ACADEMIC REGULATIONS-R23

COURSE STRUCTURE AND DETAILED SYLLABI

for

B. Tech Regular (Full - Time) Four Year Degree Program

(For the batches admitted from the Academic Year 2023-24)

and

B. Tech. (Lateral Entry Scheme)

(For the batches admitted from the Academic Year 2024-25)

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

Accredited by NBA, New Delhi & NAAC, Bengaluru | Affiliated to JNTUA, Ananthapuramu, Recognized by the UGC under Section 12(B) and 12(F) | Approved by AICTE, New Delhi

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FOREWORD

The autonomy conferred Sri Venkateswara College Engineering and technology by JNT University, Ananthapuramu based on performance as well as future commitment and competency to impart quality education. It is a mark of its ability to function independently in accordance with the set norms the monitoring bodies UGC and AICTE. It reflects the confidence of the affiliating University in the autonomous institution to uphold and maintain standards it expects to deliver on its own behalf and thus awards degrees on behalf of college. Thus, an autonomous institution is given the freedom to have its own curriculum, examination system and monitoring mechanism, independent of the affiliating University but under its observance.

Sri Venkateswara College of Engineering and Technology is proud to win the confidence of all the above bodies monitoring the quality in education and has gladly accepted the responsibility of sustaining, the standards and ethics it has been striving for more than a decade in reaching its present standing in the arena of contemporary technical education.

As a follow up, statutory bodies like Academic Council and

Boards of Studies are constituted with the guidance of the Governing Body of the College and recommendations of the JNTUA, Ananthapuramu to frame the regulations, course structure and syllabi under autonomous status.

The autonomous regulations, course structure and syllabi have been prepared after prolonged and detailed interaction with several expertise solicited from academics, industry and research, to produce quality engineering graduates to the society.

All the faculty, parents and students are requested to go through all the rules and regulations carefully. Any clarifications needed are to be sought at appropriate time and with principal of the college, without presumptions, to avoid unwanted subsequent inconveniences and embarrassments. The cooperation of all the stake holders is sought for the successful implementation of the autonomous system in the larger interests of the college and brighter prospects of engineering graduates.

Principal

Vision and Mission of the Institute

Vision

- Carving the youth as dynamic, competent, valued and knowledgeable professionals who shall lead the Nation to a better future.

Mission

- Providing quality education, student-centered teaching-learning processes and state-of-art infrastructure for professional aspirants hailing from both rural and urban areas.
- Imparting technical and management education to encourage independent thinking, develop strong domain of knowledge, own contemporary skills and positive attitudes towards holistic growth of young minds.
- Evolving Institution into a Center of Excellence and Research.

Quality policies

Sri Venkateswara College of Engineering and Technology strides towards excellence by adopting a system of quality policies and processes with continued improvements to enhance student's skills and talent for their exemplary contribution to the society, the nation and the word.

Vision of Mechanical Engineering

To be recognized as a center for quality education in Mechanical Engineering and allied areas and to train young students to solve the problems of tomorrow.

Mission of Mechanical Engineering

M1: Provide excellent foundation through Teaching-Learning and train the students based on research to help them progress for Higher education.

M2: Fostering student development with special focus on domain and soft skills for a prospective career placement.

M3: Developing students with skills in entrepreneurship contributing to job creation and societal development.

M4: Creating an ecosystem for continuous development of faculty and students by providing relevant infrastructure and resources.

Programme Educational Objectives (PEO's) of UG:

PEO1	Pursue higher education in the varied fields of mechanical engineering and management.
PEO2	Secure a career placement in core and allied areas
PEO3	Develop skills to undertake entrepreneurship and lifelong learning

PROGRAMME SPECIFIC OUTCOMES (PSOs) of UG

PSO1	Apply the knowledge of manufacturing, thermal and industrial engineering to formulate, analyze and provide solutions to the problems related to mechanical systems
PSO2	Apply the design concepts and modern engineering software tools to model mechanical systems in various fields such as machine elements, thermal, manufacturing, industrial and inter-disciplinary fields.

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Academic Regulations (R23) for B. Tech (Regular-Full time)

(Effective for the students admitted into I year from the Academic Year 2023-24 onwards and B. Tech. (Lateral Entry Scheme) for the batches admitted from the Academic Year 2024-25 onwards)

1. Award of the Degree

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

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

(ii) Registers for 163 credits and secures all 163 credits.

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

(i) Student secures additional 18 credits fulfilling all the requisites of a B.Tech. program i.e., 163 credits.

(ii) Registering for Honors is optional.

(iii) Honors is to be completed simultaneously with B.Tech. programme.

2. Students, who fail to fulfil all the academic requirements for the award of the degree within eight academic years from the year of their admission, shall forfeit their seat in B.Tech. course and their admission stands cancelled. This clause shall be read along with clause 1 a) i).

3. Admissions

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

4. Program related terms

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

Credit Definition:

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

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

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

5. Semester/Credits:

i) A semester comprises 90 instructional days and an academic year is divided into two semesters.
ii) The summer term is for eight weeks during summer vacation. Internship/ apprenticeship / work-based vocational education and training can be carried out during the summer term, especially by students who wish to exit after two semesters or four semesters of study.
iii) Regular courses may also be completed well in advance through MOOCs satisfying prerequisites.

6. Structure of the Undergraduate Programme:

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

S. No.	Category	Breakup of Credits (Total 163)	Percentage of total credits	AICTE Recommendation (%)
1.	Humanities and Social Science including Management (HM)	13	8%	8 – 9%
2.	Basic Sciences (BS)	20	13%	12 - 16%
3.	Engineering Sciences (ES)	23.5	14%	10 – 18%
4.	Professional Core (PC)	57.5	34%	30 – 36%
5.	Electives – Professional (PE) & Open (OE); Domain Specific Skill Enhancement Courses (SEC)	33	21%	19 - 23%
6.	Internships & Project work(PR)	16	10%	8 – 11%
7.	Mandatory Courses (MC)	Non-credit	Non-credit	-

7. Course Classification:

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

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

8. Programme Pattern

i. Total duration of the of B. Tech (Regular) Programme is four academic years.
ii. Each academic year of study is divided into two semesters.
iii. Minimum number of instructional days in each semester is 90 days.
iv. There shall be mandatory student induction program for fresher's, with a three-week duration before the commencement of first semester. Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas,

Familiarization to Dept./Branch & Innovations etc., are included as per the guidelines issued by AICTE.

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

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

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

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

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

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

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

xii. 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.

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

xiv. Undergraduate degree with Honors is introduced by the Institution for the students having good academic record.

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

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

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

9. Evaluation Process

The performance of a student in each semester shall be evaluated subject wise with a maximum of 100 marks for theory and 100 marks for practical subject. Summer Internships shall be evaluated for 50 marks, Full Internship & Project work in final semester shall be evaluated for 200 marks, mandatory courses with no credits shall be evaluated for 30 mid semester marks.

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

Theory Courses

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

i) For theory subject, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End-Examination.
ii) For practical subject, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End- Examination.
iii) If any course contains two different branch subjects, the syllabus shall be written in two parts with 3 units each (Part-A and Part-B) and external examination question paper shall be set with two parts each for 35 marks.
iv) If any subject is having both theory and practical components, they will be evaluated separately as theory subject and practical subject. However, they will be given same subject code with an extension of 'T' for theory subject and 'P' for practical subject.

a) Continuous Internal Evaluation

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

Note:

- The objective paper shall be prepared in line with the quality of competitive examinations questions.

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

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

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

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

For Example:

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

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

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

b) End Examination Evaluation:

End examination of theory subjects shall have the following pattern:

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

ii) Question I shall contain 10 compulsory short answer questions for a total of 20 marks such that each question carries 2 marks. There shall be 2 short answer questions from each unit.

iii) In each of the questions from 2 to 6

a) There shall be either/or type questions of 10 marks each. Student shall answer any one of them.

b) The questions from 2 to 6 shall be set by covering one unit of the syllabus for each question.

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

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

Practical Courses

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

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

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

d) The end examination shall be evaluated for 70 marks, conducted by the concerned laboratory teacher and a senior expert in the subject from the same department.

- Procedure: 20 marks
- Experimental work & Results: 30 marks
- Viva voce: 20 marks.

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

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

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

Day-to-day work shall be evaluated for 15 marks by the concerned subject teacher based on the reports/submissions prepared in the class. And there shall be two midterm examinations in a semester for duration of 2 hours each for 15 marks with weight age of 80% to better mid marks and 20% for the other. The subjective paper shall contain 3 either or type questions of equal weight age of 5 marks. There shall be no objective paper in mid semester examination. The sum of day- to-day evaluation and the mid semester marks will be the final sessional marks for the subject.

The end examination pattern for Engineering Graphics, shall consists of 5 questions, either/or type, of 14 marks each. There shall be no objective type questions in the end examination. However, the end examination pattern for other subjects related to design/drawing, multiple branches, etc is mentioned along with the syllabus.

f) There shall be no external examination for mandatory courses with zero credits. However, attendance shall be considered while calculating aggregate attendance and student shall be declared to have passed the mandatory course only when he/she secures 40% or more in the internal examinations. In case, the student fails, a re-examination shall be conducted for failed candidates for 30 marks satisfying the conditions mentioned in item 1 & 2 of the regulations.

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

10. Skill oriented Courses

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

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

iii) The course shall carry 100 marks and shall be evaluated through continuous assessments during the semester for 30 sessional marks and end examination shall be for 70 marks. Day-to-day work in the class / laboratory shall be evaluated for 30 marks by the concerned teacher based

on the regularity/assignments/viva/mid semester test. The end examination similar to practical examination pattern shall be conducted by the concerned teacher and an expert in the subject nominated by the principal.

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

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

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

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

11. Massive Open Online Courses (MOOCs):

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

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

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

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

12. Credit Transfer Policy

Adoption of MOOCs is mandatory, to enable Blended model of teaching-learning as also envisaged in the NEP 2020. As per University Grants Commission (Credit Framework for Online Learning Courses through SWAYAM) Regulation, 2016, the University/Institution shall allow up to a maximum of 20% of the total courses being offered in a particular programme i.e., maximum of 32 credits through MOOCs platform.

i) The University/Institution shall offer credit mobility for MOOCs and give the equivalent credit weightage to the students for the credits earned through online learning courses.
ii) Student registration for the MOOCs shall be only through the respective department of the institution, it is mandatory for the student to share necessary information with the department.
iii) Credit transfer policy will be applicable to the Professional & Open Elective courses only.
iv) The concerned department shall identify the courses permitted for credit transfer.
v) The University/institution shall notify at the beginning of semester the list of the online learning courses eligible for credit transfer.
vi) The institution shall designate a faculty member as a Mentor for each course to guide the students from registration till completion of the credit course.
vii) The University/institution shall ensure no overlap of MOOC exams with that of the University/institution examination schedule. In case of delay in results, the University/institution will re-issue the marks sheet for such students.
viii) Student pursuing courses under MOOCs shall acquire the required credits only after successful completion of the course and submitting a certificate issued by the competent authority along with the percentage of marks and grades.
ix) The institution shall submit the following to the examination section of the university:
    a) List of students who have passed MOOC courses in the current semester along with the certificate of completion.
    b) Undertaking form filled by the students for credit transfer.
x) The University / 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 University from time to time.

13. Academic Bank of Credits (ABC)

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

i. provide option of mobility for learners across the universities of their choice
ii. provide option to gain the credits through MOOCs from approved digital platforms.
iii. facilitate award of certificate/diploma/degree in line with the accumulated credits in ABC
iv. execute Multiple Entry and Exit system with credit count, credit transfer
and credit acceptance from students' account.

14. Mandatory Internships

Summer Internships: Two summer internships either onsite or virtual each with a minimum of 08 weeks duration, done at the end of second and third years, respectively are mandatory. It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Power projects, software MNCs or any industries in the areas of concerned specialization of the Undergraduate program. One of the two summer internships at the end of second year (Community Service Project) shall be society oriented and shall be completed in collaboration with government organizations/NGOs & others. The other internship at the end of third year is Industry Internship and shall be completed in collaboration with Industries. The student shall register for the internship as per course structure after commencement of academic year. The guidelines issued by the APSCHE / University shall be followed for carrying out and evaluation of Community Service Project and Industry Internship.

Evaluation of the summer internships shall be through the departmental committee. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the departmental committee comprising of Head of the Department, supervisor of the internship and a senior faculty member of the department. A certificate of successful completion from industry shall be included in the report. The report and the oral presentation shall carry 50% weight age each. It shall be evaluated for 50 external marks. There shall be no internal marks for Summer Internship. A student shall secure minimum 40% of marks for successful completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the institution.

