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 - 518452, Andhra Pradesh

BACHELOR OF TECHNOLOGY

ACADEMIC REGULATIONS
GPCET – R23

B.Tech Regular Four Year Degree Programme
(for the batches admitted from the academic year 2023- 2024)
&
B.Tech (Lateral Entry Scheme)
(for the 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 Ananthapur**).

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 afailuregrade 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.

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 - 518452, Andhra Pradesh

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 Recomendation (%)
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
S.No	**Broad**	**Course Category**	**Description**

	Classification		
2	Core Courses	Professional Core Courses (PC)	Includes subjects related to the parent discipline / department / branch of engineering
3	Elective Courses	Professional Elective Courses (PE)	Includes elective subjects related to the parent discipline/department/ branch of Engineering
		Open Elective Courses (OE)	Elective subjects which include interdisciplinary subjects or subjects in an area outside the parent discipline/ department/ branch of Engineering
		Domain specific Skill Enhancement Courses (SEC)	Interdisciplinary / Job-oriented / Domain courses which are relevant to the industry
4	Project & Internships	Project	B.Tech. Project or 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 40% attendance in each subject and 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.,

$$\mathbf{SGPA = \Sigma(Ci \times Gi)/\Sigma Ci}$$

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.,

$$\mathbf{CGPA = \Sigma(Ci \times Si)/\Sigma Ci}$$

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, 120 credits.

(b) Entry Policy:

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

Note: The 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 conduct mentioned in S.No. 7 to S.No. 9	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 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).

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY: KURNOOL (AUTONOMOUS)

PROGRAMME CURRICULUM STRUCTURE UNDER R23 REGULATIONS

B. TECH – COMPUTER SCIENCE AND ENGINEERING – ARTIFICAL INTELLIGENCE

INDUCTION PROGRAM

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

PROGRAMME CURRICULUM STRUCTURE UNDER R23 REGULATIONS

B. TECH – COMPUTER SCIENCE AND ENGINEERING - ARTIFICAL INTELLIGENCE

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
A40504	Data structures	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
A40505	Data structures 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 (AUTONOMOUS)

PROGRAMME CURRICULUM STRUCTURE UNDER R23 REGULATIONS
B. TECH – COMPUTER SCIENCE AND ENGINEERING- ARTIFICIAL INTELLIGENCE (CAI)

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
A40020	Probability & Statistics	BS	3	0	0	3	30	70	100
A40018	Universal Human Values 2- Understanding Harmony	HSMC	2	1	0	3	30	70	100
A43101	Principles of Artificial Intelligence	ES	3	0	0	3	30	70	100
A40506	Advanced Data Structures & Algorithms Analysis	PC	3	0	0	3	30	70	100
A40507	Database Management Systems	PC	3	0	0	3	30	70	100
A40508	Advanced Data Structures and Algorithms Analysis Lab	PC	0	0	3	1.5	30	70	100
A40509	Database Management Systems 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	2	8	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	Managerial Economics and Financial Analysis	HSMC	2	0	0	2	30	70	100
A40017	Discrete Mathematics & Graph Theory	BS	3	0	0	3	30	70	100
A43102	Machine Learning	PC	3	0	0	3	30	70	100
A40512	Object-Oriented Programming Through JAVA	PC	3	0	0	3	30	70	100
A40406	Digital Logic and Computer Organization	PC	3	0	0	3	30	70	100
A43103	AI & ML Lab	PC	0	0	3	1.5	30	70	100
A40515	Object-Oriented Programming Through JAVA Lab	PC	0	0	3	1.5	30	70	100
A40516	Full Stack Development-1	SEC	0	1	2	2	30	70	100
A40023	Design Thinking & 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									

PROGRAMME CURRICULUM STRUCTURE UNDER R23 REGULATIONS

B. TECH – COMPUTER SCIENCE AND ENGINEERING- ARTIFICIAL INTELLIGENCE (CAI)

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
A43104	Natural Language Processing	PC	3	0	0	3	30	70	100
A43105	Operating Systems & System Programming	PC	3	0	0	3	30	70	100
A43106	Computer Vision & Image Processing	PC	3	0	0	3	30	70	100
A43107a A43107b A43107c A43107d A43107e A43107f A43107g A43107h A40520e	**Professional Elective-I** 1. Ethical Hacking 2. Advanced R Programming for Data Analytics in Business 3. Software Testing 4. Data Visualization 5. Soft Computing 6. Exploratory Data Analysis with Python 7. Computational Intelligence 8. Responsible and Safe AI Systems 9. Privacy and Security in Online Social Media	PE	3	0	0	3	30	70	100
	Open Elective- I	OE	3	0	0	3	30	70	100
A43108	Computer Vision & NLP Lab	PC	0	0	3	1.5	30	70	100
A43109	AI & System Programming Lab	PC	0	0	3	1.5	30	70	100
A40523	Full Stack Development-II	SEC	0	1	2	2	30	70	100
A40032	Tinkering Lab	BS&H	0	0	2	1	30	70	100
A43110	Evaluation of Community Service Internship	PW	-	-	-	2	100	-	100
A40536	Introduction to Quantum Technologies and Applications	SEC	3	0	0	3	30	70	100
TOTAL			**18**	**1**	**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
A40471	Electronic Circuits	3-0-0	3	ECE
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
A40092	Management Information System	3-0-0	3	H&S

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

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
A43111	Cloud Computing for AI	PC	3	0	0	3	30	70	100
A43112	Big Data Analytics & AI Applications	PC	3	0	0	3	30	70	100
A43113	Full Stack AI Development	PC	3	0	0	3	30	70	100
 A43114a A43114b A43114c A43114d A43114e A43114f	**Professional Elective-II** 1. Graph Neural Networks 2. Recommender Systems 3. Predictive Analytics 4. Blockchain for AI 5. Deep Learning for AI 6. Deep Learning	PE	3	0	0	3	30	70	100
 A43115a A43115b A43115c A40528f A43115d A40527a	**Professional Elective-III** 1. AI for Finance 2. Quantum Computing 3. Social Network Analysis 4. Social Networks 5. Cybersecurity & AI-driven Threat Detection 6. Object Oriented System Development using UML, Java and Patterns	PE	3	0	0	3	30	70	100
	Open Elective- II	OE	3	0	0	3	30	70	100
A43116	Big Data & Cloud Computing Lab	PC	0	0	3	1.5	30	70	100
A43117	Full Stack AI Lab	PC	0	0	3	1.5	30	70	100
A40021	Soft skills	SEC	0	1	2	2	30	70	100
A40033	Technical Paper Writing & IPR	MC	2	0	0	-	100*	-	100*
TOTAL			20	1	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
A40472	Digital Electronics	3-0-0	3	ECE
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
A40093	Principles of Management	3-0-0	3	H&S

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL
(AUTONOMOUS)

PROGRAMME CURRICULUM STRUCTURE UNDER R23 REGULATIONS

B. TECH – COMPUTER SCIENCE AND ENGINEERING- ARTIFICIAL INTELLIGENCE (CAI)

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
A43118	Generative AI & Prompt Engineering	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
A43119a A43119b A43119c A43119d A43119e	**Professional Elective-IV** 1. Explainable AI & Model Interpretability 2. AI for Robotics 3. AI in Cybersecurity 4. AI-driven Software Engineering & DevOps 5. High Performance Computing	PE	3	0	0	3	30	70	100
A43120a A43120b A43120c A43120d	**Professional Elective-V** 1. AI for Smart Cities & IoT Systems 2. MLOps & AI Model Deployment 3. Data Wrangling 4. Healthcare AI	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
A43121	Prompt Engineering	SEC	0	1	2	2	30	70	100
A40037	Gender Sensitization	MC	2	0	0	-	100*	-	100*
A43122	Evaluation of Industry Internship	PW	-	-	-	2	100	-	100
TOTAL			19	1	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
A40473	Microprocessors and Microcontrollers	3-0-0	3	ECE
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	Electric Vehicles	3-0-0	3	EEE
A40374	Total Quality Management	3-0-0	3	ME
A40474	Transducers and Sensors	3-0-0	3	ECE
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

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
A43123a	Internship	PW	-	-	-	4	100	-	100
A43123b	Project		-	-	-	8	30	70	100
TOTAL			-	-	-	12	130	70	200

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL
(AUTONOMOUS)

COURSE STRUCTURE

I- Semester

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

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

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: Develop and use of matrix algebra techniques that are needed by engineers for practicalapplications.

CO2: Utilize mean value theorems to real life problems.

CO3: Familiarize with functions of several variables which is useful in optimization.

CO4: Learn important tools of calculus in higher dimensions.

CO5: Familiarize with double and triple integrals of functions of several variables in two dimensions using Cartesian and polar coordinates and in three dimensions using cylindrical and spherical coordinates.

3. . Course Syllabus

UNIT-I **8hrs**

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 **8hrs**

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 canonicalforms by Orthogonal Transformation.

UNIT III

Calculus **11hrs**

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(with out proof) problems and applications on the above thereom.

UNIT IV **11hrs**

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 variable, jacobians, Functional dependence, maxima and minima of functionsof two variables, method of Lagrange multipliers.

UNIT V **11hrs**

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, 10th Edition.

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 (AUTONOMOUS)

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:

CO 1	Interpret the properties of light waves and its interaction of energy with the matter
CO 2	Apply the concepts of crystallography for the determination of crystal structures
CO 3	Identify the suitable dielectric and magnetic material for the Engineering
CO 4	Apply the fundamentals of Quantum Mechanics to one dimensional motion of particles
CO 5	Determine the type of semiconductor
CO 6	Interpret the difference normal conductor and Super conductor

3. . Course Syllabus

UNIT-I **16 hrs**

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 **10 hrs**

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 8 hrs

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 **8 hrs**

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 **6 hrs**

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.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

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:

CO 1	Operate optical instruments like Travelling microscope and spectrometer
CO 2	Understand the concepts of interference by finding thickness of paper, radius of curvature of Newton's rings
CO 3	Interpret the concept of diffraction by the determination of wavelength of different colors of white light and dispersive power of grating
CO 4	Plot the intensity of the magnetic field of circular coil carrying current with varying distance and B-H curve
CO 5	Evaluate the acceptance angle of an optical fiber and numerical aperture
CO 6	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 (AUTONOMOUS)

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.

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 (AUTONOMOUS)

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: Analyse 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 andArguments, 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 of implementation**.**

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

5. Reference Books:

1. Computing fundamentals and C Programming, Balagurusamy, E., McGraw-Hill Education, 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 (AUTONOMOUS)

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 series of finite steps both using textual notation and graphic notation.

Suggested Experiments /Activities:
Tutorial 2: Problem-solving using Algorithms and Flow charts.

Lab 1: Converting algorithms/flow charts into C Source code.
Developing the algorithms/flowcharts for the following sample programs

i) Sum and average of 3 numbers
ii) Conversion of Fahrenheit to Celsius and vice versa
iii) Simple interest calculation

WEEK 3

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

Suggested Experiments/Activities:

Tutorial 3: Variable types and type conversions:

Lab 3: Simple computational problems using arithmetic expressions.

i) Finding the square root of a given number
ii) Finding compound interest
iii) Area of a triangle using 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 eachof 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 usedas 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 alongwith 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 Eulers theorem.

i) Write a C function to calculate NCR value.
ii) Write a C function to find the length of a string.
iii) Write a C function to transpose of a matrix.
iv) Write a C function to demonstrate numerical integration of differential equations using Euler'smethod

WEEK 12:

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

Suggested Experiments/Activities:

Tutorial 12: Recursion, the structure of recursive calls

Lab 12: Recursive functions

i) Write a recursive function to generate Fibonacci series.
ii) Write a recursive function to find the lcm of two numbers.
iii) Write a recursive function to find the factorial of a number.
iv) Write a C Program to implement Ackermann function using recursion.
v) Write a recursive function to find the sum of series.

WEEK 13:

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

Suggested Experiments/Activities:

Tutorial 13: Call by reference, dangling pointers

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

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

WEEK14:

Objective: To understand data files and file handling with various file I/O functions. Explore thedifferences 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

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
(AUTONOMOUS)

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

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.

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."

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 (AUTONOMOUS)

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

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

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.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

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

2. 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.**

4. Basic Mathematics
5. 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

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.

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
(AUTONOMOUS)

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 personaltalents and skills
ii) Conducting orientations programs for the students –future plans-activities-releasingroad map etc.
iii) Displaying success stories-motivational biopics- award winning movies on societalissues 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- Surveyin the village, identification of problems- helping them to solve via media- authorities-experts-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 PopulationEducation.
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, DirectorateGeneral 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.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL
(AUTONOMOUS)

COURSE STRUCTURE

II- Semester

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

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

Course Description

Course Objectives:

The main objective of introducing this course, *Communicative English,* is to facilitate effectivelistening, 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

Course Outcomes (COs)

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

CO1 Remember the concepts which the student has learnt previously and identifying their connection

CO2 Understand the structure of the sentence.

CO3 Apply grammatically correct structures in oral and written communication.

CO4 Analyze complex technical ideas with precision to interpret facts in a given text.

CO5 Write summaries and essays based on global comprehension of the texts.

CO6 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 of relevant 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

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

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.

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 (AUTONOMOUS)

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

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

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

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

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 (AUTONOMOUS)

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.

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.

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 (AUTONOMOUS)

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

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 (AUTONOMOUS)

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

4. 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

5. 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 reducibleto 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, 10th Edition.

Reference Books:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, Dennis G. Zill and Warren S. Wright, Jones andBartlett, 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 (AUTONOMOUS)

A40101 - BASIC CIVIL AND MECHANICAL 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

PART A: BASIC CIVIL ENGINEERING

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. 38th Edition.
4. Highway Engineering, S.K.Khanna, C.E.G. Justo and Veeraraghavan, Nemchand and Brothers Publications 2019. 10th 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 (AUTONOMOUS)

A40504 - DATA STRUCTURES

(COMMON TO CSE & CAI)

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

2.Course Outcomes:

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

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

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

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

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

CO5: Devise novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees.

CO6: Recognize scenarios where hashing is advantageous, and design hash-based solutions forspecific problems.

3. Course Syllabus

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

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

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

UNIT V

Trees: Introduction to Trees, Binary Search Tree – Insertion, Deletion & Traversal

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

4. Textbooks:

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

Reference Books:

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A40505 - DATA STRUCTURES 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 strengthen the ability of the students to identify and apply the suitable datastructure for the given real-world problem. It enables them to gain knowledge in practical applications of data structures.

2. Course Outcomes:

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

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

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

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

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

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

3. Course Syllabus

List of Experiments:

Exercise 1: Array Manipulation

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

Exercise 2: Linked List Implementation

i) Implement a singly linked list and perform insertion and deletion operations.
ii) Develop a program to reverse a linked list iteratively and recursively.
iii) Solve problems involving linked list traversal and manipulation.

Exercise 3: Linked List Applications

i) Create a program to detect and remove duplicates from a linked list.
ii) Implement a linked list to represent polynomials and perform addition.

Implement a double-ended queue (deque) with essential operations.

Exercise 4: Double Linked List Implementation

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

Exercise 5: Stack Operations

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

Exercise 6: Queue Operations

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

Exercise 7: Stack and Queue Applications

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

Exercise 8: Binary Search Tree

i) Implementing a BST using Linked List.
ii) Traversing of BST.

Exercise 9: Hashing

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

4. Textbooks:

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

Reference Books:

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

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 (AUTONOMOUS)

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

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

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.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL
(AUTONOMOUS)

COURSE STRUCTURE

III- Semester

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40020-Probability & Statistics

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:

CO1 Acquire knowledge in finding the analysis of the data quantitatively or categorically and various statistical elementary tools. L2, L3

CO2 Develop skills in designing mathematical models involving probability, random variables and the critical thinking in the theory of probability and its applications in real life problems. L3, L5

CO3 Apply the theoretical probability distributions like binomial, Poisson, and Normal in the relevant application areas. L3

CO4 Analyze to test various hypotheses included in theory and types of errors for large samples. L2, L3

CO5 Apply the different testing tools like t-test, F-test, chi-square test to analyze the relevant real-life problems. L3,L5

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

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

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

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

UNIT V Small sample tests Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test), $\chi 2$ - test for goodness of fit, $\chi 2$ - test for independence of attributes. Textbooks: 1. Miller and Freunds, Probability and Statistics for Engineers,7/e, Pearson, 2008. 2. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

Reference Books:

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

Learning Resources:

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

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40018--Universal Human Values 2-Understanding Harmony

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	1	0	28	14	0	3	30	70	100

Course Objectives:

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

Course Outcomes:

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

Course Topics

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

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

UNIT I Introduction to Value Education (6 lectures and 3 tutorials for practice session)

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

Lecture 2: Understanding Value Education

Tutorial 1: Practice Session PS1 Sharing about Oneself

Lecture 3: self-exploration as the Process for Value Education

Lecture4: Continuous Happiness and Prosperity – the Basic Human Aspirations

Tutorial 2: Practice Session PS2 Exploring Human Consciousness

Lecture 5: Happiness and Prosperity – Current Scenario

Lecture 6: Method to Fulfill the Basic Human Aspirations

Tutorial 3: Practice Session PS3 Exploring Natural Acceptance

UNIT II Harmony in the Human Being (6 lectures and 3 tutorials for practice session)

Lecture 7: Understanding Human being as the Co-existence of the self and the body.

Lecture 8: Distinguishing between the Needs of the self and the body

Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body.

Lecture 9: The body as an Instrument of the self

Lecture 10: Understanding Harmony in the self

Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self

Lecture 11: Harmony of the self with the body

Lecture 12: Programme to ensure self-regulation and Health

Tutorial 6: Practice Session PS6 Exploring Harmony of self with the body

UNIT III Harmony in the Family and Society (6 lectures and 3 tutorials for practice session)

Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction

Lecture 14: 'Trust' – the Foundational Value in Relationship

Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust

Lecture 15: 'Respect' – as the Right Evaluation

Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect

Lecture 16: Other Feelings, Justice in Human-to-Human Relationship

Lecture 17: Understanding Harmony in the Society

Lecture 18: Vision for the Universal Human Order

Tutorial 9: Practice Session PS9 Exploring Systems to fulfil Human Goal

UNIT IV Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session)

Lecture 19: Understanding Harmony in the Nature

Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature

Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature

Lecture 21: Realizing Existence as Co-existence at All Levels

Lecture 22: The Holistic Perception of Harmony in Existence

Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence.

UNIT V Implications of the Holistic Understanding – a Look at Professional Ethics (6 lectures and 3 tutorials for practice session)

Lecture 23: Natural Acceptance of Human Values

Lecture 24: Definitiveness of (Ethical) Human Conduct

Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct

Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order

Lecture 26: Competence in Professional Ethics

Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education

Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies

Lecture 28: Strategies for Transition towards Value-based Life and Profession

Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

Practice Sessions for UNIT I – Introduction to Value Education

PS1 Sharing about Oneself

PS2 Exploring Human Consciousness

PS3 Exploring Natural Acceptance

Practice Sessions for UNIT II – Harmony in the Human Being

PS4 Exploring the difference of Needs of self and body

PS5 Exploring Sources of Imagination in the self

PS6 Exploring Harmony of self with the body

Practice Sessions for UNIT III – Harmony in the Family and Society

PS7 Exploring the Feeling of Trust

PS8 Exploring the Feeling of Respect

PS9 Exploring Systems to fulfil Human Goal

Practice Sessions for UNIT IV – Harmony in the Nature (Existence)

PS10 Exploring the Four Orders of Nature

PS11 Exploring Co-existence in Existence

Practice Sessions for UNIT V – Implications of the Holistic Understanding – a Look at Professional Ethics

PS12 Exploring Ethical Human Conduct

PS13 Exploring Humanistic Models in Education

PS14 Exploring Steps of Transition towards Universal Human Order

READINGS:

Textbook and Teachers Manual

a. The Textbook

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

b. The Teacher's Manual

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

Reference Books

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

Mode of Conduct:

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

Tutorial hours are to be used for practice sessions.

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

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

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

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses. This course is to be taught by faculty from every teaching department, not exclusively by any one department.

Teacher preparation with a minimum exposure to at least one 8-day Faculty Development Program on Universal Human Values is deemed essential.

Online Resources:

1.https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf
2.https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf
3. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf
4. https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-S2%20Respect%20July%2023.pdf
5. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf
6. https://fdp-si.aicte-india.org/download/FDPTeachingMaterial/3-days%20FDP-SI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-S2A%20Und%20Nature-Existence.pdf

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A43101– Principles of Artificial Intelligence

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 exploration of AI principles, focusing on intelligent agents, search strategies, and game playing techniques. It delves into knowledge representation, including predicate logic and semantic networks, and addresses reasoning under uncertainty with probabilistic methods. The course also covers logical reasoning, learning from observations, and the architecture and roles of expert systems. Through this curriculum, students will acquire a deep understanding of AI methods, problem-solving techniques, and the development of advanced AI systems.

Pre-requisite:

1. Knowledge in Computer Programming.
2. A course on "Mathematical Foundations of Computer Science".

Background in linear algebra, data structures and algorithms, and probability.

2. Course Objectives:

1. The student should be made to study the concepts of Artificial Intelligence.
2. The student should be made to learn the methods of solving problems using Artificial Intelligence.

1. The student should be made to introduce the concepts of Expert Systems.
2. To understand the applications of AI, namely game playing, theorem proving, and machine learning.
3. To learn different knowledge representation techniques.

3. Course Syllabus:

UNIT - I

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

UNIT - II

Searching- Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A* ,AO*

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

UNIT - III

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

UNIT - IV

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

UNIT - V

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

4. Books and Materials

Textbooks:

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

Reference Books:

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

Online Learning Resources:

7. https://ai.google/
8. https://swayam.gov.in/nd1_noc19_me71/preview

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40506 – Advanced Data Structures & Algorithm 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:

Course Overview:

This course provides an in-depth understanding of algorithm analysis, essential data structures, and advanced problem-solving techniques. The course begins with foundational concepts in algorithm analysis, focusing on space and time complexity and asymptotic notations. It progresses to explore various advanced data structures such as AVL trees, B-trees, and heap trees, along with their operations and applications. The course delves into graph theory, discussing terminology, representations, and essential algorithms for graph traversal and connectivity. Additionally, it covers fundamental algorithm design paradigms such as divide and conquer, the greedy method, dynamic programming, backtracking, and branch and bound, applying these techniques to classic problems like sorting, shortest paths, and the knapsack problem.

Pre-requisite:

1 A solid understanding of basic data structures (arrays, linked lists, stacks, queues, binary trees).

2 Knowledge of fundamental algorithms (basic sorting and searching algorithms).

3 Familiarity with basic graph theory concepts.

4 Proficiency in a programming language (such as Python, Java, or C++).

5 Understanding of mathematical concepts related to algorithm analysis (basic combinatorics, probability, and discrete mathematics).

2. Course Objectives:

The main objectives of the course is to

1.provide knowledge on advance data structures frequently used in Computer Science domain

2.Develop skills in algorithm design techniques popularly used

3.Understand the use of various data structures in the algorithm design

3. Course Syllabus:

UNIT – I:

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

UNIT – II:

Heap Trees (Priority Queues) – Min and Max Heaps, Operations and Applications

Graphs – Terminology, Representations, Basic Search and Traversals, Connected Components and Biconnected Components, applications

Divide and Conquer: The General Method, Quick Sort, Merge Sort, Strassen's matrix multiplication, Convex Hull

UNIT – III:

Greedy Method: General Method, Job Sequencing with deadlines, Knapsack Problem, Minimum cost spanning trees, Single Source Shortest Paths

Dynamic Programming: General Method, All pairs shortest paths, Single Source Shortest Paths – General Weights (Bellman Ford Algorithm), Optimal Binary Search Trees, 0/1 Knapsack, String Editing, Travelling Salesperson problem

UNIT – IV:

Backtracking: General Method, 8-Queens Problem, Sum of Subsets problem, Graph Coloring, 0/1 Knapsack Problem

Branch and Bound: The General Method, 0/1 Knapsack Problem, Travelling Salesperson problem

UNIT – V:

NP Hard and NP Complete Problems: Basic Concepts, Cook's theorem

NP Hard Graph Problems: Clique Decision Problem (CDP), Chromatic Number Decision Problem (CNDP), Traveling Salesperson Decision Problem (TSP)

NP Hard Scheduling Problems: Scheduling Identical Processors, Job Shop Scheduling

4. Books and Materials

Textbooks:

1. Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni, Sartaj; Mehta, Dinesh 2nd Edition Universities Press

2. Computer Algorithms/C++ Ellis Horowitz, SartajSahni, SanguthevarRajasekaran2nd Edition University Press

Reference Books:

1. Data Structures and program design in C, Robert Kruse, Pearson Education Asia

2.An introduction to Data Structures with applications, Trembley & Sorenson, McGraw Hill

3.The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth, Addison-Wesley, 1997.

4.Data Structures using C & C++: Langsam, Augenstein&Tanenbaum, Pearson, 1995 Algorithms + Data Structures & Programs:, N.Wirth, PHI

5.Fundamentals of Data Structures in C++: Horowitz Sahni& Mehta, Galgottia Pub.

6.Data structures in Java:, Thomas Standish, Pearson Education Asia

Online Learning Resources:

7.https://www.tutorialspoint.com/advanced_data_structures/index.asp

8.http://peterindia.net/Algorithms.html

9.Abdul Bari,1. Introduction to Algorithms (youtube.com)

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40507 – Database Management 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:

This course provides a comprehensive understanding of database concepts, architectures, and applications. It starts with foundational knowledge about database systems, highlighting their characteristics, advantages, and differences from traditional file systems. The course covers various data models with a particular focus on the Entity-Relationship (ER) model and relational model, including essential concepts like schemas, instances, and three-tier architecture. Students will learn SQL for database manipulation and querying, and delve into schema refinement through normalization techniques.

Pre-requisite:

- **Basic Computer Knowledge:** Familiarity with basic computer concepts and terminology.
- **Programming Fundamentals:** Understanding of basic programming concepts, preferably in a language such as Python, Java, or C++.
- **Mathematical Foundations:** Basic knowledge of set theory, logic, and elementary algebra.
- **Introductory Database Concepts:** Some exposure to database terminology and concepts, though not mandatory. An introductory course in computer science would be beneficial.

2.Course Objectives:

The main objectives of the course is to

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

3.Course Syllabus:

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

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

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

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

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

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

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

4.Books and Materials:

Text Books:

1. Database Management Systems, 3rd edition, Raghurama Krishnan, Johannes Gehrke,

TMH (For Chapters 2, 3, 4)

2. Database System Concepts,5th edition, Silberschatz, Korth, Sudarsan,TMH (For Chapter 1 and Chapter 5)

Reference Books:

1.Introduction to Database Systems, 8thedition, C J Date, Pearson.

2.Database Management System, 6th edition, RamezElmasri, Shamkant B. Navathe, Pearson

3.Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

Web-Resources:

1.https://nptel.ac.in/courses/106/105/106105175/

2.https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01275806667282022456_shared/overview

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40508 – Advanced Data Structures & Algorithm Analysis 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 course provides an in-depth exploration of complex data structures and algorithms, focusing on practical implementation and problem-solving techniques. The course covers advanced tree structures such as AVL trees, B-Trees, and Heap Trees, and includes graph traversal methods, sorting techniques, and algorithms for minimum cost spanning trees and shortest paths. Students will tackle classic problems like the 0/1 Knapsack Problem, Travelling Salesperson Problem, and N-Queens Problem, using various strategies including dynamic programming, greedy algorithms, and backtracking. The course also covers optimal binary search trees and job sequencing. Through hands-on experiments and sample programs, students will gain proficiency in implementing and analysing advanced algorithms, enhancing their problem-solving skills and understanding of algorithmic efficiency.

Pre-requisite:

1.Basic knowledge of data structures and algorithms.

2. Proficiency in a programming language, preferably Java or C++.

3.Understanding of fundamental concepts in computer science, including recursion, sorting, and searching.

4 Familiarity with basic mathematical concepts and discrete mathematics.

2.Course Objectives:

The objectives of the course is to

1. acquire practical skills in constructing and managing Data structures

2.apply the popular algorithm design methods in problem-solving scenarios

3.Course Syllabus:

Experiments covering the Topics:

- Operations on AVL trees, B-Trees, Heap Trees
- Graph Traversals
- Sorting techniques
- Minimum cost spanning trees

- Shortest path algorithms
- 0/1 Knapsack Problem
- Travelling Salesperson problem
- Optimal Binary Search Trees
- N-Queens Problem
- Job Sequencing

Sample Programs:

1. Construct an AVL tree for a given set of elements which are stored in a file. And implement insert and delete operation on the constructed tree. Write contents of tree into a new file using in-order.
2. Construct B-Tree an order of 5 with a set of 100 random elements stored in array. Implement searching, insertion and deletion operations.
3. Construct Min and Max Heap using arrays, delete any element and display the content of the Heap.
4. Implement BFT and DFT for given graph, when graph is represented by
   a) Adjacency Matrix b) Adjacency Lists
5. Write a program for finding the bi-connected components in a given graph.
6. Implement Quick sort and Merge sort and observe the execution time for various input sizes (Average, Worst and Best cases).
7. Compare the performance of Single Source Shortest Paths using Greedy method when the graph is represented by adjacency matrix and adjacency lists.
8. Implement Job sequencing with deadlines using Greedy strategy.
9. Write a program to solve 0/1 Knapsack problem Using Dynamic Programming.
10. Implement N-Queens Problem Using Backtracking.
11. Use Backtracking strategy to solve 0/1 Knapsack problem.
12. Implement Travelling Sales Person problem using Branch and Bound approach.

4.Books and Materials:

Reference Books:

1. Fundamentals of Data Structures in C++, Horowitz Ellis, SahniSartaj, Mehta, Dinesh, 2ndEdition, Universities Press
2. Computer Algorithms/C++ Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, 2ndEdition, University Press
3. Data Structures and program design in C, Robert Kruse, Pearson Education Asia

4. An introduction to Data Structures with applications, Trembley& Sorenson, McGraw Hill

Online Learning Resources:

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

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40509 - Database Management Systems 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 course focuses on Database Management Systems (DBMS) and SQL programming, covering essential concepts, SQL commands, and advanced database operations. It includes practical sessions on SQL queries, PL/SQL programming, stored procedures, functions, triggers, and database connectivity using JDBC/ODBC. Students will learn how to design databases, manipulate data, and manage database objects effectively.

Pre-requisite:

- **Basic Database Concepts:** Understanding of basic database concepts such as tables, rows, columns, keys (primary, foreign), and constraints.
- **SQL Knowledge:** Familiarity with SQL commands (SELECT, INSERT, UPDATE, DELETE) and basic SQL queries is necessary.
- **Programming Skills:** Proficiency in programming languages like Java is required for JDBC programming.
- **Understanding of Data Models:** Basic knowledge of data models (e.g., relational model) and database design principles would be beneficial.

Course Objectives:

This Course will enable students to

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

3.Course Syllabus:

Experiments covering the topics:

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

- Database connectivity- ODBC/JDBC

Sample Experiments:

1. Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)
5.

   Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)

   i. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-APPLICATION ERROR.
8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
10. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.

11. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers
12. Create a table and perform the search operation on table using indexing and non-indexing techniques.
13. Write a Java program that connects to a database using JDBC
14. Write a Java program to connect to a database using JDBC and insert values into it
15. Write a Java program to connect to a database using JDBC and delete values from it

4.Books and Materials:

Text Books/Suggested Reading:

1. Oracle: The Complete Reference by Oracle Press

2. Nilesh Shah, "Database Systems Using Oracle", PHI, 2007

2. Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

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:

Course Overview:

This course offers a thorough introduction to the Python programming language, emphasizing both theoretical understanding and practical application. The course begins with the history and fundamentals of Python, including installation and basic programming constructs. Students will learn to work with control flow statements, functions, strings, lists, dictionaries, tuples, and sets. The course also covers file handling, object-oriented programming, and an introduction to data science with modules like NumPy and Pandas. Through hands-on experiments, students will gain proficiency in writing Python programs to solve real-world problems, manipulating data, and creating structured and efficient code. This course is designed to provide a strong foundation in Python, preparing students for more advanced topics in data science and software development.

Pre-requisite:

1. Basic knowledge of programming concepts.

2.Familiarity with any programming language (e.g., C, C++, Java).

3.Understanding of fundamental concepts in computer science, including variables, control structures, and basic algorithms.

4.Basic mathematical skills for understanding algorithms and problem-solving techniques.

2.Course Objectives:

The main objectives of the course are to

1.Introduce core programming concepts of Python programming language.

2.Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries

3. Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these

3.Course Syllabus:

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

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

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

Sample Experiments:

1.Write a program to find the largest element among three Numbers.

2.Write a Program to display all prime numbers within an interval

3.Write a program to swap two numbers without using a temporary variable.

4.Demonstrate the following Operators in Python with suitable examples.

i) Arithmetic Operators ii) Relational Operators iii) Assignment Operatorsiv) 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:

1.Write a program to define a function with multiple return values.

2.Write a program to define a function using default arguments.

3.Write a program to find the length of the string without using any library functions.

4.Write a program to check if the substring is present in a given string or not.

5.Write a program to perform the given operations on a list:

i. Addition ii. Insertion iii. slicing

6.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:

1.Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples.

