT.

Practice

1. https://www.youtube.com/watch?v=AQdLQV6vhbk

MODULE 2: IIOT Components

Fundamentals of Control System, introductions, components, closed loop & open loop system.

Introduction to Sensors (Description and Working principle): What is sensor? Types of sensors, working principle of basic Sensors -Ultrasonic Sensor, IR sensor, MQ2, Temperature and Humidity Sensors (DHT-11).Digital switch, Electro Mechanical switches.

Practice

1. Measurement of temperature & pressure values of the process using raspberry pi/node mcu.
2. Modules and Sensors Interfacing (IR sensor, Ultrasonic sensors, Soil moisture sensor) using Raspberry pi/node mcu.
3. Modules and Actuators Interfacing (Relay, Motor, Buzzer) using Raspberry pi/node mcu.

MODULE 3: Communication Technologies of IIoT

Communication Protocols: IEEE 802.15.4, ZigBee, Bluetooth, BLE, NFC, RFIDIndustry standards communication technology (MQTT), wireless network communication.

Practice

1. Demonstration of MQTT communication.

MODULE 4: Visualization and Data Types of IIoT

Connecting an Arduino/Raspberry pi to the Web: Introduction, setting up the Arduino/Raspberry pi development environment, Options for Internet connectivity with Arduino, Configuring your Arduino/Raspberry pi board for the IoT.

Practice

1. Visualization of diverse sensor data using dashboard (part of IoT's ‗control panel')
2. Sending alert message to the user. ways to control and interact with your environment)

MODULE 5: Retrieving Data

Extraction from Web: Grabbing the content from a web page, Sending data on the web, Troubleshooting basic Arduino issues, Types of IoT interaction, Machine to Machine interaction (M2M).

Practice

1. Device control using mobile Apps or through Web pages.
2. Machine to Machine communication.

MODULE 6: Control & Supervisory Level of Automation

Programmable logic controller (PLC), Real-time control system, Supervisory Control & Data Acquisition (SCADA).

Practice

1. Digital logic gates programming using ladder diagram.
2. Implementation of Boolean expression using ladder diagram.
3. Simulation of PLC to understand the process control concept.

Projects:

IIoT based smart energy meter

Smart Agriculture system

Automation using controller via Bluetooth

Temperature controlled Fan/cooler using controller

Automatic streetlight
Smart Baggage Tracker

Textbooks

1. The Internet of Things in the Industrial Sector, Mahmood, Zaigham (Ed.) (Springer Publication)
2. Industrial Internet of Things: Cybermanufacturing System, Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat (Springer Publication)
3. Industrial IoT Challenges, Design Principles, Applications, and Security by Ismail Butun (editor)

COURSE STRUCTURE
A40037 – GENDER SENITIZATION

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	0	28	0	0	-	100*	-	100*

1. Course Description

Course Overview

This course aims to promote gender equality and create awareness about gender-related issues in society. It covers concepts of gender, stereotypes, discrimination, and the need for sensitization. Students learn to respect diversity, promote inclusiveness, and challenge social biases. The course emphasizes the importance of creating safe and equitable environments. It prepares students to contribute positively to gender-sensitive workplaces and communities.

Course Objectives:

- To enable students to understand the gender related issues, vulnerability of women and men.
- To familiarize them about constitutional safeguard for gender equality
- To expose the students to debates on the politics and economics of work
- To help students reflect critically on gender violence
- To make them understand that gender identities and gender relations are part of culture as they shape the way daily life is lived in the family as well as wider community and the workplace.

2. Course Outcomes (COs)

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

A40037.1 Understand the basic concepts of gender and its related terminology

A40037.2 Identify the biological, sociological, psychological and legal aspects of gender

A40037.3 Use the knowledge in understanding how gender discrimination works in our society and how to counter it.

A40037.4 Analyze the gendered division of labour and its relation to politics and Economics

A40037.5 Appraise how gender-role beliefs and sharing behaviour are associated with more well-being in all culture and gender groups

A40037.6 Develop students‘ sensibility with regard to issues of gender in contemporary India

3. Course Syllabus

Unit-1

UNDERSTANDING GENDER

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood. Growing up Male. First lessons in Caste.

Unit-2

GENDER ROLES AND RELATIONS

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles- Gender Roles and Relationships Matrix-Missing Women-Sex Selection and its Consequences- Declining Sex Ratio- Demographic Consequences-Gender Spectrum -

Unit-3

GENDER AND LABOUR

Division and Valuation of Labour-Housework: The Invisible Labor- –My Mother doesn‘t

Work. –Share the Load.-Work: Its Politics and Economics -Fact and Fiction- Unrecognized and Unaccounted work -Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

Unit-4

GENDER-BASED VIOLENCE

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment - Domestic Violence - Different forms of violence against women - Causes of violence, impact of violence against women - Consequences of gender-based violence

Unit-5

GENDER AND CULTURE

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language-Just Relationships

Prescribed Books

1. A.Suneetha, Uma Bhrugubanda, et al. *Towards a World of Equals: A Bilingual Textbook on Gender*||, Telugu Akademi, Telangana, 2015.
2. Butler, Judith. *Gender Trouble: Feminism and the Subversion of Identity.* UK Paperback Edn. March 1990

Reference Books

1. Wtatt, Robin and Massood, Nazia, *Broken Mirrors: The dowry Problems in India,* London: Sage Publications, 2011.
2. Datt, R. and Kornberg, J.(eds), *Women in Developing Countries, Assessing Strategies for Empowerment,* London: Lynne Rienner Publishers, 2002.
3. Brush, Lisa D., *Gender and Governance*, New Delhi, Rawat Publication, 2007
4. Singh, Direeti, *Women and Politics World Wide*, New Delhi, Axis Publications, 2010
5. Raj Pal Singh, Anupama Sihag, *Gender Sensitization: Issues and Challenges* (English, Hardcover), Raj Publications, 2019
6. A.Revathy& Murali, Nandini, *A Life in Trans Activism* (Lakshmi Narayan Tripathi). The University of Chicago Press, 2016

Online Resources:

1. Understanding Gender
   Chrome extension://kdpelmjpfafjppnhbloffcjpeomlnpah/
   https://www.arvindguptatoys.com/arvindgupta/k amla-gender1.pdf
   https://onlinecourses.swayam2.ac.in/nou24_hs53/preview
2. Gender Roles and Relations
   https://www.plannedparenthood.org/learn/gender-identity/sex-gender-identity/what-are-gender- roles-and-stereotypes
   https://www.verywellmind.com/understanding-gender-roles-and-their-effect-on- our-relationships-7499408
   https://onlinecourses.swayam2.ac.in/cec23_hs29/preview
3. Gender and Labour
   https://www.economicsobservatory.com/what-explains-the-gender-division-of-labour-and-how- can-it-be-redressed
   https://onlinecourses.nptel.ac.in/noc23_mg67/preview
4. **GENDER-BASED VIOLENCE**
   https://eige.europa.eu/gender-based-violence/what-is-gender-based-violence?language_content_entity=en

https://www.worldbank.org/en/topic/socialsustainability/brief/violence-against-women-and-girls https://onlinecourses.swayam2.ac.in/nou25_ge38/preview

5. **GENDER AND CULTURE**
   https://gender.study/psychology-of-gender/culture-impact-gender-roles-identities/
   https://sociology.iresearchnet.com/sociology-of-culture/gender-and-culture/
   https://archive.nptel.ac.in/courses/109/106/109106136/
   Abdulali Sohaila. –I Fought For My Life and Won.
   Available online (at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

OPEN ELECTIVE – III

VII – SEMESTER

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY,KURNOOL

COURSE STRUCTURE

A40175 – BUILDING MATERIALS AND SERVICES

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

Course Objectives:

The objectives of this course are to make the student :

1. To understand the properties, classifications, and applications of building materials like stones, bricks, tiles, wood, aluminum, glass, paints, and plastics.
2. To analyze the composition, manufacturing process, and properties of cement and admixtures.
3. To apply knowledge of building components such as lintels, arches, walls, stairs, floors, roofs, foundations, and joinery.
4. To evaluate masonry, mortars, finishing techniques, and formwork systems.
5. To assess various building services including plumbing, ventilation, air conditioning, acoustics, and fire protection.

Course Outcomes:

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

1. Understand the properties, classifications, and applications of building materials like stones, bricks, tiles, wood, aluminum, glass, paints, and plastics.
2. Analyze the composition, manufacturing process, and properties of cement and admixtures.
3. Apply knowledge of building components such as lintels, arches, walls, stairs, floors, roofs, foundations, and joinery.
4. Evaluate masonry, mortars, finishing techniques, and formwork systems.
5. Assess various building services including plumbing, ventilation, air conditioning, acoustics, and fire protection.

CO – PO Articulation Matrix

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO -1	3	-	-	-	2	-	-	-	-	-	-	-	3	3
CO -2	3	3	-	-	2	-	-	-	-	-	-	2	3	3
CO -3	3	-	3	2	3	-	-	-	-	-	-	-	3	3
CO -4	-	-	3	3	3	-	2	-	-	-	-	-	3	3
CO -5	-	-	-	-	-	3	3	2	-	-	-	-	-	3

UNIT – I

StonesandBricks, Tiles: Building Stones – Classifications and Quarrying – Properties – Structural Requirements – Dressing. Bricks – CompositionofBrick Earth – Manufacture and Structural Requirements, Fly Ash, Ceramics. Timber, Aluminum, Glass, PaintsandPlastics: Wood - Structure – Types and Properties – Seasoning – Defects; Alternate Materials for Timber

– GI / Fibre – Reinforced Glass Bricks, Steel & Aluminum, Plastics.

UNIT – II

Cement &Admixtures: Types of Cement - Ingredients of Cement – Manufacture – Chemical Composition – Hydration - Field & Lab Tests – Fineness – Consistency – Initial &Final Setting – Soundness . Admixtures – Mineral & Chemical Admixtures – Uses

UNIT – III

Building Components: Lintels, Arches, Walls, Vaults – Stair Cases – Types of Floors, Types of Roofs – Flat, Curved, Trussed; Foundations – Types; Damp Proof Course; Joinery – Doors – Windows – Materials – Types.

UNIT – IV

Mortars, MasonryandFinishing's Mortars: Lime and Cement Mortars Brick Masonry – Types – Bonds; Stone Masonry – Types; Composite Masonry – Brick-Stone Composite; Concrete, Reinforced Brick. Finishers: Plastering, Pointing, Painting, Claddings – Types – Tiles – ACP.form Work: Types: Requirements – Standards – Scaffolding – Design; Shoring, Underpinning.