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

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

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

15. Guidelines for offering a Minor

The Minor program requires the completion of 18 credits in Minor stream chosen. The concept of Minor degree is introduced in the curriculum of all B. Tech. programs offering a Major degree. The main objective of Minor degree in a discipline is to promote interdisciplinary knowledge among the students, the students admitted in to B.Tech. in a major stream/branch are eligible to obtain degree in Minor in another stream. In order to earn a Minor degree in a discipline, a student has to earn 18 extra credits (By studying FIVE theory and TWO laboratory / Applied Project Work courses) from the courses of the minor discipline.

a) Students who are desires of pursuing their special interest areas other than the chosen discipline of Engineering may opt for additional courses in minor specialization groups offered by a department other than their parent department. For example, if Mechanical Engineering student selects subjects from Civil Engineering under this scheme, he / she will get Major degree of Mechanical Engineering with minor degree of Civil Engineering.

b) Student can also opt for industry relevant tracks of any branch to obtain the minor degree. For example, a B. Tech Mechanical Engineering student can opt for the industry relevant tracks like Data Analytics Track, IOT track, Artificial Intelligence and Machine learning

track, etc.

i. A student is permitted to register for Minor in V semester after the results of III Semester are declared.
ii. A Student shall register for two theory courses in III B. Tech I Semester, two theory courses and one laboratory course in III B. Tech II Semester and one theory course and one laboratory course in IV B. Tech I Semester. If Applied Project Work is offered in Minor degree instead of Laboratory courses, it shall be offered in IV B. Tech I Semester.
iii. The Principal of the college shall arrange separate class work and timetable of the courses offered under minor program.
iv. Courses that are used to fulfil the student's primary major may not be double counted towards the minor. Courses with content substantially equivalent to courses in the student's primary Major may not be counted towards the Minor.
v. The attendance for the registered courses under Minor and regular courses offered for Major degree in a semester are to be considered separately.
vi. A student shall maintain an attendance of 75% in all registered courses under Minor to be eligible for attending semester end examinations.
vii. The teaching and evaluation procedure for courses offered in Minor degree shall be similar to regular B. Tech courses.
viii. In case of Applied Project Work, the Evaluation shall be made by the Internal departmental committee (Head of the Department and one senior faculty member of the Department and Supervisor). Out of a total of 100 marks for the project, 30 marks shall be for Internal Evaluation (average of review-1 and review-2) and 70 marks for the final evaluation (Viva-voce). The evaluation of project work shall be conducted at the end of IV B. Tech, I semester.
ix. A student registered for Minor shall pass in all subjects that constitute the requirement for the Minor degree program. No class/division (i.e., second class, first class and distinction, etc.) shall be awarded for Minor degree programme.
x. If a student drops or is terminated from the Minor program, the additional credits so far earned cannot be converted into open or core electives; they will remain extra. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.
xi. The Minor degree shall be mentioned in the degree certificate as Bachelor of Technology in XXX with Minor in YYY. For example, Bachelor of Technology in Computer Science & Engineering with Minor in Electronics & Communication Engineering or the chosen industry relevant track. This shall also be reflected in the transcripts, along with the list of courses taken for Minor degree program with CGPA mentioned separately.

15.1 Enrolment into Minor:

i. Students of a Department/Discipline are eligible to opt for Minor degree specialization groups offered by a department other than their parent department.
ii. The student without any backlog subjects upto III Semester is permitted for enrolment into Minor degree.
iii. If a student is detained due to lack of attendance either in Major or in Minor, registration shall be cancelled.
iv. Transfer of credits from Minor to regular B. Tech degree and vice-versa shall not be permitted.
v. Minor is to be completed simultaneously with a Major degree program.

15.2 Registration for Minor:

i. The eligible and interested students shall apply through the HOD of his/her parent department. The whole process should be completed within one week before the start of every semester. Selected students shall be permitted to register the courses under Minor.
ii. The selected students shall submit their willingness to the principal through his/her parent department. The parent department shall maintain the record of student pursuing the Minor degree.
iii. The students enrolled in the Minor degree courses will be monitored continuously. An advisor/mentor from parent department shall be assigned to a group of students to monitor the progress.

16. Guidelines for offering Honors

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

i. Honors is introduced in the curriculum of all B. Tech. programs offering a major degree and is applicable to all B. Tech (Regular and Lateral Entry) students admitted in Engineering & Technology.
ii. A student shall earn additional 18 credits for award of B.Tech.(Honors) degree from same branch/ department/ discipline registered for major degree. This is in addition to the credits essential for obtaining the Undergraduate degree in Major Discipline (i.e., 163 credits).
iii. A student is permitted to register for Honors in V semester based on the results of III Semester.
iv. A Student shall register for two theory courses in III B.Tech I-Semester, two theory courses and one laboratory course in III B.Tech II Semester and one theory course and one laboratory course in IV B.Tech I-Semester. If Applied Project Work is offered in Honors degree instead of Laboratory courses, it shall be offered in IV B. Tech I Semester.
v. The Principal of the college shall arrange separate class work and timetable of the courses offered under Honors program.

vi. Courses that are used to fulfil the student's primary major may not be double counted towards the Honors. Courses with content substantially equivalent to courses in the student's primary Major may not be counted towards the Honors.

vii. Students can complete the courses offered under Honors either in the college or in online platforms like SWAYAM with a minimum duration of 12 weeks for a 3- credit course 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.

viii. In case of Applied Project Work, the Evaluation shall be made by the Internal departmental committee (Head of the Department and one senior faculty member of the Department and Supervisor). Out of a total of 100 marks for the project, 30 marks shall be for Internal Evaluation (average of review-1 and review-2) and 70 marks for the final evaluation (Viva-voce). The evaluation of project work shall be conducted at the end of IV B. Tech, I semester.

ix. The attendance for the registered courses under Honors and regular courses offered for Major degree in a semester are to be considered separately.

x. A student shall maintain an attendance of 75% in all registered courses under Honors to be eligible for attending semester end examinations.

xi. A student registered for Honors shall pass in all subjects that constitute the requirement for the Honors degree program. No class/division (i.e., second class, first class and distinction, etc.) shall be awarded for Honors degree programme.

xii. If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into open or core electives; they will remain extra. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

xiii. The Honors will be mentioned in the degree certificate as Bachelor of Technology (Honors) in XYZ. For example, B.Tech. (Honors) in Mechanical Engineering

16.1 Enrollment into Honors:

i. Students of a Department/Discipline are eligible to opt for Honors program offered by the same Department/Discipline

ii. The enrolment of student into Honors is based on the CGPA obtained in the major degree program. CGPA shall be taken up to III semester in case of regular entry students and only III semester in case of lateral entry students. Students having 7 CGPA without any backlog subjects will be permitted to register for Honors.

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

iv. Transfer of credits from Honors to regular B. Tech degree and vice-

versa shall not be permitted.

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

16.2 Registration for Honors:

i. The eligible and interested students shall apply through the HOD of his/her parent department. The whole process should be completed within one week before the start of every semester. Selected students shall be permitted to register the courses under Honors.

ii. The selected students shall submit their willingness to the principal through his/her parent department offering Honors. The parent department shall maintain the record of student pursuing the Honors.

iii. The students enrolled in the Honors courses will be monitored continuously. An advisor/mentor from parent department shall be assigned to a group of students to monitor the progress.

17. Attendance Requirements:

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

ii) Shortage of Attendance below 65% in aggregate shall in NO CASE be condoned.

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

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

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

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

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

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

18. Conduct of Semester End Examination and Evaluation:

18.1 Semester end examination shall be conducted by the Controller of Examination (COE) by inviting 50% Question Papers from the External and 50% Question papers from the Internal Subject Experts. Principal will decide the External and Internal subject experts.

18.2 The answer papers of semester end examination should be evaluated externally / internally.

18.3 The marks for the internal evaluation components will be added to the external evaluation marks secured in the Semester – End examinations, to arrive at total marks for any subject in that semester.

18.4 Performance in all the subjects is tabulated program-wise and will be scrutinized by the office of the Controller of Examinations. Total marks obtained in each subject are converted into letter grades. Finally subject-wise marks and grades details, subject-wise and branch-wise pass percentages are calculated through software.

18.5 Results Committee: Results Committee comprising of Principal, Controller of Examinations, Additional Controller of Examinations (Confidential), One Senior Professor nominated by the Principal and the University Nominee will oversee the details of marks, grades and pass percentages of all the subjects and branch-wise pass percentages.

18.6 Office of the Controller of Examinations will generate student-wise result sheets and the same will be published through college website.

18.7 Student-wise Grade Sheets are generated and issued to the students.

19. Promotion Rules:

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

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

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

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

after securing the required credits he/she shall be permitted to join in the V semester or VII semester respectively as the case may be.

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

20. Grading:

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

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

Structure of Grading of Academic Performance

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

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

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

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

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

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

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

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

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

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

Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

While computing the SGPA the subjects in which the student is awarded Zero grade points will also be included.

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

Award of Class:

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

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

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

21. With–holding of Results

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

22. Personal Verification /Recounting / Revaluation / Final Valuation

22.1 Personal Verification of Answer Scripts:

Candidates appear in a particular semester end examinations may appeal for verification of their answer script(s) for arithmetic correction in totaling of marks and any omission / deletion in evaluation within 7 days from the date of declaration of results at the office of the Controller of Examinations on the prescribed proforma and by paying the prescribed fee per answer script.

It is clarified that personal verification of answer script shall not tantamount to revaluation of answer script. This is only a process of reverification by the candidate. Any mistake / deficiency with regard to arithmetic correction in totaling of marks and any omission / deletion in evaluation if found, the institution will correct the same.

22.2 Recounting / Revaluation:

Students shall be permitted for request for recounting/revaluation of the Semester-End examination answer scripts within a stipulated period after payment of prescribed fee. After recounting or revaluation, records are updated with changes if any and the student will be issued a revised grade sheet. If there are no changes, the same will be intimated to the students.

22.3 Final Valuation:

Students shall be permitted for request for final valuation of the Semester–End Examination answer scripts within a stipulated period after the publication of the revaluation results by paying the necessary fee. The final valuation shall be carried out by an expert not less than Associate Professor as per the scheme of valuation supplied by the examination branch in the presence of the student, Controller of Examinations and Principal. However students are not permitted to discuss / argue with the examiner. If the increase in marks after final valuation is equal to or more than 15% of the previous valuation marks, the marks obtained after final valuation shall be treated as final. If the variation of marks after final valuation is less than 15% of the previous valuation marks, then the earlier valuation marks shall be treated as the final marks.

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.

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

to enter the workforce.

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

iii) **Bachelor of Science (in Field of study/discipline)** i.e., **B.Sc. Engineering in (Field of study/discipline)**- Programme duration: First three years (first six semesters) of the undergraduate programme, 123 credits.

b) Entry Policy:

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

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

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 start-ups. This period may be extended to two years at the most and these two years would not be counted for the time for the maximum time for graduation. The principal of the college shall forward such proposals submitted by the students to the University. An evaluation committee constituted by the institution shall evaluate the proposal submitted by the student and the committee shall decide whether to permit the student(s) to avail the Gap Year or not

25. Transitory Regulations:

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

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

26. Minimum Instruction Days for a Semester:

The minimum instructional days excluding exams for each semester shall be 90 days.

27. Medium of Instruction:

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

28. Student Transfers:

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

29. General Instructions:

i. The academic regulations should be read as a whole for purpose of any interpretation.
ii. Malpractices rules-nature and punishments are appended.
iii. Where the words "he", "him", "his", occur in the regulations, they also include "she", "her", "hers", respectively.
iv. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor / Head of the Institution is final.
v. The University / institution may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the Universities.

*** *** ***

ACADEMIC REGULATIONS (R23)
FOR B.TECH. (LATERAL ENTRY SCHEME)
*(Effective for the students admitted into II year through Lateral Entry Scheme from the Academic Year **2024-25** onwards)*

1. Award of the Degree

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

(i) Pursues a course of study for not less than three academic years and not more than six academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would in addition to the maximum period permitted for graduation (Six years).

(ii) Registers for 123 credits and secures all 123 credits.

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

(i) Student secures additional 18 credits fulfilling all the requisites of a B.Tech. program i.e., 123 credits.

(ii) Registering for Honors is optional.

(iii) Honors 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. **2**

i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the mid semester evaluation and end examination taken together.

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

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

4. Course Pattern

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

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

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

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

Identification of Courses

B. Tech

Each course shall be uniquely identified by an alphanumeric code of width 7 characters as given below.