2.Write a program to count the number of vowels in a string (No control flow allowed).

2. Write a program to check if a given key exists in a dictionary or not.
3. Write a program to add a new key-value pair to an existing dictionary.
4. 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:

1.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.

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

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

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

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

6.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:

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

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

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

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

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

6.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

7.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.

4.Books and Materials:

Reference Books:

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

2.Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2ndEdition, Pearson, 2024

3.Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

Online Learning Resources/Virtual Labs:

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL
(AUTONOMOUS)

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*	-	100*

1. Course Description

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:

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..

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.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL
(AUTONOMOUS)

COURSE STRUCTURE

IV- Semester

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

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

The course is designed in such a way that it gives an overview of concepts of managerial economics financial analysis. Managerial economics enables students to understand micro environment in which markets operate how price determination is done under different kinds of competitions. Financial analysis gives clear idea about concepts and conversions accounting procedures along with introducing students to fundamentals of ratio analysis and interpretation of financial statements.

Course Pre/corequisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

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

CO1. Define the concepts related to Managerial Economics, financial accounting and management

CO2. Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets

CO3. Apply the Concept of Production cost and revenues for effective Business decision

CO4. Analyse how to invest their capital and maximize returns

CO5. Evaluate the capital budgeting techniques

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

Text Book(s)

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

Reference Book(s)

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:

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

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40017-- Discrete Mathematics & Graph 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

Course Outcomes:

After successful completion of this course, the students should be able to:

COs	Statements	Blooms level
CO1	Apply mathematical logic to solve problems.	L2, L3
CO2	Understand the concepts and perform the operations related to sets, relations and functions. Gain the conceptual background needed and identify structures of algebraic nature.	L3, L5
CO3	Apply basic counting techniques to solve combinatorial problems.	L3
CO4	Formulate problems and solve recurrence relations.	L2, L3
CO5	Apply Graph Theory in solving computer science problems	L3, L5

UNIT I Mathematical Logic

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

UNIT II Set theory

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

UNIT III Elementary Combinatorics

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

UNIT IV : Recurrence Relations

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

UNIT IV Graphs

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

Textbooks:

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

Reference Books:

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

Online Learning Resources:

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

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A43102– 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 is designed to provide a comprehensive understanding of the principles, algorithms, and techniques involved in machine learning and data science. The course begins with an introduction to data types, data quality, and data preprocessing techniques, followed by methods for exploring and summarizing data. It then covers the evolution and paradigms of machine learning, emphasizing different learning methodologies and the stages involved in the machine learning process. The course delves into supervised learning algorithms, exploring various classification and regression techniques, and their performance evaluation.

Pre-requisite:

- **Programming Skills:** Proficiency in a programming language such as Python or R.
- **Mathematics:** Understanding of basic concepts in linear algebra, calculus, probability, and statistics.
- **Basic Data Structures and Algorithms:** Familiarity with fundamental data structures (arrays, lists, trees) and algorithmic techniques.
- **Introductory Machine Learning Concepts:** Some exposure to basic machine learning concepts and techniques, though not mandatory.
- **Data Analysis Tools:** Familiarity with data analysis tools and libraries (e.g., Pandas, NumPy, SciPy) is beneficial but not required.

2.Course Objectives:

The objectives of the course is to

- Define machine learning and its different types (supervised and unsupervised) and understand their applications.
- Apply supervised learning algorithms including decision trees and k-nearest neighbours (k-NN).
- Implement unsupervised learning techniques, such as K-means clustering.
- Perform feature engineering and dimensionality reduction techniques, such as feature extraction, feature selection, feature scaling,

3.Course Syllabus:

UNIT I:

Data: types of data, data quality, data pre-processing, measures of similarity and dissimilarity (Text Bok 2)

Exploring Data: Summary statistics (Text Bok 2)

UNIT II:

Evolution of Machine Learning, Paradigms, learning by rote, learning by deduction, learning by abduction, learning by induction, stages in machine learning, data acquisition, data representation, model selection, model learning, model evaluation, model prediction, model explanation, serch and learning, data sets used.(Text Bok 1)

UNIT III:

Supervised Learning Algorithms 1:

Different classification algorithms based on distance measures, Nearest Neighbor Classifier, K-Nearest Neighbor Classifier, Weighted K-Nearest Neighbor Algorithm, Random distance based Nearest Neighbor Algorithm, Tree-based Nearest Neighbor Algorithm, Branch and Bound method, leader clustering, KNN Regression, performance measures, performance of classifies, performance of regression algorithms, Area under ROC curve for the Breast Cancer Data Set.

UNIT IV:

Supervised Learning Algorithms 2:

The Bayes classifier, probability, conditional probability and Bayes rule, conditional probability, total probability, Bayes rule and inference, Bayes rule and classification, Bayes classifier and its optimality, Multi-class classification, parametric and non-parametric schemes for density estimation, class conditional independence and Naive bayes classifier, estimation of probability structure, Naive Bayes Classifier.

UNIT V:

Unsupervised Learning Algorithms:

Clustering: Introduction, partitioning of data, data re-organization, data compression, summarization, matrix factorization, clustering of patterns, data abstraction, clustering algorithms, Divisive clustering, Agglomerative clustering, Partitional clustering, K-Means clustering, K-Means ++ clustering, Soft partitioning, soft clustering, Fuzzy- C-means clustering, Rough clustering, Rough K-Means clustering algorithm.

4.Books and Materials:

Text Books:

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

2.“Introduction to Data Mining”, Pang-Ning Tan, Michel Stenbach, Vipin Kumar, 7th Edition, 2019.

Reference Books:

1.“Machine Learning”, Tom M. Mitchell, McGraw-Hill Publication, 2017

2.“Machine Learning in Action”,Peter Harrington, DreamTech

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40512 – Object-Oriented Programming through 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 students to the foundational concepts and principles of object-oriented programming, with a focus on Java. It begins with basic programming constructs, data types, variables, operators, and control statements. The course progresses to cover classes and objects, methods, and inheritance, emphasizing encapsulation, polymorphism, and interfaces. Students will learn about arrays, including multi-dimensional arrays and array manipulation techniques. The course also covers advanced topics such as packages, exception handling, Java I/O, and file handling. Additionally, it includes modules on string handling, multithreaded programming, and Java Database Connectivity (JDBC). The course concludes with an introduction to JavaFX for building graphical user interfaces (GUIs). Through hands-on exercises and practical examples, students will develop robust programming skills and a deep understanding of Java's object-oriented features.

Pre-requisite: NIL

2. Course Objectives:

The learning objectives of this course are to:

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

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 Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.

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

UNIT IV: Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto-unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

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

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

UNIT V: String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings,Comparison, Modifying, Searching; Class String Buffer.

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

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

Java FX GUI: Java FX Scene Builder, Java FX App Window Structure, displaying text and image, event handling, laying out nodes in scene graph, mouse events (Text Book 3)

4. Books and Materials

Text Books:

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

References Books:

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

Online Resources:

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

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40406 – Digital Logic & Computer 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 an in-depth understanding of the fundamental concepts and structure of computer systems. This course covers various aspects of data representation, digital logic circuits, computer arithmetic, processor organization, memory organization, and input/output organization. It begins with the basics of binary numbers and digital logic, then progresses to more complex topics like sequential circuits, computer arithmetic operations, and processor control mechanisms.

Pre-requisite:

- **Basic Computer Knowledge:** Familiarity with basic computer concepts and operations.
- **Fundamentals of Programming:** Understanding of basic programming principles, preferably in a language like C or Python.
- **Mathematical Foundations:** Basic knowledge of algebra, binary arithmetic, and logic.
- **Introductory Course in Digital Electronics:** Some exposure to digital logic and circuits would be beneficial, though not mandatory.

2.Course Objectives:

The main objectives of the course is to

- provide students with a comprehensive understanding of digital logic design principles and computer organization fundamentals
- Describe memory hierarchy concepts
- Explain input/output (I/O) systems and their interaction with the CPU, memory, and peripheral devices

3.Course Syllabus:

UNIT – I:

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

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

UNIT – II:

Digital Logic Circuits-II: Sequential Circuits, Flip-Flops, Binary counters, Registers, Shift Registers, Ripple counters

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

UNIT – III:

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

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

UNIT – IV:

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

UNIT – V:

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

4.Books and Materials:

Textbooks:

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

Reference Books:

1.Computer Systems Architecture, M.Moris Mano, 3rdEdition, Pearson, 2017.

2.Computer Organization and Design, David A. Paterson, John L. Hennessy, Elsevier, 2004.

3.Fundamentals of Logic Design, Roth, 5thEdition, Thomson, 2003.

Online Learning Resources:

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

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A43103- AI & ML 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 course is designed to provide comprehensive knowledge and hands-on experience in using Python for machine learning tasks and data preprocessing techniques. It covers essential libraries such as Pandas for data manipulation, scikit-learn for machine learning algorithms, and various visualization techniques. Students will learn to implement and evaluate popular machine learning algorithms, preprocess data effectively, and visualize data to gain insights.

Pre-requisite:

- **Basic Programming Skills:** Proficiency in Python programming language is essential as all experiments and implementations are done using Python.
- **Mathematical Foundations:** Understanding of basic mathematics including algebra, statistics, and probability.
- **Data Handling Skills:** Familiarity with data handling concepts would be beneficial, although not mandatory.
- **Machine Learning Fundamentals:** Basic knowledge of machine learning concepts such as supervised learning, unsupervised learning, and evaluation metrics would be helpful.

2.Course Objectives:

1. The student should be made to study the concepts of Artificial Intelligence.
2. The student should be made to learn the methods of solving problems using Artificial Intelligence.
3. The student should be made to introduce the concepts of Expert Systems and machine learning.
4. To learn about computing central tendency measures and Data preprocessing techniques
5. To learn about classification and regression algorithms
6. To apply different clustering algorithms for a problem.

3.Course Syllabus:

Software Required for ML: Python/R/Weka

List of Experiments

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

1. Pandas Library
   a) Write a python program to implement Pandas Series with labels.
   b) Create a Pandas Series from a dictionary.
   c) Creating a Pandas Data Frame.
   d) Write a program which makes use of the following Pandas methods

      i) describe () ii) head () iii) tail () iv) info ()
2. Pandas Library: Visualization

   Write a program which use pandas inbuilt visualization to plot following graphs:

   i. Bar plots ii. Histograms iii. Line plots iv. Scatter plots
3. Write a Program to Implement Breadth First Search using Python.
4. Write a program to implement Best First Searching Algorithm
5. Write a Program to Implement Depth First Search using Python.
6. Write a program to implement the Heuristic Search
7. Write a python program to implement A* and AO* algorithm. (Ex: find the shortest path)
8. Apply the following Pre-processing techniques for a given dataset.
   a. Attribute selection
   b. Handling Missing Values
   c. Discretization
   d. Elimination of Outliers
9. Apply KNN algorithm for classification and regression
10. Demonstrate decision tree algorithm for a classification problem and perform parameter tuning for better results
11. Apply Random Forest algorithm for classification and regression
12. Demonstrate Naïve Bayes Classification algorithm.
13. Apply Support Vector algorithm for classification
14. Implement the K-means algorithm and apply it to the data you selected. Evaluate performance by measuring the sum of the Euclidean distance of each example from its class center. Test the performance of the algorithm as a function of the parameters K.

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40515 – Object-Oriented Programming through JAVA 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 course provides a comprehensive introduction to Java, focusing on both foundational concepts and practical applications. Through a series of structured experiments, students will learn to write and execute Java programs, understand object-oriented programming principles, and develop skills in exception handling, multithreading, and graphical user interfaces. The course covers essential topics such as data types, control structures, classes and objects, inheritance, polymorphism, interfaces, and JDBC for database connectivity. Additionally, students will gain hands-on experience with JavaFX for building graphical applications. By the end of the course, students will be proficient in Java programming and capable of developing robust and efficient applications.

Pre-requisite:

1.Basic knowledge of programming concepts.

2.Familiarity with any programming language (e.g., C, C++).

3.Understanding of fundamental concepts in computer science, including variables, control structures, and basic algorithms.

4.Basic mathematical skills for understanding algorithms and problem-solving techniques.

2.Course Objectives:

The aim of this course is to

1. Practice object oriented programming in the Java programming language

2.implement Classes, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism

3.Illustrate inheritance, Exception handling mechanism, JDBC connectivity

4.Construct Threads, Event Handling, implement packages, Java FX GUI

3.Course Syllabus:

Experiments covering the Topics:

Object Oriented Programming fundamentals- data types, control structures

Classes, methods, objects, Inheritance, polymorphism,

Exception handling, Threads, Packages, Interfaces

Files, I/O streams, JavaFX GUI

Sample Experiments:

Exercise – 1:

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

b) Write a java program that display the roots of a quadratic equation ax2+bx=0. Calculate the discriminate D and basing on value of D, describe the nature of root.

Exercise - 2

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

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

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

Exercise - 3

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

b) Write a JAVA program implement method overloading.

c) Write a JAVA program to implement constructor.

d) Write a JAVA program to implement constructor overloading.

Exercise - 4

a) Write a JAVA program to implement Single Inheritance

b) Write a JAVA program to implement multi level Inheritance

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

Exercise - 5

a) Write a JAVA program give example for “super” keyword.

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

c) Write a JAVA program that implements Runtime polymorphism

Exercise - 6

a) Write a JAVA program that describes exception handling mechanism

b) Write a JAVA program Illustrating Multiple catch clauses

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

Write a JAVA program for creation of User Defined Exception

Exercise - 7

a) Write a JAVA program that creates threads by extending Thread class. First thread display

"Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third display "Welcome" every 3 seconds, (Repeat the same by implementing Runnable)

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

c) Write a Program illustrating Daemon Threads.

d) Write a JAVA program Producer Consumer Problem

Exercise – 8

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

2.Without writing any code, build a GUI that display text in label and image in an ImageView (use JavaFX)

3.Build a Tip Calculator app using several JavaFX components and learn how to respond to user interactions with the GUI

Exercise – 9

1. Write a java program that connects to a database using JDBC

b)Write a java program to connect to a database using JDBC and insert values into it.

c) Write a java program to connect to a database using JDBC and delete values from it

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40516- Full Stack Development - 1

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 is designed to provide comprehensive training in web development. Students will learn to design static web pages using HTML elements and their attributes, and enhance these pages with appropriate CSS styles. The curriculum covers dynamic web page creation using JavaScript, including form validation and manipulation of HTML elements. Key topics include HTML lists, links, images, tables, forms, and frames, along with CSS styling techniques and JavaScript programming essentials, such as conditional statements, loops, functions, events, and Node.js.

2.Course Objectives:

Pre-requisite:

The prerequisites for this course are:

1. Basic understanding of computer operations and internet usage.
2. Familiarity with fundamental programming concepts.
3. Prior experience with any programming language (recommended but not mandatory).
4. A willingness to learn and explore web development technologies.

3.Course Syllabus:

Experiments covering the Topics:

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

Sample Experiments:

1. Lists, Links and Images

a. Write a HTML program, to explain the working of lists.

Note: It should have an ordered list, unordered list, nested lists and ordered list in an unordered list and definition lists.

b. Write a HTML program, to explain the working of hyperlinks using <a> tag and href, target Attributes.

c. Create a HTML document that has your image and your friend's image with a specific height and width. Also when clicked on the images it should navigate to their respective profiles.

d. Write a HTML program, in such a way that, rather than placing large images on a page, the preferred technique is to use thumbnails by setting the height and width parameters to something like to 100*100 pixels. Each thumbnail image is also a link to a full sized version of the image. Create an image gallery using this technique

2. HTML Tables, Forms and Frames

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

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

a.Write a HTML program, that makes use of <article>, <aside>, <figure>, <figcaption>, <footer>, <header>, <main>, <nav>, <section>, <div>, <span> tags.

b.Write a HTML program, to embed audio and video into HTML web page.

c.Write a program to apply different types (or levels of styles or style specification formats) - inline, internal, external styles to HTML elements. (identify selector, property and value).

4. Selector forms

a. Write a program to apply different types of selector forms

Simple selector (element, id, class, group, universal)

Combinator selector (descendant, child, adjacent sibling, general sibling)

Pseudo-class selector

Pseudo-element selector

Attribute selector

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

a. Write a program to demonstrate the various ways you can reference a color in CSS.

b. Write a CSS rule that places a background image halfway down the page, tilting it horizontally. The image should remain in place when the user scrolls up or down.

c. Write a program using the following terms related to CSS font and text:

i. font-size ii. font-weight iii. font-style

iv. text-decoration v. text-transformation vi. text-alignment

d. Write a program, to explain the importance of CSS Box model using

Content ii. Border iii. Margin iv. padding

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

a. Write a program to embed internal and external JavaScript in a web page.

b. Write a program to explain the different ways for displaying output.

c. Write a program to explain the different ways for taking input.

d. Create a webpage which uses prompt dialogue box to ask a voter for his name and age. Display the information in table format along with either the voter can vote or not

7. JavaScript Pre-defined and User-defined Objects

a. Write a program using document object properties and methods.

b. Write a program using window object properties and methods.

c. Write a program using array object properties and methods.

d.Write a program using math object properties and methods.

e. Write a program using string object properties and methods.

f. Write a program using regex object properties and methods.

g. Write a program using date object properties and methods.

h. Write a program to explain user-defined object by using properties, methods, accessors, constructors and display.

8. JavaScript Conditional Statements and Loops

a. Write a program which asks the user to enter three integers, obtains the numbers from the user and outputs HTML text that displays the larger number followed by the words "LARGER NUMBER" in an information message dialog. If the numbers are equal, output HTML text as "EQUAL NUMBERS".

b. Write a program to display week days using switch case.

c. Write a program to print 1 to 10 numbers using for, while and do-while loops.

d. Write aprogram to print data in object using for-in, for-each and for-of loops

e. Develop a program to determine whether a given number is an 'ARMSTRONG NUMBER' or not. [Eg: 153 is an Armstrong number, since sum of the cube of the digits is equal to the number i.e.,13 + 53+ 33 = 153]

f. Write a program to display the denomination of the amount deposited in the bank in terms of 100's, 50's, 20's, 10's, 5's, 2's & 1's. (Eg: If deposited amount is Rs.163, the output should be 1-100's, 1-50's, 1- 10's, 1-2's & 1-1's)

9. Javascript Functions and Events

a. Design a appropriate function should be called to display
b. Factorial of that number
c. Fibonacci series up to that number
d. Prime numbers up to that number
e. Is it palindrome or not

10.Design a HTML having a text box and four buttons named Factorial, Fibonacci, Prime, and Palindrome. When a button is pressed an appropriate function should be called to display

1. Factorial of that number
2. Fibonacci series up to that number
3. Prime numbers up to that number
4. Is it palindrome or not

11. Write a program to validate the following fields in a registration page

i. Name (start with alphabet and followed by alphanumeric and the length should not be less than 6 characters)
ii. Mobile (only numbers and length 10 digits)
iii. E-mail (should contain format like xxxxxxx@xxxxxx.xxx)

4.Books and Materials:

Text Books:

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40023 – DESIGN THINKING & 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

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

- Define the concepts related to design thinking
- Explain the fundamentals of Design Thinking and innovation
- Apply the design thinking techniques for solving problems in various sectors
- Analyze to work in a multidisciplinary environment
- Evaluate the value of creativity

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.

UNITV

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

Text Book(s)

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

Reference Book(s)

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

COMMUNITY SERVICE PROJECT

……Experiential learning through community engagement

Introduction

- Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development.
- Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
- Community Service Project is meant to link the community with the college for mutual benefit. The community will benefit with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and emerge as a socially responsible institution.

Objective

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships.
The specific objectives are;

- To sensitize the students to the living conditions of the people who are around them, To help students to realize the stark realities of society.
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
- To make students aware of their inner strength and help them to find new /out of box solutions to social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Implementation of Community Service Project

- Every student should put in 6 weeks for the Community Service Project during the summer vacation.
- Each class/section should be assigned with a mentor.
- Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, housewives, etc
- A logbook must be maintained by each of the students, where the activities undertaken/involved to be recorded.
- The logbook has to be countersigned by the concerned mentor/faculty in charge.

- An evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
- The final evaluation to be reflected in the grade memo of the student.
- The Community Service Project should be different from the regular programs of NSS/NCC/Green Corps/Red Ribbon Club, etc.
- Minor project reports should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.
- Award of marks shall be made as per the guidelines of Internship/apprentice/ on the job training.

Procedure

- A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, to enable them to commute from their residence and return back by evening or so.
- The Community Service Project is a twofold one
  - First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers; rather, it could be another primary source of data.
  - Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like –
    - Agriculture
    - Health
    - Marketing and Cooperation
    - Animal Husbandry
    - Horticulture
    - Fisheries
    - Sericulture
    - Revenue and Survey
    - Natural Disaster Management
    - Irrigation
    - Law & Order
    - Excise and Prohibition
    - Mines and Geology
    - Energy
    - Internet
    - Free Electricity
    - Drinking Water

EXPECTED OUTCOMES

BENEFITS OF COMMUNITY SERVICE PROJECT TO STUDENTS

Learning Outcomes

- Positive impact on students’ academic learning

- Improves students' ability to apply what they have learned in "the real world"
- Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development.
- Improved ability to understand complexity and ambiguity

Personal Outcomes

- Greater sense of personal efficacy, personal identity, spiritual growth, and moral development
- Greater interpersonal development, particularly the ability to work well with others, and build leadership and communication skills.

Social Outcomes

- Reduced stereotypes and greater inter-cultural understanding
- Improved social responsibility and citizenship skills
- Greater involvement in community service after graduation

Career Development

- Connections with professionals and community members for learning and career opportunities
- Greater academic learning, leadership skills, and personal efficacy can lead to greater opportunity.

Relationship with the Institution

- Stronger relationships with faculty
- Greater satisfaction with college
- Improved graduation rates

BENEFITS OF COMMUNITY SERVICE PROJECT TO FACULTY MEMBERS

- Satisfaction with the quality of student learning
- New avenues for research and publication via new relationships between faculty and community
- Providing networking opportunities with engaged faculty in other disciplines or institutions
- A stronger commitment to one's research.

BENEFITS OF COMMUNITY SERVICE PROJECT TO COLLEGES AND UNIVERSITIES

- Improved institutional commitment.
- Improved student retention
- Enhanced community relations

BENEFITS OF COMMUNITY SERVICE PROJECT TO COMMUNITY

- Satisfaction with student participation
- Valuable human resources needed to achieve community goals.

- New energy, enthusiasm and perspectives applied to community work.
- Enhanced community-university relations.

SUGGESTIVE LIST OF PROGRAMMES UNDER COMMUNITY SERVICE PROJECT

The following the recommended list of projects for engineering students. The lists are not exhaustive and open for additions, deletions, and modifications. Colleges are expected to focus on specific local issues for this kind of project. The students are expected to carry out these projects with involvement, commitment, responsibility, and accountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of project. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting should be ensured.

For Engineering Students

1. Water facilities and drinking water availability
2. Health and hygiene
3. Stress levels and coping mechanisms
4. Health intervention programmes
5. Horticulture
6. Herbal plants
7. Botanical survey
8. Zoological survey
9. Marine products
10. Aqua culture
11. Inland fisheries
12. Animals and species
13. Nutrition
14. Traditional health care methods
15. Food habits
16. Air pollution
17. Water pollution
18. Plantation
19. Soil protection
20. Renewable energy
21. Plant diseases
22. Yoga awareness and practice
23. Health care awareness programmes and their impact
24. Use of chemicals on fruits and vegetables
25. Organic farming
26. Crop rotation
27. Floury culture
28. Access to safe drinking water
29. Geographical survey

30. Geological survey
31. Sericulture
32. Study of species
33. Food adulteration
34. Incidence of Diabetes and other chronic diseases
35. Human genetics
36. Blood groups and blood levels
37. Internet Usage in Villages
38. Android Phone usage by different people
39. Utilisation of free electricity to farmers and related issues
40. Gender ration in schooling lvel- observation.

Complimenting the community service project the students may be involved to take up some awareness campaigns on social issues/special groups. The suggested list of programs

Programs for School Children

1. Reading Skill Program (Reading Competition)
2. Preparation of Study Materials for the next class.
3. Personality / Leadership Development
4. Career Guidance for X class students
5. Screening Documentary and other educational films
6. Awareness Program on Good Touch and Bad Touch (Sexual abuse)
7. Awareness Program on Socially relevant themes.

Programs for Women Empowerment

1. Government Guidelines and Policy Guidelines
2. Women's Rights
3. Domestic Violence
4. Prevention and Control of Cancer
5. Promotion of Social Entrepreneurship

General Camps

1. General Medical camps
2. Eye Camps
3. Dental Camps
4. Importance of protected drinking water
5. ODF awareness camp
6. Swatch Bharath
7. AIDS awareness camp
8. Anti Plastic Awareness
9. Programs on Environment
10. Health and Hygiene
11. Hand wash programmes
12. Commemoration and Celebration of important days

Programs for Youth Empowerment

1. Leadership
2. Anti-alcoholism and Drug addiction

3. Anti-tobacco
4. Awareness on Competitive Examinations
5. Personality Development

Common Programs

1. Awareness on RTI
2. Health intervention programmes
3. Yoga
4. Tree plantation
5. Programs in consonance with the Govt. Departments like –
   - i. Agriculture
   - ii. Health
   - iii. Marketing and Cooperation
   - iv. Animal Husbandry
   - v. Horticulture
   - vi. Fisheries
   - vii. Sericulture
   - viii. Revenue and Survey
   - ix. Natural Disaster Management
   - x. Irrigation
   - xi. Law & Order
   - xii. Excise and Prohibition
   - xiii. Mines and Geology
   - xiv. Energy

Role of Students:

- Students may not have the expertise to conduct all the programmes on their own. The students then can play a facilitator role.
- For conducting special camps like Health related, they will be coordinating with the Governmental agencies.
- As and when required the College faculty themselves act as Resource Persons.
- Students can work in close association with Non-Governmental Organizations like Lions Club, Rotary Club, etc or with any NGO actively working in that habitation.
- And also, with the Governmental Departments. If the program is rolled out, the District Administration could be roped in for the successful deployment of the program.
- An in-house training and induction program could be arranged for the faculty and participating students, to expose them to the methodology of Service Learning.

Timeline for the Community Service Project Activity

Duration: 8 weeks

1. Preliminary Survey (One Week)

- A preliminary survey including the socio-economic conditions of the allotted habitation to be conducted.

- A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty. (However, a template could be designed for different habitations, rural/urban.
- The Governmental agencies, like revenue administration, corporation and municipal authorities and village secretariats could be aligned for the survey.

2. Community Awareness Campaigns (One Week)

- Based on the survey and the specific requirements of the habitation, different awareness campaigns and programmes to be conducted, spread over two weeks of time. The list of activities suggested could be taken into consideration.

3. Community Immersion Programme (Three Weeks)

Along with the Community Awareness Programmes, the student batch can also work with any one of the below-listed governmental agencies and work in tandem with them. This community involvement programme will involve the students in exposing themselves to experiential learning about the community and its dynamics. Programs could be in consonance with the Govt. Departments.

4. Community Exit Report (One Week)

- During the last week of the Community Service Project, a detailed report of the outcome of the 8 weeks' works to be drafted and a copy shall be submitted to the local administration. This report will be a basis for the next batch of students visiting that habitation. The same report submitted to the teacher-mentor will be evaluated by the mentor and suitable marks are awarded for onward submission to the University.
- Throughout the Community Service Project, a daily logbook need to be maintained by the students batch, which should be countersigned by the governmental agency representative and the teacher-mentor, who is required to periodically visit the students and guide them.

COURSE STRUCTURE

V - Semester

COURSE STRUCTURE

A43104 – NATURAL LANGUAGE 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 Objective

- Explain and apply fundamental algorithms and techniques in the area of natural language processing(NLP)
- Discuss approaches to syntax and semantics in NLP.
- Examine current methods for statistical approach esto machine translation.
- Teach machine learning techniques used in NLP.

2. Course Outcomes (COs)

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

CO1. Understand the various NLP Applications and Organization of Natural language, able to learn and implement realistic applications using Python.
CO2. Apply the various Parsing techniques, Bayes Rule, Shannon game, Entropy and Cross Entropy.
CO3. Understand the fundamentals of CFG and parsers and mechanisms in ATN's.
CO4. Apply Semantic Interpretation and Language Modelling.
CO5. Apply the concept of Machine Translation and multilingual Information Retrieval systems and Automatic Summarization.

3. Course Syllabus

UNIT-1 Introduction to Natural language

The Study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different Levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Back ground: An outline of English syntax.

UNIT-2 Grammars and Parsing

Grammars and Parsing – Top – Down and Bottom-Up Parsers, Transition Network Grammars, Feature Systems and Augmented Grammars, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks, Bayees Rule, Shannon game, Entropy and Cross Entropy.

UNIT-3 Grammars for Natural Language

Grammars for Natural Language, Movement Phenomenon in Language, Gap Threading, Human Preferences in Parsing, Shift Reduce Parsers, Deterministic Parsers.

UNIT-4

Semantic Interpretation

Semantic & Logical form, Word senses & ambiguity, the basic logical form language, Encoding ambiguity in the logical Form, Verbs &States in logical form, the maticroles, Speech acts & embedded sentences, Defining semantics structure model theory.

Language Modelling

Introduction, n-Gram Models, Language model Evaluation, Parameter Estimation, Language Model Adaption, Types of Language Models, Language-Specific Modelling Problems, Multilingual and Cross lingual Language Modelling.

UNIT-5

Machine Translation

Survey: Introduction, Problems of Machine Translation, Is Machine Translation Possible, Brief History, Possible Approaches, Current Status. Anusaraka or Language Accessor: Background, Cutting the Gordian Knot, The Problem, Structure of Anusaraka System, User Interface, Linguistic Area, Giving up Agreement in Anusaraka Output, Language Bridges.

Multilingual Information Retrieval

Introduction, Document Pre-processing, Monolingual Information Retrieval, CLIR, MLIR, Evaluation in Information Retrieval, Tools, Software and Resources.

Multilingual Automatic Summarization

Introduction, Approach esto Summarization, Evaluation, How to Build a Summarizer, Competitions and Datasets.

4. Books and Materials

Text Books:

1. James Allen, Natural Language Understanding, 2ndEdition, 2003, Pearson Education.
2. Multilingual Natural Language Processing Applications: From Theory To Practice-Daniel M.Bikel and ImedZitouni, Pearson Publications.
3. Natural Language Processing, A Paninian Perspective, Akshar Bharathi, Vineet Chaitanya, Prentice –Hall of India.

Reference Books:

1. Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.
2. Jurafsky, Dan and Martin, James, Speech and Language Processing, 2ndEdition, Prentice Hall, 2008.
3. Manning, Christopher and Hen rich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.

Online Learning Resources:

1. https://nptel.ac.in/courses/106/105/106105158/
2. http://www.nptelvideos.in/2012/11/natural-language-processing.html

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL
(AUTONOMOUS)

COURSE STRUCTURE

A43105 – OPERATING SYSTEM & SYSTEM PROGRAMMING

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

This course provides a comprehensive foundation in operating systems and system software. It covers the fundamental principles of operating systems including process management, memory management, file and I/O systems, and system security. Students will explore advanced concepts like process synchronization, deadlocks, virtual memory, RAID storage, and Unix/Linux environments. Additionally, the course introduces system software components such as assemblers, linkers, loaders, and macro processors, along with modern language processing techniques. By the end, students will gain the knowledge and practical skills necessary for system-level programming, including shell scripting, process control, and concurrency in Unix/Linux.

2.Course Outcomes (COs)

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

CO1. Describe the structure and functions of operating systems and apply scheduling and synchronization techniques to manage processes and resolve deadlocks.
CO2. Explain memory management and virtual memory concepts, and analyse file and storage system structures and algorithms.
CO3.Illustrate I/O system operations, protection mechanisms, and demonstrate basic Unix/Linux commands and shell scripting.
CO4.Identify and describe components of system software including language processors, assemblers, macro processors, linkers, and loaders.
CO5.Analyze the compilation process and implement basic system-level programming concepts like process creation, file I/O, and concurrency mechanisms.

3. Course Syllabus

UNIT - I: Fundamentals of Operating Systems and Process Management

Introduction to Operating Systems: Definition and Basics, Generations and Types of Operating Systems, OS Structure: Layered, Monolithic, Microkernel, OS Services, System Calls, System Boot, System Programs, Virtual Machines, **Process Management:** Process Concepts, Process States, Process Control Block, Context Switching, Threads and Multithreading, Process Scheduling: Scheduling Criteria and Scheduling Algorithms, Multiprocessor Scheduling: Types and Performance Evaluation, **Process Synchronization and Deadlocks:** Race Conditions, Critical Section, Mutual Exclusion, Peterson‘s Solution, Semaphores, Monitors Classic IP, C Problems: Reader-Writers,Dining Philosophers, Deadlocks: Definition, Characteristics, Prevention, Avoidance, Detection and Recovery

UNIT - II: Memory, File, and Storage Management

Memory Management: Logical vs. Physical Address Mapping, Contiguous Memory Allocation, Internal and External Fragmentation, Compaction, Paging and Page Tables, Segmentation, Virtual Memory: Demand Paging, Page Faults, Page Replacement Algorithms, Thrashing and Working Set Model, **File System Management:** File Concepts, Access Methods, File Types and Operations, Directory Structure, File System Structure, Allocation Methods, Free-Space Management, Directory Implementation. **Storage Management:** Mass Storage: Disk Structure, RAID Levels, Disk Scheduling Algorithms, Swap Space Management, Stable Storage, Tertiary Storage Structure

UNIT - III: I/O Systems, Security, and Unix/Linux Overview

I/O System Management: I/O Hardware: Devices, Device Controllers, Direct Memory Access, I/O Software: Interrupt Handlers, Device Drivers, Device-Independent I/O Software, **System Protection and Security:** Security Environment, Security Design Principles, User Authentication, Protection Mechanisms, Protection Domain, Access Control List, **Unix/Linux Overview & Case Studies:** Development of Unix/Linux, Role of Kernel, System Calls, Elementary Linux Commands, Shell Programming, Directory Structure, System Administration.