UNIT – V

Building Services: Plumbing Services: Water Distribution, Sanitary – Lines &Fittings; Ventilations: Functional Requirements Systems of Ventilations. Air-Conditioning - Essentials andTypes; Acoustics – Characteristic – Absorption – Acoustic Design; Fire Protection – Fire Hazards – Classification of Fire Resistant Materials and Constructions.

TEXT BOOKS:

1. Building Materials and Construction – Arora&Bindra, Dhanpat Roy Publications.
2. Building Materials and Construction by G C Sahu, Joygopal Jena McGraw hill Pvt Ltd 2015.

REFRENCE BOOKS:

1. Building Construction by B. C. Punmia, Ashok Kumar Jain andArun Kumar Jain - Laxmi Publications (P) ltd., New Delh
2. P. C. Varghese, Building Materials, Prentice Hall of India, 2015.
3. N.Subramanian ,"Building Materials Testing and Sustainability", Oxford Higher Education, 2019.
4. R. Chudley, Construction Technology, Longman Publishing Group, 1973.
5. S. K. Duggal, Building Materials, Oxford & IBH Publishing Co. Ltd., New Delhi, 2019

Online Learning Resources:

https://archive.nptel.ac.in/courses/105/102/105102088/

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40176 – ENVIRONMENTAL IMPACT ASSESSMENT

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the principles, methodologies, and significance of Environmental Impact Assessment (EIA).
2. Analyze the impact of developmental activities on land use, soil, and water resources.
3. Evaluate the impact of development on vegetation, wildlife, and assess environmental risks.
4. Develop environmental audit procedures and assess compliance with environmental regulations.
5. Understand and apply environmental acts, notifications, and legal frameworks in EIA studies.

Course Outcomes (COs):

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

1. Apply various methodologies for conducting Environmental Impact Assessments.
2. Analyze the impact of land-use changes on soil, water, and air quality.
3. Evaluate the environmental impact on vegetation, wildlife, and conduct risk assessments.
4. Develop environmental audit reports and assess compliance with environmental policies.
5. Interpret and apply environmental acts and regulations related to EIA.

CO – PO Articulation Matrix

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO -1	3	2	2	2	2	3	-	-	-	-	-	1	2	2
CO -2	3	3	3	2	2	3	-	-	-	-	-	1	3	2
CO -3	3	3	3	2	2	3	3	-	-	-	-	1	3	3
CO -4	3	3	3	3	2	3	3	-	-	-	-	1	3	3
CO -5	2	2	2	2	2	3	3	3	-	-	-	1	2	2

UNIT – I

Concepts and methodologies of EIA

Initial Environmental Examination, Elements of EIA, - Factors Affecting E-I-A Impact Evaluation and Analysis, Preparation of Environmental Base Map, Classification of Environmental Parameters- Criteria for The Selection of EIA Methodology, E I A Methods, Ad-Hoc Methods, Matrix Methods, Network Method Environmental Media Quality Index Method, Overlay Methods and Cost/Benefit Analysis.

UNIT – II

Impact of Developmental Activities and Land Use

Introduction and Methodology for The Assessment of Soil and Ground Water, Delineation of Study Area, Identification of Actives. Procurement of Relevant Soil Quality, Impact Prediction, Assessment of Impact Significance, Identification and Incorporation of Mitigation Measures. E I Ain Surface Water, Air and Biological Environment: Methodology for The Assessment of Impacts On Surface Water Environment, Air Pollution Sources, Generalized Approach for Assessment of Air Pollution Impact.

UNIT – III

Assessment of Impact On Vegetation, Wildlife and Risk Assessment

Introduction - Assessment of Impact of Development Activities On Vegetation and Wildlife, Environmental Impact of Deforestation – Causes and Effects of Deforestation - Risk Assessment and Treatment of Uncertainty-Key Stages in Performing An Environmental Risk Assessment- Advantages of Environmental Risk Assessment.

UNIT – IV

Environmental Audit

Introduction - Environmental Audit & Environmental Legislation Objectives of Environmental Audit, Types of Environmental Audit, Audit Protocol, Stages of Environmental Audit, Onsite Activities, Evaluation of Audit Data and Preparation of Audit Report

UNIT – V

Environmental Acts and Notifications

The Environmental Protection Act, The Water Preservation Act, The Air (Prevention &Control of Pollution Act), Wild Life Act - Provisions in The EIA Notification, Procedure for Environmental Clearance, Procedure for Conducting Environmental Impact Assessment Report-Evaluation of EIA Report. Environmental Legislation Objectives, Evaluation of Audit Data and Preparation of Audit Report. Post Audit Activities, ConceptofISO and ISO 14000.

TEXT BOOKS:

1. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B. S. Publication, Hyderabad 2nd edition 2011
2. Environmental Impact Assessment, by Canter Larry W., McGraw-Hill education Edi (1996)

REFRENCE BOOKS:

1. Environmental Engineering, by Peavy, H. S, Rowe, D. R, Tchobanoglous, G.Mc-Graw Hill International Editions, New York 1985.
2. Environmental Science and Engineering, by Suresh K. Dhaneja, S.K., Katania& Sons Publication, New Delhi
3. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke, Prentice Hall Publishers.
4. Environmental Pollution and Control, by H. S. Bhatia, Galgotia Publication (P) Ltd, Delhi

Online Learning Resources:

https://archive.nptel.ac.in/courses/124/107/124107160/

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40273 – SMART GRID TECHNOLOGIES

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

Course Outcomes:

CO1: Understanding the Concept and Evolution of Smart Grids. L2

CO2: Analyzing Wide Area Monitoring System and Synchrophasor Technology. L4

CO3: Applying Smart Metering and Advanced Metering Infrastructure (AMI) Concepts. L3

CO4: Evaluating Information and Communication Technology (ICT) Systems in Smart Grids.L5

CO5: Designing Smart Grid Applications and Cybersecurity Measures. L6

UNIT I Introduction to Smart Grid:

Evolution of Electric Grid – Need for Smart Grid – Difference between conventional & smart grid – Overview of enabling technologies – International experience in Smart Grid deployment efforts – Smart Grid road map for India – Smart Grid Architecture.

UNIT II Wide Area Monitoring System:

Fundamentals of Synchro phasor Technology – concept and benefits of Wide Area Monitoring System – Structure and functions of Phasor Measuring Unit (PMU) and Phasor Data Concentrator (PDC) – Road Map for Synchrophasor applications (NAPSI) – Operational experience and Blackout analysis using PMU - Case study on PMU.

UNIT III Smart Meters:

Features and functions of Smart Meters – Functional specification – category of Smart Meters – Automatic Meter Reading (AMR) and Advanced Metering Infrastructure (AMI) drivers and benefits – AMI protocol – Demand Side Integration: Peak load, Outage and Power Quality management.

UNIT IV Information and Communication Technology:

Overview of Smart Grid Communication system – Modulation and Demodulation Techniques: Radio Communication – Mobile Communication – Power Line Communication – Optical Fibre Communication – Communication Protocol for Smart Grid.

UNIT V Smart Grid Applications and Cyber Security Applications:

Overview and concept of Renewable Integration – Introduction to distributed generation - Role of Protective Relaying in Smart Grid – House Area Network – Advanced Energy Storage Technology: Flow battery – Fuel cell – SMES – Super capacitors – Plug – in Hybrid electric Vehicles - Cyber Security: Security issues in DG, Distribution Automation, AMI, Electric Vehicle Management Systems – Approach to assessment of smart grid cyber security risks – Methodologies. Cyber Security requirements – Smart Grid Information Model.

TEXT BOOKS:

1. James Momoh, "SMART GRID : Fundamentals of Design and Analysis", John Wiley and Sons, New York, 2012.

2. Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, "Smart Grid: Technology and Applications", John Wiley & Sons, New Jersey, 2012.

REFERENCES:

1. Power Grid Corporation of India Limited, "Smart Grid Primer", 1st Edition, Power Grid Corporation of India Limited, Bangalore, India, 2013.
2. Fereidoon.P.Sioshansi, "Smart Grid – Integrating Renewable, Distributed and Efficient Energy", 1st Edition, Academic Press, USA, 2011.
3. Stuart Borlase, "Smart Grids: Infrastructure, Technology and Solutions", 1st Edition, CRC Press Publication, England, 2013.
4. Phadke A G, Thorp J S, "Synchronized Phasor Measurements and Their Applications", 1st Edition, Springer, Newyork, 2012.

COURSE STRUCTURE

A40373 – 3D PRINTING TECHNOLOGIES

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

Course objectives: The objectives of the course are to	
1	**Understand** the fundamental concepts of prototyping and distinguish between traditional and rapid prototyping methods.
2	**Demonstrate** the working principles, materials, and applications of solid-, liquid-, and powder-based RP systems.
3	**Define** the processes and classifications of rapid tooling and reverse engineering techniques.
4	**Identify** common errors in 3D printing and evaluate pre-processing, processing, and post-processing issues.
5	**Familiarize** RP-related software and its role in applications such as design, manufacturing, and medical fields.

Course Outcomes: On successful completion of the course, the student will be able to,		
1	Define and explain the evolution and need for rapid prototyping in modern product development.	L1,L2,L6
2	Compare and contrast various 3D printing technologies based on working principles, materials, and limitations.	L2,L4
3	Apply knowledge of rapid tooling and reverse engineering techniques for industrial and design applications.	L3,L5,L6
4	Diagnose and interpret different types of errors encountered in 3D printing processes and recommend solutions.	L2,L3,L5 ,
5	Use RP-specific software tools to manipulate STL files and prepare models for printing in real-world scenarios.	L1,L3,L6

UNIT I Introduction to 3D Printing

Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Need for time compression in product development, Usage of RP parts, Generic RP process, Distinction between RP and CNC, other related technologies, Classification of RP.

UNIT II Solid and Liquid Based RP Systems

Working Principle, Materials, Advantages, Limitations and Applications of Fusion Deposition Modelling (FDM), Laminated Object Manufacturing (LOM), Stereo lithography (SLA), Direct Light Projection System (DLP) and Solid Ground Curing (SGC).