No. of Digits	Description
First two digits	Year of regulations Ex:23
Next one letter	Type of program: A: B. Tech B: M. Tech C: M.B.A D: M.C.A E: BBA F: BCA
Next two letters	Code of program: CE: Civil Engineering, EE: Electrical and Electronics Engineering, ME: Mechanical Engineering, EC: Electronics and Communication Engineering, BM: Electronics and Communication Engineering (Bio Medical Engineering), CS: Computer Science and Engineering, CC: Computer Science and Engineering (Cyber Security), CM: Computer Science and Engineering (Artificial Intelligence and Machine Learning), CA: Computer Science and Engineering (Artificial Intelligence), AI: Artificial Intelligence, AD: Artificial Intelligence and Data Science, CD: Computer Science and Engineering (Data Science), CB: Computer Science and Business Systems, IT: Information Technology, CO: Computer Science and Engineering (Internet of Things), MB: Management Courses, HS: Humanities and Sciences
Last two digits	Indicate serial numbers: ≥ 01

Ex:
23ACE01
23AEE01
23AME01
23AEC01
23ABM01
23ACS01
23ACC01
23ACM01
23ACA01
23AAI01
23AAD01
23ACD01
23ACB01
23AIT01
23ACO01
23AMB01
23AHS01

RULES FOR DISCIPLINARY ACTION FOR MALPRACTICE / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices / Improper Conduct	**Punishment**
	If the candidate	
1.(a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled.
3.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year.
4.	Smuggles in the Answer book or additional sheet or takes out or	Expulsion from the examination hall and cancellation of the

	arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
6.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Semester/year. The candidate is also debarred and forfeits of seat.
7.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled

		from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the impostor is an outsider, he will be handed over to the police and a case is registered against him.
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 or 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	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

	the tendency to disrupt the orderly conduct of the examination.	
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Examination committee for further action to award suitable punishment.	

B.TECH. - COURSE STRUCTURE – R23
(Applicable from the academic year 2023-24 onwards)

INDUCTION PROGRAMME

S. No.	Course Name	Category	L-T-P-C
1	Physical Activities -- Sports, Yoga and Meditation, Plantation	MC	0-0-6-0
2	Career 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

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF MECHANICAL ENGINEERING

Course Structure and Scheme of Examination

I B. Tech I Semester – ME **Regulations: R23**

S. No	Category	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SEE	Total
1.	BS & H	23AHS01	Communicative English	2	0	0	2	30	70	100
2.	BS & H	23AHS03	Engineering Chemistry	3	0	0	3	30	70	100
3.	ES	23ACE01	Basic Civil and Mechanical Engineering	3	0	0	3	30	70	100
4.	ES	23ACS01	Introduction to Programming	3	0	0	3	30	70	100
5.	BS & H	23AHS04	Linear Algebra and Calculus	3	0	0	3	30	70	100
6.	ES	23AME02	Engineering Workshop	0	0	3	1.5	30	70	100
7.	BS & H	23AHS06	Communicative English Lab	0	0	2	1	30	70	100
8.	BS & H	23AHS08	Engineering Chemistry Lab	0	0	2	1	30	70	100
9.	ES	23ACS02	Computer Programming Lab	0	0	3	1.5	30	70	100
10	MC	23AHS10	Health and Wellness, Yoga and Sports	0	0	1	0.5	100	0	100
TOTAL				**14**	**0**	**11**	**19.5**	**370**	**630**	**1000**

I B. Tech II Semester – ME **Regulations: R23**

S. No	Category	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SEE	Total
1.	BS & H	23AHS05	Engineering Physics	3	0	0	3	30	70	100
2.	ES	23AEE01	Basic Electrical and Electronics Engineering	3	0	0	3	30	70	100
3.	ES	23AME01	Engineering Graphics	1	0	4	3	30	70	100
4.	BS & H	23AHS11	Differential Equations and vector calculus	3	0	0	3	30	70	100
5.	ES	23AEE02	Electrical and Electronics Engineering Workshop	0	0	3	1.5	30	70	100
6.	ES	23AIT01	IT Workshop	0	0	2	1	30	70	100
7.	PC	23ACE02	Engineering Mechanics	3	0	0	3	30	70	100
8.	BS & H	23AHS09	Engineering Physics Lab	0	0	2	1	30	70	100
9.	PC	23ACE04	Engineering Mechanics Lab	0	0	3	1.5	30	70	100
10	MC	23AHS12	NSS /NCC/Scouts and Guides/Community Service	0	0	1	0.5	100	0	100
TOTAL				**13**	**0**	**15**	**20.5**	**370**	**630**	**1000**

II B. Tech I Semester – ME **Regulations: R23**

S. No	Category	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SEE	Total
1.	BS	23AHS15	Numerical Methods &Transform Techniques	3	0	0	3	30	70	100
2.	HSMC	23AMB01	Universal Human Values Understanding Harmony& Ethical human conduct	2	1	0	3	30	70	100
3.	ES	23AME03	Thermodynamics	2	0	0	2	30	70	100
4.	PC	23ACE08	Mechanics of Solids	3	0	0	3	30	70	100
5.	PC	23AME04	Material Science and Metallurgy	3	0	0	3	30	70	100
6.	PC LAB	23ACE12	Mechanics of Solids and Materials Science Lab	0	0	3	1.5	30	70	100
7.	PC LAB	23AME06	Computer-Aided Machine Drawing	0	0	3	1.5	30	70	100
8.	SC	23AEC07	Embedded Systems and IoT	0	0	2	1.0	30	70	100
9.	ES	23ACS09	Python programming	0	1	2	2	30	70	100
10	AC	23AHS18	Environmental Science	2	0	0	-	-	-	-
11	AC	23AHS24	Quantitative Aptitude and Reasoning-1	4	0	0	-	-	-	-
TOTAL				**19**	**2**	**10**	**20**	**270**	**630**	**900**

II B. Tech II Semester – ME **Regulations: R23**

S. No	Category	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SEE	Total
1.	ME-1	23AME07	Industrial Management	2	0	0	2	30	70	100
2.	BS	23AHS19	Complex Variables, Probability and Statistics	3	0	0	3	30	70	100
3.	PC	23AME08	Manufacturing processes	3	0	0	3	30	70	100
4.	PC	23ACE17	Fluid Mechanics & Hydraulic Machines	3	0	0	3	30	70	100
5.	PC	23AME09	Theory of Machines	3	0	0	3	30	70	100
6.	PC LAB	23ACE20	Fluid Mechanics & Hydraulic Machines Lab	0	0	3	1.5	30	70	100
7.	PC LAB	23AME10	Manufacturing processes Lab	0	0	3	1.5	30	70	100
8.	SC	23AHS20	Soft Skills	0	1	2	2	30	70	100
9.	ES	23AMB05	Design Thinking & Innovation	1	0	2	2	30	70	100
10	AC	23AHS25	Quantitative aptitude-2	4	0	0	-	-	-	-
TOTAL				**19**	**1**	**10**	**21**	**270**	**630**	**900**
Mandatory Community Service Project Internship of 08 Weeks Duration During Summer Vacation										

III B. Tech I Semester – ME **Regulations: R23**

S. No	Category	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SEE	Total
1.	PC	23AME11	Machining Process	3	0	0	3	30	70	100
2.	PC	23AME12	Thermal Engineering	3	0	0	3	30	70	100
3.	PC	23AME13	Metrology and Measurements	3	0	0	3	30	70	100
4.	PC	23ACS27	Introduction to Quantum Technologies and Applications	3	0	0	3	30	70	100
Professional Elective - I										
5.	PE - 1	23AME14	Tool Design	3	0	0	3	30	70	100
		23AME15	Automobile Engineering							
		23AME16	Mechanical behaviour of Materials							
		23AME17	Work study and Ergonomics							
		23AME18	Nano Technology							
6.	OE		Open Elective - I	3	0	0	3	30	70	100
7.	PC	23AME19	Thermal Engineering Lab	0	0	3	1.5	30	70	100
8.	PC	23AME20	Dynamics lab	0	0	3	1.5	30	70	100
9.	SC	23AME21	Machine Tools & Metrology lab	0	1	2	2	30	70	100
10.	ES	23ACO03	Tinkering Lab	0	0	2	1	30	70	100
11.	PR	23AME22	Community Service Project	-	-	-	2	30	70	100
12.	AC	23AHS30	Quantitative Aptitude and Reasoning-3	4	0	0	-	-	-	-
13.	AC	23AHS31	French Language	2	0	0	-	-	-	-
		23AHS32	German Language							
		23AHS33	Japanese Language							
TOTAL				**24**	**1**	**10**	**26**	**300**	**700**	**1000**

Open Elective – I

S. No.	Course Code	Course Name	Offered by the Dept.
1	23ACE30	Green Buildings	CIVIL
2	23ACE31	Construction Technology and Management	
3	23AEE23	Electrical Safety Practices and Standards	EEE
4	23AEC30	Electronic Circuits	ECE
5	23ACS06	Object Oriented Programming Through Java	CSE & Allied/IT
6	23ACA13	Fundamentals of Artificial Intelligence	
8	23AHS26	Mathematics for Machine Learning and AI	Mathematics
9	23AHS27	Materials Characterization Techniques	Physics
10	23AHS28	Chemistry of Energy Systems	Chemistry
11	23AHS29	English for Competitive Examinations	Humanities
12	23AMB06	Entrepreneurship and New Venture Creation	

III B. Tech II Semester – ME **Regulations: R23**

S. No	Category	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SEE	Total
1.	PC	23AME24	Heat Transfer	3	0	0	3	30	70	100
2.	PC	23AME25	CAD/CAM	3	0	0	3	30	70	100
3.	PC	23AME26	Design of Machine Members	3	0	0	3	30	70	100
Professional Elective - II										
4.	PE – II	23AME27	Engineering Fracture Mechanics	3	0	0	3	30	70	100
		23AME28	Introduction to Turbo Machinery							
		23AEE14	Control Systems							
		23AME29	Operations Research							
		23AME30	Smart Materials							
Professional Elective - III										
5.	PE – III	23AME31	Applications of Computational Fluid dynamics	3	0	0	3	30	70	100
		23AME32	Industrial Safety							
		23AME33	Design of Automobile Transmission Systems							
		23AME34	Mechanics & Manufacturing of Composite Materials							
		23AME35	Introduction to hybrid and electric vehicles							
6.	OE - II		Open Elective – II	3	0	0	3	30	70	100
7.	PC	23AME36	Heat Transfer Lab	0	0	3	1.5	30	70	100
8.	PC	23AME37	CAD/CAM Lab	0	0	3	1.5	30	70	100
9.	SC	23AME38	3D Printing Lab	0	1	2	2	30	70	100
10.	AC	23AMB16	Technical paper writing and IPR	2	0	0	-	-	-	-
TOTAL				**20**	**1**	**8**	**23**	**270**	**630**	**900**
Mandatory Industry Internship of 6-8 weeks duration during summer vacation										

Open Elective – II

S. No.	Course Code	Course Name	Offered by the Dept.
1	23ACE44	Disaster Management	CIVIL
2	23ACE45	Sustainability In Engineering Practices	
3	23AEE33	Renewable Energy Sources	EEE
4	23AEC26	Digital Circuits	ECE
5	23ACD07	Operating System & System Security	CSE& Allied/IT
6	23ACM04	Machine Learning for Engineers	
7	23AHS35	Optimization Techniques and Applications	Mathematics
8	23AHS36	Mathematical Foundation of Quantum Technologies	
9	23AHS37	Physics of Electronic Materials and Devices	Physics
10	23AHS38	Chemistry of Polymers and Applications	Chemistry
11	23AHS39	Academic Writing and Public Speaking	Humanities

IV B. Tech I Semester – ME **Regulations: R23**

S. No	Category	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SE E	Total
1.	PC	23ACM25	AI & ML for Mechanical Engineering	3	0	0	3	30	70	100
Management Elective										
2.	ME	23AMB17	Business Ethics and Corporate Governance	2	0	0	2	30	70	100
		23AMB18	E-Business							
		23AMB19	Management Science							
		23AMB02	Managerial Economics and Financial Analysis							
		23AMB03	Organizational Behavior							
		23AMB04	Business Environment							
Professional Elective - IV										
3.	PE - IV	23AME40	Mechanical Vibrations	3	0	0	3	30	70	100
		23AME41	Finite Element Methods for Mechanical Engineering							
		23AME42	Refrigeration & Air Conditioning							
		23AEC52	Mechatronics & MEMS							
		23AME43	Power Plant Engineering							
Professional Elective - V										
4.	PE - V	23AME44	Non-Conventional Energy Sources	3	0	0	3	30	70	100
		23AME39	Automation & Robotics							
		23AME45	Non-Destructive Testing							
		23AME46	Total Quality Management							
		23AME47	Smart Manufacturing							
5.	OE - III		Open Elective - III	3	0	0	3	30	70	100
6.	OE - IV		Open Elective - IV	3	0	0	3	30	70	100
7.	SC	23AME48	Introduction to Drone Technology	0	1	2	2	30	70	100
8.	AC	23AHS49	Gender Sensitization	2	0	0	-	-	-	-
9.	IN	23AME49	Evaluation of Industry Internship	-	-	-	2	30	70	100
TOTAL				**18**	**1**	**4**	**21**	**270**	**630**	**900**