UNIT IV: System Software and Language Processing

Overview of System Software: Software and Software Hierarchy, Systems Programming and Machine Structure, Interfaces, Address Space, and Computer Languages, System Software Development and Recent Trends, **Language Processors:** Programming Languages and Language Processing, Symbol Tables and Data Structures for Language Processing, Search and Allocation Data Structures, **Assemblers and Macro Processors:** Elements of Assembly Language Programming, Design and Types of Assemblers, Macro Definitions, Expansion, Nested Macros, and Advanced Macro Features, Design of Macro Assemblers and Macro Processors, **Linkers and Loaders:** Concept of Linking and Relocation, Linking in MS-DOS, Dynamic Linking, Loading Schemes: Sequential, Direct, Absolute, Relocating, and Linking Loaders, Comparison of Linkers and Loaders

UNIT V: System Programming

Scanning and Parsing: Programming Language Grammars and Classification, Ambiguity in Grammatic Specification, Scanning, Parsing, **Compilers and Interpreters:** Compilation Process, Semantic Gap, Binding, and Scope Rules, Memory Allocation, Compilation of Expressions & Control Structures, Code Optimization, Overview of Interpreters and Debuggers, **Operating System Command & Shell Basics:** C Development Tools, Machine-Level Representation of Data and Programs, **System-Level Programming and Concurrency:** File I/O, Process Creation & Control (fork, exec), Pipes, Signals, and Basic Threading.

Textbooks:

1. Operating System Concepts (9th or 10th Edition) by Abraham Silberschatz, Peter Baer Galvin, and Greg Gagne in publisher: Wiley
2. Operating Systems: A Concept-Based Approach (3rd Edition) by D. M. Dhamdhere publisher: McGraw Hill

Reference Books:

1. Real-Time Systems: Theory and Practice by Rajib Mall, Publisher: Pearson
2. System Software: An Introduction to Systems Programming (3rd Edition) by Leland L. Beck & D. Manjula, Publisher: Pearson.

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A43106 – COMPUTER VISION AND IMAGE 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

- Introduce fundamental concepts of image processing and computer vision.
- Develop proficiency in applying algorithms for image analysis and interpretation.
- Explore techniques for feature extraction, object recognition, and scene understanding.
- Understand the integration of machine learning methods in computer vision applications

2.Course Outcomes (COs)

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

CO1.Understand image formation, representation, and apply basic image processing and frequency domain techniques for image enhancement and restoration.

CO2.Apply edge detection, segmentation, morphological, and texture analysis techniques for extracting features from images.

CO3.Analyze 3D vision and motion using techniques like stereo vision, optical flow, and camera calibration for scene understanding and depth estimation.

CO4.Evaluate object recognition approaches and machine learning models including traditional and deep learning techniques used in computer vision.

CO5.Implement advanced computer vision applications such as image compression, face recognition, and medical image analysis using case studies.

3.Course Syllabus

UNIT I: Introduction to Computer Vision and Image Processing

Overview of Computer Vision and Image Processing:Definitions and scope, Historical development and applications, Image Formation and Representation: Image acquisition methods, Sampling and quantization, Color spaces and models, Fundamentals of Image Processing:Point operations (brightness and contrast adjustments), Histogram processing, Spatial filtering techniques Fourier Transform and Frequency Domain Processing:Discrete Fourier Transform (DFT), Filtering in the frequency domain, Image restoration concept.

UNIT II: Image Analysis Techniques

Edge Detection and Feature Extraction:Gradient operators (Sobel, Prewitt), Canny edge detector, Corner and interest point detection, Image Segmentation:Thresholding methods, Region-based segmentation, Clustering techniques (K-means, Mean-Shift), Morphological Image Processing: Erosion and dilation, Opening and closing operations, Applications in shape analysis, Texture Analysis, Statistical methods (co-occurrence matrices), Transform-based methods (Gabor filters), Applications in pattern recognition

UNIT III: 3D Vision and Motion Analysis

Stereo Vision:Epipolar geometry,Disparity mapping, Depth estimation techniques, Structure from Motion (SfM):Feature tracking across frames, 3D reconstruction from motion, Applications in scene understanding, Optical Flow and Motion Analysis:Lucas-Kanade method, Horn-Schunck method, Motion segmentation, Camera Calibration and 3D Reconstruction:Intrinsic and extrinsic parameters, Calibration techniques, 3D point cloud generation

UNIT IV: Object Recognition and Machine Learning in Vision

Feature Descriptors and Matching:Scale-Invariant Feature Transform (SIFT), Speeded-Up Robust Features (SURF), Feature matching algorithms, Object Detection and Recognition:Template matching , Deformable part models, Convolutional Neural Networks (CNNs), Introduction to Machine Learning for Vision:Supervised and unsupervised learning, Support Vector Machines (SVMs), Decision trees and random forests, Deep Learning Architectures:Autoencoders, Recurrent Neural Networks (RNNs), Generative Adversarial Networks (GANs)

UNIT V: Applications and Advanced Topics

Image Compression:Lossy and lossless compression techniques, Standards (e.g., JPEG, PNG), Morphological Image Processing:Dilation, erosion, opening, and closing operations.,Applications in shape analysis, Case Studies:Face recognition systems., Automated visual inspection, Medical image analysis.

Reference Books

1. Forsyth, D. A., & Ponce, J. (2002). Computer Vision: A Modern Approach. Prentice Hall.
2. Shapiro, L. G., & Stockman, G. C. (2001). Computer Vision. Prentice Hall.

Textbooks:

1. Gonzalez, R. C., & Woods, R. E. (2008). Digital Image Processing (3rd ed.). Pearson Prentice Hall.Stony Brook University
2. Szeliski, R. (2010). Computer Vision: Algorithms and Applications. Springer.

Online Learning Resources:

1. Coursera: Introduction to Computer Vision and Image Processing. LinkCoursera
2. Stanford University: CS231n: Deep Learning for Computer Vision. Linkcs231n.stanford.edu
3. MIT OpenCourseWare: Introduction to Computer Vision. Link

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A43107a - ETHICAL HACKING

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 DESCRIPTION:

The objective of the course is to present an introduction to Ethical techniques with an emphasis on how to organize, maintain and secure the data - efficiently, and effectively.

COURSE OUTCOMES:

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

CO1. Describe the fundamental topics of hacking and network connectivity.
CO2. Implement the tools and techniques of Ethical hacking.
CO3. Learn the privacy, design and secure operations using cryptographic algorithms.
CO4. Apply the security and integrity tools in the cryptography system
CO5. Improving the secure and network systems.

SYLLABUS

UNIT I : INTRODUCTION TO ETHICAL HACKING

Introduction to ethical hacking. Fundamentals of computer networking. TCP/IP protocol stack, IP addressing and routing, TCP and UDP, IP subnets, and Routing protocols, types IP version 6.

UNIT II: ATTACKER AND VICTIM SYSTEM

Installation of attacker and victim system, Information gathering using advanced google search,archive.org, netcraft, whois, host, dig, dnsenum and NMAP tool**.** Vulnerability scanning using NMAP, Vulnerability scanning using NMAP and Nessus. Creating a secure hacking environment.

UNIT III : SYSTEM HACKING

Introduction, System Hacking password cracking, privilege escalation, application execution. Malware and Virus. ARP spoofing and MAC attack. Introduction to cryptography, private-key encryption, public-key encryption. Cryptographic hash functions, digital signature and certificate, applications. Steganography, biometric authentication, network-based attacks.

UNIT IV :DNS AND EMAIL SECURITY.

Introduction, Packet sniffing using Wireshark and burp suite, password attack using burp suite.Social engineering attacks and Denial of service attacks. Elements of hardware security: side-channel attacks, physical inclinable functions, hardware trojans.

UNIT V :SECURE BOOT MECHANISMS

Introduction,Different types of attacks using Metasploit framework: password cracking, privilege escalation, remote code execution, etc.Attack on web servers: password attack, SQL injection,Case studies: various attacks scenarios and their remedies.

TEXTBOOKS:

1. Data and Computer Communications -- W. Stallings.
2. Introduction to Computer Networks and Cybersecurity -- C-H. Wu and J. D. Irwin
3. Cryptography and Network Security: Principles and Practice -- W. Stallings

Reference Books:

1. Data Communication and Networking -- B. A. Forouzan
2. TCP/IP Protocol Suite -- B. A. Forouzan
3. UNIX Network Programming -- W. R. Stallings

Online Learning Resources:

1) Ethical Hacking Professional Certificate | NPTEL-12 weeks course

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A43107b – Advanced R Programming for Data Analytics in Business

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 Objectives:

The course is introduced for students to

- Understand basic concepts of R Programming
- Study different learning algorithms
- Illustrate evaluation of learning algorithms

Pre-requisite Fundamentals of Computers and Programming

2.Course Outcomes (CO):

After completion of the course, students will be able to

CO1. Identify machine learning techniques suitable for a given problem.
CO2. Solve the problems using various machine learning techniques.
CO3. Develop application using machine learning techniques.
CO4. Able to apply Regression methods for different applications.
CO5. Design of clustering techniques for a given problem.

3.Course Syllabus:

UNIT - I **Advanced R programming for Data Science: Introduction and Background**

Fundamentals of R: Installation and set-up, set working directory, packages, and libraries; R operators: Arithmetic, assignment, comparison, and logical operators; Working with different data types; Vector creation and manipulation; Miscellaneous functions: Sequence, repetition, sorting, generate random numbers, user-defined functions, lapply, sapply, and tapply function; Factor variables, Indexing, Data coercion, conditional statements

Introduction to Data Visualization with R: Basic Plotting types: Barchart, Pie Chart, Histogram, Density plot, Boxplot; Plot customization: Adding legend, Adding color in plots, Adding axis labels and chart title, Modifying axis and scales; Overlay plots in R

UNIT - II **Advanced Data Visualization with ggplot2**

Key components; Color, size, shape, and other aesthetic attributes; Faceting: Wrap faceting and Grid faceting; Plot geoms: Adding a smoother to a plot, Boxplots, jitterplots, histogram, frequency polygons, Time series with line and path plots; Modifying the axes; Quick plots; Correlation matrix with ggplot.

Exploratory Data Analysis (EDA) and Data Wrangling: Reading and writing the data, exporting, and saving a data frame; Data handling and cleaning: Recording the variables, dealing with NAs, adding a row and column to the data frame, wide to long data formats, merging the data frames.

UNIT - III **Handling Complex Date and Time Objects:**

Getting the current date and time, POSIX classes (POSIXct and POSIXlt), Parsing dates, Date and time components, Dates not in Standard Format; Operations on dates: subtract/add, finding difference, generating a sequence, truncate; Time zones; Time intervals: Interval and overlaps;

Periods and durations; Date arithmetic; Rounding the dates

Basic Statistics with R: Measures of central tendency, Measures of Variability, Measures of Shape; summary statistics by group; Dealing with outliers: Truncate and Winsorize.

Probability and Stochastics with R: Probability Distribution, Binomial Distribution, Normal Distribution, Sampling Distribution, Types of Sampling: Probability vs non-Probability

UNIT – IV **Advanced Inferential Statistics with R:**

One-sample test, two-sample test, T statistics, Z statistics, Test with Proportion, Test with variances; ANOVA: one way and two ways Introduction to Model Building and Evaluation: Simple and Multiple Linear Regression Modeling (SLRM): Linearity and normality, Fitting SLRM, Storing and printing the regression results, Interpretation of the regression results, Diagnosis of the fitted model, Tests for autocorrelation and heteroskedasticity, Computation of robust standard errors, and Visualization of regression results

Introduction to Time-series Modelling and Panel Data Methods Time-series modelling, issues with time-series data, basic time-series properties, Introduction to pandel data, Reading & Writing Panel Data, Panel Data Manipulation, Outlier Treatment, Panel Data Visualization, Descriptive Statistics Pooled OLS, Fixed Effect Estimation, LSDV Estimation, Random Effect Estimation, Diagnostic Tests, Residual Analysis, Robust Estimation

UNIT – V **Advanced Non-Linear Modelling and Evaluation**

Quantile Regression Method, Reading & Writing Quantile Data, Quantile Data Manipulation, Outlier Treatment, Quantile Data Visualization, Diagnostic Tests, Residual Analysis, Robust Estimation, Advanced Classification Methods: Logit/Probit Regression Modelling

Introduction to Classification Algorithms, Linear probability models, Introduction to Logit/Probit Modelling, Thresholding and Classification Matrix, ROC Curve, Parameter Interpretation, Maximum Likelihood Estimation, and Goodness-of-Fit measures.

4.Textbooks:

1. Hadley Wickham, "R for Data Science," O'Reilly, 1st Edition
2. Robert I. Kabacoff, "R in Action: Data Analysis and Graphics with R," Manning, 2nd Edition
3. Chris Chapman and Elea McDonnell Feit, "R for Marketing Research and Analytics," Springer, 2nd Edition

Reference Books:

1. John Fox and Sanford Weisberg, "An R Companion to Applied Regression," Sage, 3rd Edition.
2. Hadley Wickham, "ggplot2 Elegant Graphics for Data Analysis," Springer, 2nd Edition

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc24_mg113/preview

COURSE STRUCTURE

A43107c – SOFTWARE TESTING

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

This course covers essential topics in software testing methodologies, including graph-based testing criteria, logic coverage, mutation testing, and specialized techniques for testing web applications and object-oriented systems.

2. Course Outcomes (COs)

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

CO1. Understand the fundamentals of graph-based testing and apply structural graph coverage criteria effectively.

CO2. Apply data flow graphs and integration testing techniques to ensure comprehensive code coverage.

CO3. Implement logic coverage criteria in software testing scenarios and effectively partition input spaces for functional testing.

CO4. Conduct syntax-based and mutation testing to enhance software reliability and detect potential faults in program logic.

CO5. Gain proficiency in testing web applications and services using symbolic testing and automated random testing methodologies.

3. Course Syllabus

UNIT-1

Motivation, Terminologies, Testing based on Models and Criteria, Automation-JUnit as an example, Basics of Graphs: As used in testing, Structural Graph Coverage Criteria, Elementary Graph Algorithms

UNIT-2

Data Flow Graphs, Algorithms and Graph Coverage Criteria: Applied to test code, Testing Source code: Classic coverage criteria, Software Design and Integration testing, Design Intergration and Graph coverage, Specification testing and Graph Coverage and finite state machines, Logics: Basics Needed for Software testing, coverage criteria

UNIT-3

Logic Coverage Criteria: Applied to Test Code_1, Applied to Test Code_2, Issues in Applied to Test Code, Applied to test Specifications, Applied to finite state machines, Functional testing, Input Space Partitioning, Covering Criteria and example

UNIT-4

Syntax Based Testing, Mutation Testing, Mutation Testing for Programs, Mutation Operators for Source Code, Mutation Testing vs. Graph and Logic Based Testing, Mutation testing-Mutation for Integration, Grammars and Inputs

UNIT-5

Testing of Web Applications and Web Services, testing and Object-Oriented Applications, Symbolic testing, DART (Directed Automated Random Testing)

4. Online Learning Resources:

1. https://nptel.ac.in/courses/106105150
2. https://www.coursera.org/specializations/software-testing-automation
3. https://www.softwaretestinghelp.com/

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A43107d – DATA VISUALIZATION
(Professional Elective-I)

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

- To understand the principles, techniques, and tools of data visualization.
- To develop the ability to transform data into visual insights using different types of charts and plots.
- To introduce the cognitive and perceptual foundations of effective data visualization.
- To apply tools and programming environments (like Python, Tableau, or Power BI) for creating interactive and dynamic visualizations.
- To analyze real-world datasets and effectively communicate data-driven findings visually.

2.Course Outcomes:

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

- CO1: Interpret different types of data and recognize the appropriate visualization methods. (Understand, Analyze)
- CO2: Design effective and interactive data visualizations using various tools. (Apply, Create)
- CO3: Apply visual encoding and perceptual principles in presenting complex data. (Apply, Evaluate)
- CO4: Analyze and visualize real-world data sets using Python libraries and dashboards. (Analyze, Evaluate)
- CO5: Create visual stories and dashboards for effective communication of insights. (Create, Apply)

3.Course Syllabus

UNIT I: Introduction to Data Visualization & Perception

Introduction to Data Visualization, Importance and Scope of Data Visualization, Data Types and Sources, Visual Perception: Pre-attentive Processing, Gestalt Principles, Data-Ink Ratio, Data Density, Lie Factor, Visualization Process and Design Principles, Tools Overview: Tableau, Power BI, Python Libraries

UNIT II: Visualization Techniques for Categorical & Quantitative Data

Charts for Categorical Data: Bar Charts, Pie Charts, Column Charts, Charts for Quantitative Data: Histograms, Line Charts, Boxplots, Scatter Plots, Bubble Charts, Heatmaps, Choosing the Right Chart Type, Best Practices in Labeling, Coloring, and Scaling.

UNIT III: Multidimensional, Temporal and Hierarchical Data Visualization

Visualizing Multivariate Data: Parallel Coordinates, Radar Charts, Time-Series Visualization: Time Plots, Animation over Time, Geographic Data Visualization: Maps, Choropleths, Hierarchical Data: Treemaps, Sunburst Charts, Network and Graph Visualization.

UNIT IV: Data Visualization Using Python and Dashboards

Introduction to Matplotlib, Seaborn, and Plotly, Creating Static and Interactive Charts, Pandas Visualization Capabilities, Dashboards with Dash, Streamlit, Power BI, Case Studies: Real-world Dataset Visualization.

UNIT V: Storytelling with Data and Ethical Visualization

Storytelling and Narrative Techniques in Visualization, Dashboards and Reporting, Misleading Visualizations and Bias, Ethical Principles in Data Visualization, Final Project: Create a Storytelling Dashboard with Real Data.

Textbooks:

1. Tamara Munzner, Visualization Analysis and Design, CRC Press, 2014.
2. Nathan Yau, Data Points: Visualization That Means Something, Wiley, 2013.

Reference Books:

1. Alberto Cairo, The Truthful Art: Data, Charts, and Maps for Communication, New Riders, 2016.
2. Cole Nussbaumer Knaflic, Storytelling with Data: A Data Visualization Guide for Business Professionals, Wiley, 2015.
3. Claus O. Wilke, Fundamentals of Data Visualization, O'Reilly, 2019.
4. Rohan Chopra, Hands-On Data Visualization with Bokeh, Packt Publishing, 2019.

Online Learning Resources:

1. NPTEL: Data Visualization - IIT Madras
   Coursera: Data Visualization with Python by IBM

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A43107e - SOFT COMPUTING
(Professional Elective-I)

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 Objectives:

- Understand the concepts of soft computing techniques and how they differ from traditional AI techniques.
- Introduce the fundamentals of fuzzy logic and fuzzy systems.
- Familiarize with artificial neural networks and their architectures.
- Learn genetic algorithms and their role in optimization.
- Explore hybrid systems integrating fuzzy logic, neural networks, and genetic algorithms.

2. Course Outcomes:

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

- Understand the components and applications of soft computing.
- Apply fuzzy logic concepts to real-world problems.
- Build and train various neural network models.
- Implement genetic algorithms for problem-solving and optimization.
- Design hybrid systems using soft computing techniques.

3. Course Syllabus:

UNIT I: Introduction to Soft Computing and Fuzzy Logic

Introduction to Soft Computing: Definition, Components, Differences with Hard Computing, Applications of Soft Computing, Fuzzy Logic: Crisp Sets vs Fuzzy Sets, Membership Functions, Fuzzy Set Operations, Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems: Mamdani and Sugeno Models, Defuzzification Techniques.

UNIT II: Artificial Neural Networks – I

Introduction to Neural Networks: Biological Neurons vs Artificial Neurons, Architecture of Neural Networks: Feedforward, Feedback, Learning Rules: Hebbian, Delta, Perceptron Learning Rule, Single Layer Perceptron and its Limitations, Multi-Layer Perceptron: Backpropagation Algorithm, Applications of Neural Networks

UNIT III: Artificial Neural Networks – II

Hopfield Networks and Associative Memories, Radial Basis Function Networks, Self-Organizing Maps (SOM), Recurrent Neural Networks (RNNs) – Basic Concepts, Convolutional Neural Networks (CNNs) – Overview and Applications, Practical Use Cases in Image and Pattern Recognition,

UNIT IV: Genetic Algorithms and Optimization

Introduction to Genetic Algorithms, GA Operators: Selection, Crossover, Mutation, Fitness Function and Evaluation, Schema Theorem, Elitism, Applications in Function Optimization, Scheduling, and Robotics, Introduction to Particle Swarm Optimization (PSO).

UNIT V: Hybrid Systems and Advanced Topics

Hybrid Systems: Neuro-Fuzzy Systems, Fuzzy-GA, GA-ANN, ANFIS: Architecture and Learning, Case Studies on Hybrid Systems, Introduction to Deep Learning in Soft Computing, Real-World Applications: Forecasting, Control Systems, Medical Diagnosis, Image Processing.

4. Textbooks/Materials:

Textbooks:

1. S. N. Sivanandam, S. N. Deepa, “Principles of Soft Computing”, Wiley India, 3rd Edition
2. Timothy J. Ross, “Fuzzy Logic with Engineering Applications”, Wiley, 4th Edition
3. S. Rajasekaran and G. A. Vijayalakshmi Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications”, PHI

Reference Books:

1. Laurene Fausett, “Fundamentals of Neural Networks: Architectures, Algorithms and Applications”, Pearson
2. David E. Goldberg, “Genetic Algorithms in Search, Optimization and Machine Learning”, Pearson
3. Simon Haykin, “Neural Networks and Learning Machines”, Pearson, 3rd Edition
4. Bart Kosko, “Neural Networks and Fuzzy Systems”, Prentice Hall

Online Learning Resources:

1. NPTEL – Soft Computing by Prof. S. Sengupta (IIT Kharagpur)
2. Coursera – Neural Networks and Deep Learning (Andrew Ng)

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A43107f -EXPLORATORY DATA ANALYSIS WITH PYTHON (Professional Elective-I)

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

- To introduce the principles and practices of Exploratory Data Analysis (EDA) using Python.
- To teach techniques for data cleaning, preprocessing, transformation, and visualization.
- To apply statistical techniques and visual methods to discover patterns and relationships.
- To gain experience using popular Python libraries such as NumPy, Pandas, Matplotlib, and Seaborn.
- To prepare datasets for further machine learning and predictive modeling.

2.Course Outcomes: After completion of the course, students will be able to:

- CO1.Understand and apply key concepts of EDA and data preprocessing. (Cognitive Level: Understand, Apply)
- CO2.Perform exploratory analysis using Python libraries and interpret results. (Cognitive Level: Apply, Analyze)
- CO3.Handle missing data, outliers, and categorical features effectively. (Cognitive Level: Apply)
- CO4.Create meaningful visualizations to support data-driven insights. (Cognitive Level: Analyze, Evaluate)
- CO5Use EDA as a foundation for data science workflows. (Cognitive Level: Apply, Create)

3.Course Syllabus

UNIT I – Introduction to EDA and Python Environment
Introduction to Data Science and EDA, Importance of EDA in Data Science Life Cycle, Setting up Python Environment: Jupyter, Anaconda, VS Code, Introduction to NumPy and Pandas: Arrays, Series, DataFrames, Data loading, viewing, basic operations (info, describe, shape)

UNIT II – Data Wrangling and Preprocessing
Handling Missing Data (mean, median, drop, interpolation), Dealing with Duplicates, Outliers, and Anomalies, Encoding Categorical Variables (Label, One-hot), Data Transformation: Scaling, Normalization, Binning, Data Types Conversion and Data Type Casting.

UNIT III – Univariate and Bivariate Analysis
Measures of Central Tendency and Dispersion, Distribution Plots: Histograms, Boxplots, KDE, Bar Charts, Count Plots, Pie Charts, Bivariate Analysis: Scatter Plots, Pair Plots, Heatmaps, Correlation and Covariance Analysis

UNIT IV – Data Visualization Techniques
Visualization with Matplotlib and Seaborn, Customizing Plots: Titles, Legends, Labels, Themes, Advanced Visuals: Violin Plots, Strip Plots, Swarm Plots, Multivariate Visualization and Subplots, Plotly and Interactive Visualizations (basic overview)

UNIT V – EDA Case Studies and Real-Time Datasets
Step-by-step EDA on Sample Datasets (Titanic, Iris, Sales, etc.), Outlier Detection Techniques, Feature Engineering Techniques in EDA, EDA Report Generation using Python Notebooks, Preparing

Data for Machine Learning Models

Textbooks:

1. **Jake VanderPlas**, Python Data Science Handbook: Essential Tools for Working with Data, O'Reilly, 2016.
2. **Wes McKinney**, Python for Data Analysis, 2nd Edition, O'Reilly, 2018.

Reference Books:

1. **Joel Grus**, Data Science from Scratch, O'Reilly, 2019.
2. **Aurelien Geron**, Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow, 2nd Edition, O'Reilly, 2019.
3. **Allen B. Downey**, Think Stats: Probability and Statistics for Programmers, O'Reilly, 2014.

Online Learning Resources:

1. NPTEL Course – Data Science for Engineers
2. Coursera – Applied Data Science with Python Specialisation (University of Michigan)

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A43107g - COMPUTATIONAL INTELLIGENCE
(Professional Elective-I)

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 Objectives:

- Understand the concepts and foundations of computational intelligence.
- Study neural networks, fuzzy logic systems, and evolutionary algorithms.
- Explore hybrid systems and their applications.
- Apply computational intelligence techniques to real-world problem-solving.
- Analyze the effectiveness of various computational intelligence approaches.

2.Course Outcomes: After completion of the course, students will be able to:

- CO1.Describe and differentiate neural networks, fuzzy logic, and evolutionary computation. (Understand)
- CO2.Apply neural and fuzzy systems for real-time decision-making. (Apply)
- CO3.Analyze complex problems using soft computing tools. (Analyze)
- CO4.Develop hybrid intelligent systems. (Create)
- CO5.Evaluate and compare the performance of CI-based systems. (Evaluate)

3. Course Syllabus

UNIT I: Introduction to Computational Intelligence and Artificial Neural Networks

Definition and Scope of Computational Intelligence (CI), Components of CI: Neural Networks, Fuzzy Logic, Evolutionary Computation, Biological Neuron vs. Artificial Neuron, McCulloch-Pitts Model, Perceptron, Adaline and Madaline, Multilayer Feedforward Networks, Backpropagation Algorithm, Applications of ANN in Pattern Recognition and Classification.

UNIT II: Fuzzy Logic and Fuzzy Systems

Introduction to Fuzzy Logic and Fuzzy Sets, Membership Functions, Fuzzy Set Operations, Fuzzy Rules and Inference Systems, Fuzzification and Defuzzification, Fuzzy Control Systems, Fuzzy Reasoning and Approximate Reasoning

UNIT III: Evolutionary Computation Techniques

Basics of Evolutionary Algorithms (EA), Genetic Algorithms (GA): Operators, Encoding, Fitness Function, Selection, Crossover and Mutation, Convergence Criteria, Genetic Programming (GP), Differential Evolution (DE), Applications of GA and GP

UNIT IV: Swarm Intelligence and Hybrid Systems

Swarm Intelligence: Ant Colony Optimization (ACO), Particle Swarm Optimization (PSO), Behavior of Swarms and Collective Intelligence, Comparison of Evolutionary Algorithms and Swarm Techniques, Hybrid Systems: Neuro-Fuzzy, Fuzzy-GA, ANN-GA Systems, Case Studies in Hybrid Systems

UNIT V: Applications of Computational Intelligence

CI in Image and Signal Processing, CI for Optimization Problems and Robotics, CI in Biomedical Engineering and Finance, Intelligent Agents and Decision-Making Systems, Real-time Applications and Emerging Trends in CI.

Textbooks:

1. S. Rajasekaran and G. A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic, and Genetic Algorithms: Synthesis and Applications, PHI Learning.
2. Timothy J. Ross, Fuzzy Logic with Engineering Applications, Wiley India.

Reference Books:

1. S.N. Sivanandam, S. N. Deepa, Principles of Soft Computing, Wiley India.
2. Simon Haykin, Neural Networks and Learning Machines, Pearson.
3. James Kennedy and Russell C. Eberhart, Swarm Intelligence, Morgan Kaufmann.
4. Andries P. Engelbrecht, Computational Intelligence: An Introduction, Wiley.

Online Learning Resources:

1. NPTEL - Computational Intelligence
2. Coursera – Computational Intelligence
3. YouTube: IIT Lectures on Soft Computing and CI

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE
A43107h - Responsible and Safe AI Systems
(Professional Elective-I)

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:

There has been an exponential increase in the use of platforms / technologies like ChatGPT, Gemini, Llama, Sora, DALL-E, etc. in our day-to-day lives. There Language & Vision models have changed our way of living, and way we seek & create information. This course provides students with a comprehensive understanding of the ethical, social, and safety considerations essential for developing and deploying artificial intelligence (AI) systems. Uncover the intricacies of algorithmic transparency, fairness in machine (un)learning, interpretability, consistency and many more. The course encourages critical thinking and fosters a deep appreciation for the impact of AI on individuals and communities.

PREREQUISITES: Any level of machine learning / AI course would help, it is not mandatory though
Learning outcomes.

2. COURSE OUTCOMES:

By the end of the module, students should be able to:

- Develop an appreciation for what is involved in Learning models from data
- Understand a wide variety of learning algorithms
- Understand how to evaluate models generated from data
- Apply the algorithms to a real problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models

3. SYLLABUS

UNIT 1

AI Capabilities Improvement in last 5-10 years, imminent risks from AI Models: Toxicity, bias, goal misspecification, adversarial examples etc. Long-term risks from AI Models: Misuse, Misgeneralization, Rogue AGI, Principles of RAI - Transparency; Accountability; Safety, Robustness and Reliability, Privacy and Security; Fairness and non-discrimination; Human-Centred Values; Inclusive and Sustainable development, Interpretability

UNIT 2

Deep Learning Techniques, Language/Vision Models, AI Risks for Gen models, Adversarial Attacks – Vision, NLP, Superhuman Go agents, ML Poisoning Attacks like Trojans, Implications for current and future AI safety, Explain-ability, Imminent and Long-term potential for transparency techniques

UNIT 3

Mechanistic Interpretability, Representation Engineering, model editing and probing, Critiques of Transparency for AI Safety, Privacy & Fairness in AI, Metrics and Tools for RAI - measuring bias/fairness, adversarial testing, details of Lime/SHAP/GradCam

UNIT 4

Audit mechanisms Regulation landscape - DPDP act (India), GDPR (EU), EU AI act, US presidential declaration, Ethical approvals, informed consent, participatory design, future of work, Indian context

UNIT 5

What is AGI? When could it be achieved, Instrumental Convergence: Power Seeking, Deception etc., RAI in Legal domain, RAI in Health care domain, RAI in Education domain, A few other domains, Policy issues in RAI and Couple of panel discussion with industry practitioners, academic, government (possibly), and others.

Reference Books:

- Mitchell T, Machine Learning, McGraw-Hill, 1997
- S. Rogers and M. Girolami, A first course in Machine Learning, CRC Press, 2011
- C. Bishop, Pattern Recognition and Machine Learning, 2007
- D. Barber, Bayesian Reasoning and Machine Learning, 2012
- Duda, Hart and Stork, Pattern Classification, Wiley-Interscience.

Online Learning Resources:

https://onlinecourses.nptel.ac.in/noc24_cs132/preview

COURSE STRUCTURE

A40520e – Privacy and Security in Online Social Media (PE-1)

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:

With increase in the usage of the Internet, there has been an exponential increase in the use of online social media and networks on the Internet. Websites like Facebook, YouTube, LinkedIn, Twitter, Flickr, Instagram, Google+, FourSquare, Pinterest, Tinder, and the likes have changed the way the Internet is being used. However, widely used, there is a lack of understanding of privacy and security issues on online social media. Privacy and security of online social media need to be investigated, studied and characterized from various perspectives (computational, cultural, psychological, etc.). Student completing the course will be able to appreciate various privacy and security concerns (spam, phishing, fraud nodes, identity theft) on Online Social Media and Student will be able to clearly articulate one or two concerns comprehensively on one Online Social Media, this will be achieved by homework.