UNIT III Powder Based & Other RP Systems

Powder Based RP Systems: Working Principle, Materials, Advantages, Limitations and Applications of Selective Laser Sintering (SLS), Direct Metal Laser Sintering (DMLS), Laser Engineered Net Shaping (LENS) and Electron Beam Melting (EBM).
Other RP Systems: Working Principle, Materials, Advantages, Limitations and Applications of Three Dimensional Printing (3DP), Ballastic Particle Manufacturing (BPM) and Shape Deposition Manufacturing (SDM).

UNIT IV Rapid Tooling & Reverse Engineering
Rapid Tooling: Conventional Tooling Vs. Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling Methods, Soft and Hard Tooling methods.
Reverse Engineering (RE): Meaning, Use, RE – The Generic Process, Phases of RE Scanning, Contact Scanners and Noncontact Scanners, Point Processing, Application Geometric Model, Development

UNIT V

Errors in 3D Printing and Applications:

Pre-processing, processing and post-processing errors, Part building errors in SLA, SLS, etc. Software: Need for software, MIMICS, Magics, SurgiGuide, 3-matic, 3D-Doctor, Simplant, Velocity2, VoXim, Solid View, 3DView, etc., software, Preparation of CAD models, Problems with STL files, STL file manipulation, RP data formats: SLC, CLI, RPI, LEAF, IGES, HP/GL, CT, STEP. Applications: Design, Engineering Analysis and planning applications, Rapid Tooling, Reverse Engineering, Medical Applications of RP.

Textbooks:

1. Chee Kai Chua and Kah Fai Leong, "3D Printing and Additive Manufacturing Principles and Applications" 5/e, World Scientific Publications, 2017.

2. Ian Gibson, David W Rosen, Brent Stucker, "Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing", Springer, 2/e, 2010.

Reference Books:

1. Frank W.Liou, "Rapid Prototyping & Engineering Applications", CRC Press, Taylor & Francis Group, 2011.

2. Rafiq Noorani, "Rapid Prototyping: Principles and Applications in Manufacturing", John Wiley&Sons, 2006.

Online Learning Resources:

- NPTEL Course on Rapid Manufacturing.
- https://nptel.ac.in/courses/112/104/112104265/
- https://www.hubs.com/knowledge-base/introduction-fdm-3d-printing/
- https://slideplayer.com/slide/6927137/
- https://www.mdpi.com/2073-4360/12/6/1334
- https://www.centropiaggio.unipi.it/sites/default/files/course/material/2013-11-29%20-
- %20FDM.pdf
- https://lecturenotes.in/subject/197
- https://www.cet.edu.in/noticefiles/258_Lecture%20Notes%20on%20RP-ilovepdfcompressed.pdf
- https://www.vssut.ac.in/lecture_notes/lecture1517967201.pdf
- https://www.youtube.com/watch?v=NkC8TNts4B4.

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40576 – FUNDAMENTALS OF DATABASE MANAGEMENT SYSTEM

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

Course Objectives:

- To introduce the fundamental concepts of database systems and data modeling.
- To provide knowledge on relational databases and SQL for data retrieval and manipulation.
- To understand database design principles using normalization and ER modeling.
- To study transaction management, concurrency control, and database recovery.
- To explore emerging database technologies and architectures including NoSQL.

Course Outcomes (COs):

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

- **CO1**: Understand the basic concepts of database systems and their architecture.
- **CO2**: Apply ER modeling and relational algebra for database design.
- **CO3**: Analyze and implement normalization techniques for schema refinement.
- **CO4**: Evaluate transaction management techniques, concurrency control, and recovery.
- **CO5**: Explore non-relational databases and recent trends in database systems.

UNIT I: Introduction to Databases

Database System Applications and Purpose, View of Data: Data Abstraction and Data Independence, Database Users and Administrators, DBMS Architecture and Data Models, ER Model: Entities, Attributes, Relationships, ER Diagrams, Reduction of ER Model to Tables

UNIT II: Relational Model and Algebra

Structure of Relational Databases, Relational Model Concepts and Integrity Constraints, Relational Algebra: Selection, Projection, Set Operations, Joins, Tuple Relational Calculus, Introduction to SQL: DDL, DML, DCL, Advanced SQL: Sub queries, Joins, Views, Indexes

UNIT III: Database Design and Normalization

Schema Design and Logical Database Design, Functional Dependencies, Normal Forms: 1NF, 2NF, 3NF, BCNF, Decomposition and Lossless Join, Dependency Preservation, Multi-Valued and Join Dependencies.

UNIT IV: Transaction Management and Concurrency Control

Concept of a Transaction, ACID Properties, Serializability and Schedules, Concurrency Control: Lock-Based, Timestamp-Based Protocols, Deadlock Handling, Recovery Techniques: Log-Based, Shadow Paging

UNIT V: Advanced Topics and NoSQL Databases

Distributed Databases and Parallel Databases, Introduction to NoSQL: Types – Document, Columnar, Key-Value, Graph, CAP Theorem, MongoDB: Basics and CRUD Operations, Big Data and New SQL Overview, Case Studies on Real-World Databases

Textbooks:

1. **Abraham Silberschatz, Henry F. Korth, S. Sudarshan** – ***Database System Concepts***, 7th Edition, McGraw Hill
2. **Ramez Elmasri, Shamkant B. Navathe** – ***Fundamentals of Database Systems***, 7th Edition, Pearson Education

Reference Books:

1. **C.J. Date** – ***An Introduction to Database Systems***, 8th Edition, Addison-Wesley
2. **Raghu Ramakrishnan, Johannes Gehrke** – ***Database Management Systems***, 3rd Edition, McGraw Hill
3. **Pramod J. Sadalage & Martin Fowler** – ***NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence***, Pearson

Online Resources & Courses:

1. **NPTEL – Database Management Systems by IIT Madras**
2. **Coursera – Databases by Stanford University**
3. **Khan Academy – Intro to SQL**
4. **MongoDB University – Free Courses on NoSQL Databases**
5. **W3Schools SQL Tutorial**
6. **GeeksforGeeks – DBMS Concepts and Practice Problems**

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40577 – CYBER SECURITY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

Course Objectives:

1. To introduce the concept of cybercrime and its impact on information security, and provide an overview of cybercriminal behavior and various classifications of cybercrimes.
2. To explore the methodologies used by cybercriminals to plan and execute attacks, including techniques like social engineering, botnets, and cloud-related threats.
3. To understand the security risks associated with mobile and wireless devices, and examine countermeasures for securing mobile computing in organizational environments.
4. To familiarize students with the tools and techniques used in committing cybercrimes, such as phishing, malware, DoS/DDoS attacks, and code-based exploits.
5. To analyze the implications of cybercrime for organizations, including the cost of cyber attacks, intellectual property issues, and challenges posed by social computing and web-based threats.

Course Outcomes:

After completion of the course, students will be able to

1. Understand the fundamentals of cybercrime and information security, and explain the legal and global perspectives, especially with reference to Indian IT Act 2000.
2. Analyze how cybercriminals plan and execute cyber offenses using techniques like social engineering, cyber stalking, and botnets, including threats posed by cloud computing.
3. Evaluate the security challenges of mobile and wireless devices and formulate measures to secure mobile environments within an organization.
4. Identify and explain various cyber attack tools and methods such as phishing, keyloggers, Trojans, and SQL injection used in committing cybercrimes.
5. Assess the organizational implications of cybercrimes, including IPR issues, social media risks, and formulate strategies to mitigate security and privacy challenges.

UNIT I Introduction to Cybercrime

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

UNIT II Cyber Offenses: How Criminals Plan Them

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

UNIT III Cybercrime: Mobile and Wireless Devices

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices:

Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies an Measures in Mobile Computing Era, Laptops.

UNIT IV Tools and Methods Used in Cybercrime

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

UNIT V Cyber Security: Organizational Implications

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

Textbooks:

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

Reference Books:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.

2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J.DavidIrwin.CRC Press T&F Group

Online Learning Resources:

http://nptel.ac.in/courses/106105031/40

http://nptel.ac.in/courses/106105031/39

http://nptel.ac.in/courses/106105031/38

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40081 – WAVELET TRANSFORMS AND ITS APPLICATIONS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

Course Outcomes:

After successful completion of this course, the students should be able to:

COs	Statements	Blooms level
CO1	Understand wavelets and wavelet basis and characterize continuous and discrete wavelet transforms	L2, L3
CO2	Illustrate the multi resolution analysis ad scaling functions	L3, L5
CO3	Implement discrete wavelet transforms with multirate digital filters	L3
CO4	Understand multi resolution analysis and identify various wavelets and evaluate their time- frequency resolution properties.	L2, L3
CO5	Design certain classes of wavelets to specification and justify the basis of the application of wavelet transforms to different fields	L3,L5

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	-	-	-	-	-	-	-	1
CO2	3	2	2	2	-	-	-	-	-	-	-	1
CO3	3	2	2	1	-	-	-	-	-	-	-	1
CO4	2	2	2	1	-	-	-	-	-	-	-	1
CO5	3	3	2	1	-	-	-	-	-	-	-	1

1-Slightly, 2-Moderately, 3-Substantially.

UNIT – I: Wavelets (08)

Wavelets and Wavelet Expansion Systems - Wavelet Expansion- Wavelet Transform- Wavelet System- More Specific Characteristics of Wavelet Systems -Haar Scaling Functions and Wavelets -effectiveness of Wavelet Analysis -The Discrete Wavelet Transform- The Discrete-Time and Continuous Wavelet Transforms.

UNIT – II: A Multiresolution Formulation of Wavelet Systems (08)

Signal Spaces -The Scaling Function -Multiresolution Analysis - The Wavelet Functions - The Discrete Wavelet Transform- A Parseval's Theorem - Display of the Discrete Wavelet Transform and the Wavelet Expansion.

UNIT – III Filter Banks and the Discrete Wavelet Transform (08)

Analysis - From Fine Scale to Coarse Scale- Filtering and Down-Sampling or Decimating - Synthesis - From Coarse Scale to Fine Scale -Filtering and Up-Sampling or Stretching - Input Coefficients - Lattices and Lifting - -Different Points of View.

UNIT – IV Time-Frequency and Complexity (08)

Multiresolution versus Time-Frequency Analysis- Periodic versus Nonperiodic Discrete Wavelet Transforms -The Discrete Wavelet Transform versus the Discrete-Time Wavelet Transform- Numerical Complexity of the Discrete Wavelet Transform.