Open Elective – III

S. No	Course Code	Course Name	Offered by the Dept.
1	23ACE55	Building Materials and Services	CIVIL
2	23ACE26	Environmental Impact Assessment	
3	23AEE42	Smart Grid Technologies	EEE
4	23AEC14	Microprocessors and Microcontrollers	ECE
5	23ACS12	Data Base Management Systems	CSE & Allied/IT
6	23ACC10	Cyber Security	
7	23AHS41	Wavelet transforms and its Applications	Mathematics
8	23AHS42	Smart Materials and Devices	Physics
9	23AHS43	Introduction to Quantum Mechanics	
10	23AHS44	Green Chemistry and Catalysis for Sustainable Environment	Chemistry
11	23AHS45	Employability Skills	Humanities

Open Elective – IV

S. No	Course Code	Course Name	Offered by the Dept.
1	23ACE56	Geo-Spatial Technologies	CIVIL
2	23ACE57	Solid Waste Management	
3	23AEE43	Electric Vehicles	EEE
4	23AEC53	Transducers and Sensors	ECE
5	23ACS16	Computer Networks	CSE & Allied/IT
6	23ACO01	Internet of Things	
7	23ACS35	Quantum Computing	
8	23AMB22	Financial Mathematics	Mathematics
9	23AHS46	Sensors And Actuators for Engineering Applications	Physics
10	23AHS47	Chemistry Of Nanomaterials and Applications	Chemistry
11	23AHS48	Literary Vibes	Humanities

IV B. Tech II Semester – ME **Regulations: R23**

S. No	Category	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SEE	Total
1.	IN	23AME53	Internship	-	-	24	4	30	70	100
	PR	23AME54	Project	-	-	-	8	30	70	100
TOTAL				**-**	**-**	**24**	**12**	**60**	**140**	**200**

Honors in Mechanical Engineering

Regulations: R23

S. No	Year & Sem	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SEE	Total
1.	III-I	23AME55	Automotive Thermal Systems	3	0	0	3	30	70	100
2.	III-I	23AME56	Simulation and Modelling of Manufacturing Systems	3	0	0	3	30	70	100
3.	III -II	23AME57	Supply Chain Management	3	0	0	3	30	70	100
4.	III -II	23AME58	Advanced Mechanism Design	3	0	0	3	30	70	100
5.	IV -I	23AME59	Bio Mechanics	3	0	0	3	30	70	100
6.	IV -I	23AME60	Applied Project Work	0	0	6	3	30	70	100
Total				**15**	**0**	**6**	**18**	**180**	**420**	**600**

LIST OF MINORS OFFERED TO MECHANICAL ENGINEERING

S. No.	Minor Title	Department offering the Minor
1	Building Planning & Construction Technology	Civil
2	Micro Grid Technology	EEE
3	Energy Systems	
4	Embedded Systems and IoT	ECE & VLSI
5	Electronic Systems	
6	Bio Medical Engineering	EBM
7	Computer Science and Engineering	CSE & Allied
8	Cyber Security	
9	Internet of Things	
10	Data Science	
11	Artificial Intelligence & Machine Learning	
12	Data Analytics	
13	Data Science and Analytics	
14	Programming & Computational Intelligence	
15	AI Applications & Emerging Technologies	
16	Quantum Computing	
17	Quantum Technologies	
18	Cloud Computing	
19	Full Stack Mern & Devops	
20	Machine Learning and Generative AI	
21	Data Science with AWS	
22	UX/UI Design	
23	AI & DS	
24	Computer Science & Business Systems	

1. Building Planning & Construction Technology

S. No	Year & Sem	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SEE	Total
1.	III-I	23ACE67	Construction Materials	3	0	0	3	30	70	100
2.	III-I	23ACE68	Construction Methods	3	0	0	3	30	70	100
3.	III -II	23ACE69	Fundamentals of Building Planning and Drawing	3	0	0	3	30	70	100
4.	III -II	23ACE70	Basic Surveying	3	0	0	3	30	70	100
5.	IV-I	23ACE72	Essentials of Concrete Technology	3	0	0	3	30	70	100
6.	III -II	23ACE71	Basic Surveying Lab	0	0	3	1.5	30	70	100
7.	IV-I	23ACE73	Basic Concrete Technology Lab	0	0	3	1.5	30	70	100
Total				**15**	**0**	**6**	**18**	**210**	**490**	**700**

2. Micro Grid Technology

S. No	Year & Sem	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SEE	Total
1.	III-I	23AEE58	Futuristic Power Systems	3	0	0	3	30	70	100
2.	III-I	23AEE59	Power Electronic Converters for Energy Sources	3	0	0	3	30	70	100
3.	III -II	23AEE60	Microgrid Power and Control Architecture	3	0	0	3	30	70	100
4.	III -II	23AEE61	Microgrid System Design	3	0	0	3	30	70	100
5.	IV -I	23AEE62	Analysis of Smart Grid Systems	3	0	0	3	30	70	100
6.	IV -I	23AEE63	Project in Micro Grid Technology	0	0	6	3	30	70	100
Total				**15**	**0**	**6**	**18**	**180**	**420**	**600**

3. Energy Systems

S. No	Year & Sem	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SEE	Total
1.	III-I	23AEE52	Energy Audit and Management	3	0	0	3	30	70	100
2.	III-I	23AEE53	Energy Management in Building	3	0	0	3	30	70	100
3.	III -II	23AEE54	Energy Storage Technologies	3	0	0	3	30	70	100
4.	III -II	23AEE55	Energy Scenario and Energy Policy	3	0	0	3	30	70	100
5.	IV -I	23AEE56	Waste Energy Management	3	0	0	3	30	70	100
6.	IV -I	23AEE57	Project in Energy Systems	0	0	6	3	30	70	100
Total				**15**	**0**	**6**	**18**	**180**	**420**	**600**

4. **Embedded Systems and IOT**

S. No	Year & Sem	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SEE	Total
1.	III-I	23AEC63	Embedded Systems Technology	3	0	0	3	30	70	100
2.	III-I	23AEC64	Real Time Embedded systems design and Analysis	3	0	0	3	30	70	100
3.	III -II	23AEC65	Principles of IoT	3	0	0	3	30	70	100
4.	III -II	23AEC48	Wireless Networks	3	0	0	3	30	70	100
5.	IV-I	23AEC66	Principles of IoT Lab	0	0	3	1.5	30	70	100
6.	IV-I	23AEC35	Embedded systems & IOT Applications	3	0	0	3	30	70	100
7.	III -II	23AEC67	Industrial Internet of things Lab	0	0	3	1.5	30	70	100
Total				**15**	**0**	**6**	**18**	**210**	**490**	**700**

5. Electronic Systems

S. No	Year & Sem	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SEE	Total
1.	III-I	23AEC10	Analog and Digital Communications	3	0	0	3	30	70	100
2.	III-I	23AEC69	Electronic Instrumentation	3	0	0	3	30	70	100
3.	III -II	23AEC16	Analog & Digital IC Applications	3	0	0	3	30	70	100
4.	III -II	23AEC68	Principles of Communication Engineering	3	0	0	3	30	70	100
5.	IV-I	23AEC22	Analog & Digital IC Applications Lab	0	0	3	1.5	30	70	100
6.	IV-I	23AEC33	VLSI Design	3	0	0	3	30	70	100
7.	III -II	23AEC40	VLSI Design Lab	0	0	3	1.5	30	70	100
Total				**15**	**0**	**6**	**18**	**210**	**490**	**700**

6. Bio Medical Engineering

S. No	Year & Sem	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SEE	Total
1.	III-I	23ABM09	Nano Biotechnology	3	0	0	3	30	70	100
2.	III-I	23ABM10	Tissue Engineering	3	0	0	3	30	70	100
3.	III -II	23ABM02	Biomaterials	3	0	0	3	30	70	100
4.	III -II	23ABM14	Bio MEMS & Bio Micro fluids	3	0	0	3	30	70	100
5.	IV-I	23ABM03	Biomaterials Lab	3	0	0	3	30	70	100
6.	IV-I	23ABM04	Biosensors & Transducers	0	0	3	1.5	30	70	100
7.	III -II	23ABM05	Biosensors & Transducers Lab	0	0	3	1.5	30	70	100
Total				**15**	**0**	**6**	**18**	**210**	**490**	**700**

7. Computer Science and Engineering

S. No	Year & Sem	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SEE	Total
1.	III-I	23ACS24	Cloud computing	3	0	0	3	30	70	100
2.	III-I	23AIT02	Software Engineering	3	0	0	3	30	70	100
3.	III -II	23ACS05	Advanced Data Structures & Algorithm Analysis	3	0	0	3	30	70	100
4.	III -II	23ACS43	Computer Organization	3	0	0	3	30	70	100
5.	IV-I	23ACS07	Advanced Data Structures and Algorithm Analysis Lab	0	0	3	1.5	30	70	100
6.	IV-I	23ACS44	Web Technologies	3	0	0	3	30	70	100
7.	III -II	23ACS45	Web Technologies Lab	0	0	3	1.5	30	70	100
Total				**15**	**0**	**6**	**18**	**210**	**490**	**700**

8. Cyber Security

S. No	Year & Sem	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SEE	Total
1.	III-I	23ACC05	Cyber Crimes & Digital Forensics	3	0	0	3	30	70	100
2.	III-I	23ACC16	Cyber Laws and Security Policies	3	0	0	3	30	70	100
3.	III-II	23ACC01	Introduction to Cyber Security	3	0	0	3	30	70	100
4.	III-II	23ACC11	Blockchain Technology	3	0	0	3	30	70	100
5.	III-II	23ACC02	Cyber Security Lab			3	1.5	30	70	100
6.	IV-I	23ACC04	Cryptography & Network Security (Pre-requisite: Computer Networks)	3	0	0	3	30	70	100
7.	IV-I	23ACC08	Cryptography & Network Security Lab	0	0	3	1.5	30	70	100
Total				**15**	**0**	**6**	**18**	**210**	**490**	**700**

9. Internet of Things

S. No	Year & Sem	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SEE	Total
1.	III – I	23ACO01	Internet of Things	3	0	0	3	30	70	100
2.	III – I	23ACS25	Wireless Sensor Networks	3	0	0	3	30	70	100
3.	III – II	23ACO16	Communication Protocols for IoT	3	0	0	3	30	70	100
4.	III – II	23ACO19	Industrial IoT	3	0	0	3	30	70	100
5.	IV - I	23ACS24	Cloud Computing	3	0	0	3	30	70	100
6.	III – II	23ACO02	Internet of Things Lab	0	0	3	1.5	30	70	100
7.	IV – I	23ACS26	Cloud Computing Lab	0	0	3	1.5	30	70	100
Total				**15**	**0**	**6**	**18**	**210**	**490**	**700**

10. Data Science

S. No	Year & Sem	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SEE	Total
1.	III- I	23ACD36	Data Science for Engineers	3	0	0	3	30	70	100
2.	III - I	23ACD37	Statistical Learning for Data Science	3	0	0	3	30	70	100
3.	III- II	23ACD38	Introduction to Data Engineering	3	0	0	3	30	70	100
4.	III- II	23ACM34	Machine learning fundamentals	3	0	0	3	30	70	100
5.	IV-I	23ACD39	Data Science applications	3	0	0	3	30	70	100
6.	III- II	23ACD40	Data Science Practice Lab (R/Python)	0	0	3	1.5	30	70	100
7.	IV- I	23ACD41	Statistical Learning & ML Lab	0	0	3	1.5	30	70	100
Total				**15**	**0**	**6**	**18**	**210**	**490**	**700**