2. Course Outcomes (COs)

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

CO1. Understand the structure and characteristics of online social networks (OSNs) and the methodologies for data collection using social media APIs.

CO2. Analyze the key challenges, opportunities, and ethical pitfalls in mining and interpreting data from online social networks.

CO3. Evaluate trust, credibility, and reputation mechanisms in social systems and their implications for user interaction and content authenticity.

CO4. Assess the role of online social media (OSM) in policing and law enforcement, with a focus on privacy concerns, phishing attacks, and fraudulent identity detection.

CO5. Critically review and discuss contemporary research papers related to online social networks and media, demonstrating an ability to synthesize findings and propose future research directions.

3. Course Syllabus

UNIT-1

What is Online Social Networks, data collection from social networks, challenges, opportunities, and pitfalls in online social networks, APIs, Collecting data from Online Social Media.

UNIT-2

Trust, credibility, and reputations in social system, Online social Media and Policing.

UNIT-3

Information privacy disclosure, revelation and its effects in OSM and online social networks, Phishing in OSM

UNIT-4

Identifying fraudulent entities in online social networks, Refresher for all topics

UNIT-5

Research paper discussion

4. Books and Materials

Text Books:

1. https://drive.google.com/file/d/1Pt9-gq70dYsByxOeF6t4pY-QXLtHm0JM/view
2. https://onlinecourses.nptel.ac.in/noc24_cs04/course?user_

Online Learning Resources:

- https://onlinecourses.nptel.ac.in/noc24_cs04/course?

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A43108 - COMPUTER VISION & NLP LAB

(Professional Core)

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

1.Course Description

- To provide hands-on experience in implementing image processing and computer vision algorithms.
- To familiarize students with natural language processing techniques using Python libraries.
- To enable the integration of CV and NLP for building intelligent applications.

2.Course Outcomes:

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

- Apply image processing techniques for feature extraction and classification.
- Implement NLP techniques such as tokenization, POS tagging, and sentiment analysis.
- Analyze visual and textual data using open-source tools.
- Develop applications that combine Computer Vision and NLP for real-world tasks.

List of Experiments:

1. Load and display an image using OpenCV and perform basic operations like resizing, cropping, and rotation.

2. Apply edge detection (Sobel, Canny) and thresholding techniques on grayscale and color images.

3. Implement image filtering operations: Gaussian, Median, and Bilateral filters.

4. Perform object detection using contour detection and bounding boxes.

5. Detect faces using Haar Cascade or DNN-based pre-trained models in OpenCV.

6. Implement color-based object tracking using HSV space and CamShift algorithm.

7. Preprocess text data (tokenization, stopword removal, stemming, lemmatization) using NLTK/spaCy.

8. Implement Part-of-Speech (POS) tagging and Named Entity Recognition (NER) using spaCy.

9. Build a simple sentiment analysis classifier using bag-of-words or TF-IDF and Naïve Bayes.

10. Perform topic modeling using Latent Dirichlet Allocation (LDA).

11. Extract text from an image using Optical Character Recognition (OCR) with Tesseract and perform text summarization.

12. Final Mini Project: Integrate CV and NLP (e.g., Read text from signboards or documents and translate/summarize it).

3.Lab Software Requirements:

- **Languages/Tools:** Python, OpenCV, NLTK, spaCy, Tesseract OCR, scikit-learn, NumPy, Pandas, Matplotlib
- **Platforms:** Jupyter Notebook / Google Colab / PyCharm / VS Code

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A43109 - AI & SYSTEM PROGRAMMING LAB

(Professional Core)

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

- ### 1.Course Description
  - To provide practical exposure to foundational AI algorithms and system programming.
  - To develop skills to write intelligent systems and low-level programs.
  - To integrate concepts of AI and system programming for automation and optimization.

2.Course Outcomes:

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

- Implement search algorithms and logic programming using AI tools.
- Construct assemblers, macro processors, and shell scripts.
- Develop system utilities using C and integrate them with AI tools.
- Demonstrate real-time intelligent system automation using scripting and AI logic.

1. Write simple programs in Prolog for facts, rules, and queries.
2. Develop a Prolog-based expert system for medical diagnosis or animal identification.
3. Implement Depth-First Search (DFS) and Breadth-First Search (BFS) in Python.
4. Implement A* Search Algorithm using heuristics in Python.
5. Implement the Minimax algorithm for a simple game (e.g., Tic Tac Toe).
6. Design and implement a two-pass assembler in C.
7. Implement a Macro Processor using C for assembly language programs.
8. Develop a simple Linux Shell (command interpreter) using C.
9. Write shell scripts for file operations, process creation, and monitoring.
10. Demonstrate inter-process communication using pipes and signals in Linux.
11. Integrate AI logic (search/expert system) into a shell script or system utility for task automation.
12. **Final Mini Project**: Develop an AI-powered system utility (e.g., Intelligent File Manager, AI Bot for CLI commands).

3.Lab Software Requirements:

- **Languages:** Python, Prolog, C
- **Tools:** GCC, SWI-Prolog, Linux (Ubuntu/WSL), Shell, Lex/Yacc (optional)
- **IDEs:** Code::Blocks / VS Code / Geany / Terminal-based compilation

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40523 - FULL STACK DEVELOPMENT-II

(Skill Enhancement Course)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	1	2	42	1	2	2	30	70	100

1.Course Description

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

2. Course Outcomes:

CO1. Building fast and interactive UIs

CO2. Applying Declarative approach for developing web apps

CO3. Understanding ES6 features to embrace modern JavaScript

CO4. Building reliable APIs with Express. Js

CO5. Create and manage Git repositories, track changes, and push code to GitHub.

3. Course Syllabus

Experiments covering the Topics:

- Introduction to DOM (Document Object Model), Ecma Script (ES6) standards and features like Arrow functions, Spread operator, Rest operator, Type coercion, Type hoisting, String literals, Array and Object Destructuring.
- Basics of React. js like React Components, JSX, Conditional rendering Differences between Real DOM and Virtual DOM.
- Important React.js concepts like React hooks, Props, React forms, Fetch API, Iterative rendering using JavaScript map() function.
- JavaScript runtime environment node. js and its uses, Express. js and Routing, Micro-Services architecture and MVC architecture, database connectivity using (My SQL)
- Introduction to My SQL, setting up MySQL and configuring, Databases, My SQL queries, subqueries, creating My SQL driver for database connectivity to Express. js server.
- Introduction to Git and GitHub and upload project& team collaboration

Sample Experiments:

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

2. **Basics of React. js**

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

3. Important concepts of React. js

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

4. Introduction to Git and GitHub

a. **Setup**

- Install Git on local machine.
- Configure Git (user name, email).
- Create GitHub account and generate a personal access token.

b. **Basic Git Workflow**

- Create a local repository using `git init`
- Create and add files → `git add .`
- Commit files → `git commit -m "Initial commit"`
- Connect to GitHub remote → `git remote add origin <repo_url>`
- Push to GitHub → `git push -u origin main`

c. **Branching and Collaboration**

- Create a branch → `git checkout -b feature1`
- Merge branch to main → `git merge feature1`
- Resolve merge conflicts (guided)

5. Upload React Project to GitHub

- Create a new React app using `npx create-react-app myapp`
- Initialize a git repo and push to GitHub
- Use `.gitignore` to exclude `node_modules`
- Create multiple branches: `feature/navbar`, `feature/form`
- Practice merge and pull requests (can use GitHub GUI)

6. Introduction to Node. js and Express. js

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

7. Introduction to My SQL

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

8. Team Collaboration Using GitHub

- Form groups of 2–3 students
- Create a shared GitHub repo
- Assign tasks and work in branches
- Use Issues, Pull Requests, and Code Reviews
- Document code with `README.md`

Textbooks:

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

Reference Books:

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

Online Learning Resources:

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

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL
(AUTONOMOUS)

COURSE STRUCTURE

A40032 - TINKERING 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	28	1	30	70	100

1. Course Description:

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.

2. 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

3. Course Outcomes:

CO1. Demonstrate series and parallel circuits using a breadboard.
CO2. Apply components to build automation circuits like traffic lights and LDR-based systems.
CO3. Analyze Arduino/ESP32-based projects for LED control, sensor, and motor interfacing.
CO4. Design and simulate IoT projects using Tinkercad and Arduino IDE.
CO5. Create innovative prototypes like walking robots and rockets using design thinking and 3D printing.

4. 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.

5. Laboratory Equipment/Software/Tools Required:

- Breadboard, Resistors & LEDs
- Jumper Wires cables kit multi colored
- Breadboard power supply module
- LED Traffic Lights Signal Module
- LDR module
- Arduino Uno + USB cable
- IR Sensor Module
- SG90 Servo Motor
- ESP32 + cable
- Multi-meters
- 9V Adapters
- Soil Moisture Sensor
- Arduino IDE software
- Tinkercad Online Platform

6. 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

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL
(AUTONOMOUS)

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

1. Course Objectives

- 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.

2. Course Outcomes (COs)

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

CO1. Explain core quantum principles in a non-mathematical manner.
CO2. Compare classical and quantum information systems.
CO3. Identify theoretical issues in building quantum computers.
CO4. Discuss quantum communication and computing concepts.
CO5. Recognize applications, industry trends, and career paths in quantum technology.

3. Course Syllabus

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

4. Books and Materials

Text Books:

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

Reference Books:

1. David McMahon, Quantum Computing Explained, Wiley, 2008.
2. Phillip Kaye, Raymond Laflamme, Michele Mosca, An Introduction to Quantum Computing, Oxford University Press, 2007.
3. Scott Aaronson, Quantum Computing Since Democritus, Cambridge University Press, 2013.
4. Alastair I.M. Rae, Quantum Physics: A Beginner's Guide, Oneworld Publications, Revised Edition, 2005.
5. Eleanor G. Rieffel, Wolfgang H. Polak, Quantum Computing: A Gentle Introduction, MIT Press, 2011.
6. Leonard Susskind, Art Friedman, Quantum Mechanics: The Theoretical Minimum, Basic Books, 2014.
7. Bruce Rosenblum, Fred Kuttner, Quantum Enigma: Physics Encounters Consciousness, Oxford University Press, 2nd Edition, 2011.
8. GiulianoBenenti, GiulioCasati, GiulianoStrini, 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

VI - Semester

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A43111 - Cloud Computing for AI (Professional Core)

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

1. To introduce the concepts, models, and services of cloud computing and its role in AI.
2. To explore the architecture and deployment of AI applications on cloud platforms.
3. To equip students with skills in using cloud-based tools and services for AI/ML workloads.
4. To understand data storage, processing, and security in cloud for AI tasks.
5. To apply cloud computing principles to real-world AI-based solutions.

2.Course Outcomes:

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

CO1.Explain cloud computing architecture, services, and deployment models.
CO2.Utilize cloud platforms (AWS, GCP, Azure) for training and deploying AI models.
CO3.Handle large-scale data storage and processing in the cloud environment.
CO4.Integrate AI workflows using serverless and container-based architectures.
CO5.Analyze challenges in security, cost, scalability, and performance of cloud-based AI systems.

3. Course Syllabus

UNIT I: Introduction to Cloud Computing and AI Integration

Basics of Cloud Computing: Characteristics, Models, and Services, Cloud Service Models: IaaS, PaaS, SaaS, Deployment Models: Public, Private, Hybrid, Community, AI and Cloud Convergence: Benefits and Challenges, Use Cases of AI in Cloud: NLP, Vision, Analytics, Overview of Cloud Providers for AI: AWS, Azure, GCP.

UNIT II: Storage, Computing, and Data Processing in the Cloud

Cloud Storage Services: S3, Blob, BigQuery, Virtualization and Elastic Computing, Distributed Computing with Hadoop and Spark, Data Ingestion and Processing Pipelines, Data Lakes and Warehousing in the Cloud, Cost Optimization for Storage and Compute Resources.

UNIT III: Cloud-based Machine Learning and Deep Learning

ML Services on AWS (SageMaker), Azure ML, GCP Vertex AI, Training and Deploying Models on Cloud, AutoML and Custom ML Model Workflows, GPUs/TPUs for Model Training, Experiment Tracking and Model Evaluation, Integration of Notebooks (Jupyter, Colab) with Cloud Storage.

UNIT IV: Advanced Cloud Concepts for AI Applications

Containers and Docker for AI Applications, Kubernetes and Cloud-native AI Workflows, Serverless Computing: AWS Lambda, Azure Functions, CI/CD Pipelines for AI Models in Cloud, Scaling AI Applications using Load Balancers and Auto-Scaling. Monitoring and Logging in Cloud for AI Workflows.

UNIT V: Security, Ethics, and Case Studies in Cloud AI

Security and Privacy in Cloud-based AI, Identity and Access Management (IAM) in Cloud, Cost Management and Billing for AI Services, Ethical Issues and Fairness in Cloud AI, Case Study: AI in Healthcare Cloud Solutions, Case Study: Real-Time Analytics in Financial Cloud Services.

Textbooks:

1. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, Mastering Cloud Computing, McGraw-Hill.
2. Judith Hurwitz et al., Cloud Computing for Dummies, Wiley.
3. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, O'Reilly.

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A43112 -BIG DATA ANALYTICS & AI APPLICATIONs

(Professional Core)

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

1. To introduce the fundamentals of big data and its role in AI-driven applications.
2. To explore big data tools and technologies such as Hadoop, Spark, and NoSQL databases.
3. To enable students to build scalable AI pipelines for data analytics.
4. To apply AI/ML algorithms for real-time and batch processing environments.
5. To demonstrate use cases of big data in domains like healthcare, finance, and IoT using AI.

2.Course Outcomes:

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

CO1.Understand the architecture and ecosystem of big data processing.
CO2.Analyze and manage large-scale datasets using Hadoop and Spark.
CO3.Apply AI/ML techniques to extract insights from big data.
CO4.Design and implement scalable data pipelines using distributed frameworks.
CO5.Solve real-world domain problems with AI-powered big data solutions.

3. Course Syllabus

UNIT I: Introduction to Big Data and Analytics Ecosystem
Definition and Characteristics of Big Data – Volume, Velocity, Variety, Veracity, Value, Types of Analytics: Descriptive, Diagnostic, Predictive, Prescriptive, Big Data Challenges and Opportunities, Hadoop Ecosystem Overview: HDFS, MapReduce, YARN, NoSQL Databases: Key-Value, Columnar, Document, Graph Models, Data Lake vs. Data Warehouse.

UNIT II: Big Data Tools and Frameworks
Apache Spark Architecture and RDDs, Spark SQL, DataFrames, and Datasets, Spark Streaming for Real-Time Analytics, Kafka for Data Ingestion and Message Queues, Hive, Pig, and Impala for Big Data Querying, Comparative Analysis of Hadoop vs. Spark.

UNIT III: Machine Learning on Big Data
Introduction to MLlib and Scikit-learn, Data Preprocessing for Big Data ML Pipelines, Supervised Learning: Classification and Regression on Large Datasets, Unsupervised Learning: Clustering and Dimensionality Reduction, Model Evaluation and Validation Techniques, Distributed Training and Optimization Techniques.

UNIT IV: AI Applications on Big Data
Predictive Maintenance using Big Data & AI, Fraud Detection in Banking with Machine Learning, AI in Healthcare: Diagnosis, Genomics, Patient Monitoring, Retail and E-commerce Analytics, AI for Smart Cities and IoT Sensor Data Analysis, Evaluation of Real-Time AI Applications on Streaming Data.

UNIT V: Advanced Topics and Case Studies
Deep Learning on Big Data using TensorFlow on Spark, Explainable AI (XAI) in Big Data Environments, Ethical Issues and Data Governance in Big Data AI, Edge Computing and AI for Low Latency Applications, Case Study 1: AI-Powered Big Data in Healthcare, Case Study 2: Big Data AI Solution in Smart Manufacturing.

Textbooks:

1. Big Data: Principles and Paradigms by Rajkumar Buyya, Rodrigo N. Calheiros, Amir Vahid Dastjerdi – Wiley
2. Learning Spark: Lightning-Fast Big Data Analysis by Jules S. Damji et al. – O'Reilly
3. Data Science and Big Data Analytics by EMC Education Services – Wiley

Reference Books:

1. Designing Data-Intensive Applications by Martin Kleppmann – O'Reilly
2. Machine Learning with Spark by Rajdeep Dua, Tathagata Das – Packt Publishing
3. Streaming Systems by Tyler Akidau – O'Reilly Media
4. Artificial Intelligence for Big Data by Anand Deshpande – Packt

Online Learning Resources:

- https://www.coursera.org/specializations/big-data – Coursera Big Data Specialization
- https://spark.apache.org/docs/latest/ – Apache Spark Documentation

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE
A43113 – FULL STACK AI DEVELOPMENT
(Professional Core)

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 Objectives

The course aims to:

1. Introduce students to full stack web development using modern technologies like React, Node.js, and MongoDB.
2. Develop the ability to design, build, and deploy responsive and data-driven web applications.
3. Equip students with knowledge of integrating AI and ML models into full-stack systems for intelligent automation.
4. Provide hands-on experience in Python-based data analysis, visualization, and AI integration.
5. Enable students to apply algorithmic thinking and AI techniques to solve real-world problems using web platforms.

2. Course Outcomes (COs)

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

CO1. Design and develop responsive web interfaces using HTML5, CSS3, JavaScript, and GitHub.
CO2. Implement server-side logic and RESTful APIs using Node.js, Express.js, and MongoDB.
CO3. Build and deploy full-stack applications integrating React frontend with backend services.
CO4. Manage state, authentication, authorization, and file handling in full-stack web applications.
CO5. Deploy full-stack applications using modern cloud platforms with proper environment setup and optimization.

3. Course Syllabus

UNIT - I – Web Foundations using HTML, CSS, JavaScript & GitHub

Overview of Web Development & Full Stack Architecture,HTML5: Structure, Forms, Tables, Multimedia, Semantic Tags,CSS3: Selectors, Layouts, Flexbox, Grid, Responsive Design, Tailwind CSS,JavaScript: Variables, Functions, Arrays, Events, DOM Manipulation, ES6+ Features,Form Elements & Validation: Input types, form handling, and client-side checks,Debugging: Console tools and browser developer utilities,Version Control: Git essentials, branching, merging, pull requests,Project Hosting: GitHub Pages, repository management.

UNIT - II – Backend Development with Node.js, Express, Angular & MongoDB

Introduction to Server-Side Programming using Node.js,Express.js Framework: Routing, Middleware, Body Parsing, CORS, MongoDB: Database setup, Collections, CRUD Operations with Mongoose, AJAX & JSON: Asynchronous data exchange between client and server,Angular: Components, Forms, Two-Way Data Binding, API Integration, Connecting Frontend → Node.js Server → MongoDB, Authentication (JWT), Optimization Essentials: Query optimization, indexing basics.

UNIT - III – React Framework & Full-Stack Integration

React Fundamentals: Components, Props, State, Hooks, Lifecycle, Forms in React: Controlled vs Uncontrolled Components,Form Validation using React Hook Form / Formik, API Communication with Fetch/Axios, Connecting React → Express → MongoDB, Routing with React Router, State Management using Redux/Context API, Error Handling & Form Submission Feedback, Deployment using Netlify / Render.

UNIT IV – Advanced Frontend & Backend Integration

API Design Principles: REST structure, endpoint planning, Data Flow in Full Stack Applications: Client → Server → Database → UI update, Authentication Workflow: Login, protected routes, token handling in frontend, Authorization Basics: Role-based UI control, API access control, File Handling in Full Stack Apps: Image/file upload using Multer, Pagination & Filtering Techniques: Server-side pagination, query filtering in MongoDB, Reusable UI Components: Navigation bars, forms, cards, modals

UNIT V – Full-Stack Application Development & Deployment

Full-Stack Project Architecture: Folder structure for React/Angular + Node + MongoDB, Routing Strategy: Nested routes, layout routes, public vs private paths, Form Modules: Advanced form validation flows, error messaging, user feedback, State Persistence: LocalStorage/session storage handling, Media Handling: Serving static images/files from backend, Search & Filter Modules: Frontend search + server-side filtering integration, Notifications & Alerts: Toast, modal-based feedback systems, Project Deployment Steps.

4. Books and Materials

Text Books:

1. Vasan Subramanian, Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, 2nd Edition, APress, 2019
2. Node.js, Express & MongoDB Web Development by Brad Dayley, Brendan Dayley & Caleb Dayley, Pearson Education, Latest Edition.

Reference Books:

1. Full-Stack React, TypeScript & Node by David Choi, Packt Publishing.
2. Web Development with Node and Express by Ethan Brown, O’Reilly Media.
3. React Explained by Zac Gordon, LeanPub.
4. MongoDB: The Definitive Guide by Shannon Bradshaw, Eoin Brazil & Kristina Chodorow, O’Reilly Media.

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A43114a -GRAPH NEURAL NETWORKS

(Professional Elective-II)

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

- To introduce the fundamentals of graph theory and graph-structured data.
- To explore the concepts of neural networks extended to non-Euclidean domains.
- To understand architectures and algorithms behind various types of GNNs.
- To apply GNN models in real-world applications such as recommendation, social networks, and bioinformatics.
- To enable students to build and evaluate GNN models using frameworks like PyTorch Geometric and DGL.

2.Course Outcomes:

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

CO1.Understand the basics of graph structures and their significance in machine learning.
CO2.Learn and implement different types of GNN architectures.
CO3.Apply GNNs to real-world structured data problems.
CO4.Use modern libraries and tools to train and evaluate GNNs.
CO5.Analyze the effectiveness and limitations of GNNs in different domains.

3. Course Syllabus

UNIT I: Fundamentals of Graph Theory and Machine Learning on Graphs
Introduction to Graphs: Nodes, Edges, Adjacency Matrix, Types of Graphs: Directed, Undirected, Weighted, Bipartite, Graph Traversal Algorithms (BFS, DFS), Graph Representations for ML (Adjacency List, Matrix, Laplacian), Node, Edge, and Graph-level Prediction Problems, Motivation and Challenges for Learning on Graphs.

UNIT II: Spectral and Spatial Methods for Graph Learning
Spectral Graph Theory Basics, Graph Convolution via Spectral Methods, Chebyshev and First-order Approximations, Spatial Graph Convolutions, Comparison of Spectral vs Spatial GNNs, Graph Laplacian and Eigenvalue Properties.

UNIT III: Graph Neural Network Architectures
Graph Convolutional Networks (GCNs), Graph Attention Networks (GATs), GraphSAGE: Sampling and Aggregation, Graph Isomorphism Networks (GIN), Message Passing Neural Networks (MPNNs), Inductive vs Transductive GNN Learning.

UNIT IV: Applications of GNNs
Node Classification (e.g., Cora, Citeseer), Link Prediction (e.g., Recommender Systems), Graph Classification (e.g., Molecule Property Prediction), Traffic Forecasting and Social Network Modeling, GNNs in Healthcare and Bioinformatics, Explainability and Interpretability in GNNs.

UNIT V: Implementation, Optimization, and Recent Advances
Overview of PyTorch Geometric and DGL, Data Loading and Preprocessing for Graph Datasets, Model Training, Loss Functions, and Evaluation Metrics, Hyperparameter Tuning in GNNs, Recent Research Trends and Architectures (e.g., Heterogeneous GNNs, Graph Transformers), Challenges and Future Directions in GNNs

Textbooks:

1. Zonghan Wu, Shirui Pan, Fengwen Chen, Guodong Long, Chengqi Zhang, Philip S. Yu, A Comprehensive Survey on Graph Neural Networks, IEEE Transactions on Neural Networks and Learning Systems, 2021.
2. Yao Ma, Jiliang Tang, Deep Learning on Graphs, Cambridge University Press, 2021.
3. William L. Hamilton, Graph Representation Learning, Morgan & Claypool Publishers, 2020.

Reference Books:

1. Barrett, Jure Leskovec, Mining of Massive Datasets, Cambridge University Press.
2. Thomas Kipf, GCN and related papers and tutorials (arXiv).
3. Petar Veličković, Graph Attention Networks (original paper and slides).
4. Michael Bronstein et al.,Geometric Deep Learning: Grids, Groups, Graphs, Geodesics, and Gauges (arXiv preprint).

Online Learning Resources:

1. https://pytorch-geometric.readthedocs.io/ – PyTorch Geometric Docs
2. https://cs.stanford.edu/people/jure/ – Stanford GNN Projects
3. https://www.coursera.org/learn/graph-neural-networks – Coursera GNN Course by Stanford

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A43114b -RECOMMENDER SYSTEMS

(Professional Elective-II)

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

- To understand the theoretical foundations and practical techniques behind recommender systems.
- To explore collaborative, content-based, and hybrid recommendation methods.
- To apply matrix factorization and deep learning for building intelligent recommenders.
- To analyze system performance using standard evaluation metrics.
- To design and implement recommender systems for real-world applications.

2.Course Outcomes:

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

CO1.Explain the core concepts and types of recommender systems.
CO2.Implement basic collaborative and content-based filtering techniques.
CO3.Apply matrix factorization and deep learning models to recommendation problems.
CO4.Evaluate and optimize recommender systems using appropriate metrics.
CO5.Design scalable and context-aware recommender systems for diverse applications.

3. Course Syllabus

UNIT I: Introduction to Recommender Systems

Introduction to Information Filtering Systems, Types of Recommender Systems: Content-based, Collaborative, Hybrid, Data Sources: Explicit vs Implicit Feedback, Applications and Challenges in Recommendation, User and Item Profiling, Popularity, Personalization, and Serendipity Trade-offs.

UNIT II: Collaborative Filtering Techniques

User-based Collaborative Filtering, Item-based Collaborative Filtering, Similarity Measures: Cosine, Pearson, Jaccard, Neighborhood Selection and k-NN, Cold-start and Data Sparsity Issues, Memory-based vs Model-based Collaborative Filtering.

UNIT III: Content-based and Hybrid Systems

Item Feature Extraction and Vector Representation, TF-IDF and Cosine Similarity in Recommendations, User Profile Learning, Limitations of Content-based Filtering, Hybrid Recommender Architectures, Case Study: Netflix, Amazon Hybrid Systems.

UNIT IV: Matrix Factorization and Deep Learning Approaches

Latent Factor Models and SVD, ALS and SGD for Matrix Factorization, Non-negative Matrix Factorization (NMF), Neural Collaborative Filtering (NCF), Deep Learning Models: Autoencoders, CNNs, RNNs for Recommendations, Graph-based and Knowledge Graph Recommenders.

UNIT V: Evaluation, Ethics, and Industrial Applications

Evaluation Metrics: Precision, Recall, F1, NDCG, MAP, A/B Testing in Recommender Systems, Explainability in Recommendations, Fairness, Bias, and Privacy in Recommenders, Scalability and

Real-time Recommendations, Deploying Recommender Systems at Scale (e.g., Spotify, YouTube).

Textbooks:

1. **Charu C. Aggarwal**, Recommender Systems: The Textbook, Springer, 2016.
2. **Francesco Ricci, Lior Rokach, and Bracha Shapira**, Recommender Systems Handbook, Springer, 2nd Ed., 2015.

Reference Books:

1. **Jannach, Dietmar et al.**, Recommender Systems: An Introduction, Cambridge University Press, 2010.
2. **Michael Ekstrand, Joseph A. Konstan**, Collaborative Filtering Recommender Systems, Now Publishers, 2011.
3. Research papers from ACM RecSys Conference proceedings.

Online Learning Resources:

- https://www.coursera.org/learn/recommender-systems – Coursera: University of Minnesota
- https://www.kaggle.com/learn/recommendation-systems – Kaggle Course
- https://developers.google.com/machine-learning/recommendation – Google Developers

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A43114c - PREDICTIVE ANALYTICS
(Professional Elective-II)

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

- To introduce the fundamental concepts and techniques of predictive analytics.
- To apply statistical models and machine learning algorithms for prediction.
- To interpret model performance using evaluation metrics.
- To explore feature engineering, model tuning, and cross-validation.
- To implement predictive solutions for real-world business and research problems.

2.Course Outcomes:

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

CO1.Understand the principles and importance of predictive analytics.
CO2.Apply regression and classification models for predictive tasks.
CO3.Perform data preprocessing, feature selection, and transformation.
CO4.Evaluate and validate models using standard metrics.
CO5.Design predictive solutions to solve domain-specific challenges.

3. Course Syllabus

UNIT I: Introduction to Predictive Analytics
Introduction to Predictive Analytics and Business Intelligence, Types of Predictive Models: Classification, Regression, Time Series, Supervised vs Unsupervised Learning, Predictive Modeling Workflow, Applications in Marketing, Finance, Healthcare, Challenges in Predictive Analytics.

UNIT II: Data Preparation and Feature Engineering
Data Cleaning: Handling Missing, Noisy, and Inconsistent Data, Feature Selection and Dimensionality Reduction (PCA, LDA), Feature Scaling: Normalization, Standardization, Encoding Categorical Variables, Feature Extraction and Construction, Dealing with Imbalanced Datasets.

UNIT III: Predictive Modeling with Regression and Classification
Linear Regression and Polynomial Regression, Logistic Regression for Binary Classification, Decision Trees and Random Forest, k-Nearest Neighbors (k-NN) and Naïve Bayes, Support Vector Machines (SVM), Model Selection and Comparison.

UNIT IV: Model Evaluation and Validation
Training, Testing, and Validation Sets, Cross-Validation Techniques (k-Fold, Stratified, LOOCV), Evaluation Metrics: Accuracy, Precision, Recall, F1 Score, ROC-AUC, Confusion Matrix and Classification Report, Bias-Variance Trade-off and Overfitting, Hyperparameter Tuning: Grid Search, Random Search.

UNIT V: Advanced Topics and Applications
Ensemble Learning: Bagging, Boosting (AdaBoost, XGBoost), Predictive Analytics with Time Series (ARIMA, Prophet), Deep Learning for Predictive Modeling (ANNs, LSTM), Use of Predictive Analytics in IoT, Retail, and Healthcare, Ethics and Privacy in Predictive Analytics, Building and Deploying End-to-End Predictive Systems.

Textbooks:

1. **Dean Abbott**, Applied Predictive Analytics: Principles and Techniques for the Professional Data Analyst, Wiley, 2014.
2. **John D. Kelleher, Brendan Tierney**, Data Science: Predictive Analytics and Data Mining, MIT Press, 2018.

Reference Books:

1. **Galit Shmueli et al.**, Data Mining for Business Analytics: Concepts, Techniques, and Applications in R, Wiley, 2017.
2. **Eric Siegel**, Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die, Wiley, 2016.
3. **Trevor Hastie, Robert Tibshirani, Jerome Friedman**, The Elements of Statistical Learning, Springer, 2009.

Online Learning Resources:

- https://www.coursera.org/specializations/predictive-analytics – Coursera Specialization
- https://www.edx.org/course/data-science-and-machine-learning-capstone – edX Predictive Analytics Courses
- https://www.kaggle.com/learn/intro-to-machine-learning – Kaggle Tutorials

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE
A43114d -BLOCKCHAIN FOR AI
(Professional Elective-II)

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

- To understand the foundational concepts of blockchain technology and its architecture.
- To explore smart contracts, consensus algorithms, and distributed ledger technology.
- To investigate the integration of AI with blockchain for secure, decentralized applications.
- To develop blockchain-enabled AI solutions for real-world use cases.
- To understand the ethical, security, and scalability challenges in Blockchain-AI ecosystems.

2.Course Outcomes:

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

CO1.Explain the fundamentals of blockchain and its components.
CO2.Analyze the role of consensus mechanisms in maintaining trust and decentralization.
CO3Apply blockchain for secure data sharing in AI systems.
CO4.Develop and deploy smart contracts using Ethereum/Solidity.
CO5.Evaluate blockchain-based AI applications in healthcare, finance, and supply chains.

3. Course Syllabus

UNIT I: Blockchain Fundamentals and Architecture

Introduction to Blockchain Technology, Components: Blocks, Hashing, Merkle Trees, Types of Blockchains: Public, Private, Consortium, Distributed Ledger Technology (DLT) and P2P Networks, Blockchain Structure and Mining, Use Cases and Evolution of Blockchain.

UNIT II: Smart Contracts and Consensus Mechanisms

Smart Contracts: Definition, Features, Use Cases, Ethereum and Solidity Basics, Consensus Algorithms: PoW, PoS, DPoS, PBFT, Gas, Transactions, and Events in Ethereum, Hyperledger Fabric: Architecture and Chaincode, Deployment and Testing of Smart Contracts.

UNIT III: Integration of Blockchain and AI

Motivation for Integrating Blockchain with AI, Decentralized AI Models and Federated Learning, Secure Model Sharing and Provenance, Blockchain for Data Integrity in AI Systems, AI for Blockchain (e.g., optimizing consensus), Case Study: Decentralized AI Marketplace.

UNIT IV: Applications of Blockchain in AI Systems

Blockchain for Explainable and Trusted AI, Applications in Healthcare and Genomics, Blockchain for Autonomous Vehicles and IoT, Financial AI Systems with Smart Contracts, Supply Chain and Logistics Intelligence, NFT-based AI Applications (Digital Identity, IP).

UNIT V: Security, Privacy and Challenges in Blockchain-AI

Security Challenges: Sybil Attacks, 51% Attacks, Privacy Preservation and Zero Knowledge Proofs, Scalability and Energy Concerns in Blockchain-AI, Ethical and Legal Concerns in AI with Blockchain, Interoperability of Blockchain Platforms, Future Trends: Quantum-Resistant Blockchain- AI.