UNIT-V Bases and Matrix Examples (08)

Bases, Orthogonal Bases, and Biorthogonal Bases -Matrix Examples - Fourier Series Example - Sine Expansion Example - Frames and Tight Frames - Matrix Examples -Sine Expansion as a Tight Frame Example.

TEXT BOOK:

1. C. Sidney Burrus, Ramesh A. Gopinath, "Introduction to Wavelets and Wavelets Transforms", Prentice Hall, (1997).
2. James S. Walker, "A Primer on Wavelets and their Scientific Applications", CRC Press, (1999).

REFERENCES:

1. RaghuveerRao, "Wavelet Transforms", Pearson Education, Asia
2. C. S. Burrus, Ramose and A. Gopinath, Introduction to Wavelets and Wavelet Transform, Prentice Hall Inc.

1. http://users.rowan.edu/~polikar/WAVELETS/WTtutorial.html

2. http://www.wavelet.org/

3. http://www.math.hawaii.edu/~dave/Web/Amara's%20Wavelet%20Page.htm

4.https://jqichina.wordpress.com/wp-content/uploads/2012/02/ten-lectures-of-waveletsefbc88e5b08fe6b3a2e58d81e8aeb2efbc891.pdf

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40082 – SMART MATERIALS AND DEVICES

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

Course Objectives	
1	To provide exposure to smart materials and their engineering applications.
2	To impart knowledge on the basics and phenomenon behind the working of smart materials
3	To explain the properties exhibited by smart materials
4	To educate various techniques used to synthesize and characterize smart materials
5	To identify the required smart material for distinct applications/devices

COs	Course Outcomes	Blooms Level
CO1	Identify key discoveries that led to modern applications of shape memory materials, describe the two phases in shape memory alloys.	L1,L2, L3, L4
CO2	Describe how different external stimuli (light, electricity, heat, stress, and magnetism) influence smart material properties.	L1,L2, L3
CO3	Summarize various types of synthesis of smart materials	L1,L2, L3
CO4	Analyze various characterization techniques used for smart materials	L1,L2, L3
CO5	Interpret the importance of smart materials in various devices	L1,L2

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1							
CO2	3	3	2	1	1							
CO3	3	3	1	1	1							
CO4	3	2	1	1	1							
CO5	3	3	1	1	-							

1-Slightly, 2-Moderately, 3-Substantially.

Syllabus:

UNIT I Introduction to Smart Materials **9H**

Historical account of the discovery and development of smart materials, Shape memory materials, chromoactive materials, magnetorheological materials, photoactive materials, Polymers and polymer composites (Basics).

UNIT II Properties of Smart Materials 9H

Optical, Electrical, Dielectric, Piezoelectric, Ferroelectric, Pyroelectric and Magnetic properties of smart materials.

UNIT III Synthesis of Smart Materials 9H

Chemical route: Chemical vapour deposition, Sol-gel technique, Hydrothermal method, Mechanical alloying and Thin film deposition techniques: Chemical etching, Spray pyrolysis.

UNIT IV Characterization Techniques 9H

Powder X-ray diffraction, Raman spectroscopy (RS), UV-Visible spectroscopy, Scanning electron microscopy (SEM), Transmission electron microscopy (TEM), Atomic force microscopy (AFM).

UNIT V Smart Materials based Devices 9H

Devices based on smart materials: Shape memory alloys in robotic hands, piezoelectric based devices, MEMS and intelligent devices.

Textbooks:

1. YaserDahman, Nanotechnology and Functional Materials for Engineers-, Elsevier, 2017

2. E. Zschech,C. Whelan, T. Mikolajick, Materials for Information Technology: Devices, Interconnects and Packaging Springer-Verlag London Limited 2005.

Reference Books:

1. Gauenzi,P.,Smart Structures, Wiley, 2009.

2. MahmoodAliofkhazraei, Handbook of functional nanomaterials, Vol (1&2), Nova Publishers, 2014

3. **Handbook of Smart Materials, Technologies, and Devices: Applications of Industry, 4.0,** Chaudhery MustansarHussain, Paolo Di Sia, Springer,2022.

4. **Fundamentals of Smart Materials,**Mohsen Shahinpoor, Royal Society of Chemistry, 2020

NPTEL course link: https://onlinecourses.nptel.ac.in/noc22_me17/preview

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40085 – INTRODUCTION TO QUANTUM MECHANICS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

COURSE OBJECTIVES	
1	To understand the fundamental differences between classical and quantum mechanics.
2	To study wave-particle duality, uncertainty principle, and their implications.
3	To learn and apply Schrödinger equations to basic quantum systems.
4	To use operator formalism and mathematical tools in quantum mechanics.
5	To explore angular momentum, spin and their quantum mechanical representations.

UNIT- I: PRINCIPLES OF QUANTUM MECHANICS

Introduction: Limitations of classical Mechanics, Difficulties with classical theories of black body radiation and origin of quantum theory of radiation.Wave-particle duality: de Broglie wavelength, Heisenberg uncertainty principle.Schrödinger time independent and time dependent wave equation, Solution of the time dependent Schrödinger equation, Concept of stationary states, Physical significance of wave function (ψ), Orthogonal, Normalized and Orthonormal functions

UNIT- II: ONE DIMENSIONAL PROBLEMS AND SOLUTIONS

Potential step – Reflection and Transmission at the interface. Potential well: Square well potential with rigid walls, Square well potential with finite walls. Potential barrier: Penetration of a potential barrier (tunneling effect). Periodic potential and Harmonic oscillator, Energy eigen functions and eigen values.

UNIT-III: OPERATOR FORMALISM

Operators, Operator Algebra, Eigen values and Eigen vectors, Postulates of quantum mechanics, Matrix representation of wave functions and linear operators.

UNIT- IV: MATHEMATICAL TOOLS FOR QUANTUM MECHANICS

The concept of row and column matrices, Matrix algebra,Hermitian operators – definition. Dirac's bra and ket notation, Expectation values, Heisenberg (operator) representation of harmonic oscillator, Ladder operators and their significance.

UNIT- V : ANGULAR MOMENTUM AND SPIN

Angular momentum operators: Definition. Eigen functions and Eigen values of AM operators. Matrix representation of angular momentum operators, System with spin half(1/2), Spin angular momentum, Pauli's spin matrices. Clebsch-Gordon coefficients. Rigid Rotator: Eigen functions and Eigen values.

BOOKS FOR STUDY:

1. Quantum Mechanics. Vol 1, A. MessaiaNoth-Holland Pub. Co., Amsterdam,(1961).
2. A Text Book of Quantum Mechanics. P.M.Mathews and K.Venkatesam, Tata McGraw Hill, New Delhi,(1976).
3. Introduction to Quantum Mechanics. R.H.Dicke and J.P.Witke, Addison-Wisley Pub.Co.Inc.,London,(1960).
4. Quantum Mechanics. S.L.Gupta, V.Kumar, H.V.Sarama and R.C.Sharma, Jai PrakashNath& Co, Meerut, (1996).

REFERENCE BOOKS:

1. Quantum Mechanics. L.I. Schiff, McGraw Hill Book Co., Tokyo, (1968).
2. Introduction to Quantum Mechanics. Richard L. Liboff, Pearson Education Ltd (Fourth Edn.) 2003.

	CourseOutcomes: After completing this course, students will be able to:	**Blooms Level**
CO1	Explain the key principles of quantum mechanics and wave-particle duality	L1, L2
CO2	Apply Schrödinger equations to solve one-dimensional quantum problems	L3, L4
CO3	Solve quantum mechanical problems using operator and matrix methods.	L2, L4
CO4	Evaluate quantum states using Dirac notation and expectation values.	L5
CO5	Analyze angular momentum and spin systems using Pauli matrices and operators.	L4, L5

NPTEL courses link :

4. **https://archive.nptel.ac.in/courses/115/101/115101107/**
5. **https://archive.nptel.ac.in/courses/122/106/122106034/**
6. **https://nptel.ac.in/courses/115106066**

CourseArticulationMatrix:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	2	2							
CO2	3	2	2	1	1							
CO3	3	3	2	1	1							
CO4	3	3	3	2	3							
CO5	3	3	1	1	1							

1-Slightly, 2-Moderately, 3-Substantially.

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY,KURNOOL

COURSE STRUCTURE

A40083 – GREEN CHEMISTRY AND CATALYSIS FOR SUSTAINABLE ENVIRONMENT

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

Course Objectives	
1	To understand principle and concepts of green chemistry.
2	To understand the types of catalysis and industrial applications.
3	To apply green solvents in chemical synthesis.
4	To enumerate different sourced of green energy.
5	To apply alternative greener methods foe chemical reactions

Course Outcomes	
CO1	Apply the Green chemistry Principles for day to day life as well as synthesis, describe the sustainable development and green chemistry, Explain economic and un-economic reactions, Demonstrate Polymer recycling.
CO2	Explain Heterogeneous catalyst and its applications in Chemical and Pharmaceutical Industries, Differentiate Homogeneous and Heterogeneous catalysis, Identify the importance of Bio and Photo Catalysis, Discuss Transition metal and Phase transfer Catalysis
CO3	Demonstrate Green solvents and importance, Discuss Supercritical carbondioxide, Explain Supercritical water, recycling of green solvents.
CO4	Describe importance of Biomass and Solar Power, Illustrate Sonochemistry, Apply Green Chemistry for Sustainable Development; discuss the importance of Renewable resources, mechanochemical synthesis.
CO5	Discuss Alternative green methods like Photoredox catalysis, single electron transfer reactions (SET), Photochemical Reactions, Microwave-assisted Reactions and Sonochemical reactions, examples and applications.

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

UNIT 1: PRINCIPLES AND CONCEPTS OF GREEN CHEMISTRY

Introduction, Green chemistry Principles, sustainable development and green chemistry, E factor, atom economy, atom economic Reactions: Rearrangement and addition reactions and atom un-economic reactions: Substitution, elimination and Wittig reactions, Reducing Toxicity. Waste - problems and Prevention: Design for degradation, Polymer recycling

UNIT 2: CATALYSIS AND GREEN CHEMISTRY

Introduction, Types of catalysis, Heterogeneous catalysis: Basics of Heterogeneous Catalysis, Zeolite and the Bulk Chemical Industry, Heterogeneous Catalysis in the Fine Chemical and Pharmaceutical Industries, Catalytic Converters, Homogeneous catalysis: Transition Metal Catalysts with Phosphine Ligands, Greener Lewis Acids, and Phase transfer catalysis, Bio-catalysis and Photo-catalysis with examples.