11. Artificial Intelligence & Machine Learning

S. No	Year & Sem	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SEE	Total
1.	III-I	23ACM33	Essentials of Artificial Intelligence	3	0	0	3	30	70	100
2.	III-I	23ACM34	Machine Learning Fundamentals	3	0	0	3	30	70	100
3.	III -II	23ACM35	Deep Learning & Neural Networks	3	0	0	3	30	70	100
4.	III -II	23ACM36	Introduction to Natural Language Processing	3	0	0	3	30	70	100
5.	IV-I	23ACM37	Introduction to Computer Vision	3	0	0	3	30	70	100
6.	IV-I	23ACM38	Essentials of AI & ML Lab	0	0	3	1.5	30	70	100
7.	III -II	23ACM39	NLP & Computer Vision Lab	0	0	3	1.5	30	70	100
Total				**15**	**0**	**6**	**18**	**210**	**490**	**700**

12. Data Analytics

S. No	Year & Sem	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SEE	Total
1.	III – I	23ACD42	Introduction to Data Analytics	3	0	0	3	30	70	100
2.	III – I	23ACD43	Data Engineering Essentials	3	0	0	3	30	70	100
3.	III – II	23ACD44	Predictive Analytics Fundamentals	3	0	0	3	30	70	100
4.	III – II	23ACD45	Big Data Analytics (Hadoop, Spark)	3	0	0	3	30	70	100
5.	IV - I	23ACD46	Data Analytics with Power BI/Tableau/Matplotlib	3	0	0	3	30	70	100
6.	III - II	23ACD47	Data Analytics Tools Lab	0	0	3	1.5	30	70	100
7.	IV- I	23ACD48	Big Data &NoSQL Lab	0	0	3	1.5	30	70	100
Total				**15**	**0**	**6**	**18**	**210**	**490**	**700**

13. Data Science and Analytics

S. No	Year & Sem	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SEE	Total
1.	III – I	23ACD49	Data Science for Engineers	3	0	0	3	30	70	100
2.	III – I	23ACD50	Statistical Learning for Data Science	3	0	0	3	30	70	100
3.	III – II	23ACD51	Data Visualization & Exploratory Data Analysis	3	0	0	3	30	70	100
4.	III – II	23ACD52	Big Data Analytics Fundamentals	3	0	0	3	30	70	100
5.	IV - I	23ACD53	Introduction to Recommender Systems	3	0	0	3	30	70	100
6.	III-II	23ACD54	Data Visualization & EDA Lab	0	0	3	1.5	30	70	100
7.	IV-I	23ACD55	Recommender System Lab	0	0	3	1.5	30	70	100
Total				**15**	**0**	**3**	**18**	**210**	**490**	**700**

14. Programming & Computational Intelligence

S. No	Year & Sem	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SEE	Total
1.	III-I	23ACA40	Quantum Computing for AI	3	0	0	3	30	70	100
2.	III-I	23ACA41	Edge AI & IoT	3	0	0	3	30	70	100
3.	III-II	23ACA38	Python for AI & Data Science	3	0	0	3	30	70	100
4.	III-II	23ACA39	Data Structures & Algorithms for AI	3	0	0	3	30	70	100
5.	IV-I	23AAD03	Reinforcement Learning	3	0	0	3	30	70	100
6.	IV-I	23ACA42	Python & DS Lab	0	0	3	1.5	30	70	100
7.	III -II	23ACA43	RL & Quantum AI Lab	0	0	3	1.5	30	70	100
Total				**15**	**0**	**6**	**18**	**210**	**490**	**700**

15. AI Applications & Emerging Technologies

S. No	Year & Sem	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SEE	Total
1.	III-I	23AAI15	Introduction to AI in Cybersecurity	3	0	0	3	30	70	100
2.	III-I	23ACA28	HealthCare AI	3	0	0	3	30	70	100
3.	III-II	23AAI16	AI in Finance & Business Analytics	3	0	0	3	30	70	100
4.	III-II	23AAI17	Ethical AI & Responsible AI	3	0	0	3	30	70	100
5.	IV-I	23AAI18	Introduction to Generative AI & Prompt Engineering	3	0	0	3	30	70	100
6.	IV-I	23AAI19	AI Applications Lab	0	0	3	1.5	30	70	100
7.	III -II	23AAI20	Generative AI Lab	0	0	3	1.5	30	70	100
Total				**15**	**0**	**6**	**18**	**210**	**490**	**700**

16. Quantum Computing

S. No	Year & Sem	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SEE	Total
1.	III -I	23ACS46	Introduction to Quantum Computing	3	0	0	3	30	70	100
2.	III-I	23ACS47	Mathematical Foundations for Quantum Computing	3	0	0	3	30	70	100
3.	III -I	23ACS52	Quantum Programming and Simulation Lab	0	0	3	1.5	30	70	100
4.	III -II	23ACS48	Quantum Algorithms	3	0	0	3	30	70	100
5.	III -II	23ACS49	Quantum Information and Communication	3	0	0	3	30	70	100
6.	III-II	23ACS51	Quantum Algorithms Lab	0	0	3	1.5	30	70	100
7.	IV-I	23ACS50	Quantum Machine Learning (QML)	3	0	0	3	30	70	100
Total				**15**	**0**	**6**	**18**	**210**	**490**	**700**

17. Quantum Technologies

S. No	Year & Sem	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SEE	Total
1.	III – I	23AIT24	Foundations of Quantum Technologies	3	0	0	3	30	70	100
2.	III – I	23AIT25	Solid State Physics for Quantum Technologies	3	0	0	3	30	70	100
3.	III – II	23AIT26	Quantum Optics Prerequisites for Quantum Technologies	3	0	0	3	30	70	100
4.	III – II	23AIT27	Introduction to Quantum Communication	3	0	0	3	30	70	100
5.	IV - I	23AIT28	Introduction to Quantum Sensing	3	0	0	3	30	70	100
6.	III – II	23AIT29	Quantum Communication and Sensing Lab	0	0	3	1.5	30	70	100
7.	IV – I	23AIT30	Quantum Devices and Materials Lab	0	0	3	1.5	30	70	100
Total				**15**	**0**	**6**	**18**	**210**	**490**	**700**

18. Cloud Computing

S. No	Year & Sem	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SEE	Total
1.	III-I	23ACS53	Fundamentals of Cloud Computing	3	0	0	3	30	70	100
2	III-I	23ACS54	Virtualization and Cloud Infrastructure	3	0	0	3	30	70	100
3.	III -II	23ACS55	Cloud Platforms and Development	3	0	0	3	30	70	100
4.	III -II	23ACS56	Cloud Security and Compliance	3	0	0	3	30	70	100
5.	IV -I	23ACS57	Cloud Application Design and DevOps	3	0	0	3	30	70	100
6	IV -I	23ACS58	Capstone project	0	0	6	3	30	70	100
Total				**15**	**0**	**6**	**18**	**180**	**420**	**600**

19. Full Stack Mern & Devops

S. No	Year & Sem	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SEE	Total
1.	III-I	20ACS59	Web Fundamentals, Advanced JavaScript & GitHub	3	0	0	3	30	70	100
2	III-I	20ACS60	Backend Development with Node.js & Express	3	0	0	3	30	70	100
3.	III -II	20ACS61	Building User Interfaces with React.js	3	0	0	3	30	70	100
4.	III -II	20ACS62	DevOps Fundamentals & CI/CD Pipelines	3	0	0	3	30	70	100
5.	IV -I	20ACS63	Advanced Backend & Microservices	3	0	0	3	30	70	100
6	IV -I	20ACS64	Project on full stack MERN and Devops	0	0	6	3	30	70	100
Total				**15**	**0**	**6**	**18**	**180**	**420**	**600**

20. Machine Learning and Generative AI

S. No	Year & Sem	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SEE	Total
1.	III-I	23ACM47	Python -Foundation to Mastering	3	0	0	3	30	70	100
2	III-I	23ACM48	Essentials of Python for Data Analysis	3	0	0	3	30	70	100
3.	III -II	23ACM49	Foundations of Responsible AI	3	0	0	3	30	70	100
4.	III -II	23ACM50	Foundations of Gen AI	3	0	0	3	30	70	100
5.	IV -I	23ACM51	Natural Language Processing with Neural Networks	3	0	0	3	30	70	100
6	IV -I	23ACM52	Capstone Project	0	0	6	3	30	70	100
Total				**15**	**0**	**6**	**18**	**180**	**420**	**600**

21. DATA SCIENCE WITH AWS

S. No	Year & Sem	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SEE	Total
1.	III-I	23ACD56	Foundations Of Cloud concepts	3	0	0	3	30	70	100
2	III-I	23ACD57	Predictive Data Analytics using R	3	0	0	3	30	70	100
3.	III -II	23ACD58	Data Engineering with AWS	3	0	0	3	30	70	100
4.	III -II	23ACD59	Cloud-Native Machine Learning	3	0	0	3	30	70	100
5.	IV -I	23ACD60	Deep Learning: The Modern Approach	3	0	0	3	30	70	100
6	IV -I	23ACD61	Capstone Project and Portfolio Development	0	0	6	3	30	70	100
Total				**15**	**0**	**6**	**18**	**180**	**420**	**600**

22. UX/UI Design

S. No	Year & Sem	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SEE	Total
1.	III – I	23AIT37	Introduction to Design and Visual Communication	3	0	0	3	30	70	100
2	III – I	23AIT38	Human Centered Design and Interaction Principles	3	0	0	3	30	70	100
3.	III – II	23AIT39	UX Research and Design Thinking	3	0	0	3	30	70	100
4.	III – II	23AIT40	Prototyping and Usability Testing	3	0	0	3	30	70	100
5.	IV - I	23AIT41	Frontend Development for Designers	3	0	0	3	30	70	100
6	IV - I	23AIT42	Capstone Project and Portfolio Development	0	0	6	3	30	70	100
Total				**15**	**0**	**6**	**18**	**180**	**420**	**600**

23. AI & DS

S. No	Year & Sem	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SEE	Total
1.	III – I	23ACD56	Foundations Of Cloud concepts	3	0	0	3	30	70	100
2	III – I	23ACD57	Predictive Data Analytics using R	3	0	0	3	30	70	100
3.	III – II	23ACD58	Data Engineering with AWS	3	0	0	3	30	70	100
4.	III – II	23ACD59	Cloud-Native Machine Learning	3	0	0	3	30	70	100
5.	IV - I	23ACD60	Deep Learning: The Modern Approach	3	0	0	3	30	70	100
6	IV - I	23ACD61	Capstone Project and Portfolio Development	0	0	6	3	30	70	100
Total				**15**	**0**	**6**	**18**	**180**	**420**	**600**

24. Computer Science & Business Systems

S. No	Year & Sem	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P	C	CIA	SEE	Total
1.	III-I	23ACB15	Fundamentals of Computer Systems & Business Environment	3	0	0	3	30	70	100
2	III-I	23ACE16	Database Management & Enterprise Systems	3	0	0	3	30	70	100
3.	III -II	23ACB17	Software Engineering for Business Applications	3	0	0	3	30	70	100
4.	III -II	23ACB18	Business Intelligence and Analytics	3	0	0	3	30	70	100
5.	IV -I	23ACB19	Digital Transformation & Business Strategy	3	0	0	3	30	70	100
6	IV -I	23ACB20	Capstone Project and Portfolio Development	0	0	6	3	30	70	100
Total				**15**	**0**	**6**	**18**	**180**	**420**	**600**

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

I B. Tech - I Semester (Common to All Branches)

L	T	P	C
3	0	0	3

23AHS01- COMMUNICATIVE ENGLISH

Course Objectives:

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

Course Outcomes:

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

UNIT I

Lesson	**:**	**HUMAN VALUES:** Gift of Magi **(Short Story)**
Listening	**:**	Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.
Speaking	**:**	Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.
Reading	**:**	Skimming to get the main idea of a text; scanning to look for specific pieces of information.
Writing	**:**	Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.
Grammar	**:**	Parts of Speech, Basic Sentence Structures-forming questions
Vocabulary	**:**	Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

UNIT II

Lesson	**:**	**NATURE: The Brook by Alfred Tennyson (Poem)**
Listening	**:**	Answering a series of questions about main ideas and supporting ideas after listening to audio texts.
Speaking	**:**	Discussion in pairs/small groups on specific topics followed by short structure talks.
Reading	**:**	Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
Writing	**:**	Structure of a paragraph - Paragraph writing (specific topics)
Grammar	**:**	Cohesive devices - linkers, use of articles and zero article; prepositions.
Vocabulary	**:**	Homonyms, Homophones, Homographs.