Textbooks:

1. Imran Bashir, Mastering Blockchain: Unlocking the Power of Cryptocurrencies, Smart Contracts, and Decentralized Applications, Packt, 2020.
2. Melanie Swan, Blockchain: Blueprint for a New Economy, O'Reilly Media, 2015.
3. Joseph Holbrook, Architecting AI Solutions on Blockchain, Packt Publishing, 2020.

Reference Books:

1. Arshdeep Bahga, Vijay Madisetti, Blockchain Applications: A Hands-On Approach, VPT, 2017.
2. Karamjit Singh, Blockchain for AI: Use Cases and Implementation, Springer, 2023.
3. Roger Wattenhofer, The Science of the Blockchain, 2016.

Online Learning Resources:

- Coursera: Blockchain Specialization – University at Buffalo
- edX: Blockchain Fundamentals – UC Berkeley
- Coursera: AI and Blockchain – IBM

COURSE STRUCTURE

A43114f – DEEP 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

This course introduces the fundamentals and key advancements in Deep Learning. It covers neural network models including perceptrons, multilayer perceptrons, and feedforward networks; training using backpropagation and gradient-based optimization methods; dimensionality reduction methods like PCA and SVD; representation learning using autoencoders; regularization and training improvements; word embeddings; and advanced deep learning architectures such as CNNs, RNNs, and attention-based encoder–decoder systems.

2. Course Outcomes (COs)

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

CO1. Explain the historical development of deep learning and the fundamentals of neural computation (McCulloch–Pitts neuron, perceptron).

CO2. Build multilayer perceptrons (MLPs) and feed forward neural networks and analyze their representation power.

CO3. Apply backpropagation and gradient descent based optimization algorithms for training deep networks.

CO4. Use dimensionality reduction techniques such as PCA and SVD for feature extraction and analysis.

CO5. Implement autoencoders and apply regularization techniques to improve generalization and reduce overfitting.

3. Course Syllabus

UNIT-1 Introduction to Deep Learning & Perceptron Models

History of Deep Learning, Success Stories, McCulloch Pitts Neuron, Thresholding Logic, Perceptrons, Perceptron Learning Algorithm.

UNIT-2 Multilayer Perceptrons & Feedforward Neural Networks

MLPs, Representation Power of MLPs, Sigmoid Neurons, Gradient Descent, Feedforward Neural Networks, Representation Power of Feedforward Networks.

UNIT-3 Backpropagation & Optimization Techniques

Backpropagation, GD, Momentum, Nesterov Accelerated GD, SGD, AdaGrad, RMSProp, Adam.

UNIT-4 Linear Algebra Foundations & Representation Learning

Eigenvalues & Eigenvectors, Eigenvalue Decomposition, Basis, PCA (interpretations), SVD, Autoencoders and relation to PCA, Regularization in Autoencoders, Denoising, Sparse and Contractive Autoencoders.

UNIT-5 Regularization, CNNs, RNNs & Attention Models

Regularization techniques (Bias–Variance, L2, Early stopping, Augmentation, Dropout, Ensembles), Pre-training, Better activations, Weight initialization, Batch Normalization, Word Embeddings, CNN Architectures (LeNet → ResNet) & visualization methods, RNNs (BPTT, GRU, LSTM), Encoder–Decoder, Attention mechanism and Attention over Images.

4. Books and Materials

Text Books:

1) Ian Goodfellow, Yoshua Bengio and Aaron Courville, **Deep Learning**, MIT Press. Available

Online Learning Resources:

1) https://nptel.ac.in/courses/106106184

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A43115a -AI FOR FINANCE

(Professional Elective-III)

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

- To introduce the role of Artificial Intelligence (AI) in financial applications and decision-making.
- To understand financial data types, sources, and processing methods.
- To apply machine learning and deep learning models in various finance sectors.
- To analyze risk, fraud detection, credit scoring, and portfolio management using AI.
- To evaluate ethical and regulatory challenges in AI-enabled finance.

2.Course Outcomes:

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

CO1.Describe the fundamentals of AI techniques applicable to finance.
CO2.Analyze financial time series data using AI-based models.
CO3.Apply machine learning for fraud detection and credit risk analysis.
CO4.Build predictive models for stock prices, trading, and customer segmentation.
CO5.Evaluate the limitations and ethical implications of AI in financial systems.

3. Course Syllabus

UNIT I: Introduction to Finance and AI Applications
Introduction to Financial Markets and Instruments, Overview of AI Techniques in Finance, Types of Financial Data: Market, Transactional, Customer, Financial Statements and Key Indicators, AI Use Cases in Banking, Insurance, and Investment, FinTech and the Rise of Robo-Advisors.

UNIT II: Machine Learning in Finance
Supervised Learning for Credit Scoring, Unsupervised Learning for Customer Segmentation, Feature Engineering for Financial Data, Handling Imbalanced Datasets in Fraud Detection, Time Series Forecasting with Regression and ARIMA, Model Validation and Backtesting in Finance.

UNIT III: Deep Learning and NLP in Finance
Introduction to Deep Learning for Finance, Stock Price Prediction using LSTM and RNNs, Sentiment Analysis from Financial News and Tweets, NLP for Document Classification: Earnings Reports, Chatbots and Virtual Assistants in Banking, Reinforcement Learning for Portfolio Optimization.

UNIT IV: AI-Driven Financial Applications
Fraud Detection Systems using ML and DL, Credit Risk and Loan Default Prediction, AI in

AI Practices in Finance, Emerging Trends: Quantum AI, Decentralized Finance (DeFi).

Textbooks:

1. Yves Hilpisch, Artificial Intelligence in Finance: A Python-Based Guide, O'Reilly, 2020.
2. Yves Hilpisch, Python for Finance: Mastering Data-Driven Finance, O'Reilly, 2018.
3. Markus Loecher, Machine Learning for Finance, Packt Publishing, 2021.

Reference Books:

1. A. W. Lo, The Evolution of Technical Analysis, Wiley Finance, 2010.
2. Tony Guida, Big Data and Machine Learning in Quantitative Investment, Wiley, 2019.
3. Tucker Balch, AI for Trading – Georgia Tech Specialization, Coursera.

Online Learning Resources:

- Coursera: AI for Trading – by NYIF and Google Cloud
- edX: Artificial Intelligence in Finance – NYIF
- Udemy: Machine Learning and AI in Finance
- DataCamp: Financial Trading with Python
- YouTube: AI for Finance by Sentdex, Two Minute Papers, and DataProfessor

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A43115b -QUANTUM COMPUTING

(Professional Elective-III)

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

- 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.

2.Course Outcomes:

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

CO1.Explain the fundamental concepts of quantum mechanics used in computing.
CO2.Construct and analyze quantum circuits using standard gates.
CO3.Apply quantum algorithms like Deutsch-Jozsa, Grover‘s, and Shor‘s.
CO4.Develop simple quantum programs using Qiskit or similar platforms.
CO5.Analyze applications and challenges of quantum computing in real-world domains.

3. Course Syllabus

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:

- 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

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A43115c –SOCIAL NETWORK ANALYSIS

(Professional Elective-III)

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

- To introduce the fundamentals and key concepts of social network theory and graph theory.
- To analyze the structure and properties of large-scale social networks.
- To apply centrality, influence, and community detection measures.
- To model information diffusion and network dynamics.
- To implement real-world social network analysis using tools and datasets.

2.Course Outcomes:

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

CO1.Understand basic network models and social network structures.
CO2.Analyze key properties like centrality, clustering, and small-world effect.
CO3.Apply community detection algorithms and influence maximization.
CO4.Interpret diffusion models for viral marketing and information spread.
CO5.Use tools such as Gephi, NetworkX, or SNAP for real-world SNA.

3. Course Syllabus

UNIT I: Introduction to Social Networks and Graph Theory

Basic Concepts: Graphs, Nodes, Edges, Directed/Undirected Graphs, Real-world Examples: Facebook, Twitter, LinkedIn, Adjacency Matrix and Graph Representation, Types of Social Networks: Ego, Bipartite, Multilayer, Degree Distribution, Path Length, and Connectivity, Random Graph Models: Erdős–Rényi and Watts-Strogatz.

UNIT II: Structural Properties of Networks

Network Centrality Measures: Degree, Closeness, Betweenness, Eigenvector Centrality and PageRank, Network Clustering and Community Detection Basics, Triadic Closure and Clustering Coefficient, Small-world Phenomenon and Milgram‘s Experiment, Homophily, Influence, and Structural Balance.

UNIT III: Community Detection and Subgroup Analysis

Girvan–Newman Algorithm and Modularity, Label Propagation and Louvain Method, Clique Detection and k-Core Decomposition, Overlapping Communities and Fuzzy Clustering, Cohesive Subgroups and Structural Equivalence, Evaluation Metrics: NMI, Modularity Score.

UNIT IV: Information Diffusion and Influence in Networks

Models of Diffusion: Linear Threshold and Independent Cascade, Influence Maximization and Viral Marketing, Contagion Models and Epidemic Spreading, Rumor Propagation and Cascade Models, Information Bottlenecks and Bridges, Measuring Influence and Reach.

UNIT V: Tools, Applications, and Ethics in SNA

SNA Tools: Gephi, Pajek, NetworkX, SNAP, Case Study: Twitter and Hashtag Analysis, LinkedIn Network Mining and Graph Features, Applications in Marketing, Security, and Epidemiology, Ethical Issues in Social Network Data Mining, Building and Visualizing Your Own Social Graph.

Textbooks:

1. Wasserman, S., & Faust, K., Social Network Analysis: Methods and Applications, Cambridge University Press, 1994.
2. Easley, D., & Kleinberg, J., Networks, Crowds, and Markets: Reasoning About a Highly Connected World, Cambridge University Press, 2010.
3. Newman, M., Networks: An Introduction, Oxford University Press, 2010.

Reference Books:

1. Borgatti, S. P., Everett, M. G., & Johnson, J. C., Analyzing Social Networks, SAGE Publications, 2018.
2. Barabási, A.-L., Linked: How Everything Is Connected to Everything Else, Basic Books, 2014.
3. Hansen, D., Shneiderman, B., & Smith, M. A., Analyzing Social Media Networks with NodeXL, Elsevier, 2020.

Online Learning Resources:

- Coursera – Social Network Analysis (University of Michigan)
- [YouTube – NetworkX and Gephi Tutorials (freeCodeCamp, TheNetNinja)]
- edX – Networks: Friends, Money, and Bytes (University of California, Berkeley)
- Khan Academy – Graph Theory

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A43115d -CYBERSECURITY & AI-DRIVEN THREAT DETECTION

(Professional Elective-III)

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

- To provide a foundational understanding of cybersecurity principles and threat landscapes.
- To explore the application of AI and machine learning techniques in detecting cyber threats.
- To analyze malware behavior, intrusion patterns, and anomaly detection using intelligent systems.
- To evaluate and build automated systems for real-time security analytics.
- To understand the ethical, legal, and societal implications of AI-driven security systems.

2.Course Outcomes:

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

CO1.Understand cybersecurity frameworks, threat types, and vulnerabilities.
CO2.Apply AI/ML techniques for cyber threat identification and classification.
CO3.Analyze patterns in malware, network traffic, and security logs.
CO4.Design and evaluate intelligent intrusion detection and prevention systems.
CO5.Explore ethical hacking practices and policy aspects in AI-based security.

3. Course Syllabus

UNIT I: Fundamentals of Cybersecurity

Introduction to Cybersecurity: CIA Triad, Threats & Vulnerabilities, Types of Attacks: Malware, Phishing, DDoS, Insider Threats, Security Policies and Access Controls, Risk Assessment and Vulnerability Management, Cryptography Basics: Symmetric, Asymmetric, Hash Functions, Cybersecurity Frameworks: NIST, ISO 27001, OWASP.

UNIT II: Machine Learning for Cyber Threat Detection

Supervised and Unsupervised Learning in Security Contexts, Feature Engineering for Security Data, Classification Models for Intrusion Detection (SVM, RF, KNN), Clustering Techniques for Anomaly Detection, Evaluation Metrics: Accuracy, Precision, ROC, F1 Score, Case Study: AI for Email Phishing Detection.

UNIT III: Deep Learning in Threat Intelligence

Deep Neural Networks for Cybersecurity, RNNs and LSTMs for Log and Sequence Data, Autoencoders for Anomaly Detection, CNNs for Malware Classification using Binary Analysis, Adversarial Attacks on AI-based Security Systems, Case Study: Threat Detection using Deep Learning.

UNIT IV: Real-Time Threat Detection and SIEM Systems

Security Information and Event Management (SIEM), Log Analysis and Real-Time Alerting, Threat Intelligence Platforms (TIPs), Integration of AI in SIEM Tools (Splunk, ELK Stack), Network Traffic and Packet Inspection using ML, SOC Operations and Automation using AI

UNIT V: Ethical Hacking, Privacy, and Legal Aspects

Penetration Testing & Ethical Hacking with AI Tools, Red Team vs. Blue Team Simulation, Data Privacy Regulations: GDPR, HIPAA, Cyber Laws, AI Bias and Fairness in Security Decision-Making, Case Study: Ethical Dilemmas in AI Security Systems, Future Trends: Zero Trust, AI SOC, Federated Threat Detection.

Textbooks:

1. Stallings, W., Network Security Essentials: Applications and Standards, Pearson Education.
2. Shon Harris & Fernando Maymi, CISSP All-in-One Exam Guide, McGraw Hill.
3. Emmanuel Tsukerman, Machine Learning for Cybersecurity Cookbook, Packt Publishing.
4. Clarence Chio & David Freeman, Machine Learning and Security, O'Reilly Media.

Reference Books:

1. John Paul Mueller, Luca Massaron, Machine Learning for Dummies, Wiley.
2. Mark Stamp, Information Security: Principles and Practice, Wiley.
3. Bruce Schneier, Secrets and Lies: Digital Security in a Networked World, Wiley.
4. Shai Shalev-Shwartz and Shai Ben-David, Understanding Machine Learning, Cambridge University Press.

Online Learning Resources:

- Coursera – AI for Cybersecurity (IBM)
- edX – Cybersecurity Fundamentals by Rochester Institute of Technology
- MIT OpenCourseWare – Computer and Network Security
- [YouTube – Cybersecurity & AI Tutorials by Simplilearn, Great Learning]
- Udemy – Machine Learning for Cybersecurity
- Splunk Documentation – AI & Threat Detection

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL
(AUTONOMOUS)

COURSE STRUCTURE
A43116 -BIG DATA & CLOUD COMPUTING LAB
(Professional Core)

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

1.Course Description

- To provide hands-on experience in working with big data tools and cloud computing environments.
- To equip students with practical skills in data ingestion, transformation, analysis, and visualization using Hadoop and Spark ecosystems.
- To enable deployment and management of cloud services using AWS, Azure, or GCP.
- To expose students to cloud-native storage, computing, and container orchestration techniques.
- To integrate big data workflows with cloud infrastructure for scalable, distributed data processing.

2.Course Outcomes:

- CO1.Students will be able to implement big data pipelines and cloud-based solutions using tools like Hadoop, Spark, and cloud platforms such as AWS, Azure, or GCP.
- CO2.Students gain proficiency in managing distributed data processing, scalable storage, cloud service provisioning, and deploying applications using containers and orchestration platforms.
- CO3.Students will understand the synergy between big data technologies and cloud computing to solve real-world problems efficiently.

List of Lab Experiments:

1. Installation and Configuration of Hadoop Cluster (Single Node & Multi-node)
   Hadoop HDFS setup, NameNode & DataNode configuration
2. Working with HDFS: File Operations
   Upload, read, delete, and replicate files in HDFS
3. MapReduce Programming Basics
   Word count, sorting, and filtering examples in Java/Python
4. Apache Hive & Pig for Querying Large Datasets
   Creation of tables, data loading, and running
   queries
5. Apache Spark Basics: RDDs and DataFrames
   Implement Spark transformations and
   actions
6. Data Preprocessing and Machine Learning using PySpark MLlib
   Classification or regression using MLlib pipelines
7. Introduction to Cloud Computing and AWS/Azure/GCP Console
   Creating virtual machines, basic compute and storage services
8. Cloud Storage and Database Services
   Using S3 (AWS), Blob (Azure), or GCP buckets and Cloud SQL/NoSQL
9. Deploying Big Data Workloads on Cloud (EMR, HDInsight, Dataproc)
   Running Hadoop/Spark jobs in cloud-managed services
10. Cloud Function/Serverless Deployment
11. Building and deploying a serverless function (e.g., AWS Lambda)
    Containerization with Docker
12. Building, running, and managing Docker containers Orchestration with Kubernetes in the Cloud

13. Deploy and manage a containerized application using GKE/EKS/AKS

Text Books:

1. Tom White, Hadoop: The Definitive Guide, O'Reilly Media.
2. Rajkumar Buyya et al., Mastering Cloud Computing, McGraw-Hill Education.
3. Holden Karau et al., Learning Spark: Lightning-Fast Big Data Analysis, O'Reilly Media.

Reference Books:

1. Vignesh Prajapati, Big Data Analytics with R and Hadoop, Packt Publishing.
2. Benjamin Bengfort, Data Analytics with Hadoop, O'Reilly.
3. Srinivasan & J.Shrinivasan, Cloud Computing – A Hands-on Approach, Wiley India.

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL
(AUTONOMOUS)

COURSE STRUCTURE

A43117 - FULL STACK AI LAB

(Professional Core)

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 Objectives:

- Enable students to build end-to-end AI-powered web applications.
- Integrate frontend, backend, database, and AI models in real-time.
- Provide hands-on experience with Flask, Express, MongoDB, React, and ML models.
- Develop and deploy AI applications using industry-standard practices.

2. Course Outcomes:

CO1. Design frontend interfaces using React/HTML/CSS.
CO2. Build backend logic using Flask or Node.js APIs.
CO3. Integrate and deploy ML models with web services.
CO4. Store and retrieve data using MongoDB/MySQL.
CO5. Test, debug, and deploy AI-based web applications.

3. List of Lab Experiments:

1. Setup Flask or Node.js server with React/HTML frontend.
2. Create login/signup system with Express/Flask and MongoDB.
3. Train and save ML model (e.g., Naive Bayes, Logistic Regression).
4. Build API to serve ML model predictions via Flask.
5. Integrate ML predictions in frontend using fetch/AJAX.
6. Create dynamic dashboard using Chart.js/Plotly.
7. Implement JWT tokens or sessions for authentication.
8. Add file upload functionality (image/text for prediction).
9. Store interactions/predictions in database and visualize history.
10. Create CI/CD pipeline using GitHub Actions/Heroku.
11. Build mini-project: News Classifier / Spam Detector / Fake News Detector.
12. Final Demo & Deployment on Render/Heroku/Vercel/localhost.

4. Books and Materials:

Text Books:

1. "Full Stack Deep Learning" by Emmanuel Ameisen, O'Reilly, 2020
2. "Flask Web Development" by Miguel Grinberg, O'Reilly, 2018
3. "Python Machine Learning" by Sebastian Raschka, Packt Publishing

Reference Books:

1. "Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow" by Aurélien Géron
2. "MongoDB: The Definitive Guide" by Kristina Chodorow
3. "Node.js Design Patterns" by Mario Casciaro

Online Courses:

- Full Stack Web Development with Flask and Python- Udemy

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

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	1	2	2	30	70	100

(Common to All Branches of Engineering)

1.Course Description

- 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:

COs **Statements**

CO1 List out various elements of soft skills

CO2 Describe methods for building professional image

CO3 Apply critical thinking skills in problem solving

CO4 Analyse the needs of an individual and team for well-being

CO5 Assess the situation and take necessary decisions

CO6 Create a productive work place atmosphere using social and work-life skills ensuring personal and emotional well-being

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*, K I 2018 ,esuoH gnihsilbuP lanoitanretnI

Reference Books

1. Sharma, Prashant, *Soft Skills: Personality Development for Life Success*, BPB Publications 2018.
2. Alex K,*Soft 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. 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**

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL
(AUTONOMOUS)

COURSE STRUCTURE

A40033 -TECHNICAL REPORT WRITING & IPR

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	0	24	0	0	0	30	70	100

1.Course Description To enable the students to practice the basic skills of research paper writing

1. To make the students understand the importance of IP and to educate them on the basic concepts of Intellectual Property Rights.
2. To practice the basic skills of performing quality literature review
3. To help them in knowing the significance of real life practice and procedure of Patents.
4. To enable them learn the procedure of obtaining Patents, Copyrights, & Trade Marks

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

CO1 Identify key secondary literature related to their proposed technical pape writing

CO2 Explain various principles and styles in technical writing

CO3 Use the acquired knowledge in writing a research/technical paper

CO4 Analyse rights and responsibilities of holder of Patent, Copyright, rademark, International Trademark etc.

CO5 Evaluate different forms of IPR available at national & international evel

CO6 Develop skill of making search of various forms of IPR by using modern ools and techniques.

3. Course Syllabus

UNIT – I:

Principles of Technical Writing: styles in technical writing; clarity, precision, coherence andlogical sequence in writing-avoiding ambiguity- repetition, and vague language -highlighting your findings-discussing your limitations -hedging and criticizing -plagiarism and paraphrasing .

UNIT – II:

Technical Research Paper Writing: Abstract- Objectives-Limitations-Review of Literature- Problems

and Framing Research Questions- Synopsis

UNIT – III:

Process of research: publication mechanism: types of journals- indexing-seminars- conferences- proof reading –plagiarism style; seminar & conference paper writing; Methodology-discussion-results- citation rules

UNIT – IV:

Introduction to Intellectual property: Introduction, types of intellectual property, International organizations, agencies and ties, importance of intellectual property rights

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and uating 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

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL
(AUTONOMOUS)

COURSE STRUCTURE

VII - Semester

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A43118 – GENERATIVE AI & PROMPT ENGINEERING

(Professional Core)

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 Objectives:

- Understand the foundations and working of Generative AI models.
- Explore various generative models like GANs, VAEs, and LLMs.
- Learn prompt engineering techniques to effectively interact with language models.
- Design applications using LLMs with precise control through prompting.
- Understand ethical and societal implications of using Generative AI.

2.Course Outcomes (COs):

1. Explain the fundamentals of Generative AI, compare model architectures (GANs, VAEs, Transformers), and evaluate their use in generating text, images, and other media.
2. Apply prompt engineering techniques including few-shot learning, output formatting, and debugging to control and guide generative model outputs.
3. Analyze the architecture and capabilities of large language models (LLMs), and build NLP applications using prompt engineering and fine-tuning techniques.
4. Design complex multi-step prompting workflows using tools like LangChain and LlamaIndex, and generate structured or multimodal outputs safely and effectively.
5. Assess the ethical, legal, and societal implications of generative AI, and evaluate its responsible use across fields like healthcare, education, and law.

3.Course Syllabus:

Unit I: Introduction to Generative AI

Overview of Generative AI and Applications, Generative vs Discriminative Models, Latent Space and Data Generation Concepts, Architectures: GANs, VAEs, Autoregressive Models, Generative AI in Text, Image, Audio, and Video, LLMs: Pretrained Transformers as, Generators, Training Challenges and Evaluation of Generative Models, Case Studies: Image Synthesis, Text Generation.

Unit II: Prompt Engineering Fundamentals

Introduction to Prompt Engineering, Prompt Formats: Zero-shot, One-shot, Few-shot, Prompt Tuning vs Prompt Programming, In-Context Learning & Chain-of-Thought Prompting, Role of Instructions and Examples in Prompts, Controlling Output Style, Tone, and Format, Prompt Failure Cases and Debugging, Prompt Engineering for Coding, Text Completion, Q&A

Unit III: Generative Models in NLP

Transformer Architecture Recap (BERT, GPT), GPT-3/4, PaLM, Claude, and LLaMA Architectures, Text Generation Pipelines and APIs (OpenAI, HuggingFace), Prompt Engineering with GPT Models, Fine-tuning vs Instruct Tuning, Retrieval-Augmented Generation (RAG), Evaluation Metrics: BLEU, ROUGE, Perplexity, Building LLM-based Apps with LangChain.

Unit IV: Advanced Prompt Engineering & Tools

Role of Temperature, Top-k, Top-p Sampling, Structured Outputs: Tables, JSON, Function Calls, Agentic Prompting and Multi-step Reasoning, Prompt Chaining and Memory Handling, Prompt Templates for Automation (LangChain, LlamaIndex), Prompt Engineering for Multimodal Models (DALL·E, Gemini, Sora), Safety Layers & Guardrails in Prompting,AutoGPT, BabyAGI, and Agentic Workflow Building.

Unit V: Ethics, Risks, and Applications of Generative AI

Risks: Hallucination, Toxicity, Bias, Deepfakes and Misinformation Challenges, Copyright, IP, and Data Privacy in Generated Content, Evaluation of Responsible AI Outputs, Red Teaming and Safety Testing, Applications in Education, Medicine, Art, and Law, Regulatory Landscape for Generative AI, Future Trends and Research Directions

Textbooks

1. "Deep Learning with Python", François Chollet, Manning, 2nd Edition
2. "Generative Deep Learning", David Foster, O'Reilly, 2nd Edition
3. "Building Systems with ChatGPT", Emmanuel Ameisen (O'Reilly Short Reads)
4. "The Art of Prompt Engineering", Nathan Hunter (Free online eBook)

Reference Books & Papers

1. Vaswani et al., Attention is All You Need
2. OpenAI Technical Reports on GPT Models
3. Papers from NeurIPS, ACL, ICML related to XAI and LLMs
4. LangChain Documentation

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40034 – BUSINESS ETHICS AND CORPORATE GOVERNANCE

Management Course- II

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 OBJECTIVES : The objectives of this course are

- 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

COURSE OUTCOMES:

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

CO1	Understand the Ethics and different types of Ethics.
CO2	Understand business ethics and ethical practices in management
CO3	Understand the role of ethics in management
CO4	Apply the knowledge of professional ethics & technical ethics
CO5	Analyze corporate law, ethics, codes & principles
CO6	Evaluate corporate governance & corporate scams

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.

Text books.

1. Murthy CSV: Business Ethics and Corporate Governance, HPH July 2017

2. Bholananth Dutta, S.K. Podder – Corporation Governance, VBH. June 2010

Reference books

1. Dr. K. Nirmala, KarunakaraReaddy. *Business Ethics and Corporate Governance*, HPH

2. H.R.Machiraju: *Corporate Governance*, HPH, 2013

3. K. Venkataramana, *Corporate Governance*, SHBP.

4. N.M.Khandelwal. *Indian Ethos and Values for Managers*

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/

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40035 – E-Business

Management Course- II

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 Objectives: The Objectives of this course are

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

CO1 Remember E-Business & its nature, scope and functions.
CO2 Understand E-market-Models which are practicing by the organizations
CO3 Apply the concepts of E-Commerce in the present globalized world.
CO4 Analyze the various E-payment systems & importance of net banking.
CO5 Evaluate market research strategies & E-advertisements.
CO6 Understand importance of E-security & control

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:E-Security

Security risks and challenges in electronic commerce - Cyber threats - Phishing, hacking, identity theft, and malware - Digital Signatures & Certificates - Security protocols over public networks (HTTP, SSL, TLS) -Firewalls in securing e-business platforms.

Learning Outcomes: -After completion of this unit student will

- Understand E-Security
- Contrast and compare security protocols and public network
- Evaluate on Digital signature

Unit-V:E-Marketing:

Introduction – Online Marketing – Advantages of Online Marketing – Internet Advertisement – Advertisement Methods – Conducting Online Market Research– – E-marketing planning: Online branding, social media marketing, and email marketing - E-business strategies: Digital advertising, content marketing, and analytics – E-Customer Relationship Management (eCRM) E-supply chain management (e-SCM)

Learning Outcomes: -After completion of this unit student will

- Understand the concept of online marketing
- Apply the knowledge of online marketing
- Compare e-CRM and e-SCM

Text Books:

1. Arati Oturkar&Sunil Khilari. *E-Business*. Everest Publishing House, 2022
2. P.T.S Joseph. *E-Commerce*, Fourth Edition, Prentice Hall of India, 2011

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 India 2007
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

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40036 – MANAGEMENT SCIENCE

Management Course- II

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 OBJECTIVES : The objectives of this course are:

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

CO1	Remember the concepts & principles of management and designs of organization in a practical world
CO2	Understand the knowledge of Work-study principles & Quality Control techniques in industry
CO3	Apply the process of Recruitment & Selection in organization.
CO4	Analyze the concepts of HRM & different training methods.
CO5	Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project & to analyze the business through SWOT.
CO6	Create awareness on contemporary issues in modern management & technology

3.COUSE 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

<u>Text Books:</u> 1. Frederick S. Hillier, Mark S. Hillier. Introduction to Management Science, October 26, 2023

2 A.R Aryasri, *Management Science*, TMH, 2019

<u>References:</u>

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/

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A43119a – EXPLAINABLE AI &MODEL INTERPRETABILITY

Professional Elective-IV

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 Objectives:

- To introduce the principles of interpretability and explainability in AI/ML models.
- To analyze the trade-offs between model accuracy and interpretability.
- To explore popular post-hoc and intrinsic explainability techniques.
- To examine fairness, accountability, and transparency in AI systems.
- To develop hands-on skills with interpretability tools and libraries.

2.Course Outcomes:

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

CO1: Understand the need for explainability in modern AI systems.
CO2: Differentiate between black-box and white-box models.
CO3 : Apply interpretability techniques such as SHAP, LIME, and PDPs.
CO4: Evaluate the fairness and transparency of AI systems.
CO5: Use explainability tools for model auditing and deployment in high-stakes domains.

3.Course Syllabus:

UNIT I: Foundations of Explainable AI

Introduction to Explainability and Interpretability, Importance of XAI in Healthcare, Finance, and Law , White-box vs Black-box Models, Desiderata: Fairness, Accountability, Transparency, Human-Centered AI and Trust ,Taxonomy of XAI Techniques (Global vs Local, Post-hoc vs Intrinsic), Regulatory and Ethical Implications (GDPR, AI Bill of Rights), Model Simplicity vs Predictive Power.

UNIT II: Model-Specific Explainability Techniques

Decision Trees and Rule-based Models, Linear Models and Feature Importance, Generalized Additive Models (GAMs), Visualization of Weights and Coefficients, Logistic Regression Coefficient Interpretation, Case Study: Credit Scoring using Transparent Models,Comparison of Interpretable ML Models, Use Cases and Trade-offs.

UNIT III: Model-Agnostic Explainability Techniques

Local Interpretable Model-agnostic Explanations (LIME), SHAP Values (SHapley Additive exPlanations), Partial Dependence Plots (PDPs), Individual Conditional Expectation (ICE) Plots,Anchors and Counterfactual Explanations, Feature Interaction and Permutation Importance, Comparative Analysis of SHAP, LIME, PDP, Model Debugging with XAI.

UNIT IV: Deep Learning Explainability

Visualizing CNNs: Filters, Feature Maps, Saliency Maps and Grad-CAM, Integrated Gradients, Explaining RNNs and LSTM Outputs, Concept Activation Vectors (TCAV), Attention-based Interpretability in Transformers, Explaining Language Models (BERT, GPT) Evaluation of Deep Model Explanations.

UNIT V: Fairness, Bias & Tools for XAI

Fairness Metrics: Demographic Parity, Equal Opportunity, Sources of Bias in Data and Models, Discrimination Detection and Mitigation Strategies, Introduction to AIF360, What-If Tool, Fairlearn, Case Study: Bias in Hiring Algorithms, Explainability in ML Pipelines (MLFlow, Skater), XAI in Federated and Privacy-Preserving AI, Designing Interpretable AI Systems from Scratch.

Textbooks:

1. Christoph Molnar, —Interpretable Machine Learning‖, Leanpub.
2. Sameer Singh et al., —Explainable AI: Interpreting, Explaining and Visualizing Deep Learning‖, Springer.
3. Dan Roth, Zachary Lipton, and Been Kim, —Explainable AI: Foundations, Developments, Prospects‖, MIT Press (Online forthcoming).

Reference Books:

1. Marco Tulio Ribeiro et al., —Why Should I Trust You?‖ (LIME) – Research Paper
2. Scott Lundberg et al., —A Unified Approach to Interpreting Model Predictions‖ (SHAP) – NIPS
3. A. Barredo Arrieta et al., —Explainable Artificial Intelligence (XAI): Concepts, Taxonomies, Opportunities and Challenges‖, Information Fusion Journal.
4. Zachary C. Lipton, —The Mythos of Model Interpretability‖ – Communications of the ACM

Online Learning Resources:

- Coursera – Explainable AI with Google Cloud
- Udacity – AI for Everyone by Andrew Ng
- HarvardX – Data Science: Machine Learning Interpretability

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A43119b – AI for Robotics

Professional Elective-IV

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 Objectives

- Introduce the fundamental principles of robotics and artificial intelligence integration.
- Understand robot perception, localization, mapping, motion planning, and control using AI algorithms.
- Apply machine learning and deep learning techniques in robotic environments.
- Explore the use of reinforcement learning, behavior-based AI, and neural networks in autonomous robots.
- Enable students to build intelligent robots that can perceive, learn, and adapt to dynamic environments.