UNIT 3: GREEN SOLVENTS IN CHEMICAL SYNTHESIS

Green Solvents: Concept, Tools and techniques for solvent selection, supercritical fluids: Super critical carbondioxide, super critical water, Polyethylene glycol (PEG), Ionic liquids, Recyling of green solvents.

UNIT 4: EMERGING GREENER TECHNOLOGIES

Biomass as renewable resource, Energy: Energy from Biomass, Solar Power, Chemicals from Renewable Feedstock's, Chemicals from Fatty Acids, Polymers from Renewable Resources, Alternative Economies: The Syngas Economy, The Biorefinery, Design for energy efficiency, Mechanochemical synthesis.

UNIT 5: ALTERNATIVE GREENER METHODS

Photochemical Reactions - Examples, Advantages and Challenges, Photoredox catalysis, single electron transfer reactions (SET), Examples of Photochemical Reactions, Microwave-assisted Reactions and Sonochemical reactions, examples and applications.

Text Books :

1. M. Lancaster, Green Chemistry an introductory text, Royal Society of Chemistry, 2002.
2. Paul T. Anastas and John C. Warner, Green Chemistry Theory and Practice, 4th Edition, Oxford University Press, USA

References :

1. Green Chemistry for Environmental Sustainability, First Edition, Sanjay K. Sharma and AckmezMudhoo, CRC Press, 2010.
2. Edited by AlvisePerosa and Maurizio Selva , Hand Book of Green chemistry Volume 8: Green Nanoscience, wiley-VCH, 2013.

COURSE STRUCTURE

A40084 – EMPLOYABILITY SKILLS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

Course Objectives:

- To encourage all round development of the students by focusing on productive skills
- To make the students aware of Goal setting and writing skills
- To enable them to know the importance of presentation skills in achieving desired goals.
- To help them develop organizational skills through group activities

To function effectively with heterogeneous teams

Course Outcomes (CO):	Blooms Level
CO1: Understand the importance of goals and try to achieve them	L1, L2
CO2: Explain the significance of self-management	L1, L2
CO3: Apply the knowledge of writing skills in preparing eye-catchy resumes	L3
CO4: Analyse various forms of Presentation skills	L4
CO5: Judge the group behaviour appropriately	L5
CO6: Develop skills required for employability.	L3, L6

UNIT - I	**Goal Setting and Self-Management**	Lecture Hrs

Definition, importance, types of Goal Setting – SMART Goal Setting – Advantages-Motivation – Intrinsic and Extrinsic Motivation – Self-Management - Knowing about self – SWOC Analysis

UNIT - II	**Writing Skills**	Lecture Hrs

Definition, significance, types of writing skills – Resume writing Vs CV Writing - E-Mail writing, Cover Letters - E-Mail Etiquette -SoP (Statement of Purpose)

UNIT - III	**Technical Presentation Skills**	Lecture Hrs

Nature, meaning & significance of Presentation Skills – Planning, Preparation, Presentation, Stage Dynamics –Anxiety in Public speaking (Glossophobia)- PPT & Poster Presentation

UNIT - IV	**Group Presentation Skills**	Lecture Hrs

Body Language – Group Behaviour - Team Dynamics – Leadership Skills – Personality Manifestation- Group Discussion-Debate –Corporate Etiquette

UNIT - V	**Job Cracking Skills**	Lecture Hrs

Nature, characteristics, importance & types of Interviews – Job Interviews – Skills for success – Job searching skills - STAR method - FAQs- Answering Strategies – Mock Interviews

Textbooks:

1. Sabina Pillai, Agna Fernandez. *Soft Skills & Employability Skills*,2014.Cambridge Publisher.

2.Alka Wadkar. Life Skills for Success, Sage Publications, 2016.

Reference Books:

1. Gangadhar Joshi. Campus to Corporate Paperback , Sage Publications. 2015
2. Sherfield Montogomery Moody,Cornerstone Developing Soft Skills, Pearson Publications. 4 Ed. 2008
3. Shikha Kapoor. *Personality Development and Soft Skills - Preparing for Tomorrow* .1 Edition, Wiley, 2017.
4. M. Sen Gupta, *Skills for Employability*, Innovative Publication, 2019.
5. Steve Duck and David T McMahan, *The Basics f Communication Skills A Relational Perspective*, Sage press, 2012.

Online Learning Resources:

1. https://youtu.be/gkLsn4ddmTs
2. https://youtu.be/2bf9K2rRWwo
3. https://youtu.be/FchfE3c2jzc
4. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ
5. https://www.youtube.com/c/skillopedia/videos
6. https://onlinecourses.nptel.ac.in/noc25_hs96/preview
7. https://onlinecourses.nptel.ac.in/noc21_hs76/preview
8. https://archive.nptel.ac.in/courses/109/107/109107172/#
9. https://archive.nptel.ac.in/courses/109/104/109104107/

OPEN ELECTIVE – IV

VII – SEMESTER

COURSE STRUCTURE

A40177 – GEO-SPATIAL TECHNOLOGIES

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

Course Objectives:

The objectives of this course are to make the student :

1. To understand raster-based spatial analysis techniques, including query, overlay, and cost-distance analysis.
2. To analyze vector-based spatial analysis techniques such as topology, overlay, and proximity analysis.
3. To apply network analysis techniques for geocoding, shortest path analysis, and location-allocation problems.
4. To evaluate surface andgeostatistical analysis methods, including terrain modeling, watershed analysis, and spatial interpolation.
5. To assess GIS customization, Web GIS, and mobile mapping techniques for real-world applications.

Course Outcomes:

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

1. Understand raster-based spatial analysis techniques, including query, overlay, and cost-distance analysis.
2. Analyze vector-based spatial analysis techniques such as topology, overlay, and proximity analysis.
3. Apply network analysis techniques for geocoding, shortest path analysis, and location-allocation problems.
4. Evaluate surface andgeostatistical analysis methods, including terrain modeling, watershed analysis, and spatial interpolation.
5. Assess GIS customization, Web GIS, and mobile mapping techniques for real-world applications.

CO – PO Articulation Matrix

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO -1	3	-	-	-	2	-	-	-	-	-	-	-	3	3
CO -2	3	3	-	-	2	-	-	-	-	-	-	2	3	3
CO -3	3	-	3	2	3	-	-	-	-	-	-	-	3	3
CO -4	-	-	3	3	3	-	2	-	-	-	-	-	3	3
CO -5	-	-	-	-	3	3	3	2	-	-	-	-	3	3

UNIT – I		

RASTER ANALYSIS

Raster Data Exploration: Query Analysis - Local Operations: Map Algebra, Reclassification, Logical and Arithmetic Overlay Operations—Neighborhood - Operations: Aggregation, Filtering – Extended Neighborhood-Operations- Zonal Operations - Statistical Analysis – Cost-Distance Analysis-Least Cost Path.

UNIT – II		

VECTOR ANALYSIS

Non-Topological Analysis: Attribute Database Query, Structured Query Language, Co-Ordinate Transformation, Summary Statistics, Calculation of Area, Perimeter and Distance – topological Analysis: Reclassification, Aggregation, Overlay Analysis: Point-In-Polygon, Line-In-Polygon, Polygon-On-Polygon: Clip, Erase, Identity, Union, Intersection – Proximity Analysis: Buffering

UNIT – III		

NETWORK ANALYSIS

Network – Introduction - Network Data Model – Elements of Network - Building A Network Database - Geocoding – Address Matching - Shortest Path in A Network – Time and Distance Based Shortest Path Analysis – Driving Directions – Closest Facility Analysis – Catchment / Service Area Analysis-Location-Allocation Analysis

UNIT – IV		

SURFACE and GEOSTATISTICAL ANALYSIS

Surface Data – Sources of X,Y, Z Data – DEM, TIN – Terrain Analysis – Slope, Aspect, Viewshed, Watershed Analysis: Watershed Boundary, Flow Direction, Flow Accumulation, Drainage Network, Spatial Interpolation: IDW, Spline, Kriging, Variogram.

UNIT – V		

CUSTOMISATION, WEB GIS, MOBILE MAPPING

Customisation of GIS: Need, Uses, Scripting Languages –Embedded Scripts – Use of Python Script - Web GIS: Web GIS Architecture, Advantages of Web GIS, Web Applications- Location Based Services: Emergency and Business Solutions - Big Data Analytics.

TEXT BOOKS:

1. Kang – Tsung Chang, Introduction to Geographical Information System, 4th Ed., Tata McGraw Hill Edition, 2008.
2. Lo, C.P. andYeung, Albert K.W., Concepts and Techniques of Geographic Information Systems Prentice Hall, 2002.

REFRENCE BOOKS:

1. Michael N. Demers, Fundamentals of Geographic Information Systems, Wiley,2009
2. Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasaraju, “An Introduction to Geographical Information Systems, Pearson Education, 2nd Edition, 2007.

3. John Peter Wilson, The Handbook of Geographic Information Science, Blackwell Pub.,2008

Online Learning Resources:

https://archive.nptel.ac.in/courses/105/105/105105202/

https://onlinecourses.nptel.ac.in/noc19_cs76/preview

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40178 – SOLID WASTE MANAGEMENT

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

Course Objectives:

The objectives of this course are to make the student :

1. To understand the types, sources, and characteristics of solid waste, along with regulatory frameworks.
2. To analyze engineering systems for solid waste collection, storage, and transportation.
3. To apply resource and energy recovery techniques for sustainable solid waste management.
4. To evaluate landfill design, construction, and environmental impact mitigation strategies.
5. To assess hazardous waste management techniques, including biomedical and e-waste disposal.

Course Outcomes:

1. Understand the types, sources, and characteristics of solid waste, along with regulatory frameworks.
2. Analyze engineering systems for solid waste collection, storage, and transportation.
3. Apply resource and energy recovery techniques for sustainable solid waste management.
4. Evaluate landfill design, construction, and environmental impact mitigation strategies.
5. Assess hazardous waste management techniques, including biomedical and e-waste

CO – PO Articulation Matrix

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO -1	3	-	-	-	2	-	2	-	-	-	-	-	3	3
CO -2	3	3	-	-	2	-	3	-	-	-	-	2	3	3
CO -3	3	-	3	2	3	-	3	-	-	-	-	-	3	3
CO -4	-	-	3	3	3	-	3	2	-	-	-	-	3	3
CO -5	-	-	-	-	3	3	3	3	-	-	-	-	3	3

UNIT – I

Solid Waste: Definitions, Types of Solid Wastes, Sources of Solid Wastes, Characteristics, and Perspectives; Properties of Solid Wastes, Sampling of Solid Wastes, Elements of Solid Waste Management - Integrated Solid Waste Management, Solid Waste Management Rules 2016.