UNIT III

Lesson	**:**	**BIOGRAPHY: Elon Musk**
Listening	**:**	Listening for global comprehension and summarizing what is listened to.
Speaking	**:**	Discussing specific topics in pairs or small groups and reporting what is discussed
Reading	**:**	Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.
Writing	**:**	Summarizing, Note-making, paraphrasing
Grammar	**:**	Verbs - tenses; subject-verb agreement; Compound words, Collocations
Vocabulary	**:**	Compound words, Collocations

UNIT IV

Lesson	**:**	**INSPIRATION: The Toys of Peace by** Saki
Listening	**:**	Making predictions while listening to conversations/ transactional dialogues without video; listening with video.
Speaking	**:**	Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.
Reading	**:**	Studying the use of graphic elements in texts to convey information, reveal Trends / patterns/relationships, communicate processes or display complicated data.
Writing	**:**	Letter Writing: Official Letters, Resumes
Grammar	**:**	Reporting verbs, Direct & Indirect speech, Active & Passive Voice
Vocabulary	**:**	Words often confused, Jargons

UNIT V

Lesson	**:**	**MOTIVATION:** The Power of Intrapersonal Communication (An Essay)
Listening	**:**	Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.
Speaking	**:**	Formal oral presentations on topics from academic contexts
Reading	**:**	Reading comprehension.
Writing	**:**	Critical Writing - Writing structured essays on specific topics.
Grammar	**:**	Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)
Vocabulary	**:**	Technical Jargons

Text books:

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

Reference Books:

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

Web Resources:

GRAMMAR:

1. www.bbc.co.uk/learningenglish
2. https://dictionary.cambridge.org/grammar/british-grammar/
3. www.eslpod.com/index.html
4. https://www.learngrammar.net/

5. https://english4today.com/english-grammar-online-with-quizzes/
6. https://www.talkenglish.com/grammar/grammar.aspx

VOCABULARY

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

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	3	3	-	-	-	-
CO2	-	-	-	-	-	-	-	-	3	3	-	-	-	-
CO3	-	-	-	-	-	-	-	-	3	3	-	-	-	-
CO4	-	-	-	-	-	-	-	-	3	3	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	3				
Average	-	-	-	-	-	-	-	-	2	3	-	-	-	-
Level of correlation	-	-	-	-	-	-	-	-	2	3	-	-	-	-

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)

I B. Tech - I SEM (Common to CE, ME)

L	T	P	C
3	0	0	3

23AHS03 ENGINEERING CHEMISTRY

Course Outcomes:
At the end of the course, the students will be able to
CO1: Understand the impact of hard water and its removal, apply the concept of estimation of hardness.
CO2: Demonstrate the corrosion prevention methods and factors affecting corrosion. Explain the preparation, properties, and applications of thermoplastics & thermosetting, elastomers & conducting polymers.
CO3: Explain calorific values, octane number, refining of petroleum and cracking of oils.
CO4: Explain the setting and hardening of cement.
CO5: Summarize the concepts of colloids, micelle and nanomaterials.

UNIT I
Water Technology
Soft and hardwater, Estimation of hardness of water by EDTA Method, Estimation of dissolved Oxygen - Boiler troubles –Priming, foaming, scale and sludge, Caustic embrittlement, Industrial water treatment – Specifications for drinking water, Bureau of Indian Standards (BIS) and World health organization (WHO) standards, Ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electrodialysis.

UNIT II Electrochemistry and Applications
Electrodes –electrochemical cell, Nernst equation, cell potential calculations. Primary cells – Zinc-air battery, Secondary cells – Nickel-Cadmium (NiCad), and lithium-ion batteries- working principle of the batteries including cell reactions; Fuel Cells-Basic Concepts, the principle and working of hydrogen-oxygen Fuel cell. Corrosion: Introduction to corrosion, electrochemical theory of corrosion, differential aeration cell corrosion, galvanic corrosion, metal oxide formation by dry electrochemical corrosion, Pilling Bedworth ratios and uses, Factors affecting the corrosion, cathodic and anodic protection, electroplating and electro less plating (Nickel and Copper).

UNIT III Polymers and Fuel Chemistry
Introduction to polymers, functionality of monomers, Mechanism of chain growth, step growth polymerization. Thermoplastics and Thermo-setting plastics-: Preparation, properties and applications of polystyrene. PVC Nylon 6,6 and Bakelite. Elastomers – Preparation, properties and applications of Buna S, Buna N, Thiokol rubbers.

Fuels – Types of fuels, calorific value of fuels, numerical problems based on calorific value; Analysis of coal (Proximate and Ultimate analysis), Liquid Fuels, refining of petroleum, Octane and Cetane number-alternative fuels- propane, methanol, ethanol and bio fuel-bio diesel.

UNIT IV Modern Engineering Materials
Composites- Definition, Constituents, Classification- Particle, Fibre and Structural reinforced composites, properties and Engineering applications
Refractories- Classification, Properties, Factors affecting the refractory materials and Applications. Lubricants- Classification, Functions of lubricants, Mechanism, Properties of lubricating oils – Viscosity, Viscosity Index, Flash point, Fire point, Cloud point, saponification and Applications.
Building materials- Portland Cement, constituents, Setting and Hardening of cement.

UNIT V Surface Chemistry and Nanomaterials

Introduction to surface chemistry, colloids, nanometals and nanometal oxides, micelle formation, synthesis of colloids (Braggs Method), chemical and biological methods of preparation of nanometals and metal oxides, stabilization of colloids and nanomaterials by stabilizing agents, adsorption isotherm (Freundlich and Langmuir), BET equation (no derivation), applications of colloids and nanomaterials – catalysis, medicine, sensors, etc.

Text Books:

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

Reference Books:

1. H.F.W. Taylor, Cement Chemistry, 2/e, Thomas Telford Publications, 1997.
2. D.J. Shaw, Introduction to Colloids and Surface Chemistry, Butterworth-Heineman, 1992.
3. Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd Edition

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-	-	-
Average	3	2.25	-	-	-	-	-	-	-	-	-	-	-	-
Level of correlation	3	2	-	-	-	-	-	-	-	-	-	-	-	-

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

I B. Tech - I Semester (Common to All Branches)

L	T	P	C
3	0	0	3

23ACE01 BASIC CIVIL AND MECHANICAL ENGINEERING

Course Outcomes: On completion of the course, the student should 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 highways in terms of geometrics.

CO4: Understand the importance of water resources and storage structures so that the social responsibilities of water conservation will be appreciated.

CO5: Understand the different manufacturing processes and explain the basics of thermal engineering and its applications.

CO6: Describe the working of different mechanical power transmission systems and powerplants; learn basics of robotics.

PART A: BASIC CIVIL ENGINEERING

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-Tests on these materials.

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

UNIT II

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

UNIT III

Transportation Engineering, Water Resources and Environmental Engineering: Importance of Transportation in Nation's economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements - Simple Differences - Basic geometric design elements of a highway- Camber- Stopping Sight Distance- Super elevation- Introduction.

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

Textbooks:

1. G. Shanmugam and M. S. Palanisamy, Basic Civil and the Mechanical Engineering, Tata McGraw Hill publications (India) Pvt. Ltd.
2. Basic Civil Engineering, S.S. Bhavikatti, New Age International Publishers.
3. Engineering Materials, Dr. S.C. Rangwala, Charotor Publishing House.
4. Highway Engineering, S. K. Khanna, C.E.G. Justo and Veeraraghavan, Nemchand and Brothers

Publications.

5. Irrigation Engineering and Hydraulic Structures - Santosh Kumar Garg, Khanna Publishers, Delhi.
6. Building Construction, Dr. B. C. Punmia, Lakshmi Publications, Delhi.

Reference Books:

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

PART B: BASIC MECHANICAL ENGINEERING

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.

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	3	-	-	-	3	3	-	-	2	3
CO2	3	3	3	-	3	-	-	-	3	-	-	-	2	3
CO3	3	3	3	-	3	-	-	-	3	-	-	-	2	3
CO4	3	3	3	-	3	-	--	-	3	3	-	-	2	3
CO5	3	3	3	-	3	-	-	-	3	3	-	-	2	3
CO6	3	3	3	-	3	-	-	-	3	-	-	-	2	3
Average	3	3	3	-	3	-	-	-	3	3	-	-	2	3
Level of correlation	3	3	3	-	3	-	-	-	3	3	-	-	2	3

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)

I B. Tech I Semester, CSE (Common to all branches)

L	T	P	C
3	0	0	3

23ACS01 INTRODUCTION TO PROGRAMMING

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

CO1: Understand basics of computers, the concept of algorithm and algorithmic thinking.
CO2: Develop the ability to analyze a problem, develop an algorithm to solve it.
CO3: Proficiently use the C programming language to implement various algorithms.
CO4: Understand more advanced features of C language.
CO5: Develop problem-solving skills and the ability to debug and optimize the code.

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.

Problem solving techniques: Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms.

Overview of C: History Of C, Basic Structure of C Program, Primitive Data Types, Variables, and Constants, Basic Input and Output, Operations, Type Conversion, and Casting.

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

Definition of Arrays, Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Multidimensional Arrays, Introduction to Strings, operations on strings

UNIT IV Functions

Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables, Recursion.

UNIT V User Defined Data types, File Handling, Pointers

User-defined data types-Structures- Introduction, Nested Structures, Array of Structures, Structures and Functions, and Unions, pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers. Operations on file handling Self-Referential structures, Linked List (creation and display)

Text Books:

1. B. A. Forouzan and R. F. Gilberg, Computer Science: A Structured Programming Approach Using C, 3/e, Cengage Learning, 2007.
2. Problem solving with C, M. T. Somashekara, PHI
3. "The C Programming Language" by Brian W. Kernighan and Dennis M. Ritchie
4. Schaum's Outline of Programming with C by Byron S Gottfried (1996), McGraw-Hill Education (ISBN:978-0070240353)

Reference Books:

1. Balagurusamy, E. (2008). Computing fundamentals and C Programming. McGraw-Hill Education.
2. Programming in C Rema Theraja-2nd edition 2016
3. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE
4. Jeri R. Hanly, Ellot B. Koffman, Problem Solving and Program Design in C, 5/e, Pearson

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	1	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	1	2	-	-	-	-	-	-	-	-	-	-
CO5	3	3	2	3	-	-	-	-	-	-	-	-	-	-
Average	3	3	2	2	-	-	-	-	-	-	-	-	-	-
Level of correlation	3	3	2	2	-	-	-	-	-	-	-	-	-	-

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

I B. Tech I Semester (Common to All Branches)

L	T	P	C
3	0	0	3

23AHS04 LINEAR ALGEBRA & CALCULUS

Course Outcomes:
At the end of the course, the student will be able to
CO1: Develop and use of matrix algebra techniques that are needed by engineers for practical applications.
CO2: Utilize mean value theorems to real life problems.
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.

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

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

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

UNIT IV Partial differentiation and Applications (Multi variable calculus)
Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Directional derivative, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobians, Functional dependence, maxima and minima of functions of two variables, method of Lagrange multipliers.

UNIT V Multiple Integrals (Multi variable Calculus)
Double integrals, triple integrals, change of order of integration, change of variables to polar, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

Textbooks:

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

Reference Books:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5thEdition.
4. Advanced Engineering Mathematics, Micheael Greenberg, , Pearson publishers, 9thedition.
5. Higher Engineering Mathematics, H. K Das, Er. Rajnish Verma, S. ChandPublications,2014, Third Edition (Reprint 2021)

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	3	1	-	-	-	-	-	-	-	-	-	-	-
Average	3	2.6	1.75	-	-	-	-	-	-	-	-	-	-	-
Level of correlation	3	3	2	-	-	-	-	-	-	-	-	-	-	-

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

L	T	P	C
0	0	3	1.5

23AME02 ENGINEERING WORKSHOP
(Common to All branches of Engineering)

Course Outcomes:

After completion of this course, the student 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.

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) Go down lighting d) Tube light
e) Three phase motor f) Soldering of wires

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

7. **Welding Shop**: Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint.

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

Textbooks:
1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published, 2019.

Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn. 2015.

2. A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai &Co.,2015&2017.

Reference Books:

1. Elements of Workshop Technology, Vol. I 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.; AtulPrakashan,2021-22.