2.Course Outcomes

- Demonstrate an understanding of how AI techniques are applied in robot control and autonomy.
- Apply vision, perception, and sensor fusion techniques for real-time robotic applications.
- Implement path planning and navigation algorithms in dynamic environments.
- Analyze and apply learning-based models such as reinforcement learning and deep neural networks in robotics.
- Evaluate AI-enabled robotic systems based on their performance, efficiency, and adaptability.

3.Course Syllabus:

UNIT I – Fundamentals of Robotics and AI

Introduction to Robotics: Types and Components, Overview of Artificial Intelligence and Machine Learning, Relationship between Robotics and AI, Sensors and Actuators in Robotics, Embedded Systems and Microcontrollers in Robotics, Architecture of Autonomous Robots, Programming Tools: ROS (Robot Operating System), Python, C++, Applications of AI in Robotics – Overview

UNIT II – Perception and Sensor Fusion

Computer Vision for Robotics: Basics and Techniques, Depth Sensing, RGB-D Cameras, LIDAR, and Ultrasonic Sensors, Feature Extraction and Object Recognition, Kalman Filter and Extended Kalman Filter, Particle Filter and Sensor Fusion Techniques, SLAM (Simultaneous Localization and Mapping) – Concepts, Visual SLAM and LiDAR-based SLAM, 3D Mapping and Scene Reconstruction.

UNIT III – Motion Planning and Navigation

Path Planning Algorithms – Dijkstra, A*, RRT, Obstacle Detection and Avoidance, Robot Kinematics and Dynamics, Trajectory Generation and Optimization, Localization Techniques – GPS, Wi-Fi, Odometry, Autonomous Navigation in Indoor and Outdoor Environments, Multi-Robot Coordination and Swarm Intelligence, Integration of Perception and Planning Systems

UNIT IV – AI Techniques in Robotics

Supervised and Unsupervised Learning for Robotics, Neural Networks and Deep Learning Models for Robot Vision, Reinforcement Learning – Q-Learning and Deep Q Networks, Policy Gradient and Actor-Critic Methods, Behavior-Based Robotics and Finite State Machines, Imitation Learning and Learning from Demonstration, Transfer Learning for Robotic Tasks, Safety and Generalization in AI Models for Robots

UNIT V – Advanced Applications and Ethical Considerations

Humanoid and Service Robots with AI, AI in Industrial, Healthcare, and Assistive Robotics, Edge AI and Real-Time Inference in Robots, Human-Robot Interaction and Social Intelligence, Autonomous Vehicles and Delivery Drones, AI in Robotics Competitions (RoboCup, DARPA), Ethical Issues in AI-Enabled Robotics, Future Trends: Neuromorphic and Quantum Robotics

Textbooks

1. "Artificial Intelligence for Robotics" by Robin R. Murphy
2. "Probabilistic Robotics" by Sebastian Thrun, Wolfram Burgard, Dieter Fox
3. "Introduction to Autonomous Robots" by Nikolaus Correll, Bradley Hayes, et al.

Reference Books

1. "Robot Operating System (ROS) for Absolute Beginners" by Lentin Joseph
2. "Modern Robotics: Mechanics, Planning, and Control" by Kevin M. Lynch and Frank C. Park
3. "Learning for Adaptive and Reactive Robot Control" by Aude Billard, Jean-Jacques Slotine
4. IEEE Transactions and Springer Journals on Robotics and Intelligent Systems

Online Courses

1. AI for Robotics – Udacity (by Sebastian Thrun)
2. Modern Robotics: Mechanics, Planning, and Control – Coursera (Northwestern University)
3. Deep Learning for Robotics – edX

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A43119c – AI IN CYBER SECURITY

Professional Elective-IV

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 Objectives:

- To introduce the fundamental concepts of AI and their applications in cybersecurity.
- To understand AI-driven techniques for threat detection, classification, and mitigation.
- To explore machine learning and deep learning methods used for malware and intrusion detection.
- To equip students with skills in building intelligent security systems.
- To examine ethical, legal, and privacy aspects in AI-driven cybersecurity.

2.Course Outcomes:

- Understand AI principles and their relevance in cybersecurity.
- Apply machine learning techniques to detect and respond to threats.
- Analyze security incidents using intelligent tools and models.
- Evaluate and implement AI models for malware detection and anomaly analysis.
- Design AI-based cybersecurity frameworks for real-world scenarios.

3.Course Syllabus:

UNIT I: Introduction to AI in Cybersecurity

Role of AI in Modern Cybersecurity, Overview of Cyber Threats and Attack Vectors, Fundamentals of Machine Learning for Security, AI vs Traditional Security Techniques, AI-Based Cyber Defense Lifecycle, Threat Intelligence with AI, Cybersecurity Data Types and Challenges, Case Studies of AI-Driven Attacks and Defenses

UNIT II: Machine Learning for Cyber Threat Detection

Supervised Learning for Intrusion Detection, Unsupervised Learning for Anomaly Detection, Feature Engineering from Network Traffic, Classification Algorithms: SVM, Decision Trees, Random Forests, Clustering Techniques: K-Means, DBSCAN, Ensemble Models and Model Evaluation Metrics, Real-Time Threat Detection Pipelines, Data Imbalance and Adversarial Sampling

UNIT III: Deep Learning in Cybersecurity

Neural Networks for Threat Classification, CNNs for Malware Detection from Binary Files, RNNs/LSTMs for Sequential Log Analysis, Autoencoders for Anomaly Detection,GANs in Malware Evasion and Defense,Transfer Learning for Threat Signature Extraction, Deep Learning vs Traditional Models: A Comparative Study,Real-World Use Cases and Limitations

UNIT IV: AI for Specific Security Domains

AI for Phishing and Spam Detection, AI in Cloud Security and Edge Devices, Botnet and DDoS Attack Detection, AI-Driven Endpoint Security, Natural Language Processing for Threat Intelligence, Behavioral Biometrics and Fraud Detection, AI in Social Engineering Attack Prevention, Security Information and Event Management (SIEM) with AI

UNIT V: Challenges, Ethics & Future of AI in Cybersecurity

Explainable AI (XAI) in Cybersecurity, Adversarial Attacks and Defenses in AI Systems, Data Privacy and Federated Learning, Legal and Ethical Issues in AI Security Solutions, AI Model Bias and Fairness in Security Decisions, Securing AI Models Against Manipulation, Building Scalable AI- Powered SOCs, Future Trends: Autonomous Security, AI-Augmented Threat Hunting

Textbooks:

1. Clarence Chio & David Freeman, —Machine Learning and Security‖, O‘Reilly Media.
2. Xiaofeng Chen et al., —Artificial Intelligence and Big Data Analytics for Cybersecurity‖, Springer.
3. Mark Stamp, —Information Security: Principles and Practice‖, Wiley.

Reference Books:

1. Sumeet Dua & Xian Du, —Data Mining and Machine Learning in Cybersecurity‖, CRC Press.
2. Shai Shalev-Shwartz & Shai Ben-David, —Understanding Machine Learning‖, Cambridge University Press.
3. Zhiwei Lin & Yang Xiang, —Cyber Security Intelligence and Analytics‖, Springer.
4. Bhavani Thuraisingham, —Data Mining for Malware Detection‖, CRC Press.

Online Learning Resources:

- Coursera – —AI for Cybersecurity‖ by University of Colorado
- Udemy – —Machine Learning for Cybersecurity‖
- edX – —Cybersecurity MicroMasters‖ by RIT

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A43119d – AI-DRIVEN SOFTWARE ENGINEERING & DEVOPS

Professional Elective-IV

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 Objectives:

- To introduce the principles and practices of AI-driven software engineering and DevOps.
- To explore how AI techniques can automate and optimize software development workflows.
- To study intelligent tools for code generation, testing, monitoring, and deployment.
- To equip students with skills in AI-powered CI/CD pipelines and operations.
- To foster an understanding of ethical implications and reliability in intelligent software systems.

2.Course Outcomes:

- CO1:Understand AI's role in modern software development and operations.
- CO2:Apply machine learning techniques to automate software engineering tasks.
- CO3:Design and manage intelligent CI/CD and DevOps workflows.
- CO4:Evaluate AI tools in software testing, refactoring, and monitoring.
- Co5:Implement AI-based solutions for predictive maintenance and decision support in DevOps.

3.Course Syllabus:

UNIT I: Foundations of AI in Software Engineering

Overview of Traditional vs AI-driven Software Development, AI Opportunities in Software Lifecycle Phases, Introduction to ML/DL Models in Engineering Tasks, Code Representation and Learning from Code, NLP for Source Code Understanding, Software Knowledge Graphs and Reasoning, Datasets and Benchmarks for Software Engineering AI, Case Studies of AI-Enhanced Development Tools

UNIT II: AI in Code Generation and Refactoring

Program Synthesis and Code Completion Models, Large Language Models (e.g., Codex, CodeBERT) in IDEs, Code Clone Detection and Automated Refactoring, Learning-Based Bug Detection and Code Smell Identification, AI in Software Architecture Recommendations, Embedding Techniques for Source Code, Prompt Engineering for Software Tasks, Reliability and Safety in Generated Code

UNIT III: Intelligent Testing, QA, and Debugging

Test Case Generation Using AI, Automated Unit Testing, Regression Testing with ML, Learning Bug Patterns from Repositories, AI-Based Static and Dynamic Code Analysis, Fault Localization and Automated Debugging, Quality Assurance Metrics Enhanced by AI, Reinforcement Learning for Test Prioritization, Ethics and Bias in AI-Driven Testing – (E)

UNIT IV: AI in DevOps Automation and CI/CD

DevOps Fundamentals and Integration with AI, Intelligent CI/CD Pipeline Design, Predictive Build Failure and Log Analysis, AI in Infrastructure-as-Code and Deployment Orchestration, Self-Healing Systems and AIOps Concepts, Log Analytics and Anomaly Detection in Production, AI in Monitoring, Tracing, and Feedback Loops, DevSecOps and AI for Security Automation

UNIT V: Advanced Topics and Ethical Considerations

Explainability and Transparency in AI-Driven Tools, Ethical and Legal Aspects in Automated Engineering, Human-AI Collaboration in Software Teams, Risk Management in Autonomous Code Deployment, AI for Technical Debt Prediction and Management, AI for Developer Productivity Analytics, Research Trends and Challenges in AI for SE, Capstone: Building a Smart DevOps Workflow

Textbooks:

1. Tim Menzies, Diomidis Spinellis, and Thomas Zimmermann, ―Perspectives on Data Science for Software Engineering‖, Morgan Kaufmann.
2. André van der Hoek, Reid Holmes, ―Software Engineering for Machine Learning‖, Springer.
3. Len Bass, Ingo Weber, Liming Zhu, ―DevOps: A Software Architect's Perspective‖, Addison-Wesley.

Reference Books:

1. Carlos Eduardo Parnin et al., ―AI for Software Engineering: Foundations, Advances, and Trends‖, Springer.
2. Luciano Baresi et al., ―Machine Learning Techniques for Software Quality Evaluation‖, Springer.
3. Gene Kim, Jez Humble, and Nicole Forsgren, ―Accelerate: The Science of Lean Software and DevOps‖, IT Revolution.

Online Learning Resources:

1. Coursera – ―AI for Software Engineering‖ by DeepLearning.AI
2. edX – ―DevOps for Developers‖ by Microsoft
3. GitHub Copilot and OpenAI Codex documentation
4. PapersWithCode – AI for Software Engineering benchmarks
5. MIT OCW – ―Software Systems‖ and ―DevOps and CI/CD‖
6. Udemy – ―AI-Powered DevOps Pipelines and Automation‖
7. Google Cloud – AIOps and MLOps tutorials

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A43120a – AI for Smart Cities & IoT Systems

Professional Elective-V

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 Objective:

1. To understand the foundational concepts of smart cities and IoT architectures integrated with AI technologies.
2. To explore AI-driven solutions for urban mobility, transportation, and traffic management systems.
3. To apply AI and IoT techniques for efficient energy, waste, and water management in smart urban environments.
4. To examine AI applications in smart healthcare, surveillance, and public safety systems.
5. To design, deploy, and evaluate AIoT systems with an understanding of real-time processing, governance, and future challenges.

2.Course Outcomes:

1. Describe the architecture and components of smart cities and explain how AI and IoT integrate to optimize urban planning and services.
2. Apply AI models in transportation systems to improve traffic flow, public mobility, and autonomous vehicle operations.
3. Develop AI and IoT solutions for sustainable energy, waste, and water management in smart city ecosystems.
4. Analyze AI-based healthcare, surveillance, and emergency response applications, considering privacy and ethical aspects.
5. Design and deploy AIoT systems using edge/cloud platforms and evaluate them using appropriate governance and performance metrics.

3.Course Syllabus:

Unit I: Introduction to AI in Smart Cities and IoT Systems
Smart City Concepts: Components, Infrastructure, and Urban Needs, Overview of IoT and AI Integration, Smart City Frameworks (India, Singapore, EU, etc.), IoT Architecture: Sensing, Network, Processing, and Application Layers, Role of AI in Urban Planning and Resource Optimization, Case Studies on AI in Smart Cities, Edge, Fog, and Cloud Computing Concepts for Smart Systems

Unit II: AI Applications in Smart Transportation and Mobility
Traffic Monitoring and Congestion Prediction using AI, Intelligent Traffic Signal Control using Reinforcement Learning, Autonomous Vehicles and AI Algorithms, Vehicle Detection and License Plate Recognition using CV, Public Transport Optimization using Predictive Analytics, Smart Parking and Navigation Systems, Use of Drones and AI for Traffic Surveillance

Unit III: AI and IoT for Smart Energy, Waste, and Water Management
AI for Smart Grids and Energy Consumption Prediction, Load Balancing and Demand Forecasting using ML, Waste Segregation and Collection Automation using CV, Water Quality Monitoring Systems using IoT Sensors, Leak Detection and Anomaly Detection Models, Smart Metering and Energy Theft Detection, Sustainability and Carbon Monitoring AI Models

Unit IV: Smart Healthcare, Surveillance, and Public Safety
IoT-based Health Monitoring and Alert Systems, Predictive Healthcare and Disease Outbreak Detection, AI for CCTV Surveillance, Crowd Monitoring, and Violence Detection, NLP for Emergency Response and Chatbot Assistance, Smart Ambulance Routing and Response Optimization, COVID-19

Contact Tracing and Monitoring via AI & IoT, Data Privacy, Security & Ethical Issues in Surveillance Systems.

Unit V: AIoT System Design, Deployment, and Governance

AI Model Deployment on Edge Devices (Raspberry Pi, Jetson Nano), Smart City Dashboards and Data Visualization, Real-time Streaming and Analytics Platforms (Apache Kafka, Spark), Cloud Integration: AWS IoT, Google Cloud AI, Azure IoT Suite, Governance Frameworks, Data Privacy, and Policy Standards, Evaluation Metrics for Smart City Projects, Future Trends in AIoT and Smart Urban Living

Text Books:

1. Pethuru Raj & Anupama C. Raman, The Internet of Things: Enabling Technologies, Platforms, and Use Cases, CRC Press.
2. Janaka Ekanayake, Smart Grid: Technology and Applications, Wiley.
3. Rajkumar Buyya, Fog and Edge Computing: Principles and Paradigms, Wiley.
4. Adrian McEwen, Hakim Cassimally, Designing the Internet of Things, Wiley.

Reference Books:

1. Mahalik N. P., Sensor Networks and Applications, McGraw Hill.
2. Kim F. Taylor, Urban Artificial Intelligence and Governance, Springer.
3. Dastbaz, J. & Pattinson, C., Smart Cities: Innovation and Sustainability, Springer.
4. Research papers from IEEE Smart Cities, AIoT Journal, and Springer Urban Tech.

Online Courses:

1. Coursera – Smart Cities: Management of Smart Urban Infrastructures (EPFL)
2. edX – Internet of Things (IoT) Program – Curtin University

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A43120b – ML Ops & AI Model Deployment

Professional Elective-V

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 Objective:

- To understand the principles and best practices of operationalizing machine learning models in production environments.
- To explore the life cycle of AI model development, deployment, monitoring, and maintenance using modern MLOps frameworks.
- To develop skills in CI/CD for ML, reproducibility, model versioning, and containerization using Docker and Kubernetes.
- To deploy machine learning models using cloud-native services and track their performance using real-time metrics.
- To address scalability, reliability, and ethical considerations in ML model deployment.

2.Course Outcomes:

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

CO1:Illustrate the lifecycle and pipeline components of MLOps and implement basic version control and orchestration for ML workflows.
CO2:Package ML models using appropriate tools and deploy them using Docker and Kubernetes environments with effective resource management.
CO3:Develop and deploy machine learning models as APIs using FastAPI/Flask and configure for real-time or batch inference scenarios.
CO4:Monitor and log ML systems using modern tools and detect data/model drift with strategies for continuous evaluation and feedback.
CO5:Implement end-to-end MLOps solutions using cloud platforms and CI/CD tools, and analyze deployment challenges in real-world use cases.

3.Course Syllabus:

UNIT I: Introduction to MLOps and Deployment Pipelines

Definition and need of MLOps, ML system lifecycle and pipeline components, DevOps vs. MLOps: key differences, CI/CD for ML projects, Data versioning and model lineage, Introduction to DVC, Git, and MLFlow, Workflow orchestration using Apache Airflow, Automated testing in ML pipelines,

UNIT II: Model Packaging and Environment Management.

Packaging ML models using Pickle, Joblib, ONNX, Python virtual environments, Conda, Pipenv, Introduction to Docker for ML workloads, Building Dockerfiles for ML apps, Using Kubernetes for orchestration, Security, logging, and resource management, Docker Compose and Helm charts for deployment, Hands-on: Containerize and deploy a scikit-learn model

UNIT III: Model Serving and APIs

RESTful API design for ML models, Model deployment using FastAPI and Flask, TensorFlow Serving, TorchServe basics, Introduction to gRPC for ML deployment, Asynchronous inference and batch vs real-time serving, Load testing and benchmarking, Authentication and authorization in model APIs, Deploying models on edge devices

UNIT IV: Monitoring, Logging, and Continuous Evaluation

Importance of monitoring and alerting in MLOps, Data drift and model drift detection, Logging prediction results and metadata, Prometheus, Grafana, and ELK Stack, A/B testing and canary deployments, Shadow deployments and rollback strategies, Feedback loops for continuous learning, Integration with external monitoring tools

UNIT V: Cloud-native MLOps and Case Studies

ML deployment on AWS SageMaker, Azure ML, Google AI Platform, CI/CD using GitHub Actions, Jenkins, and GitLab CI, AutoML and model registry, Real-world case study: End-to-end MLOps pipeline, Challenges and limitations in enterprise ML deployment, Responsible AI in production systems, Future trends in MLOps, Capstone Project Planning

Text Books:

1. Introducing MLOps: How to Scale Machine Learning Projects with DevOps Tools – Mark Treveil, Alok Shukla, O'Reilly Media.
2. Machine Learning Engineering – Andriy Burkov, TrueShelf Publishing.
3. Designing Machine Learning Systems – Chip Huyen, O‘Reilly Media.

Reference Books:

1. Practical MLOps – Noah Gift, O‘Reilly Media
2. Kubeflow for Machine Learning – Trevor Grant et al., O'Reilly
3. Hands-On MLOps: Implement Machine Learning in Production – Munn, Meza, Vohra, Packt Publishing
4. Research papers from arXiv, MLSys Conference, and ICML Industry Track

Online Courses:

1. Coursera – MLOps Specialization by DeepLearning.AI
2. Google Cloud – MLOps: Continuous Delivery and Automation Pipelines
3. Udemy – MLOps: ML Pipelines, CI/CD, and Model Deployment

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A43120c – Data Wrangling

Professional Elective-V

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 Objectives:

- To introduce the fundamental techniques for acquiring, cleaning, transforming, and manipulating data.
- To enable students to handle real-world messy data for analysis and machine learning.
- To teach efficient use of libraries like Pandas, NumPy, and SQL for data wrangling.
- To promote understanding of handling missing values, outliers, and inconsistent formats.
- To expose students to automation, reproducibility, and workflow design in data preprocessing.

2.Course Outcomes:

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

- CO1:Understand and apply core data wrangling techniques.
- CO2:Clean, transform, and reshape data using Python and SQL.
- CO3:Handle missing values, data inconsistencies, and outliers.
- CO4:Merge and join multiple datasets from different sources.
- CO5:Automate data pipelines and preprocessing workflows for analytics and ML.

3.Course Syllabus:

UNIT I: Introduction to Data Wrangling and Data Acquisition

Introduction to Data Wrangling: Importance and Use Cases, Types of Data: Structured, Semi-Structured, Unstructured, Data Acquisition Techniques: APIs, Web Scraping, Reading Data from CSV, Excel, JSON, XML, Using Python libraries: pandas, requests, BeautifulSoup, Working with Databases using SQLAlchemy and pandas, Loading Large Datasets and Chunking, Exploratory Analysis Before Cleaning.

UNIT II: Handling Missing, Noisy, and Inconsistent Data

Identifying and Understanding Missing Data, Techniques for Imputing Missing Values, Handling Inconsistent Data: Dates, Texts, Units, Removing Duplicates and Irrelevant Data, Detecting and Treating Outliers, Normalization and Standardization Techniques, Regular Expressions for Text Cleaning, Visualizing Missing/Outlier Data.

UNIT III: Data Transformation and Feature Engineering

Data Type Conversion and Parsing , Feature Extraction from Text, Dates, and Strings, One-Hot Encoding, Label Encoding, Binning and Discretization, Data Aggregation and Grouping, Pivoting, Melting, and Reshaping Data, Handling Imbalanced Data, Creating Derived Features and Feature Selection.

UNIT IV: Data Integration, Joining, and Workflows

Merging and Joining Datasets (Inner, Outer, Left, Right), Concatenation and Appending DataFrames, Data Consistency and Referential Integrity, Resolving Schema Mismatches, Designing Reusable Data

Wrangling Functions, Automating Workflows with Functions and Pipelines, Data Lineage and Documentation, Case Study: End-to-End Data Wrangling Pipeline.

UNIT V: Tools, Libraries, and Case Studies in Data Wrangling

Pandas and NumPy Advanced Techniques, Pyjanitor, Dask, and Polars for Efficient Wrangling, Using OpenRefine for Data Cleaning, SQL vs NoSQL in Data Wrangling, Real-world Wrangling Case Studies (Finance, Healthcare, Retail), Best Practices and Common Pitfalls in Data Wrangling, Reproducibility and Versioning in Data Pipelines, Final Capstone: Build and Evaluate a Clean Dataset for ML/

Textbooks:

1. M. Heydt – Data Wrangling with pandas, O'Reilly Media.
2. Hadley Wickham – R for Data Science (Data Wrangling Chapters), O'Reilly.
3. J. VanderPlas – Python Data Science Handbook, O'Reilly Media.

Reference Books:

1. Wes McKinney – Python for Data Analysis, O'Reilly.
2. Cathy O'Neil and Rachel Schutt – Doing Data Science, O'Reilly.
3. David Mertz – Cleaning Data for Effective Data Science, Packt.

Online Learning Resources:

1. Data Wrangling with pandas (Datacamp): https://www.datacamp.com/courses/data-manipulation-with-pandas
2. Coursera: Data Wrangling, Analysis and AB Testing with SQL – *https://www.coursera.org/learn/data-wrangling-analysis-abtesting*
3. edX: Data Wrangling with R – https://online.rice.edu/courses/data-wrangling-r

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A43120d – Healthcare AI

Professional Elective-V

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 Objectives:

- To provide a foundational understanding of AI applications in healthcare.
- To familiarize students with medical data types, preprocessing, and ethical considerations.
- To explore ML and DL algorithms tailored for diagnosis, prognosis, and treatment recommendations.
- To expose students to real-world healthcare systems and AI solutions like predictive modeling, EHRs, and medical imaging.
- To enable students to design, evaluate, and deploy AI-driven healthcare applications.

2.Course Outcomes:

After completing this course, students will be able to:

- Understand the scope, challenges, and benefits of AI in healthcare.
- Apply data preprocessing and modeling techniques specific to biomedical data.
- Analyze the performance of ML/DL models in clinical contexts.
- Develop AI-driven applications for tasks like disease diagnosis, drug discovery, and patient monitoring.
- Evaluate ethical, legal, and societal implications of AI in healthcare.

3.Course Syllabus:

UNIT I: Introduction to AI in Healthcare

Overview of Healthcare Systems and Data Ecosystem , AI in Clinical Decision Support Systems (CDSS), Types of Medical Data: EHRs, Imaging, Genomic, Sensor Data, Applications of AI in Diagnosis, Prognosis, and Monitoring, Use Cases: Radiology, Pathology, Oncology, Cardiology, Limitations and Challenges of AI in Healthcare, AI for Telemedicine and Remote Patient Monitoring.

UNIT II: Medical Data Preprocessing and Feature Engineering

Data Cleaning, Imputation, and Normalization for Clinical Data, Handling Missing Values, Outliers, and Bias, Feature Engineering from EHRs and Time-Series Data, Text Mining for Medical Notes using NLP, Encoding Diagnosis and Procedure Codes (ICD, CPT), Temporal Pattern Extraction from Clinical Sequences, Data Privacy, Anonymization, and HIPAA Compliance.

UNIT III: Machine Learning & Deep Learning in Healthcare

Supervised Learning for Risk Prediction and Classification, Unsupervised Learning for Patient Segmentation, Deep Learning for Medical Imaging: CNNs, Transfer Learning, Recurrent Neural Networks for Time-series Clinical Data, Survival Analysis and Time-to-Event Prediction, Model Evaluation Metrics: Sensitivity, Specificity, AUC, Handling Imbalanced Datasets in Healthcare, Interpretability in Medical ML Models (LIME, SHAP)

UNIT IV: Specialized Healthcare AI Applications

AI for Disease Diagnosis: Diabetes, Cancer, Heart Disease, AI in Medical Imaging: X-ray, MRI, CT Scan Analysis, Predictive Modeling for ICU Admission & Mortality Risk, AI in Genomics and Personalized Medicine, Drug Discovery and Repurposing with AI, Chatbots and Virtual Health Assistants, Remote Monitoring using IoT & Wearables + AI.

UNIT V: Ethics, Regulation, and Future Directions in Healthcare AI

Ethical AI in Healthcare: Bias, Fairness, and Accountability, Regulatory Landscape: FDA Approval, CE Marking, Explainable AI and Clinical Trust, Federated Learning for Privacy-Preserving AI, Clinical Trials and AI Decision-Support Tools, Case Studies: Google DeepMind, IBM Watson Health, PathAI, Responsible Deployment of AI in Healthcare Settings.

Textbooks:

1. Jiang, Fei et al. – Artificial Intelligence in Healthcare: Past, Present and Future.
2. Kevin Frick – Introduction to Healthcare AI.
3. Eric Topol – Deep Medicine: How Artificial Intelligence Can Make Healthcare Human Again.

Reference Books:

1. Mathias Goyen – AI in Medical Imaging.
2. Bertalan Meskó – The Guide to the Future of Medicine: Technology and The Human Touch.
3. Peter Szolovits – Artificial Intelligence in Medicine (Morgan Kaufmann).

Online Learning Resources:

1. Coursera: AI for Medicine Specialization (offered by DeepLearning.AI)
   https://www.coursera.org/specializations/ai-for-medicine
2. HarvardX: Data Science in Healthcare (edX)
   https://online-learning.harvard.edu/course/data-science-healthcare

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A43121 – PROMPT ENGINEERING

(Skill Enhancement Course)

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:

This course delves into prompt engineering principles, strategies, and best practices, a crucial aspect in shaping AI models' behavior and performance. Understanding Prompt Engineering is a comprehensive course designed to equip learners with the knowledge and skills to effectively generate and utilize prompts in natural language processing (NLP) and machine learning (ML) applications. This course delves into prompt engineering principles, strategies, and best practices, a crucial aspect in shaping AI models' behavior and performance.

2.Course Outcomes:

CO1: Under standing the fundamentals and evolution of prompt engineering.

CO2: Gaining the ability to craft effective closed-ended, open-ended, and role based prompts.

CO3: Learning to probe and stress-test AI models for bias and robustness.

CO4: Applying prompt optimization techniques and performance evaluation methods.

CO5: Mitigating bias and promoting ethical prompting practices in NLP/ML systems.

3.Course Syllabus:

Module 1: Introduction to Prompt Engineering

- *Lesson 1: Foundations of Prompt Engineering*
  - Overview of prompt engineering and its significance in NLP and ML.
  - Historical context and evolution of prompt-based approaches.

Module 2: Types of Prompts and Their Applications

- *Lesson 2: Closed-Ended Prompts*
  - Under standing and creating prompts for specific answers.
  - Applications in question- answering systems.
- *Lesson 3: Open-Ended Prompts*
  - Crafting prompts for creative responses.
  - Applications in language generation models.

Module 3: Strategies for Effective Prompting

- *Lesson 4: Probing Prompts*
  - Designing prompts to reveal model biases.
  - Ethical considerations in using probing prompts.
- *Lesson 5: Adversarial Prompts*
  - Creating prompts to stress-test models.

  - Enhancing robustness through adversarial prompting.

Module 4: Fine-Tuning and Optimizing with Prompts

- *Lesson 6: Fine-Tuning Models with Prompts*
  - Techniques for incorporating prompts during model training.
  - Balancing prompt influence and generalization.
- *Lesson 7: Optimizing Prompt Selection*
  - Methods for selecting optimal prompts for specific tasks.
  - Customizing prompts based on model behavior.

Module 5: Evaluation and Bias Mitigation

- *Lesson 8: Evaluating Prompt Performance*
  - Metrics and methodologies for assessing model performance with prompts.
  - Interpreting and analyzing results.
- *Lesson 9: Bias Mitigation in Prompt Engineering*
  - Strategies to identify and address biases introduced by prompts.
  - Ensuring fairness and inclusivity in prompt-based models.

Module 6: Real-World Applications and Case Studies

- *Lesson 10: Case Studies in Prompt Engineering*
- *Exploration of successful implementations and challenges in real-world scenarios.*
- *Guest lectures from industry experts sharing their experiences.*

Text books:

1. "Prompt Engineering in Action" – *Danny D. Sullivan*
2. "The Art of Prompt Engineering with Chat GPT: A Hands-On Guide" – *Nathan Hunter.*

Reference Books:

1. "Prompt Engineering in Practice" – *Michael F. Lewis*
2. "Mastering AI Prompt Engineering: The Ultimate Guide for Chat GPT Users" – *Adriano Damiao*
3. "Writing AI Prompts For Dummies" – *Stephanie Diamond and Jeffrey Allan*
4. "Prompt Engineering Guide" (Online Resource) – *promptingguide.ai*

Online Resource link :

https://www.udemy.com/course/understanding-prompt- engineering/?couponCode=NVDINCTA35TRT

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL
(AUTONOMOUS)

COURSE STRUCTURE

A40037 – GENDER SENSITIZATION

(Audit Course)

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	30	70	100

1.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 (CO):

COs	Statements
CO1	Understand the basic concepts of gender and its related terminology
CO2	Identify the biological, sociological, psychological and legal aspects of gender.
CO3	Use the knowledge in understanding how gender discrimination works in our society and how to counter it.
CO4	Analyzethe gendered division of labour and its relation to politics and economics.
CO5	Appraise how gender-role beliefs and sharing behaviour are associated with more well-being in all culture and gender groups
CO6	Develop students‘ sensibility with regard to issues of gender in contemporary India

3.Course Syllabus:

Unit-1UNDERSTANDING 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-2GENDER 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-3GENDER 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-4GENDER-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-5GENDER 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

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 ELECTIVES

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40171 - GREEN BUILDINGS

(OPEN ELECTIVE - I)

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 Objectives :

The objectives of this course are to make the student:

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

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

TEXT BOOKS:

1. Handbook on Green Practices published by Indian Society of Heating Refrigerating and Air conditioning Engineers, 2009.

Green Building Hand Book by tom woolley and Sam kimings, 2009.

2. **REFRENCE BOOKS:**

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

3. **Online Learning Resources:**

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

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40172 - CONSTRUCTION TECHNOLOGY AND MANAGEMENT (OPEN ELECTIVE – I)

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

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

2.Course Outcomes:

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

CO1: Understand (Cos)project management fundamentals, organizational structures, and leadership principles in construction.

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

CO3:Apply planning, scheduling, and project management techniques such as CPM and PERT.

CO4:Evaluate various contract types, contract formation, and legal aspectsin construction management.

CO5: 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 andProject 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 forLabour, Material, Design, Construction – Drafting of Contract Documents Based On IBRD/ MORTH Standard Bidding Documents – Construction Contracts – Contract Problems – Arbitration and Legal Requirements Computer Applications in Construction Management: Software for Project Planning, Scheduling and Control.

UNIT – V

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

TEXT BOOKS:

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

REFRENCE BOOKS:

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

Online Learning Resources:

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

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A40271 - ELECTRICAL SAFETY PRACTICES AND STANDARDS
(Open Elective-I)

COURSE STRUCTURE

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:

This course introduces the fundamentals of electrical safety, including electric shock, arc, blast, and related hazards. It covers safety components like conductors, insulators, grounding, bonding, and protective equipment. Students learn safety practices for various environments such as train stations, swimming pools, and medical areas. The course includes first aid procedures and case studies for practical understanding. It concludes with key electrical safety standards such as NFPA 70E, OSHA, IEEE, NEC, and statutory regulations.