UNIT – II		
Engineering SystemsforSolid Waste Management: Solid Waste Generation; On-Site Handling, Storage and Processing; Collection of Solid Wastes; Stationary Container System and Hauled Container Systems – Route Planning - Transfer and Transport; Processing Techniques;		
UNIT – III		
Engineering Systems for Resource and Energy Recovery: Processing Techniques; Materials Recovery Systems; Recovery of Biological Conversion Products – Composting, Pre and Post Processing, Types of Composting, Critical Parameters, Problems With Composing - Recovery of Thermal Conversion Products; Pyrolisis, Gasification, RDF - Recovery of Energy From Conversion Products; Materials and Energy Recovery Systems.		
UNIT – IV		
Landfills: Evolution of Landfills – Types and Construction of Landfills – Design Considerations – Life of Landfills- Landfill Problems – Lining of Landfills – Types of Liners – Leachate Pollution and Control – Monitoring Landfills – Landfills Reclamation.		
UNIT – V		
Hazardous Waste Management: – Sources and Characteristics, Effects On Environment, Risk Assessment – Disposal of Hazardous Wastes – Secured Landfills, Incineration - Monitoring – Biomedical Waste Disposal, E-Waste Management, Nuclear Wastes, Industrial Waste Management		
TEXT BOOKS:		
1. Tchobanoglous G, Theisen H and Vigil SA 'Integrated Solid Waste Management, Engineering Principles and Management Issues' McGraw-Hill, 1993. 2. Vesilind PA, Worrell W and Reinhart D, 'Solid Waste Engineering' Brooks/Cole Thomson Learning Inc., 2002.		
REFRENCE BOOKS:		
1. Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, 'Environmental Engineering', McGraw Hill Inc., New York, 1985. 2. Qian X, Koerner RM and Gray DH, 'Geotechnical Aspects of Landfill Design and Construction' Prentice Hall, 2002.		
Online Learning Resources:		
https://archive.nptel.ac.in/courses/105/103/105103205/ https://archive.nptel.ac.in/courses/120/108/120108005/		

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY,KURNOOL

COURSE STRUCTURE

A40274 – INTRODUCTION TO ELECTRIC VEHICLES

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

Course Objectives: To make the student

• Remember and understand the differences between conventional Vehicle and Electric Vehicles, electro mobility and environmental issues of EVs.

• Analyze various EV configurations, parameters of EV systems and Electric vehicle dynamics.

• Analyze the basic construction, operation and characteristics of fuel cells and battery charging techniques in HEV systems.

•Design and analyze the various control structures for Electric vehicle.

Course Outcomes (CO): Student will be able to

CO 1: To understand and differentiate between Conventional Vehicle and Electric Vehicles, electro

mobility and environmental issues of EVs. -L2

CO 2: Understand Various dynamics of Electric Vehicles. -L2

CO 3: To remember and understand various configurations in parameters of EV system and dynamic

aspects of EV. -L1

CO 4: To analyze fuel cell technologies in EV and HEV systems. -L3

CO 5: To analyze the battery charging and controls required of EVs. -L3

UNIT I Introduction to EV Systems and Energy Sources:

Past, Present and Future of EV - EV Concept- EV Technology- State-of-the Art of EVs- EV configuration- EV system- Fixed and Variable gearing- Single and multiple motor drive- In-wheel drives- EV parameters: Weight, size, force and energy, performance parameters. Electro mobility and the environment- History of Electric power trains- Carbon emissions from fuels- Green houses and pollutants- Comparison of conventional, battery, hybrid and fuel cell electric systems.

UNIT II EV Propulsion and Dynamics:

Choice of electric propulsion system- Block diagram- Concept of EV Motors- Single and multi-motor configurations- Fixed and variable geared transmission- In-wheel motor configuration- Classification - Electric motors used in current vehicle applications - Recent EV Motors- Vehicle load factors- Vehicle acceleration.

UNIT III Fuel Cells:

Introduction of fuel cells- Basic operation- Model - Voltage, power and efficiency- Power plant system – Characteristics- Sizing - Example of fuel cell electric vehicle - Introduction to HEV- Brake specific fuel consumption - Comparison of Series-Parallel hybrid systems- Examples.

UNIT IV Battery Charging and Control:

Battery charging: Basic requirements- Charger architecture- Charger functions- Wireless charging- Power factor correction.

Control: Introduction- Modeling of electro mechanical system- Feedback controller design approach- PI controller's designing- Torque-loop, Speed control loop compensation- Acceleration of battery electric vehicle.

UNIT V Energy Storage Technologies:

Role of Energy Storage Systems- Thermal- Mechanical-Chemical- Electrochemical- Electrical -Efficiency of energy storage systems- Super capacitors-Superconducting Magnetic Energy Storage (SMES)- SOC- SoH -fuel cells - G2V- V2G- Energy storage in Micro-grid and Smart grid- Energy Management with storage systems- Battery SCADA

Textbooks:

1.C.C Chan, K.T Chau: Modern Electric Vehicle Technology, Oxford University Press Inc., New York 2001,1st Edition

2.Ali Emadi, "Advanced Electric Drive Vehicles", CRC Press, 2017,1st Edition

Reference Books:

1.Electric and Hybrid Vehicles Design Fundamentals, Iqbal Husain, CRC Press 2021, 3rd Edition.

2.Francisco Díaz-González, Andreas Sumper, Oriol Gomis-Bellmunt," Energy Storage in Power Systems" Wiley Publication, ISBN: 978-1-118-97130-7, Mar 2016,1st Edition

3.A.G.Ter-Gazarian, "Energy Storage for Power Systems", the Institution of Engineering and Technology (IET) Publication, UK, (ISBN – 978-1-84919-219-4), Second Edition, 2011.

4.Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, "Modern Elelctric, Hybrid Elelctric and Fuel Cell Vehicles: Fundamentals, Theory and Design", CRC Press, 2004,1st Edition

5.James Larminie, John Lowry, "Electric Vehicle Technology Explained", Wiley, 2003,2nd Edition.

Online Learning Resources:

1. https://nptel.ac.in/courses/108/102/108102121/
2. https://nptel.ac.in/syllabus/108103009

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40374 – QUALITY MANAGEMENT

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

Course objectives: The objectives of the course are to	
1	Familiarize the basic concepts of Total Quality Management.
2	Expose with various quality issues in Inspection.
3	Gain Knowledge on quality control and its applications to real time..
4	Understand the extent of customer satisfaction by the application of various quality concepts.
5	Demonstrate the importance of Quality standards in Production

Course Outcomes: On successful completion of the course, the student will be able to,		
1	Define and develop on quality Management philosophies and analyze quality costs frameworks.	L1,L3,L4
2	Understanding of the historical development of Total Quality Management (TQM), implementation, and real-world applications through case studies.	L2, L3,L6
3	Evaluate the cost of poor quality, process effectiveness and efficiency to analyze areas for improvement.	L2,L4,L5
4	Apply benchmarking and business process reengineering to improve management processes.	L3,L5,L6
5	Demonstrate the set of indications to evaluate performance excellence of an organization	L1,L2,L5

UNIT – I Introduction:

Definition of Quality, Dimensions of Quality, Definition of Total quality management, Quality Planning, Quality costs – Analysis, Techniques for Quality costs, Basic concepts of Total Quality Management.

UNIT - II Historical Review:

Historical Review: Quality council, Quality statements, Strategic Planning, Deming Philosophy, Barriers of TQM Implementation, Benefits of TQM, Characteristics of successful quality leader, Contributions of Gurus of TQM, Case studies.

UNIT – III TQM Principles:

Customer Satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment teams, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures Basic Concepts, Strategy, Performance Measure Case studies.

UNIT - IV TQM Tools:

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA, The seven tools of quality, Process capability, Concept of Six Sigma, New Seven management tools, Case studies.

UNIT – V Quality Systems:

Need for ISO 9000 and Other Quality Systems, ISO 9000: 2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, QS 9000, ISO 14000 – Concept, Requirements and Benefits, Case Studies.

Text Books:

1.Dale H Besterfield, Total Quality Management, Fourth Edition, Pearson Education, 2015.

2.Subburaj Ramaswamy, Total Quality Management, Tata Mcgraw Hill Publishing Company Ltd., 2005.

3.Joel E.Ross , Total Quality Management, Third Eition, CRC Press, 2017.

Reference Books:

1.Narayana V and Sreenivasan N.S, Quality Management – Concepts and Tasks, New Age International, 1996.

2.Robert L.Flood, Beyond TQM, First Edition, John Wiley & Sons Ltd, 1993.

3.Richard S. Leavenworth & Eugene Lodewick Grant, Statistical Quality Control, Seventh Edition, Tata Mcgraw Hill, 2015

4.Samuel Ho , TQM – An Integrated Approach, Kogan Page Ltd, USA, 1995.

Online Learning Resources:

- https://www.youtube.com/watch?v=VD6tXadibk0
- https://www.investopedia.com/terms/t/total-quality-management-tqm.asp
- https://blog.capterra.com/what-is-total-quality-management/
- https://nptel.ac.in/courses/110/104/110104080/
- https://onlinecourses.nptel.ac.in/noc21_mg03/preview
- https://nptel.ac.in/courses/110/104/110104085/
- https://nptel.ac.in/noc/courses/noc18/SEM2/noc18-mg39/

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY,KURNOOL

COURSE STRUCTURE

A40578 – COMPUTER NETWORKS AND APPLICATIONS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

Course Objectives:

The course is designed to

1. To introduce the fundamentals of the Internet, networking concepts, reference models, and transmission media.
2. To understand the data link layer design, error handling mechanisms, LAN technologies, and access networks.
3. To study the routing algorithms, internetworking concepts, and network layer functionalities.
4. To explore transport layer protocols such as UDP and TCP, and understand their mechanisms, including congestion control.
5. To introduce the principles behind network applications and protocols, and explore widely used application-layer services such as the Web, Email, DNS, peer-to-peer systems, and content distribution networks.