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	3	-	-	-	3	3	-	-	2	3
CO2	3	3	3	-	3	-	-	-	3	-	-	-	2	3
CO3	3	3	-	-	3	-	-	-	3	-	-	-	2	3
CO4	3	3	-	-	3	-	--	-	3	3	-	-	2	3
Average	3	3	3	-	3	-	-	-	3	3	-	-	2	3
Level of correlation	3	3	3	-	3	-	-	-	3	3	-	-	2	3

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

L	T	P	C
0	0	2	1

20AHS06 - COMMUNICATIVE ENGLISH LAB

I B. Tech I Semester (Common to CSE, CSD, CSM, CE & ME)
I B. Tech II Semester (Common to ECE, EEE, CSC, IT, CAI, CSO, CSBS & EBM)

Course Objectives:

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 Outcomes:

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 E - mail, resume and poster for presentation

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:

- Young India Films
- Walden Infotech

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
   https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	3	3	-	-	-	-
CO2	-	-	-	-	-	-	-	-	3	3	-	-	-	-
CO3	-	-	-	-	-	-	-	-	2	3	-	-	-	-
CO4	-	-	-	-	-	-	-	-	3	3	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	3	-	-	-	-
Average	-	-	-	-	-	-	-	-	2.2	3	-	-	-	-
Level of correlation	-	-	-	-	-	-	-	-	2	3	-	-	-	-

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)

. **Tech- I SEM (Common to CE, ME)**

L	T	P	C
0	0	2	1

23AHS08 ENGINEERING CHEMISTRY LAB

Course Objectives: To verify the fundamental concepts with experiments

Course Outcomes:
At the end of the course, the students will be able to
CO1: Determine the cell constants and conductance of solutions.
CO2: Prepare a polymer and measure Viscosity of a polymer solution.
CO3: Estimate hardness, Dissolved Oxygen and Alkalinity of water samples.
CO4: Determine Physical Properties like Adsorption & Viscosity.

List of Experiments: (Any 10 experiments)

1. Determination of Hardness of a groundwater sample.
2. Estimation of Dissolved Oxygen by Winkler's method
3. Determination of Strength of an acid in Pb-Acid battery
4. Preparation of a polymer (Bakelite)
5. Determination of percentage of Iron in Cement sample by colorimetry
6. Estimation of Calcium in port land Cement
7. Preparation of nanomaterials by precipitation method.
8. Adsorption of acetic acid by charcoal
9. Determination of percentage Moisture content in a coal sample
10. Determination of Viscosity of lubricating oil by Redwood Viscometer 1
11. Determination of Viscosity of lubricating oil by Redwood Viscometer 2
12. Determination of Calorific value of gases by Junker's gas Calorimeter
13. Estimation of Acidity of water sample
14. Estimation of Alkalinity of water sample
15. Determination of Viscosity of a polymer solution using Ostwald Viscometer

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

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-	-	-
Average	3	3	-	-	-	-	-	-	-	-	-	-	-	-
Level of correlation	3	3	-	-	-	-	-	-	-	-	-	-	-	-

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
I B. Tech I Semester (Common to all branches)

L	T	P	C
0	0	3	1.5

23ACS02 COMPUTER PROGRAMMING LAB

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

List of Experiments:

WEEK 1
Objective: Getting familiar with the programming environment on the computer and writing the first program.

Suggested Experiments/Activities:
Tutorial 1: Problem-solving using Computers.
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.
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:

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

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:

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:

Problems involving if-then-else structures.

i) Write a C program to find the max and min of four numbers using if-else.
ii) Write a C program to generate electricity bill.
iii) Find the roots of the quadratic equation.
iv) Write a C program to simulate a calculator using switch case.
v) Write a C program to find the given year is a leap year or not.

WEEK 6

Objective: Explore the full scope of iterative constructs namely while loop, do-while loop and for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.

Suggested Experiments/Activities:

Tutorial 6: Loops, while and for loops

Iterative problems e.g., the sum of series

i) Find the factorial of given number using any loop.
ii) Find the given number is a prime or not.
iii) Compute sine and cos series
iv) Checking a number palindrome
v) Construct a pyramid of numbers.

WEEK 7:

Objective: Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

Suggested Experiments/Activities:
Tutorial 7: 1 D Arrays: searching.
D Array manipulation, linear search

i) Find the min and max of a 1-D integer array.
ii) Perform linear search on1D array.
iii) The reverse of a 1D integer array
iv) Find 2's complement of the given binary number.
v) Eliminate duplicate elements in an array.

WEEK 8:
Objective: Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.

Suggested Experiments/Activities:
Tutorial 8: 2 D arrays, sorting and Strings.
Matrix problems, String operations, Bubble sort

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

WEEK 9:
Objective: Explore 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 9: Functions, call by value, scope and extent,
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's method

WEEK 10:
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 10: Recursion, the structure of recursive calls
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 11:
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 11: Call by reference, dangling pointers

Simple functions using Call by reference, Dangling pointers

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

WEEK12:

Objective: Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C

Suggested Experiments/Activities:

Tutorial 12: Pointers, structures and dynamic memory allocation Pointers and structures, memory dereference.

i) Write a C program to find the sum of a 1D array using malloc ()
ii) Write a C program to find the total, average of n students using structures
iii) Enter n students data using calloc () and display failed students list
iv) Read student name and marks from the command line and display the student details along with the total.
v) Write a C program to implement realloc ()

WEEK 13:

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

Suggested Experiments/Activities:

Tutorial 13: Bitfields, Self-Referential Structures, Linked lists Bitfields, linked lists

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

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

WEEK14:

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

Suggested Experiments/Activities:

Tutorial 14: File handling

File operations

i) Write a C program to write and read text into a file.
ii) Write a C program to write and read text into a binary file using fread () and fwrite ()
iii) Copy the contents of one file to another file.
iv) Write a C program to merge two files into the third file using command-line arguments.
v) Find no. of lines, words and characters in a file
vi) Write a C program to print last n characters of a given file.

Text Books

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

Reference Books

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

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	3	-	-	-	-	-	-	-	-	-
CO2	3	3	3	3	3	-	-	-	2	-	-	-	-	-
CO3	3	3	1	2	3	-	-	-	-	-	-	-	-	-
CO4	3	2	2	-	2	-	-	-	-	-	-	-	-	-
Average	3	2.75	2	2.5	2.75	-	-	-	2	-	2	-	-	-
Level of correlation	3	3	2	3	3	-	-	-	2	-	2	-	-	-

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)

I B. Tech I Semester (Common to EEE, ECE, IT, CAI, CSO, CSC, EBM & CSBS)
I B. Tech II Semester (Common to CE, ME, CSE, CSE (DS) & CSE (AI &ML))

L	T	P	C
3	0	0	3

23AHS05 ENGINEERING PHYSICS

COURSE OUTCOMES

CO1: Enhance the fundamental knowledge in the optics and imbibe the concepts of polarization and its applications in engineering.

CO2: Interpret various crystal systems and analyze the crystal structure using different X-ray diffraction techniques.

CO3: Acquire knowledge in the basic concepts of quantum mechanics and the role of free electrons in electrical conductivity of metals.

CO4: Identify the type of semiconductors using Hall effect and the role of superconductors in modern engineering applications.

CO5: Improve their knowledge in fundamentals of Dielectric and Magnetic materials in day-to-day applications.

Unit-I: Wave Optics **8hrs**

Interference- Principle of superposition – Interference of light – Conditions for sustained interference - Interference in thin films (Reflection Geometry) – Colors in thin films – Newton's Rings – Determination of wavelength and refractive index.

Diffraction- Introduction – Fresnel and Fraunhofer diffraction – Fraunhofer diffraction due to single slit, double slit and N-slits (qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative).

Polarization- Introduction – Types of polarization – Polarization by reflection, refraction and double refraction - Nicol's Prism - Half wave and Quarter wave plates.

Unit II: Crystallography and X-ray diffraction **8hrs**

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Crystal systems - Bravais Lattices — Coordination number - Packing fraction of SC, BCC & FCC - Miller indices – Separation between successive (h k l) planes.

X- ray diffraction: Bragg's law - X-ray Diffractometer – Crystal structure determination by Laue's method.

Unit-III: Quantum Mechanics and Free Electron Theory **9hrs**

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle - Schrodinger's time independent and dependent wave equation – Significance and properties of wave function – 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 – Equation for electrical conductivity based on quantum free electron theory – Fermi-Dirac distribution – Fermi energy - Failures of free electron theory.

Unit – IV: Semiconductors and Superconductors **8hrs**

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 - Drift and diffusion currents – Einstein's equation - Hall effect and its Applications.

Superconductors: Introduction – Properties of superconductors – Meissner effect– Type I and Type II

superconductors – AC and DC Josephson effects – BCS theory (qualitative treatment) – High T_c superconductors – Applications of superconductors.

Unit–V: Dielectric and Magnetic Materials **8hrs**

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

Magnetic Materials- Introduction – Magnetic dipole moment – Magnetization – Magnetic susceptibility and Permeability – Atomic origin of magnetism – Classification of magnetic materials: Dia, Para, Ferro, Ferri & Antiferro – Domain concept of Ferromagnetism (Qualitative) – Hysteresis – Soft and Hard magnetic materials.

Text books:

1. Engineering Physics by M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy S. Chand Publications, 11th Edition 2019.
2. Engineering Physics" by D.K. Bhattacharya and Poonam Tandon, Oxford press (2018).
3. Applied Physics by P.K. Palanisamy, SciTech publications (2018)

Reference Books:

1. "Engineering Physics" - B.K. Pandey and S. Chaturvedi, Cengage Learning
2. "Fundamentals of Physics" - Halliday, Resnick and Walker, John Wiley &Sons.
3. "Fundamentals of Physics with Applications", Arthur Beiser, Samarjit Sengupta, Schaum Series.
4. "Engineering Physics" - Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.
5. "Engineering Physics" - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press.
6. "Semiconductor physics and devices: Basic principle" - A. Donald, Neamen, Mc Graw Hill.
7. "Solid state physics" – A. J. Dekker, Pan Macmillan publishers
8. "Introduction to Solid State Physics" -Charles Kittel, Wiley

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	3	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-	-	-
Average	3	2.6	-	3		-	-	-	-	-	-	-	-	-
Level of correlation	3	3	-	3		-	-	-	-	-	-	-	-	-

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY,

(AUTONOMOUS)

I B. Tech II Semester

L	T	P	C
3	0	0	3

23AEE01 BASIC ELECTRICAL & ELECTRONICS ENGINEERING

(Common to All branches of Engineering)

COURSE OUTCOMES:

After the completion of the course students 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: Analyze different electrical circuits, performance of machines and measuring instruments.

CO5: Evaluate different circuit configurations, Machine performance and Power systems operation

PART A: BASIC ELECTRICAL ENGINEERING

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.

Text Books:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition

2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013

3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

Reference Books:

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019, Fourth Edition

2. Principles of Power Systems, V.K. Mehtha, S. Chand Technical Publishers, 2020

3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017

4. Basic Electrical and Electronics Engineering, S. K. Bhatacharya, Person Publications, 2018, Second Edition.

Web Resources:

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

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

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-	-	-
Average	3	2	-	-	-	-	-	-	-	-	-	-	-	-
Level of correlation	3	2	-	-	-	-	-	-	-	-	-	-	-	-

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)

I B. Tech - II Semester
(Common to All branches of Engineering)

L	T	P	C
1	0	4	3

23AME01 ENGINEERING GRAPHICS

Course Outcomes: After completion of this course, the student 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.

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*).

Note: The practice will be carried out by using AutoCAD software.

Text Books:

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

Reference Books:

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.

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	3	-	-	-	3	3	-	-	2	3
CO2	3	3	3	-	3	-	-	-	3	-	-	-	2	3
CO3	3	3	-	-	3	-	-	-	3	-	-	-	2	3
CO4	3	3	-	-	3	-	--	-	3	3	-	-	2	3
CO5	3	3	3	--	3	-	-	-	3	3	-	-	2	3
Average	3	3	3	-	3	-	-	-	3	3	-	-	2	3
Level of correlation	3	3	3	-	3	-	-	-	3	3	-	-	2	3

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)

I B. Tech II Semester (Common to All Branches)

L	T	P	C
3	0	0	3

23AHS11 DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

Course Outcomes:

At the end of the course, the student 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.

UNIT I Differential equations of first order and first degree

Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling – Law of natural growth and decay- Electrical circuits- Orthogonal trajectories.

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 identities.

UNIT V Vector integration

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

Textbooks:

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

Reference Books:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018,14th Edition.
2. Advanced Engineering Mathematics, Dennis G. Zill and Warren S. Wright, Jones 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. R Ramana, , McGraw Hill Education, 2017

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	1	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	1	-	-	-	-	-	-	-	-	-	-	-
Average	3	3	1.5	-	-	-	-	-	-	-	-	-	-	-
Level of correlation	3	3	2	-	-	-	-	-	-	-	-	-	-	-

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, (AUTONOMOUS)

I B. Tech II Semester

L	T	P	C
0	0	3	1.5

23AEE02 ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP

(Common to All branches of Engineering)

COURSE OUTCOMES:

At the end of this course students will demonstrate the ability 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 tool sand 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.
3. Provide some exercises so that measuring instruments are learned to be used by the students.
4. Components:
5. Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, colour coding package, symbol, cost etc.
6. 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.