2.Course Outcomes:

CO1: Understanding the Fundamentals of Electrical Safety

CO2: Identifying and Applying Safety Components

CO3: Analyzing Grounding Practices and Electrical Bonding

CO4: Applying Safety Practices in Electrical Installations and Environments

CO5: Evaluating Electrical Safety Standards and Regulatory Compliance

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

TEXT BOOKS:

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

REFERENCES:

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.

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40371 - SUSTAINBLE ENERGY TECHNOLOGIES

(Open Elective-I)

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

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

2.Course Outcomes: On successful completion of this course the student will be able to

CO1 Illustrate the importance of solar radiation and solar PV modules.

CO2 Discuss the storage methods in PV systems

CO3 Explain the solar energy storage for different applications

CO4 Understand the principles of wind energy, and bio-mass energy.

CO5 Attain knowledge in geothermal energy, ocean energy and fuel cells.

3. Course Syllabus

UNIT – 1

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 – 2
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 – 3

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 – 4.

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 – 5

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

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

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

Text Books:

1. Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/TMH

2. Non-Conventional Energy Resources- Khan B.H/ Tata McGraw Hill, New Delhi, 2006

References:

1. Principles of Solar Engineering - D.Yogi Goswami, Frank Krieth& John F Kreider / Taylor &Francis

2. Non-Conventional Energy - Ashok V Desai /New Age International (P) Ltd

3. Renewable Energy Technologies -Ramesh & Kumar /Narosa

4. Non-conventional Energy Source- G.D Roy/Standard Publishers

Online Learning Resources:

https://nptel.ac.in/courses/112106318
https://youtube.com/playlist?list=PLyqSpQzTE6M-ZgdjYukayF6QevPv7WE-r&si=-mwIa2X-SuSiNy13

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

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

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40471 - ELECTRONIC CIRCUITS

(Open Elective –I)

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

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

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

CO1. Understand semiconductor diodes, their characteristics and applications.

CO2. Explore the operation, configurations, and biasing of BJTs.

CO3. Gain knowledge about the operation, analysis, and coupling techniques of BJT amplifiers.

CO4. Learn the operation, applications and uses of feedback amplifiers and oscillators.

CO5. Analyze the characteristics, configurations, and applications of operational amplifiers.

3. Course Syllabus

UNIT-I

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

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

UNIT-II

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

UNIT-III

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

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

UNIT-IV

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

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

UNIT-V

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40071 - MATHEMATICS FOR MACHINE LEARNING AND AI
(Open Elective 1)

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

- 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.

2.Course Outcomes:

After successful completion of this course, the students should be able to:

CO1	Apply linear algebra concepts to ML techniques like PCA and regression.
CO2	Analyze probabilistic models and statistical methods for AI applications.
CO3	Implement optimization techniques for machine learning algorithms.
CO4	Utilize vector calculus and transformations in AI-based models.
CO5	Develop graph-based AI models using mathematical representations.

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).

3.Course Syllabus

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).

Textbooks:

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 Books:

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

Web References:

- MIT– Mathematics for Machine Learning https://ocw.mit.edu
- Stanford CS229 – Machine Learning Course https://cs229.stanford.edu/

DeepAI – Mathematical Foundations for AI https://deepai.org

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40072 - MATERIALS CHARACTERIZATION TECHNIQUES

(Common to all branches) (Open Elective-Inter disciplinar)

(Open Elective-I)

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

1 To provide exposure to different characterization techniques.

2 To explain the basic principles and analysis of different spectroscopic techniques.

3 To elucidate the working of Scanning electron microscope - Principle, limitations and applications.

4 To illustrate the working of the Transmission electron microscope (TEM) - SAED patterns and its applications.

5 To educate the uses of advanced electric and magnetic instruments for characterization.

2.Course Outcomes

CO1 Analyze the crystal structure and crystallite size by various methods

CO2 Analyze the morphology of the sample by using a Scanning Electron Microscope

CO3 Analyze the morphology and crystal structure of the sample by using Transmission Electron Microscope

CO4 Explain the principle and experimental arrangement of various spectroscopic techniques

CO5 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.

Textbooks:

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

Reference Books:

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

NPTEL courses link :

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

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40073 - CHEMISTRY OF ENERGY SYSTEMS

(Open Elective-I)

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

- Make the student understand basic electrochemical principles such as standard electrode potentials, emf and applications of electrochemical principles in the design of batteries.

- understand the basic concepts of processing and limitations of Fuel cells & their applications.
- Impart knowledge to the students about fundamental concepts of photo
- chemical cells, reactions and applications
- Necessasity of harnessing alternate energy resources such as solar energy and its basic concepts.
- Impart knowledge to the students about fundamental concepts of hydrogen storage in different materials and liquification method.

2.Course Outcomes:

CO1	Solve the problems based on electrode potential, Describe the Galvanic Cell Differentiate between Lead acid and Lithium ion batteries, Illustrate the electrical double layer
CO2	Describe the working Principle of Fuel cell, Explain the efficiency of the fuel cell Discuss about the Basic design of fuel cells, Classify the fuel cell
CO3	Differentiate between Photo and Photo electrochemical Conversions, Illustrate the photochemical cells, Identify the applications of photochemical reactions, Interpret advantages of photoelectron catalytic conversion.
CO4	Apply the photo voltaic technology, Demonstrate about solar energy and prospects. Illustrate the Solar cells, Discuss about concentrated solar power
CO5	Differentiate Chemical and Physical methods of hydrogen storage, Discuss the metal organic frame work, Illustrate the carbon and metal oxide porous structures Describe the liquification methods

.

3.Course Syllabus

UNIT-1: 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-2: 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-3: 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-4: Solar Energy: Introduction and prospects, photovoltaic (PV) technology, concentrated solar power (CSP), Solar cells and applications. .

UNIT-5: Hydrogen Storage: Hydrogen storage and delivery: State-of-the art, Established technologies, Chemical and Physical methods of hydrogen storage, Compressed gas storage, Liquid hydrogen storage, Other storage methods, Hydrogen storage in metal hydrides, metal organic frameworks (MOF), Metal oxide porous structures, hydrogel , and Organic hydrogen carriers.

Text books

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

Reference Books:

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

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

COURSE STRUCTURE

A40074 – ENGLISH FOR COMPETITIVE EXAMINATIONS (OE-1)

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.

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40075 - ENTREPRENEURSHIP AND NEW VENTURE CREATION
(Open Elective-I)

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:

- 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 uunderstand MVP development and validation techniques to determine Product-Market fit and Initiate Solution design, Prototype for Proof of Concept.
- To enhance the ability of analyzing Customer and Market segmentation, estimate Market size, develop and validate Customer Persona

2. Course Outcomes (COs)

CO1. Understand the fundamentals of entrepreneurship and intrapreneurship along with their role in economic development.

CO2. Identify real-world problems and analyze customer needs using design thinking principles.

CO3. Evaluate customer jobs-to-be-done to design effective solutions and develop MVPs.

CO4. Apply lean business models to create business, financial, and go-to-market plans.

CO5. Develop an investor-ready pitch by assessing the scalability and storytelling aspects 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.

Core Teaching Tool: Venture Activity, no-code Innovation tools, Class activity

UNIT-IV: Business & Financial Model, Go-to-Market Plan

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

Business planning: components of Business plan- Sales plan, People plan and financial plan. Financial Planning: Types of costs, preparing a financial plan for profitability using financial template, understanding basics of Unit economics and analysing financial performance. Introduction to Marketing and Sales, Selecting the Right Channel, creating digital presence, building customer acquisition strategy. Choosing a form of business organization specific to your venture, identifying sources of funds: Debt& Equity, Map the Start-up Life-cycle to Funding Options.

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

UNIT-V: Scale Outlook and Venture Pitch readiness

Understand and identify potential and aspiration for scale vis-a-vis your venture idea. Persuasive Storytelling and its key components. Build an Investor ready pitch deck.

Core Teaching Tool: Expert talks; Cases; Class activity and discussions; Venture Activities.

4. Text Books and Materials

TEXT BOOKS

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).

REFERENCES

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

A40090– MATHEMATICS FOR 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

This course provides the essential mathematical foundations required for understanding and applying machine learning techniques. It covers core topics such as supervised and unsupervised learning, regression analysis, optimization strategies, probabilistic models, and Bayesian inference. Learners will explore gradient-based optimization, regularization methods, dimensionality reduction techniques like PCA, and signal processing tools including the Fourier transform. The course also delves into advanced probabilistic models such as Expectation Maximization, Hidden Markov Models, and variational inference. Emphasis is placed on both theoretical understanding and practical applications in real-world datasets.

2. Course Outcomes (COs)

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

CO1. Understand core concepts of learning types, linear regression, and convex optimization.
CO2. Apply optimization techniques like gradient descent and regularization in ML models.
CO3. Analyze regression and probabilistic models using MLE and SVR methods.
CO4. Evaluate dimensionality reduction and signal processing techniques in ML applications.
CO5. Create Bayesian and probabilistic learning models for inference and decision-making.

3. Course Syllabus

UNIT-1: Introduction to Learning and Optimization Foundations

Introduction to the Theory of Learning, Meaning of Learning, Supervised Machine Learning, Unsupervised Machine Learning, Linear Regression, Overfitting and Generalization, Convex Optimization, Optimization Problem Formulations.

UNIT-2: Optimization Techniques for Learning

Forward and Backward propagation in Neural network, Sub-gradient Descent for Non-smooth Functions, Regularization Techniques: Lasso and Ridge, Applications of Regularization with Medical Data, Accelerating Gradient Descent, Gradient Descent, Stochastic Gradient Descent (SGD), Minibatch Gradient Descent, Softmax Activation Function.

UNIT-3: Regression and Probabilistic Models

Support Vector Regression (SVR), Logistic Regression for Dichotomous Variables, Maximum Likelihood Estimation (MLE) for Binomial, Multinomial, Gaussian, Models in the Exponential Family, Continuation of MLE in Binomial, Multinomial, Deeper exploration of Exponential Family Models.

UNIT-4: Dimensionality Reduction and Signal Processing Applications

Dimensionality Reduction Techniques (e.g., PCA), Dynamical Systems and Control, Fourier Transform, Applications in Learning.

UNIT-5: Probabilistic and Bayesian Learning

Expectation Maximization (EM) Algorithm, Learning in Mixture Models, Hidden Markov Models (HMM),Bayesian Machine Learning, Estimating Decisions using Posterior Distributions, Model Selection with Variational Inference.

4. Books and Materials

Text Books:

1. Marc Peter Deisenroth, A. Aldo Faisal, and Cheng Soon Ong**,** *Mathematics for Machine Learning*, Cambridge University Press, 2020.
2. Trevor Hastie, Robert Tibshirani, and Jerome Friedman**,** *The Elements of Statistical Learning*, Springer, 2009.
3. Kevin P. Murphy**,** *Machine Learning: A Probabilistic Perspective*, MIT Press, 2012.
4. Stephen Boyd and Lieven Vandenberghe**,** *Convex Optimization*, Cambridge University Press, 2004.

Reference Books:

1. Bishop, Christopher M, *Pattern Recognition and Machine Learning*, Springer, 2006.
2. Deepak Khemani, A *First Course in Artificial Intelligence*, McGraw Hill Education, 2013.
3. Ethem Alpaydin, *Introduction to Machine Learning*, MIT Press, 4th Edition, 2020.
4. David Barber *Bayesian Reasoning and Machine Learning*, Cambridge University Press, 2012.
5. Tom Mitchell, *Machine Learning*, McGraw Hill, 1997.

Online Learning Resources:

- NPTEL Course: *Mathematics for Machine Learning* by IIT Faculty
  https://nptel.ac.in/
- Stanford University: *CS229 - Machine Learning* (Prof. Andrew Ng)
  https://cs229.stanford.edu/
- MIT OpenCourseWare: *Introduction to Machine Learning*
  https://ocw.mit.edu

COURSE STRUCTURE

A40091 – ENTREPRENEURSHIP (OE-1)

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

5. Course Description

Course Overview

This course provides a comprehensive exploration of entrepreneurship as a key driver of business growth and economic value. It offers essential frameworks for success and pathways to sustainable development, covering each theme with both conceptual and practical insights. By the end of the course, students will understand entrepreneurship's role in economic progress, gain clarity on success factors and risk mitigation, and develop skills to navigate the challenges of entrepreneurship effectively

Course Pre/corequisites

There are no pre/corequisites

6. Course Outcomes (COs)

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

A40091.1 Identify business opportunities through market research and competitive analysis.

A40091.2 Apply ideation techniques to create prototypes and MVPs for new ventures.

A40091.3 Evaluate the dynamics of business growth and the role of entrepreneurship in employment creation.

A40091.4 Analyze the impact of technological innovation on entrepreneurship

A40091.5 Explore funding sources and create financial strategies for startups.

7. Course Syllabus

UNIT-I

The Entrepreneurial Process Entrepreneurial Journey
Introduction to the entrepreneurial process, key stages, milestones, and challenges. Success stories and case studies of prominent entrepreneurs
Entrepreneurial Discovery-Techniques for identifying business opportunities and unmet market needs. Tools such as market research, competitive analysis, and consumer behavior insights.
Ideation and Innovation: Ideation and Prototyping-Creative techniques for generating ideas. Steps for developing prototypes and minimum viable products (MVP) using iterative methods and design thinking.

UNIT-II

Testing, Validation, and Commercialization-Strategies for product testing and customer validation. Refining business ideas based on feedback and scaling ideas into commercially viable products and services.
Disruption as a Success Driver-Understanding disruption in industries and its role in driving entrepreneurial success. Case studies of disruptive businesses and lessons on leveraging disruption for growth.

Technological Innovation and Entrepreneurship– 1 -The impact of emerging technologies (AI, blockchain, IoT, etc.) on entrepreneurship. Leveraging technology for innovation and competitive advantage.

UNIT-III

Technological Innovation and Entrepreneurship – 2
Advanced strategies for integrating technological innovation into startups. Digital transformation, automation, and scaling through tech-enabled processes.
Raising Financial Resources
Overview of funding sources such as venture capital, angel investors, and crowdfunding. Strategies for securing funding and best practices for financial management.
Education and Entrepreneurship-The role of education in fostering entrepreneurship. Developing entrepreneurial skills in academic institutions and promoting entrepreneurship as a career path.

UNIT-IV

Beyond Founders and Founder-Families Challenges of scaling a business beyond the founder. Building strong leadership teams and succession planning for family-owned and founder-led businesses.

India as a Start-up Nation-Overview of India's startup ecosystem. Government policies, initiatives, and success stories that support and promote startups in India.

National Entrepreneurial Culture-Examining how different national cultures influence entrepreneurship. A comparative study of entrepreneurial ecosystems across the globe

UNIT-V

Entrepreneurial Thermodynamics-The dynamics of business growth and the concept of "entrepreneurial energy." Strategies for maintaining momentum and managing burnout in startups**.**

Entrepreneurship and Employment-How entrepreneurship contributes to job creation and economic growth. The relationship between startups, employment generation, and economic development**.**

Start-up Case Studies-In-depth analysis of real-world startups. Lessons learned from both successful ventures and failures across various industries.

8. 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 Shark: Stories on Entrepreneurship, Penguin Books Limited

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE
A40092 – MANAGEMENT INFORMATION SYSTEM (OE-1)

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

1. The objective of this course focuses on the design, implementation and management of information systems in organizations.

2. It integrates technology, people, and processes to provide effective solutions for business operations and decision-making.

3. The course provides a deep understanding of how information systems support organizational functions, improve business processes, and drive strategic initiatives.

2.Course Outcomes (COs)

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

- Understand the Fundamentals of Management Information Systems
- Understand the Foundations of Business Intelligence (BI)
- Understand IT Strategy and its Role in Business Success
- Technologies are shaping modern IT infrastructures and driving innovation
- Understand and Apply Knowledge Management Principles

3. Course Syllabus

UNIT I

Introduction to Management Information systems: Types of MIS, Capabilities, Complements, CCR Framework; Role of manager with respect to IT in an organization, Database management systems, Data Warehousing

UNIT II

Foundations of business intelligence, Data and Text Mining, Strategic Enterprise Systems - ERP, SCM, CRM, SRM, Operational Support Systems - Manufacturing Systems, Sales and Marketing Systems, HRIS, Finance and Accounting Systems

UNIT III

IT Strategy and Balanced Scorecard – IT strategies, IT- business alignment, balanced scorecard, cloud and vendor strategies, Mobile and E-commerce – B2C, B2B and e-procurement, C2C and mobile commerce

UNIT IV

Emerging Technologies – Cloud computing, Big Data Technologies, Internet of Things, Bring Your Own Device (BYoD,) Virtual Reality, Augmented Reality, Block chain, Artificial Inelligence.

UNIT V

Knowledge Management – Decision Support Systems, Expert Systems, Learning Management Systems, Executive Information Systems, Social , ethical and security Issues in Management information system

4.Books and References

1. Kenneth C. Laudon & Jane P. Laudon. "Management Information Systems". Pearson Publishing.
2. Reading material from Harvard Business School Repository

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A40173 - DISASTER MANAGEMENT

(Open Elective – II)

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

The objectives of this course are to make the student :

1. To understand the fundamental concepts of natural disasters, their occurrence, and disaster risk reduction strategies.
2. To analyze the impact of cyclones on structures and explore retrofitting techniques for adaptive reconstruction.
3. To apply wind engineering principles and computational techniques in designing wind-resistant structures.
4. To evaluate earthquake effects on buildings and develop strategies for seismic retrofitting.
5. To assess seismic safety planning, design considerations, and innovative construction materials for disaster-resistant structures.

2.Course Outcomes:

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

1. Understand the fundamental concepts of natural disasters, their occurrence, and disaster risk reduction strategies.
2. Analyze the impact of cyclones on structures and explore retrofitting techniques for adaptive reconstruction.
3. Apply wind engineering principles and computational techniques in designing wind-resistant structures.
4. Evaluate earthquake effects on buildings and develop strategies for seismic retrofitting.
5. Assess seismic safety planning, design considerations, and innovative construction materials for disaster-resistant structures.

3. Course Syllabus

UNIT – I

Introduction to Natural Disasters– Brief Introduction to Different Types of Natural Disasters, Occurrence of Disasters in Different Climatic and Geographical Regions, Hazard Maps (Earthquake and Cyclone) of The World and India, Regulations for Disaster Risk Reduction, Post-Disaster Recovery and Rehabilitation (Socioeconomic Consequences).

UNIT – II

Cyclones and Their Impact– Climate Change and Its Impact On Tropical Cyclones, Nature of Cyclonic Wind, Velocities and Pressure, Cyclone Effects, Storm Surges, Floods, and Landslides. Behavior of Structuresin Past Cyclones and Windstorms, Case Studies. Cyclonic Retrofitting, Strengthening of Structures, and Adaptive Sustainable Reconstruction. Life-Line Structures Such as Temporary Cyclone Shelters.

UNIT – III

Wind Engineering and Structural Response– Basic Wind Engineering, Aerodynamics of Bluff Bodies, Vortex Shedding, and Associated Unsteadiness Along and Across Wind forces. Lab: Wind Tunnel Testing and Its Salient Features. Introduction to Computational Fluid Dynamics (CFD). General Planning and Design Considerations Under Windstorms and Cyclones. Wind Effects On Buildings, towers, Glass Panels, Etc., and Wind-Resistant Features in Design. Codal Provisions, Design Wind Speed, Pressure Coefficients. Coastal Zoning Regulations for Construction and Reconstruction in Coastal Areas. Innovative Construction Materials and Techniques, Traditional Construction Techniques in Coastal Areas.

UNIT – IV

Seismology and Earthquake Effects– Causes of Earthquakes, Plate Tectonics, Faults, Seismic Waves; Magnitude, Intensity, Epicenter, Energy Release, and Ground Motions. Earthquake Effects– On Ground, Soil Rupture, Liquefaction, Landslides. Performance of Ground and Buildings in Past Earthquakes– Behavior of Various Types of Buildings and Structures, Collapse Patterns; Behavior of Non-Structural Elements Such as Services, Fixtures, and Mountings – Case Studies. Seismic Retrofitting– Weakness in Existing Buildings, Aging, Concepts in Repair, Restoration, and Seismic Strengthening.

UNIT – V

Planning and Design Considerations for Seismic Safety– General Planning and Design Considerations; Building forms, Horizontal and Vertical Eccentricities, Mass and Stiffness Distribution, Soft Storey Effects, Etc.; Seismic Effects Related to Building Configuration. Plan and Vertical Irregularities, Redundancy, and Setbacks. Construction Details– Various Types of Foundations, Soil Stabilization, Retaining Walls, Plinth Fill, Flooring, Walls, Openings, Roofs, Terraces, Parapets, Boundary Walls, Underground and Overhead Tanks, Staircases, and Isolation of Structures. Innovative Construction Materials and Techniques. Local Practices– Traditional Regional Responses. Computational Investigation Techniques.

TEXT BOOKS:

1. David Alexander, *Natural Disasters*, 1st Edition, CRC Press, 2017.
2. Edward A. Keller and Duane E. DeVecchio, *Natural Hazards: Earth's Processes as Hazards, Disasters, and Catastrophes*, 5th Edition, Routledge, 2019.

REFRENCE BOOKS:

1. Ben Wisner, J.C. Gaillard, andIlanKelman (Editors), *Handbook of Hazards and Disaster Risk Reduction and Management*, 2nd Edition, Routledge, 2012.
2. Damon P. Coppola, *Introduction to International Disaster Management*, 4th Edition, Butterworth-Heinemann, 2020.
3. BimalKanti Paul, *Environmental Hazards and Disasters: Contexts, Perspectives and Management*, 2nd Edition, Wiley-Blackwell, 2020.

Online Learning Resources:

https://nptel.ac.in/courses/124107010

https://onlinecourses.swayam2.ac.in/cec19_hs20/preview

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40174 - SUSTAINABILITY IN ENGINEERING PRACTICES (OE – II)

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

The objectives of this course are to make the student :

1. To understand the fundamentals of sustainability, the carbon cycle, and the environmental impact of construction materials.
2. To analyze sustainable construction materials, their durability, and life cycle assessment.
3. To apply energy calculations in construction materials and assess their embodied energy.
4. To evaluate green building standards, energy codes, and performance ratings.
5. To assess the environmental effects of energy use, climate change, and global warming.

2.Course Outcomes: **After successful completion of this course, students will be able to:**

1. Understand the fundamentals of sustainability, the carbon cycle, and the environmental impact of construction materials.
2. Analyze sustainable construction materials, their durability, and life cycle assessment.
3. Apply energy calculations in construction materials and assess their embodied energy.
4. Evaluate green building standards, energy codes, and performance ratings.
5. Assess the environmental effects of energy use, climate change, and global warming.

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.

TEXT BOOKS:

1. Charles J Kibert, Sustainable Construction: Green Building Design & Delivery, 4th Edition , Wiley Publishers 2016.
2. Steve Goodhew, Sustainable Construction Process, Wiley Blackwell,UK, 2016.

REFRENCE BOOKS:

1. Craig A. Langston & Grace K.C. Ding, Sustainable Practicesin the Built Environment, Butterworth Heinemann Publishers, 2011.
2. William P Spence, Construction Materials, Methods & Techniques (3e), Yesdee Publication Pvt. Ltd, 2012.

Online Learning Resources:

https://archive.nptel.ac.in/courses/105/105/105105157/

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40272 - RENEWABLE ENERGY SOURCES (Open Elective-II)

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 Outcomes:

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

CO 1: Understand principle operation of various renewable energy sources. L1
CO 2: Identify site selection of various renewabl energy sources. L2
CO 3: Analyze various factors affecting on solar energy measurements, wind energy conversion techniques, Geothermal, Biomasss, Tidal Wave and Fuel cell energies L3
CO 4: Design of Solar PV modules and considerations of horizontal and vertical axis Wind energy systems. L5
CO 5: Apply the concepts of Geo Thermal Energy, Ocean Energy, Bio mass and Fuel Cells for generation of power. L4

2. 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/10810

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40372 - AUTOMATION AND ROBOTICS (Open Elective-II)

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 Fundamentals of industrial automation, production types, automation strategies, and hardware elements used in modern manufacturing processes.

2 Understanding of automated manufacturing systems, and strategies for improving productivity and flexibility in industrial automation.

3 Knowledge of industrial automation and robotics, sensors, and end-effector design for modern manufacturing environments.

4 Explain industrial automation and robotics, and trajectory planning for intelligent and efficient manufacturing applications.

5 Familiarity of industrial automation and robotics, and practical applications in manufacturing processes.

COURSE OUTCOMES: On successful completion of this course the student will be able to

1 Understand and analyze the structure and functions of automated manufacturing systems, and evaluate hardware components for efficient production.

2 Analyze and design automated flow lines with or without buffer storage, perform quantitative evaluations, apply assembly line balancing techniques.

3 Classify robot configurations, select suitable actuators and sensors, analyze and apply automation and robotics principles to optimize production efficiency and flexibility.

4 Apply kinematic and dynamic modeling using D-H notation and select appropriate hardware and control strategies for real-world industrial scenario to analyze and design automated and robotic systems.

5 Design, program, and implement robotic systems, understand and apply robotics technology to manufacturing tasks.

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.

Text Books:

1. Automation , Production systems and CIM,M.P. Groover /Pearson Edu.
2. Industrial Robotics - M.P. Groover, TMH.
3.

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:

https://www.youtube.com/watch?v=yxZm9WQJUA0&list=PLRLB5WCqU54UJG45UnazSYmnmhl-gt76o

https://www.youtube.com/watch?v=6f3bvIhSWyM&list=PLRLB5WCqU54X5Vy4DwjfSODT3ZJgwEjyE

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40472 - DIGITAL ELECTRONICS
(Open Elective-II)

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 Learn Boolean algebra, logic simplification techniques, and combinational circuit design.
2. To analyze combinational circuits like adders, subtractors, and code converters.
3. To explore combinational logic circuits and their applications in digital design.
4. To understand sequential logic circuits, including latches, flip-flops, counters, and shift registers.
5. To gain knowledge about programmable logic devices and digital IC's.

Course Outcomes:

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

1. Learn Boolean algebra, logic simplification techniques, and combinational circuit design.
2. Analyze combinational circuits like adders, subtractors, and code converters.
3. Explore combinational logic circuits and their applications in digital design.
4. Understand sequential logic circuits, including latches, flip-flops, counters, and shift registers.
5. Gain knowledge about programmable logic devices and digital IC's.

Course Syllabus:

UNIT-I

Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Introduction to Logic Gates, Ex-OR, Ex-NOR operations, Minimization of Switching Functions: Karnaugh map method, Logic function realization: AND-OR, OR-AND and NAND/NOR realizations.

UNIT-II

Introduction to Combinational Design 1: Binary Adders, Subtractors and BCD adder, Code converters - Binary to Gray, Gray to Binary, BCD to excess3, BCD to Seven Segment display.

UNIT-III

Combinational Logic Design 2: Decoders, Encoders, Priority Encoder, Multiplexers, Demultiplexers, Comparators, Implementations of Logic Functions using Decoders and Multiplexers.

UNIT-IV

Sequential Logic Design: Latches, Flip-flops, S-R, D, T, JK and Master-Slave JK FF, Edge triggered FF, set up and hold times, Ripple counters, Shift registers.

UNIT-V

Programmable Logic Devices:ROM, Programmable Logic Devices (PLA and PAL).
Digital IC's: Decoder (74x138), Priority Encoder (74x148), multiplexer (74x151) and de-multiplexer (74x155), comparator (74x85).

TEXT BOOKS:

1. Digital Design, M.Morris Mano & Michel D. Ciletti, 5th Edition, Pearson Education, 1999.
2. Switching theory and Finite Automata Theory, ZviKohavi and NirahK.Jha, 2nd Edition, Tata McGraw Hill, 2005.

REFERENCE BOOKS:

1. Fundamentals of Logic Design, Charles H Roth,Jr., 5th Edition, Brooks/cole Cengage Learning, 2004.

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40076 - OPTIMIZATION TECHNIQUES
(Open Elective -II)

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 Outcomes: After successful completion of this course, the students should be able to:

COs	Statements
CO1	Understand the meaning, purpose, tools of Operations Research and linear programming in solving practical problems in industry.
CO2	Interpret the transportation models' solutions and infer solutions to the real-world problems.
CO3	Develop mathematical skills to analyze and solve nonlinear programming models arising from a wide range of applications.
CO4	Apply the concept of non-linear programming for solving the problems involving non-linear constraints and objectives
CO5	Apply the concept of unconstrained geometric programming for solving the problems involving non-linear constraints and objectives.

UNIT – I: Linear programming I (08)

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 (08)

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 (08)

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 (08)

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 (08)

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

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40077 - PHYSICS OF ELECTRONIC MATERIALS AND DEVICES

(Common to all branches) Open Elective-II

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 Objectives

1 To make the students to understand the concept of crystal growth, defects in crystals and thin films.
2 To provide insight into various semiconducting materials and their properties.
3 To develop a strong foundation in semiconductor physics and device engineering.
4 To elucidate excitonic and luminescent processes in solid-state materials.
5 To understand the principles, technologies, and applications of modern display systems.

2.Course Outcomes:

CO1 Understand crystal growth and thin film preparation
CO2 Summarize the basic concepts of semiconductors
CO3 Illustrate the working of various semiconductor devices
CO4 Analyze various luminescent phenomena and the devices based on these concepts
CO5 Explain the working of different display devices

3. Course Syllabus

UNIT-I Fundamentals of Materials Science **9H**

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 **9H**

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: **9H**

Introduction, Band structure, PN junctions and their typical characteristics under equilibrium and under bias, Heterojunctions, Transistors, MOSFETs.

UNIT IV Excitons and Luminescence: **9H**

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 : 9H

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.,4^{th}edition, 2021.
2. Semiconductor physics & devices: basic principles, 4^{th} 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

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A40078 - CHEMISTRY OF POLYMERS AND APPLICATIONS

(Common to all branches)

Open Elective-II

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

1	To understand the basic principles of polymers
2	To understand natural polymers and their applications.
3	o impart knowledge to the students about synthetic polymers, their preparation and importance.
4	To enumerate the applications of hydogel polymers
5	To enumerate applications of conducting and degradable polymers in engineering.

2.Course Outcomes:

CO1	Classify the polymers, Explain polymerization mechanism, Differentiate addition, condensation polymerizations, Describe measurement of molecular weight of polymer
CO2	Describe the physical and chemical properties of natural polymers and Modified cellulosics.
CO3	Differentiate Bulk, solution, Suspension and emulsion polymerization, Describe fibers and elastomers, Identify the thermosetting and thermo polymers.
CO4	Identify types of polymer networks, Describe methods involve in hydrogel preparation, Explain applications of hydrogels in drug delivery,
CO5	Explain classification and mechanism of conducting and degradable polymers.

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

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40079 - ACADEMIC WRITING AND PUBLIC SPEAKING
(Common to All Branches of Engineering)

OPEN ELECTIVE - II

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

- 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

2.Course Outcomes:

By the end of the program students will be able to

- Understand various elements of Academic Writing
- Identify sources and avoid plagiarism
- Demonstrate the knowledge in writing a Research paper
- Analyse different types of essays
- Assess the speeches of others and know the positive strengths of speakers
- Build confidence in giving an impactful presentation to the audience

3. Course Syllabus

UNIT - I Introduction to Academic Writing Lecture Hrs

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** Lecture Hrs

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** Lecture Hrs

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 Lecture Hrs

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 Lecture Hrs

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

Textbooks:

3. *Critical Thinking, Academic Writing and Presentation Skills*: MG University Edition Paperback – 1 January 2010 Pearson Education; First edition (1 January 2010)
4. Pease, Allan & Barbara. *The Definitive Book of Body Language*RHUS Publishers, 2016

ference Books:

1. Alice Savage, Masoud Shafiei *Effective Academic Writing*,***2Ed.***,2014 .sserP ytisrevinU drofxO
2. Shalini Verma, *Body Language*, S Chand Publications 2011.
3. Sanjay Kumar and Pushpalata,*Communication Skills* 2E 2015, Oxford.

4. Sharon Gerson, Steven Gerson,*Technical Communication Process and Product*, Pearson, New Delhi, 2014
5. *Elbow, Peter. Writing with Power. OUP USA, 1998*

Online Learning Resources:

1. https://youtu.be/NNhTIT81nH8
2. phttps://www.youtube.com/watch?v=478ccrWKY-A
3. https://www.youtube.com/watch?v=nzGo5ZC1gMw
4. https://www.youtube.com/watch?v=Qve0ZBmJMh4
5. https://courses.lumenlearning.com/publicspeakingprinciples/chapter/chapter-12-nonverbal-aspects-of-delivery/
6. https://onlinecourses.nptel.ac.in/noc21_hs76/preview
7. https://archive.nptel.ac.in/courses/109/107/109107172/#
8. https://archive.nptel.ac.in/courses/109/104/109104107/

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40080 - MATHEMATICAL FOUNDATION OF QUANTUM TECHNOLOGIES

OPEN ELECTIVE – II

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 description:

- To provide students with essential linear algebra foundations including vector spaces, inner products, and operators for quantum mechanical applications.
- To develop understanding of the transition from finite-dimensional systems to infinite-dimensional function spaces and Hilbert space concepts.
- To establish quantum mechanical formalism including measurement theory, uncertainty relations, and time evolution principles.
- To enable students to apply quantum mechanical principles to solve problems in simple quantum systems and understand statistical interpretation.
- To introduce advanced concepts in composite systems, measurement processes, and modern perspectives in quantum mechanics.