Course Outcomes:

After completion of the course, students will be able to

1. Describe the architecture of the Internet, reference models, and explain different types of transmission media used in networking.
2. Apply error detection and correction techniques and analyze data link layer protocols and LAN technologies.
3. Explain routing algorithms and the structure of the network layer, including internetworking.
4. Analyze the working of transport layer protocols like TCP and UDP, including concepts of connection management and congestion control.
5. Explain the principles of network applications and describe the functionality of protocols such as HTTP, SMTP, DNS, and peer-to-peer systems, including multimedia streaming and content delivery networks.

UNIT I: Computer Networks and the Internet

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

UNIT II : The Data Link Layer, Access Networks, and LANs

Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols (Textbook 1) Introduction to the Link Layer, Error-Detection and -Correction Techniques, Multiple Access Links and Protocols, Switched Local Area Networks

Link Virtualization: A Network as a Link Layer, Data Center Networking, Retrospective: A Day in the Life of a Web Page Request (Textbook 2)

UNIT III: The Network Layer

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

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

UNIT V: Principles of Network Applications

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

Textbooks:

1. Andrew S.Tanenbaum, David j.wetherall, Computer Networks, 5th Edition, PEARSON.
2. James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach", 6th edition, Pearson, 2019.

Reference Books:

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

Online Learning Resources:

https://nptel.ac.in/courses/106105183/25

http://www.nptelvideos.in/2012/11/computer-networks.html
https://nptel.ac.in/courses/106105183/3

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40579 – INTRODUCTION TO INTERNET OF THINGS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

Course Objectives:

- Understand the basics of Internet of Things and protocols.
- Discuss the requirement of IoT technology
- Introduce some of the application areas where IoT can be applied.
- Understand the vision of IoT from a global perspective, understand its applications, determine its market perspective using gateways, devices and data management

Course Outcomes:

After completion of the course, students will be able to

- Understand general concepts of Internet of Things.
- Apply design concept to IoT solutions
- Analyze various M2M and IoT architectures
- Evaluate design issues in IoT applications
- Create IoT solutions using sensors, actuators and Devices

UNIT I Introduction to IoT

Definition and Characteristics of IoT, physical design of IoT, IoT protocols, IoT communication models, IoT Communication APIs, Communication protocols, Embedded Systems, IoT Levels and Templates

UNIT II Prototyping IoT Objects using Microprocessor/Microcontroller

Working principles of sensors and actuators, setting up the board – Programming for IoT, Reading from Sensors, Communication: communication through Bluetooth, Wi-Fi.

UNIT III IoT Architecture and Protocols

Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model, Protocols- 6LowPAN, RPL, CoAP, MQTT, IoT frameworks- Thing Speak.

UNIT IV Device Discovery and Cloud Services for IoT

Device discovery capabilities- Registering a device, Deregister a device, Introduction to Cloud Storage models and communication APIs Web-Server, Web server for IoT.

UNIT V UAV IoT

Introduction toUnmanned Aerial Vehicles/Drones, Drone Types, Applications: Defense, Civil, Environmental Monitoring; UAV elements and sensors- Arms, motors, Electronic Speed Controller(ESC), GPS, IMU, Ultra sonic sensors; UAV Software –Arudpilot, Mission Planner, Internet of Drones(IoD)- Case study FlytBase.

Textbooks:

1. Vijay Madisetti and ArshdeepBahga, " Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.
2. Handbook of unmanned aerial vehicles, K Valavanis;George J Vachtsevanos, New York, Springer, Boston, Massachusetts : Credo Reference, 2014. 2016.

Reference Books:

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, " From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
2. ArshdeepBahga, Vijay Madisetti - Internet of Things: A Hands-On Approach, Universities Press, 2014.
3. The Internet of Things, Enabling technologies and use cases – Pethuru Raj, Anupama C. Raman, CRC Press.
4. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013
5. Cuno Pfister, Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 9781-4493- 9357-1
6. DGCA RPAS Guidance Manual, Revision 3 – 2020
7. Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs, John Baichtal

Online Learning Resources:

1. *https://www.arduino.cc/*
2. *https://www.raspberrypi.org/*
3. *https://nptel.ac.in/courses/106105166/5*
4. *https://nptel.ac.in/courses/108108098/*4

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40580 – QUANTUM COMPUTING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

Course Objectives:

- To introduce the principles and mathematical foundations of quantum computation.
- To understand quantum gates, circuits, and computation models.
- To explore quantum algorithms and their advantages over classical ones.
- To develop the ability to simulate and write basic quantum programs.
- To understand real-world applications and the future of quantum computing in AI, cryptography, and optimization.

Course Outcomes:

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

- Explain the fundamental concepts of quantum mechanics used in computing.
- Construct and analyze quantum circuits using standard gates.
- Apply quantum algorithms like Deutsch-Jozsa, Grover's, and Shor's.
- Develop simple quantum programs using Qiskit or similar platforms.
- Analyze applications and challenges of quantum computing in real-world domains.

UNIT I: Fundamentals of Quantum Mechanics and Linear Algebra

Classical vs Quantum Computation, Complex Numbers, Vectors, and Matrices, Hilbert Spaces and Dirac Notation, Quantum States and Qubits, Superposition and Measurement, Tensor Products and Multi-Qubit Systems.

UNIT II: Quantum Gates and Circuits

Quantum Logic Gates: Pauli, Hadamard, Phase, Controlled Gates and CNOT, Unitary Operations and Reversibility, Quantum Circuit Representation, Quantum Teleportation, Simulation of Quantum Circuits.

UNIT III: Quantum Algorithms and Complexity

Quantum Parallelism and Interference, Deutsch and Deutsch-Jozsa Algorithms, Grover's Search Algorithm, Shor's Factoring Algorithm, Quantum Fourier Transform, Complexity Classes: BQP, P, NP, and QMA.

UNIT IV: Quantum Programming and Simulation Platforms

Introduction to Qiskit and IBM Quantum Experience, Writing Quantum Circuits in Qiskit, Measuring Qubits and Results, Classical-Quantum Hybrid Programs, Noisy Intermediate-Scale Quantum (NISQ) Systems, Limitations and Current State of Quantum Hardware.

UNIT V: Applications and Future of Quantum Computing

Quantum Machine Learning: Basics and Models, Quantum Cryptography and Quantum Key Distribution, Quantum Algorithms in AI and Optimization, Quantum Advantage and Supremacy, Ethical and Societal Impact of Quantum Technologies, Future Trends and Research Directions.

Textbooks:

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.

Online Learning Resources:

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

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40086 – FINANCIAL MATHEMATICS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

Course Objectives:

1. To provide mathematical foundations for financial modelling, risk assessment and asset pricing.
2. To introduce stochastic models and their applications in pricing derivatives and interest rate modelling.
3. To develop analytical skills for fixed-income securities, credit risk, and investment strategies.
4. To equip students with computational techniques for pricing financial derivatives.

Course Outcomes:

After successful completion of this course, the students should be able to:

COs	Statements	Blooms level
CO1	Explain fundamental financial concepts, including arbitrage, valuation, and risk.	L2 (Understan)
CO2	Apply stochastic models, including Brownian motion and Stochastic Differential Equations (SDEs), in financial contexts.	L3 (Apply)
CO3	Analyze mathematical techniques for pricing options and financial derivatives.	L4 (Analyze)
CO4	Evaluate interest rate models and bond pricing methodologies.	L5 (Evaluate)
CO5	Utilize computational techniques such as Monte Carlo simulations for financial modeling.	L3 (Apply)

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	1	-	-	-	-	-	2	1
CO2	3	3	2	2	2	-	-	-	-	-	1	1
CO3	3	3	3	3	2	1	-	-	-	-	3	2
CO4	3	3	3	3	1	-	-	-	-	-	2	1
CO5	3	3	3	3	3	-	-	-	-	-	2	2

• **3** = Strong Mapping, **2** = Moderate Mapping, **1** = Slight Mapping, **-** = No Mapping

UNIT-I: Asset Pricing and Risk Management (08)

Fundamental financial concepts: Returns, arbitrage, valuation, and pricing. Asset/Liability management, investment income, capital budgeting, and contingent cash flows. One-period model: Securities, payoffs, and the no-arbitrage principle. Option contracts: Speculation and hedging strategies, CAP Model, Efficient market hypothesis.

UNIT-II: Stochastic Models in Finance (08)

Random Walks and Brownian Motion. Introduction to Stochastic Differential Equations (SDEs): Drift and diffusion. Ito calculus: Ito's Lemma, Ito Integral, and Ito Isometry.

UNIT-III: Interest Rate and Credit Modelling (08)

Interest rate models and bond markets. Short-rate models: Vasicek, Cox-Ingersoll-Ross (CIR), Hull & White models, Credit risk modelling: Hazard function and hazard rate.

UNIT-IV: Fixed-Income Securities and Bond Pricing (08)

Characteristics of fixed-income products: Yield, duration, and convexity. Yield curves, forward rates, and zero-coupon bonds. Stochastic interest rate models and bond pricing PDE. Yield curve fitting and calibration techniques, Mortgage Backed Securities.

UNIT-V: Exotic Options and Computational Finance (08)

Stochastic volatility models and the Feynman-Kac theorem.Exotic options: Barriers, Asians, and Look backs. Monte Carlo methods for derivative pricing, Black-Scholes-Merton model: Derivation and applications.

Textbooks:

1. Ales Cerny, *Mathematical Techniques in Finance: Tools for Incomplete Markets*, Princeton University Press.
2. S.R. Pliska, *Introduction to Mathematical Finance: Discrete-Time Models*, Cambridge University Press.

Reference Books:

1. IoannisKaratzas& Steven E. Shreve, *Methods of Mathematical Finance*, Springer, New York.
2. John C. Hull, *Options, Futures, and Other Derivatives*, Pearson.

Web References:

- MIT– Mathematics for Machine Learning https://ocw.mit.edu
- Coursera – Financial Engineering and Risk Management (Columbia University) https://www.coursera.org/
- National Stock Exchange (NSE) India – Financial Derivatives https://www.nseindia.com/

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40087 – SENSORS AND ACTUATORS FOR ENGINEERING APPLICATIONS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

COURSE OBJECTIVES	
1	To provide exposure to various kinds of sensors and actuators and their engineering applications.
2	To impart knowledge on the basic laws and phenomenon behind the working of sensors and actuators
3	To explain the operating principles of various sensors and actuators
4	To educate the fabrication of sensors
5	To explain the required sensor and actuator for interdisciplinary application

UNIT I Introduction to Sensors and Actuators **9H**

Sensors: Types of sensors: temperature, pressure, strain, active and passive sensors, General characteristics of sensors (Principles only), Deposition: Chemical Vapor Deposition, Pattern: photolithography and Etching: Dry and Wet Etching.

Actuators: Functional diagram of actuators, Types of actuators and their basic principle of working: Pneumatic, Electromagnetic, Piezo-electric and Piezo-resistive actuators, Applications of Actuators.

UNIT II Temperature and Mechanical Sensors **9H**

Temperature Sensors: Types of temperature sensors and their basic principle of working: Thermo-resistive sensors: Thermistors, Thermo-electric sensors: Thermocouples, PN junction temperature sensors

Mechanical Sensors: Types of Mechanical sensors and their basic principle of working: Force sensors: Strain gauges, Tactile sensors, Pressure sensors: Piezoresistive, Variable Reluctance Sensor (VRP).

UNIT III Optical and Acoustic Sensors **9H**

Optical Sensors: Basic principle and working of: Photodiodes, Phototransistors and Photo resistors based sensors, Photomultipliers, Infrared sensors: thermal, Passive Infra-Red, Fiber based sensors and Thermopiles

Acoustic Sensors: Principle and working of Ultrasonic sensors, Piezo-electric resonators, Microphones

UNIT IV Magnetic and Electromagnetic Sensors **9H**

Motors as actuators (linear, rotational, stepping motors), magnetic valves, inductive sensors (LVDT, RVDT, and Proximity), Hall Effect sensors, Magneto-resistive sensors, Magnetostrictive sensors and actuators.

UNIT V Chemical and Radiation Sensors **9H**

Chemical Sensors: Principle and working of Electro-chemical, Thermo-chemical, Gas, pH, Humidity and moisture sensors.

Radiation Sensors: Principle and working of Ionization detectors, Scintillation detectors, Semiconductor radiation detectors and Microwave sensors (resonant, reflection, transmission)

Textbooks:

1. Sensors and Actuators – Clarence W. de Silva, CRC Press, 2nd Edition, 2015
2. Sensors and Actuators, D.A.Hall and C.E.Millar, CRC Press, 1999

Reference Books:

1. Sensors and Transducers- D.Patranabhis, Prentice Hall of India (Pvt) Ltd. 2003
2. Measurement, Instrumentation, and Sensors Handbook-John G.Webster, CRC press 1999
3. Sensors – A Comprehensive Sensors- Henry Bolte, John Wiley.
4. Handbook of modern sensors, Springer, Stefan Johann Rupitsch.

NPTEL course link:

https://onlinecourses.nptel.ac.in/noc21_ee32/preview

	Course Outcomes	Blooms Level
CO1	Classify different types of Sensors and Actuators along with their characteristics	L1,L2
CO2	Summarize various types of Temperature and Mechanical sensors	L1,L2
CO3	Illustrates various types of optical and mechanical sensors	L1,L2
CO4	Analyze various types of Optical and Acoustic Sensors	L1,L2, L3
CO5	Interpret the importance of smart materials in various devices	L1,L2

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1							
CO2	3	3	2	1	1							
CO3	3	3	1	1	1							
CO4	3	2	1	1	-							
CO5	3	3	1	1	-							

1-Slightly, 2-Moderately, 3-Substantially.

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40088 – CHEMISTRY OF NANOMATERIALS AND APPLICATIONS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

Course Objectives	
1	To understand basics and characterization of nanomaterials.
2	To understand synthetic methods of nanomatrials.
3	To apply various techniques for charterization of nanomaterials.
4	To understand Studies of Nano-structured Materials
5	To enumerate the applications of advanced nanomaterials in engineering

Course Outcomes	
CO1	Classify the nanostructure materials; describe scope of nanoscience and importance technology.
CO2	Describe the top-down approach, Explain aerosol synthesis and plasma arc technique, Differentiate chemical vapor deposition method and electrode position method, Discuss about highenergy ball milling.
CO3	Discuss different technique for characterization of nanomaterial, Explain electron microscopy techniques for characterization of nanomaterial, Describe BET method for surface area analysis.
CO4	Explain synthesis and properties and applications of nanaomaterials, Discuss about fullerenes and carbon nanotubes, Differentiate nanomagnetic materials and thermoelectric materials, nonlinear optical materials.
CO5	Illustrate advance engineering applications of Water treatment, sensors, electronic devices, medical domain, civil engineering, chemical engineering, metallurgy and mechanical engineering, food science, agriculture, pollutants degradation.

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

Unit – I

Basics and Characterization of Nanomaterials: Introduction**,** Scope of nanoscience and nanotecnology, nanoscience in nature, classification of nanostructured materials, importance of nanomaterials.

Unit – II

Synthesis of nanomaterials : Top-Down approach**,** Inert gas condensation, arc discharge method, aerosol synthesis, plasma arc technique, ion sputtering, laser ablation, laser pyrolysis, and chemical vapour deposition method, electrodeposition method, highenergy ball milling method.

Synthetic Methods**:** Bottom-Up approach**,** Sol-gel synthesis, microemulsions or reverse micelles, co-precipitation method, solvothermal synthesis, hydrothermal synthesis, microwave heating synthesis and sonochemical synthesis.

UNIT-III

Techniques for characterization: Diffraction technique, spectroscopy techniques, electron microscopy techniques for the characterization of nanomaterials, BET method for surface area analysis, dynamic light scattering for particle size determination.

UNIT-IV

Studies of Nano-structured Materials: Synthesis, properties and applications of the following nanomaterials -fullerenes, carbon nanotubes, 2D-nanomaterial (Graphene), core-shell, magnetic nanoparticles, thermoelectric materials, non-linear optical materials.

UNIT-V

Advanced Engineering Applications of Nanomaterials: Applications of Nano Particle, nanorods, nano wires, Water treatment, sensors, electronic devices, medical domain, civil engineering, chemical engineering, metallurgy and mechanical engineering, food science, agriculture, pollutants degradation.

TEXT BOOKS:

1. **NANO: The Essentials:** T Pradeep, MaGraw-Hill, 2007.
2. **Textbook of Nanoscience and nanotechnology:** B S Murty, P Shankar, BaldevRai, BB Rath and James Murday, Univ. Press, 2012.

REFERENCE BOOKS:

1. Concepts of Nanochemistry; LudovicoCademrtiri and Geoffrey A. Ozin& Geoffrey A. Ozin, Wiley-VCH, 2011.
2. **Nanostructures &Nanomaterials; Synthesis, Properties & Applications:** Guozhong Cao, Imperial College Press, 2007.

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40089 – LITERARY VIBES

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

Course Objectives	
1	To inculcate passion for aesthetic sense and reading skills
2	To encourage respecting others' experiences and creative writing
3	To explore emotions, communication skills and critical thinking
4	To educate how books serve as the reflection of history and society
5	To provide practical wisdom and duty of responding to events of the times

Course Outcomes		Blooms Level
CO1	Identify genres, literary techniques and creative uses of language in literary texts.	L1, L2
CO2	Explain the relevance of themes found in literary texts to contemporary, personal and cultural values and to historical forces.	L1, L2
CO3	Apply knowledge and understanding of literary texts when responding to others' problems and their own and make evidence-based arguments.	L3
CO4	Analyze the underlying meanings of the text by using the elements of literary texts.	L4
CO5	Evaluate their own work and that of others critically.	L5
CO6	Develop as creative, effective, independent and reflective students who are able to make informed choices in process and performance.	L3

UNIT I: Poetry

1. Ulysses- Alfred Lord Tennyson
2. Ain't I woman?-Sojourner Truth
3. The Second Coming-W.B. Yeats
4. Where the Mind is Without Fear-Rabindranath Tagore

UNIT II: Drama: *Twelfth Night*- William Shakespeare

1. Shakespeare -life and works
1. Plot & sub-plot and Historical background of the play
2. Themes and Criticism
3. Style and literary elements
4. Characters and characterization

UNIT III: Short Story

1. The Luncheon - Somerset Maugham
2. The Happy Prince-Oscar Wild
3. Three Questions – Leo Tolstoy
4. Grief –Antony Chekov

UNIT IV: Prose: Essay and Autobiography

1. My struggle for an Education-Booker T Washington
2. The Essentials of Education-Richard Livingston
3. The story of My Life-Helen Keller
4. Student Mobs-JB Priestly

UNIT V: Novel: *Hard Times*- Charles Dickens

1. Charles Dickens-Life and works
2. Plot and Historical background of the novel
3. Themes and criticism
4. Style and literary elements
5. Characters and characterization

Text Books:

1. Charles Dickens**.***Hard Times*.(Sangam Abridged Texts) Vantage Press, 1983
2. DENT JC.William Shakespeare. Twelfth Night**.** Oxford University Press,2016.

References:

1. WJ Long.*History of English Literature***,** Rupa Publications India; First Edition (4 October 2015)

2. RK Kaushik And SC Bhatia. Essays, Short Stories and One Act Plays, Oxford University Press .2018.

3. Dhanvel, SP. *English and Soft Skills*, Orient Blackswan,2017.

4. New Horizon, Pearson publications, New Delhi 2014

5. Vimala Ramarao, *Explorations Volume*-II, Prasaranga Bangalore University,2014**.**

6. Dev Neira, Anjana & Co. *Creative Writing: A Beginner's Manual.*Pearson India, 2008.

Online Resources

https://www.litcharts.com/poetry/alfred-lord-tennyson/ulysses

https://www.litcharts.com/lit/ain-t-i-a-woman/summary-and-analysis

https://englishliterature.education/articles/poetry-analysis/the-second-coming-by-w-b-yeats-critical-analysis-summary-and-line-by-line-explanation/#google_vignette

https://sirjitutorials.com/where-the-mind-is-without-fear-poem-notes-explanation/

https://www.litcharts.com/lit/twelfth-night/themes

https://smartenglishnotes.com/2021/11/28/the-luncheon-summary-characters-themes-and-irony/

COURSE STRUCTURE

VIII – SEMESTER

PROGRAMME CURRICULUM STRUCTURE UNDER R23 REGULATIONS

B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING

VIII SEMESTER (IV YEAR)									
Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A40437a	Internship	PW	-	-	-	4	100	-	100
A40437b	Project	PW	-	-	-	8	30	70	100
		TOTAL	-	-	-	12	130	70	200