Course Outcomes:

After successful completion of this course, the students should be able to:

COs	Statements
CO1	Understand vector spaces, inner products, and linear operators with applications to quantum systems.
CO2	Apply linear algebra concepts to function spaces and analyze the transition from finite to infinite dimensional systems.
CO3	Analyze quantum mechanical formalism including measurement theory, uncertainty relations, and time evolution.
CO4	Apply quantum mechanical principles to solve problems in simple quantum systems and evaluate statistical interpretations.
CO5	Evaluate advanced concepts in composite systems and synthesize understanding of measurement processes and modern quantum theory.

UNIT I: Linear Algebra Foundation for Quantum Mechanics (10 hours)

Vector spaces definition and examples (R^2, R^3, function spaces), Inner products (dot product, orthogonality, normalization), Linear operators (matrices, eigenvalues, eigenvectors), Finite-dimensional examples (2×2 matrices, spin-1/2 systems), Dirac notation introduction ($|\psi\rangle$, $\langle\varphi|$, $\langle\varphi|\psi\rangle$), Change of basis (transformations, unitary matrices).

UNIT II: From Finite to Infinite Dimensions (08 hours)

Function spaces (L^2 space, square-integrable functions), Inner products for functions ($\int\psi^*\varphi\, dx$), Orthogonal function sets (Fourier series, basis functions), Introduction to Hilbert space concept (complete inner product spaces), Position and momentum representations (wave functions), Operators on functions (d/dx, multiplication by x).

UNIT III: Quantum Mechanical Formalism (08 hours)

Mathematical formulation (states as vectors, observables as operators), Measurement theory (Born rule, expectation values, probabilities), Uncertainty relations (mathematical derivation from commutators), Time evolution (Schrödinger equation, unitary evolution).

UNIT IV: Applications and Statistical Interpretation (06 hours)

Simple applications (infinite square well, harmonic oscillator), Statistical interpretation (ensembles, pure vs mixed states), Measurement process (von Neumann measurement scheme).

UNIT V: Advanced Topics (08 hours)

Composite systems (tensor products basic introduction), Reversibility and irreversibility (unitary evolution vs measurement), Thermodynamic connections (equilibrium states, entropy), Modern perspectives (decoherence, measurement problem conceptual).

Textbooks:

1. David J. Griffiths, Darrell F. Schroeter, "Introduction to Quantum Mechanics", 3rd Edition, Cambridge University Press (2018).
2. R. Shankar, Principles of Quantum Mechanics, 2nd Edition, Kluwer Academy/Plenum Publishers (1994).

Reference Books:

1. George. F. Simmons, "Introduction to Topology and Modern Analysis",MedTech Science Press.
2. Gilbert Strang, Linear Algebra and Its Applications, 4th Edition, Cengage Learning (2006).
3. John von Neumann and Robert T Beyer, Mathematical Foundations of Quantum Mechanics,Princeton Univ. Press (1996).

Web Resources

1. https://eclass.uoa.gr/modules/document/file.php/CHEM248/Griffiths%20-%20Introduction%20to%20Quantum%20Mechanics%203rd%20ed%202018.pdf
2. https://fisica.net/mecanica-quantica/Shankar%20-%20Principles%20of%20quantum%20mechanics.pdf

COURSE STRUCTURE

A40093 – PRINCIPLES OF MANAGEMENT

OPEN ELECTIVE - II

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

The course provides an overview of management and its evolution. It examines management functions of planning, organizing, leading, and controlling and its impact on the business organization. It discusses necessary skills and functions required for efficient manager in contemporary business environment. Overall, it enables students to analyse and understand changing business environment, and the role of ethics, social responsibility and environmental issues in contemporary business environment.

2. Course Outcomes (COs)

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

CO1. Explain and analyse the nature, scope, evolution, functions, roles, and skills of management in modern business organizations.

CO2. Apply planning, forecasting, strategic management, and decision-making tools to analyse business environments and organizational strategies.

CO3. Design and evaluate organizational structures and management styles, including MBO, leadership styles, and coordination mechanisms for effective performance.

CO4. Analyse human resource, communication, and career development practices to enhance employee effectiveness, leadership, and organizational coordination.

CO5. Assess contemporary business challenges by evaluating the role of ethics, corporate social responsibility, environmental sustainability, and change management in organizations.

3. Course Syllabus

UNIT – I: Introduction to Management & Management Thought

Introduction to Management: Management – An Emerging Profession, Definition, Nature, Scope, Purpose, and characteristics of Management, Functions, roles, skills of an effective Manager

Evolution of Management Thought: Classical Theory, Scientific Management, Management Process or Administrative Management, Bureaucracy, Behavioural Science Approach, Quantitative Approach, Systems Approach, Contingency Approach, Operational Approach

UNIT – II: Planning, Forecasting and Decision-Making

Planning: Types of Plans, Planning Process, Introduction to Strategic Management, Types of Strategies, Understanding environment of business: Environmental appraisal – Industry Analysis - Porter's Model of competitive advantage, analysis of organisational resources and capabilities

Forecasting and Premising: Introduction to Forecasting, Essential Components in Business Forecasting, Determinants of Business Forecasts, Benefits of Forecasting, Techniques of Forecasting, Limitations of Forecasting

Decision-making: Introduction, Components of Decision-making, Decision-making Process, Group Decision-making, Creativity Problem-solving

UNIT – III: Management by Objectives, Organizing and Directing

Management by Objectives and Styles of Management: Core Concepts of MBO, Characteristics of Management by Objectives, Process of MBO, Defining the Goal, Action Plan, Final Review, Benefits of Management by Objectives, Limitations of Management by Objectives, Styles of Management, American Style of Management, Japanese Style of Management, Indian Style of Management.

Organizing and Directing: Introduction, Organizational Design, Hierarchical Systems, Organization Structure, Types of Organization Structure, Formal and Informal Organization, Factors Determining Span of Management, Centralization and Decentralization, Span of control, understanding authority and responsibility, Principles of Delegation, Authority, Developing a culture of Innovation and performance.

UNIT – IV: Staffing, Coordination and Career Development

Staffing and Coordination: Introduction, Human Resource Management, Recent Trends in HRM, Technology in HRM, Economic Challenges, Workforce Diversity, Concept of Coordination, Need for Coordination, Importance of Coordination, Principles of Coordination, Coordination Process, Types of Coordination, Issues and Systems Approach to Coordination, Techniques of Coordination.

Career Development Strategy: Introduction, Concept and Elements of Career, Overview of Career Development, Significance and Advantages of Career Development, Objectives of Career Development, Types of Career Development Programmes, Different Stages or Cycles of Career Development Process, Career Anchors, Steps in the Career Planning Process

UNIT – V: Leadership, Communication, Change and Contemporary Issues

Leadership styles of Managers: Leadership Concept, Nature, Importance, Attributes of a leader, Role of a leader in demonstrating awareness of legal, personnel, and strategic issues relating to globalization, culture and gender diversity in an organization, Role of leader in conflict resolution and negotiations.

Organizational Communication: Communication in Organizations: Introduction, Importance of Communication in the Workplace; Understanding Communication Process, Barriers to

Communication, Use of tone, language and styles in Communication, Role of Perception in influencing communication, Role of culture in communication

Change management: Concept of change, change as a natural process, Importance & Causes of change – social, economic, technological, organizational, Developing a climate for learning, Concept of learning organizations

Challenges of Contemporary Business: Role of Ethics, Corporate social responsibility, and environmental issues

4. Books and References

1. Stephen P. Robbins, David A. Decenzo, 2016. Fundamentals of Management, Pearson Education, 9th Edition

2. Harold Koontz, O'Donnell and Heinz Weihrich, 2012. Essentials of Management. New Delhi, 9th edition, Tata McGraw Hill

3. Management Fundamentals: Concepts, Applications, & Skill Development, 6th edition, Sage. 2014

4. Richard L. Daft, Principles Of Management, Cengage Learning. 2009

5. Robbins, Management, 9th edition Pearson Education. 2008

6. Drucker, P. F., *The Practice of Management*, Harper & Row

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL
(AUTONOMOUS)

COURSE STRUCTURE

A40175 – BUILDING MATERIALS AND SERVICES

(OPEN ELECTIVE – III)

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 Objectives:

The objectives of this course are to make the student :

- To understand the properties, classifications, and applications of building materials like stones, bricks, tiles, wood, aluminum, glass, paints, and plastics.
- To analyze the composition, manufacturing process, and properties of cement and admixtures.
- To apply knowledge of building components such as lintels, arches, walls, stairs, floors, roofs, foundations, and joinery.
- To evaluate masonry, mortars, finishing techniques, and formwork systems.
- To assess various building services including plumbing, ventilation, air conditioning, acoustics, and fire protection.
-
- **2.Course Outcomes:**
- **Upon successful completion of the course, students will be able to:**
- Understand the properties, classifications, and applications of building materials like stones, bricks, tiles, wood, aluminum, glass, paints, and plastics.
- Analyze the composition, manufacturing process, and properties of cement and admixtures.
- Apply knowledge of building components such as lintels, arches, walls, stairs, floors, roofs, foundations, and joinery.
- Evaluate masonry, mortars, finishing techniques, and formwork systems.
- Assess various building services including plumbing, ventilation, air conditioning, acoustics, and fire protection.
- CO – PO Articulation Matrix

3.Course Syllabus:

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
(AUTONOMOUS)

COURSE STRUCTURE

A40176 – ENVIRONMENTAL IMPACT ASSESSMENT
(OPEN ELECTIVE – III)

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 Objectives:
The objectives of this course are to make the student to:

- Understand the principles, methodologies, and significance of Environmental Impact Assessment (EIA).
- Analyze the impact of developmental activities on land use, soil, and water resources.
- Evaluate the impact of development on vegetation, wildlife, and assess environmental risks.
- Develop environmental audit procedures and assess compliance with environmental regulations.
- Understand and apply environmental acts, notifications, and legal frameworks in EIA studies.

2.Course Outcomes (COs):
Upon successful completion of the course, students will be able to:

- Apply various methodologies for conducting Environmental Impact Assessments.
- Analyze the impact of land-use changes on soil, water, and air quality.
- Evaluate the environmental impact on vegetation, wildlife, and conduct risk assessments.
- Develop environmental audit reports and assess compliance with environmental policies.
- Interpret and apply environmental acts and regulations related to EIA.

3.Course Syllabus:

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
(AUTONOMOUS)

COURSE STRUCTURE

A40273 – SMART GRID TECHNOLOGIES
(OPEN ELECTIVE – III)

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:

This course introduces Smart Grid technologies, comparing them with conventional grids and exploring global and Indian developments. It covers Wide Area Monitoring using PMUs, Smart Meters, and demand-side management. Key communication technologies and protocols for smart grids are discussed. Applications like renewable integration, energy storage, EVs, and cyber security are also addressed.

2.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

3.Course Syllabus:

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.

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40373 – 3D PRINTING TECHNOLOGIES

(OPEN ELECTIVE – III)

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 objectives: The objectives of the course are to

- **Understand** the fundamental concepts of prototyping and distinguish between traditional and rapid prototyping methods.
- **Demonstrate** the working principles, materials, and applications of solid-, liquid-, and powder-based RP systems.

  Define the processes and classifications of rapid tooling and reverse engineering techniques.
- **Identify** common errors in 3D printing and evaluate pre-processing, processing, and postprocessing issues.
- **Familiarize** RP-related software and its role in applications such as design, manufacturing, and medical fields.

2.Course Outcomes: On successful completion of the course, the student will be able to,

- Define and explain the evolution and need for rapid prototyping in modern product development.
- Compare and contrast various 3D printing technologies based on working principles, materials, and limitations.
- Apply knowledge of rapid tooling and reverse engineering techniques for industrial and design applications.
- Diagnose and interpret different types of errors encountered in 3D printing processes and recommend solutions.
- Use RP-specific software tools to manipulate STL files and prepare models for printing in
- real-world scenarios.

3.Course Syllabus:

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 (AUTONOMOUS)

COURSE STRUCTURE

A40473 – MICROPROCESSORS AND MICROCONTROLLERS

(OPEN ELECTIVE – III)

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 Objectives:

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

2.Course Outcomes:

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

- Gain knowledge on the architecture, operation, and configurations of the 8086 microprocessors.
- Get familiar with 8086 programming concepts, instruction set, and assembly language development tools.
- Know 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.

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, A/D and D/A converters, Need for 8259 programmable interrupt controllers.

UNIT IV

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

UNIT V

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

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.

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40081 – WAVELET TRANSFORMS AND ITS APPLICATIONS

(OPEN ELECTIVE – III)

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:

This course introduces the fundamental concepts of wavelet theory and its applications in signal processing. It begins with an overview of wavelet expansion systems and transforms, highlighting the key characteristics of wavelet systems such as the Haar scaling functions. Students will explore multiresolution analysis, discrete and continuous wavelet transforms, and Parseval's theorem. The course further delves into filter banks, decomposition and reconstruction processes using down-sampling and up-sampling, and lifting schemes. Emphasis is also placed on time-frequency analysis, computational complexity, and the comparison of various transform techniques. Finally, the course explores orthogonal, biorthogonal bases, frames, and matrix-based examples to reinforce the understanding of wavelet-based signal representation and processing.

2.Course Outcomes:

After successful completion of this course, the students should be able to:

CO1. Understand wavelets and wavelet basis and characterize continuous and discrete wavelet Transforms
CO2. Illustrate the multi resolution analysis ad scaling functions
CO3. Implement discrete wavelet transforms with multirate digital filters
CO4. Understand multi resolution analysis and identify various wavelets and evaluate their time-frequency resolution properties.
CO5. Design certain classes of wavelets to specification and justify the basis of the application of wavelet transforms to different fields.

UNIT – I: Wavelets

Wavelets and Wavelet Expansion Systems - Wavelet Expansion- Wavelet Transform- Wavelet System-More Specific Characteristics of Wavelet Systems -Haar Scaling Functions and Wavelets - effectiveness of Wavelet Analysis -The Discrete Wavelet Transform- The Discrete-Time and Continuous Wavelet Transforms.

UNIT – II: A Multiresolution Formulation of Wavelet Systems

Signal Spaces -The Scaling Function -Multiresolution Analysis - The Wavelet Functions - The Discrete Wavelet Transform- A Parseval's Theorem - Display of the Discrete Wavelet Transform and the Wavelet Expansion.

UNIT – III Filter Banks and the Discrete Wavelet Transform

Analysis - From Fine Scale to Coarse Scale- Filtering and Down-Sampling or Decimating -Synthesis - From Coarse Scale to Fine Scale -Filtering and Up-Sampling or Stretching - Input Coefficients - Lattices and Lifting - -Different Points of View.

UNIT – IV Time-Frequency and Complexity

Multiresolution versus Time-Frequency Analysis- Periodic versus Nonperiodic Discrete Wavelet Transforms -The Discrete Wavelet Transform versus the Discrete-Time Wavelet Transform- Numerical Complexity of the Discrete Wavelet Transform.

UNIT-V Bases and Matrix Examples

Bases, Orthogonal Bases, and Biorthogonal Bases -Matrix Examples - Fourier Series Example - Sine Expansion Example - Frames and Tight Frames - Matrix Examples -Sine Expansion as a Tight Frame Example.

TEXT 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 (AUTONOMOUS)

COURSE STRUCTURE

A40082 – SMART MATERIALS AND DEVICES

(OPEN ELECTIVE – III)

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

- To provide exposure to smart materials and their engineering applications.
- To impart knowledge on the basics and phenomenon behind the working of smart materials
- To explain the properties exhibited by smart materials
- To educate various techniques used to synthesize and characterize smart materials
- To identify the required smart material for distinct applications/devices

2.Course Outcomes

- Identify key discoveries that led to modern applications of shape memory materials,
- describe the two phases in shape memory alloys.
- Describe how different external stimuli (light, electricity, heat, stress, and magnetism) influence smart material properties.
- Summarize various types of synthesis of smart materials
- Analyze various characterization techniques used for smart materials
- Interpret the importance of smart materials in various devices

3.Course syllabus:

UNIT I Introduction to Smart Materials

Historical account of the discovery and development of smart materials, Shape memory materials, chromoactive materials, magnetorheological materials, photoactive materials, Polymers and polymer composites (Basics).

UNIT II Properties of Smart Materials

Optical, Electrical, Dielectric, Piezoelectric, Ferroelectric, Pyroelectric and Magnetic properties of smart materials.

UNIT III Synthesis of Smart Materials

Chemical route: Chemical vapour deposition, Sol-gel technique, Hydrothermal method, Mechanical alloying and Thin film deposition techniques: Chemical etching, Spray pyrolysis.

UNIT IV Characterization Techniques

Powder X-ray diffraction, Raman spectroscopy (RS), UV-Visible spectroscopy, Scanning electron microscopy (SEM), Transmission electron microscopy (TEM), Atomic force microscopy (AFM).

UNIT V Smart Materials based Devices

Devices based on smart materials: Shape memory alloys in robotic hands, piezoelectric based devices, MEMS and intelligent devices.

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
(AUTONOMOUS)

COURSE STRUCTURE

A40085 – INTRODUCTION TO QUANTUM MECHANICS
(OPEN ELECTIVE – III)

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:

- To understand the fundamental differences between classical and quantum mechanics.
- To study wave-particle duality, uncertainty principle, and their implications.
- To learn and apply Schrödinger equations to basic quantum systems.
- To use operator formalism and mathematical tools in quantum mechanics.
- To explore angular momentum, spin and their quantum mechanical representations.

2.Course Outcomes:

- Explain the key principles of quantum mechanics and wave-particle duality
- Apply Schrödinger equations to solve one-dimensional quantum problems
- Solve quantum mechanical problems using operator and matrix methods.
- Evaluate quantum states using Dirac notation and expectation values.
- Analyze angular momentum and spin systems using Pauli matrices and operators.

3.Course Syllabus:

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 value.

Text Books:

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.

Online Resources:

1. https://archive.nptel.ac.in/courses/115/101/115101107/
2. https://archive.nptel.ac.in/courses/122/106/122106034/
3. https://nptel.ac.in/courses/115106066

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL
(AUTONOMOUS)

COURSE STRUCTURE

A40083 – GREEN CHEMISTRY AND CATALYSIS FOR SUSTAINABLE ENVIRONMENT

(OPEN ELECTIVE – III)

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 Objectives

- TO UNDERSTAND PRINCIPLE AND CONCEPTS OF GREEN CHEMISTRY.
- TO UNDERSTAND THE TYPES OF CATALYSIS AND INDUSTRIAL APPLICATIONS.
- TO APPLY GREEN SOLVENTS IN CHEMICAL SYNTHESIS.
- TO ENUMERATE DIFFERENT SOURCED OF GREEN ENERGY.
- TO APPLY ALTERNATIVE GREENER METHODS FOE CHEMICAL REACTIONS

2.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.

3.Course Syllabus:

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, 4^{TH} 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.

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40084 – EMPLOYABILITY SKILLS

(OPEN ELECTIVE – III)

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 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

2.Course Outcomes (CO):

CO1: Understand the importance of goals and try to achieve them

CO2: Explain the significance of self-management

CO3: Apply the knowledge of writing skills in preparing eye-catchy resumes

CO4: Analyse various forms of Presentation skills

CO5: Judge the group behaviour appropriately

CO6: Develop skills required for employability.

3.Course Syllabus:

UNIT – I

Definition, importance, types of Goal Setting – SMART Goal Setting – Advantages-Motivation – Intrinsic and Extrinsic Motivation – Self-Management - Knowing about self – SWOC Analysis

UNIT – II **Writing Skills**

Definition, significance, types of writing skills – Resume writing Vs CV Writing - E-Mail writing, Cover Letters - E-Mail Etiquette -SoP (Statement of Purpose)

UNIT - III **Technical Presentation Skills**

Nature, meaning & significance of Presentation Skills – Planning, Preparation, Presentation, Stage Dynamics –Anxiety in Public speaking (Glossophobia)- PPT & Poster Presentation

UNIT - IV **Group Presentation Skills**

Body Language – Group Behaviour - Team Dynamics – Leadership Skills – Personality Manifestation- Group Discussion-Debate –Corporate Etiquette

UNIT - V **Job Cracking Skills**

Nature, characteristics, importance & types of Interviews – Job Interviews – Skills for success – Job searching skills - STAR method - FAQs- Answering Strategies – Mock Interviews

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/

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40177– GEO-SPATIAL TECHNOLOGIES

(OPEN ELECTIVE – IV)

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 Objectives:

The objectives of this course are to make the student :

- To understand raster-based spatial analysis techniques, including query, overlay, and cost-distance analysis.
- To analyze vector-based spatial analysis techniques such as topology, overlay, and proximity analysis.
- To apply network analysis techniques for geocoding, shortest path analysis, and location-allocation problems.
- To evaluate surface and geostatistical analysis methods, including terrain modeling, watershed analysis, and spatial interpolation.
- To assess GIS customization, Web GIS, and mobile mapping techniques for real- world applications.

2.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.

3.Course Syllabus:

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 (AUTONOMOUS)

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

(OPEN ELECTIVE – IV)

1.Course Objectives:

The objectives of this course are to make the student :

- To understand the types, sources, and characteristics of solid waste, along with regulatory frameworks.
- To analyze engineering systems for solid waste collection, storage, and transportation.
- To apply resource and energy recovery techniques for sustainable solid waste management.
- To evaluate landfill design, construction, and environmental impact mitigation strategies.
- To assess hazardous waste management techniques, including biomedical and e-waste disposal.

2.Course Outcomes:

- Understand the types, sources, and characteristics of solid waste, along with regulatory frameworks.
- Analyze engineering systems for solid waste collection, storage, and transportation.
- Apply resource and energy recovery techniques for sustainable solid waste management.
- Evaluate landfill design, construction, and environmental impact mitigation strategies.
- Assess hazardous waste management techniques, including biomedical and e-waste

3.Course Syllabus:

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 (AUTONOMOUS)

COURSE STRUCTURE

A40274 – Electric Vehicles

(OPEN ELECTIVE – IV)

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 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.

2.Course Outcomes (CO):

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

3.Course Syllabus:

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 (AUTONOMOUS)

COURSE STRUCTURE

A40374 – Total Quality Management

(OPEN ELECTIVE – IV)

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 objectives:

- Familiarize the basic concepts of Total Quality Management.
- Expose with various quality issues in Inspection.
- Gain Knowledge on quality control and its applications to real time..
- Understand the extent of customer satisfaction by the application of various quality concepts.
- Demonstrate the importance of Quality standards in Production

2.Course Outcomes:

CO 1 Define and develop on quality Management philosophies and analyze quality costs frameworks.

CO 2 Understanding of the historical development of Total Quality Management (TQM), implementation, and real-world applications through case studies.

CO 3 Evaluate the cost of poor quality, process effectiveness and efficiency to analyze areas for improvement.

CO 4 Apply benchmarking and business process reengineering to improve management processes.

CO 5 Demonstrate the set of indications to evaluate performance excellence of an organization

3.Course Syllabus:

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 (AUTONOMOUS)

COURSE STRUCTURE

A40474 – TRANSDUCERS AND SENSORS

(OPEN ELECTIVE – IV)

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 Objectives:

1. To understand characteristics of Instrumentation System and the operating principle of motion transducers.
2. To explore working principles, and applications of different temperature transducers and Piezo-electric sensors.
3. To provide knowledge on flow transducers and their applications.
4. To study the working principles of pressure transducers.
5. To introduce working principle and applications of force and sound transducers.

2.Course Outcomes:

1. Understand characteristics of Instrumentation System and the operating principle of motion transducers.
2. Explore working principles, and applications of different temperature transducers and Piezo-electric sensors.
3. Gain knowledge on flow transducers and their applications.
4. Learn the working principles of pressure transducers.
5. Understand the working principle and applications of force and sound transducers.

3.Course Syllabus:

UNIT I

Introduction: General Configuration and Functional Description of measuring instruments, Static and Dynamic Characteristics of Instrumentation System, Errors in Instrumentation System, Active and Passive Transducers and their Classification.

Motion Transducers: Resistive strain gauge, LVDT, RVDT, Capacitive transducers, Piezo-electric transducers, seismic displacement pick-ups, vibrometers and accelerometers.

UNIT II

Temperature Transducers: Standards and calibration, fluid expansion and metal expansion type transducers - bimetallic strip, Thermometer, Thermistor, RTD, Thermocouple and their characteristics.

Hall effect transducers, Digital transducers, Proximity devices, Bio-sensors, Smart sensors, Piezo-electric sensors.

UNIT III

Flow Transducers: Bernoulli‘s principle and continuity, Orifice plate, Nozzle plate, Venture tube, Rotameter, Anemometers, Electromagnetic flow meter, Impeller meter and Turbid flow meter.

UNIT IV

Pressure Transducers: Standards and calibration, different types of manometers, elastic transducers, diaphragm bellows, bourdon tube, capacitive and resistive pressure transducers, high and low pressure measurement.

UNIT V

Force and Sound Transducers: Proving ring, hydraulic and pneumatic load cell, dynamometer and gyroscopes. Sound level meter, sound characteristics, Microphone**.**

TEXT BOOKS

1. A.K. Sawhney, ―A course in Electrical and Electronics Measurements and Instrumentation‖, Dhanpat Rai& Co. 3rd edition Delhi, 2010.
2. Rangan C.S, Sarma G.R and Mani V S V, ―Instrumentation Devices and Systems‖, TATA McGraw Hill publications, 2007.

REFERENCE BOOKS

1. Doebelin. E.O, ―Measurement Systems Application and Design‖,McGraw Hill International, New York, 2004.
2. Nakra B.C andChaudharyK.K , ―Instrumentation Measurement and Analysis‖, Second Edition, Tata McGraw-Hill Publication Ltd.2006.

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40086 – FINANCIAL MATHEMATICS
(OPEN ELECTIVE – IV)

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 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.

2.Course Outcomes:

CO1	Explain fundamental financial concepts, including arbitrage, valuation, and risk.
CO2	Apply stochastic models, including Brownian motion and Stochastic Differential Equations (SDEs), in financial contexts.
CO3	Analyze mathematical techniques for pricing options and financial derivatives.
CO4	Evaluate interest rate models and bond pricing methodologies.
CO5	Utilize computational techniques such as Monte Carlo simulations for financial modeling.

3.Course Syllabus:

UNIT-I: Asset Pricing and Risk Management

Fundamental financial concepts: Returns, arbitrage, valuation, and pricing. Asset/Liability management, investment income, capital budgeting, and contingent cash flows. One-period model: Securities, payoffs, and the no-arbitrage principle. Option contracts: Speculation and hedging strategies, CAP Model, Efficient market hypothesis.

UNIT-II: Stochastic Models in Finance

Random Walks and Brownian Motion. Introduction to Stochastic Differential Equations (SDEs): Drift and diffusion. Ito calculus: Ito‘s Lemma, Ito Integral, and Ito Isometry.

UNIT-III: Interest Rate and Credit Modelling

Interest rate models and bond markets. Short-rate models: Vasicek, Cox-Ingersoll-Ross (CIR), Hull & White models, Credit risk modelling: Hazard function and hazard rate.

UNIT-IV: Fixed-Income Securities and Bond Pricing

Characteristics of fixed-income products: Yield, duration, and convexity. Yield curves, forward rates, and zero-coupon bonds. Stochastic interest rate models and bond pricing PDE. Yield curve fitting and calibration techniques, Mortgage Backed Securities.

UNIT-V: Exotic Options and Computational Finance

Stochastic volatility models and the Feynman-Kac theorem.Exotic options: Barriers, Asians, and Look backs. Monte Carlo methods for derivative pricing, Black-Scholes-Merton model: Derivation and applications.

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:

1. MIT– Mathematics for Machine Learning https://ocw.mit.edu
2. Coursera – Financial Engineering and Risk Management (Columbia University) https://www.coursera.org/
3. National Stock Exchange (NSE) India – Financial Derivatives https://www.nseindia.com/

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

COURSE STRUCTURE

A40087 – SENSORS AND ACTUATORS FOR ENGINEERING APPLICATIONS

(OPEN ELECTIVE – IV)

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 OBJECTIVES

- To provide exposure to various kinds of sensors and actuators and their engineering
- applications.
- To impart knowledge on the basic laws and phenomenon behind the working of sensors and
- Actuators
- To explain the operating principles of various sensors and actuators
- To educate the fabrication of sensors
- To explain the required sensor and actuator for interdisciplinary application

2.Course Outcomes

CO1 Classify different types of Sensors and Actuators along with their characteristics
CO2 Summarize various types of Temperature and Mechanical sensors
CO3 Illustrates various types of optical and mechanical sensors
CO4 Analyze various types of Optical and Acoustic Sensors
CO5 Interpret the importance of smart materials in various devices

3.Course Syllabus:

UNIT I Introduction to Sensors and Actuators

Sensors: Types of sensors: temperature, pressure, strain, active and passive sensors, General characteristics of sensors (Principles only), Deposition: Chemical Vapor Deposition, Pattern: photolithography and Etching: Dry and Wet Etching.
Actuators: Functional diagram of actuators, Types of actuators and their basic principle of working: Pneumatic, Electromagnetic, Piezo-electric and Piezo-resistive actuators, Applications of Actuators.

UNIT II Temperature and Mechanical Sensors

Temperature Sensors: Types of temperature sensors and their basic principle of working: Thermo- resistive sensors: Thermistors, Thermo-electric sensors: Thermocouples, PN junction temperature sensors
Mechanical Sensors: Types of Mechanical sensors and their basic principle of working: Force sensors: Strain gauges, Tactile sensors, Pressure sensors: Piezoresistive, Variable Reluctance Sensor (VRP).

UNIT III Optical and Acoustic Sensors

Optical Sensors: Basic principle and working of: Photodiodes, Phototransistors and Photo resistors based sensors, Photomultipliers, Infrared sensors: thermal, Passive Infra-Red, Fiber based sensors and Thermopiles
Acoustic Sensors: Principle and working of Ultrasonic sensors, Piezo-electric resonators, Microphones

UNIT IV Magnetic and Electromagnetic Sensors

Motors as actuators (linear, rotational, stepping motors), magnetic valves, inductive sensors (LVDT, RVDT, and Proximity), Hall Effect sensors, Magneto-resistive sensors, Magnetostrictive sensors and actuators.

UNIT V Chemical and Radiation Sensors

Chemical Sensors: Principle and working of Electro-chemical, Thermo-chemical, Gas, pH, Humidity and moisture sensors.
Radiation Sensors: Principle and working of Ionization detectors, Scintillation detectors, Semiconductor radiation detectors and Microwave sensors (resonant, reflection, transmission)

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

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL
(AUTONOMOUS)

COURSE STRUCTURE

A40088 – CHEMISTRY OF NANOMATERIALS AND APPLICATIONS

(OPEN ELECTIVE – IV)

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 Objectives

- To understand basics and characterization of nanomaterials.
- To understand synthetic methods of nanomatrials.
- To apply various techniques for charterization of nanomaterials.
- To understand Studies of Nano-structured Materials
- To enumerate the applications of advanced nanomaterials in engineering

.

2.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.

3.Course Syllabus:

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, B B 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 (AUTONOMOUS)

COURSE STRUCTURE

A40089 – LITERARY VIBES

(OPEN ELECTIVE – IV)

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 Objectives

- To inculcate passion for aesthetic sense and reading skills
- To encourage respecting others' experiences and creative writing
- To explore emotions, communication skills and critical thinking
- To educate how books serve as the reflection of history and society
- To provide practical wisdom and duty of responding to events of the times

2.Course Outcomes

CO1	Identify genres, literary techniques and creative uses of language in literary texts.
CO2	Explain the relevance of themes found in literary texts to contemporary, personal and cultural values and to historical forces
CO3	Apply knowledge and understanding of literary texts when responding to others' problems and their own and make evidence-based arguments
CO4	Analyze the underlying meanings of the text by using the elements of literary texts
CO5	Evaluate their own work and that of others critically
CO6	Develop as creative, effective, independent and reflective students who are able to make informed choices in process and performance

3.Course Syllabus:

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

1. https://www.litcharts.com/poetry/alfred-lord-tennyson/ulysses
2. https://www.litcharts.com/lit/ain-t-i-a-woman/summary-and-analysis
3. https://englishliterature.education/articles/poetry-analysis/the-second-coming-by-w-b-yeats- critical-analysis-summary-and-line-by-line-explanation/#google_vignettehttps://sirjitutorials.com/where-the-mind-is-without-fear-poem-notes-explanation/
4. https://www.litcharts.com/lit/twelfth-night/themes
5. https://smartenglishnotes.com/2021/11/28/the-luncheon-summary-characters-themes-and- irony/