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

Mapping of COs with POs & PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	3	-	-	1	-	3	-	-	-	-	-
CO2	3	3	-	3	-	-	2	-	3	-	-	-	-	-
CO3	3	2	-	1	-	-	2	-	3	-	-	-	-	-
CO4	3	2	-	3	-	-	2	-	3	-	-	-	-	-
CO5	3	3	-	3	-	-	2	-	3	-	-	-	-	-
Average	3	2.6	-	2.6	-	-	1.8	-	3	-	-	-	-	-
Level of correlation	3	3	-	3	-	-	2	-	3	-	-	-	-	-

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous)

I B. Tech II Semester

L	T	P	C
0	0	2	1

23AIT01 IT WORKSHOP
(Common to all branches)

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. Differentiate RAM &ROM.

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

Task 1: 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 are no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

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

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

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

LaTeX and WORD

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

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

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

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

EXCEL

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

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

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

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

LOOKUP/VLOOKUP

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).

Mapping of COs with POs & PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	3	-	-	1	-	3	-	-	-	-	-
CO2	3	3	-	3	-	-	2	-	3	-	-	-	-	-
CO3	3	2	-	1	-	-	2	-	3	-	-	-	-	-
CO4	3	2	-	3	-	-	2	-	3	-	-	-	-	-
CO5	3	3	-	3	-	-	2	-	3	-	-	-	-	-
Average	3	2.6	-	2.6	-	-	1.8	-	3	-	-	-	-	-
Level of correlation	3	3	-	3	-	-	2	-	3	-	-	-	-	-

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

I B. Tech - II Semester (Common to All Branches)

L	T	P	C
3	0	0	3

23ACE02 ENGINEERING MECHANICS

Course Outcomes:
On Completion of the course, the student should be able to

CO1: Understand the fundamental concepts in mechanics and determine the frictional forces for bodies in contact.

CO2: Analyze different force systems such as concurrent, coplanar and spatial systems and calculate their resultant forces and moments.

CO3: Calculate the centroids, center of gravity and moment of inertia of different geometrical shapes.

CO4: Apply the principles of work-energy and impulse-momentum to solve the problems of rectilinear and curvilinear motion of a particle.

CO5: Solve the problems involving the translational and rotational motion of rigid bodies.

UNIT I

Introduction to Engineering Mechanics – Basic Concepts. Scope and Applications

Systems of Forces: Coplanar Concurrent Forces – Components in Space – Resultant –Moment of Force and its Application – Couples and Resultant of Force Systems.

Friction: Introduction**,** limiting friction and impending motion, Coulomb's laws of dry friction, coefficient of friction, Cone of Static friction.

UNIT II

Equilibrium of Systems of Forces: Free Body Diagrams, Lami's Theorem, Equations of Equilibrium of Coplanar Systems, Graphical method for the equilibrium, Triangle law of forces, converse of the law of polygon of forces condition of equilibrium, Equations of Equilibrium for Spatial System of forces, Numerical examples on spatial system of forces using vector approach, Analysis of plane trusses. Principle of virtual work with simple examples

UNIT III

Centroid: Centroids of simple figures (from basic principles) – Centroids of Composite Figures **Centre of Gravity:** Centre of gravity of simple body (from basic principles), Centre of gravity of composite bodies, Pappus theorems.

Area Moments of Inertia: Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia.

Mass Moment of Inertia: Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, Mass Moment of Inertia of composite bodies.

UNIT IV

Rectilinear and Curvilinear motion of a particle: Kinematics and Kinetics –D'Alembert's Principle - Work Energy method and applications to particle motion- Impulse Momentum method.

UNIT V

Rigid body Motion: Kinematics and Kinetics of translation, Rotation about fixed axis and plane motion, Work Energy method and Impulse Momentum method.

Textbooks:

1. S. Timoshenko, D. H. Young, J.V. Rao, S. Pati., Engineering Mechanics, 5th Edition, McGraw Hill Education.
2. Hibbeler R.C., Engineering Mechanics: Statics and Dynamics, 14th Edition, Pearson Education, Inc., New Delhi, 2022

Reference Books:

1. Engineering Mechanics, Statics and Dynamics, Rogers and M A. Nelson., McGraw Hill Education.
2. Engineering Mechanics, Statics and Dynamics, I.H. Shames., 4th Edition, PHI, 2002.
3. Engineering Mechanics, Volume-I: Statics, Volume-II: Dynamics, J. L. Meriam and L.G. Kraige., 6th Edition, John Wiley, 2008.
4. Engineering Mechanics: Principles of Statics and Dynamics, R.C. Hibbler., PearsonPress,2006.
5. Introduction to Statics and Dynamics, Andy Ruina and Rudra Pratap., Oxford University Press, 2011.

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	-	-	-	-	-	-	-	-	-	2
CO2	3	3	3	-	-	-	-	-	-	-	-	-	-	2
CO3	3	3	3	-	-	-	-	-	-	-	-	-	-	2
CO4	3	3	2	-	-	-	-	-	-	-	-	-	-	2
CO5	3	3	2	-	-	-	-	-	-	-	-	-	-	2
Average	3	3	2	-	-	-	-	-	-	-	-	-	-	2
Level of correlation	3	3	2	-	-	-	-	-	-	-	-	-	-	2

3- High mapping **2-Medium Mapping** **1- Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)

I B. Tech I Semester (Common to EEE, ECE, IT, CAI, CSO, CSC, EBM & CSBS)
I B. Tech II Semester (Common to CE, ME, CSE, CSE(DS) & CSE (AI &ML))

L	T	P	C
0	0	2	1

23AHS09 ENGINEERING PHYSICS LAB

Course Outcomes:

CO1: Impart the basic knowledge in optical properties of light such as interference and diffraction.
CO2: Apply skills to study the characteristics of a semiconductor, variation of magnetic field with distance of a coil and Hysteresis curve.
CO3: Imbibe scientific attitude in applications of various experiments.

(Any **TEN** of the following listed experiments)

List of Engineering Physics Experiments

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

Course Outcomes:

The students will be able to

1. **Operate** optical instruments like microscope and spectrometer
2. **Estimate** the wavelength of different colors using diffraction grating and resolving power
3. **Plot** the intensity of the magnetic field of circular coil carrying current with distance
4. **Determine** the resistivity of the given semiconductor using four probe method
5. **Identify** the type of semiconductor i.e., n-type or p-type using hall effect
6. **Calculate** the band gap of a given semiconductor

References:

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

URL:*www.vlab.co.in*

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	1	-	-	1	-	-	-	-	-	-	-	-	-
CO3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	2.6	1	-	-	1	-	-	-	-	-	-	-	-	-
Level of correlation	3	1	-	-	1	-	-	-	-	-	-	-	-	-

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

I B. Tech - II Semester (ME)

L	T	P	C
0	0	3	1.5

23ACE04 ENGINEERING MECHANICS LAB

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

CO1: Evaluate the coefficient of friction between two different surfaces and between the inclined plane and the roller.
CO2: Verify Law of Polygon of forces and Law of Moment using force polygon and bell crank lever.
CO3: Determine the Centre of gravity and Moment of Inertia of different configurations.
CO4: Verify the equilibrium conditions of a rigid body under the action of different force systems.

Students have to perform any 10 of the following Experiments:

List of Experiments:

1. Verification of Law of Parallelogram of Forces.
2. Verification of Law of Triangle of Forces.
3. Verification of the Law of polygon for coplanar-concurrent forces acting on a particle in equilibrium and to find the value of unknown forces considering particle to be in equilibrium using universal force table.
4. Determination of coefficient of Static and Rolling Frictions
5. Determination of Centre of Gravity of different shaped Plane Lamina.
6. Verification of the conditions of equilibrium of a rigid body under the action of coplanar on-concurrent, parallel force system with the help of a simply supported beam.
7. Study of the systems of pulleys and draw the free body diagram of the system.
8. Determine the acceleration due to gravity using a compound pendulum.
9. Determine the Moment of Inertia of the compound pendulum about an axis perpendicular to the plane of oscillation and passing through its centre of mass.
10. Determine the Moment of Inertia of a Flywheel.
11. Verification of Law of Moment using Rotation Disc Apparatus and Bell Crank Lever.

References:

1. S. Timoshenko, D. H. Young, J.V. Rao, S. Pati., Engineering Mechanics, 5th Edition,McGraw Hill Education.
2. Hibbeler R.C., Engineering Mechanics: Statics and Dynamics, 14th Edition, PearsonEducation, Inc., New Delhi, 2022

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-		
Average	3	2.5	-	-	-	-	-	-	-	-	-	-	-	-
Level of correlation	3	3	-	-	-	-	-	-	-	-	-	-	-	-

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

II B. Tech - I Semester (ME)

L	T	P	C
3	0	0	3

23AHS15 NUMERICAL METHODS & TRANSFORM TECHNIQUES (MECH)

Course Outcomes:

CO1: Apply numerical methods to solve algebraic and transcendental equations.
CO2: Derive interpolating polynomials using interpolation formulae.
CO3: Solve differential and integral equations numerically.
CO4: Understand the use of Laplace transform in system modeling, digital signal processing, process control, solving Boundary Value Problems.
CO5: Apply Fourier series and Fourier transform in communication theory and signal analysis, image processing and filters, data processing and analysis, solving partial differential equations for problems on gravity**.**

UNIT I
Solution of Algebraic & Transcendental Equations
Introduction-Bisection Method-Iterative method, Regula-falsi method and Newton Raphson Method System of Algebraic equations: Gauss Elimination, Jacoby and Gauss Siedal method.

UNIT II
Interpolation
Finite Differences-Newton's forward and backward interpolation formulae – Lagrange's formulae. Curve fitting: Fitting of straight line, second-degree and Exponential curve by method of least squares.

UNIT III
Solution of Initial value problems to Ordinary differential equations
Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's and modified Euler's methods-Runge-Kutta methods (second and fourth order).

UNIT IV
Laplace Transforms
Definition-Laplace transform of standard functions-existence of Laplace Transform – Inverse transform – First shifting Theorem, transforms of derivatives and integrals – Unit step function – Second shifting theorem– Convolution theorem – Laplace transform of Periodic function.

UNIT V
Fourier series and Fourier transforms
Fourier series: Determination of Fourier coefficients (Euler's) – Dirichlet conditions for the existence of Fourier series -Fourier series of Even and odd functions – Fourier series in an arbitrary interval – Half-range Fourier sine and cosine expansions
Fourier transforms: Fourier integral theorem (without proof) – Fourier sine and cosine integrals-complex form of Fourier integral. Fourier transform – Fourier sine and cosine transforms – Properties – Inverse transforms – convolution theorem.

Textbooks:

1. S S Sastry, Introductory Methods of Numerical Analysis, PHI Learning Private Limited.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2017, 44th Edition

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley &Sons, 2018, 10th Edition.
2. R. K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Alpha Science International Ltd.,2021 5th Edition (9th reprint).
3. H. K Das, Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand publications,2014, Third Edition (Reprint 2021) Alan Jeffrey, Advanced Engineering Mathematics, Elsevier.

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc17_ma14/preview
2. https://onlinecourses.nptel.ac.in/noc24_ma05/preview
3. http://nptel.ac.in/courses/111105090

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-		
CO5	3	2	-	-	-	-	-	-	-	-	-	-		
Average	3	2.4	-	-	-	-	-	-	-	-	-	-	-	-
Level of correlation	3	2	-	-	-	-	-	-	-	-	-	-	-	-

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

II B. Tech - I Semester (ME)

L	T	P	C
2	1	0	3

23AMB01 UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT
(Common to All Branches of Engineering)

Course Outcomes:

CO1: Define the terms like Natural Acceptance, Happiness and Prosperity.
CO2: Identify one's self, and one's surroundings (family, society nature).
CO3: Apply what they have learnt to their own self in different day-to-day settings in real life
CO4: Relate human values with human relationship and human society.
CO5: Justify the need for universal human values and harmonious existence.

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 Goa

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
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

Textbooks and Teacher manuals:

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. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj – Pandit Sunderlal
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/UHVII%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf
2. https://fdp-si.aicte-india.org/UHVII%20Class%20Notes%20&%20Handouts/ UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf
3. https://fdp-si.aicte-india.org/UHVII%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf
4. https://fdp-si.aicte-india.org/UHVII%20Class%20Notes%20&%20Handouts/UHV%20Handout% 205 -Harmony%20in%20the%20Nature%20and%20Existence.pdf

Mapping of COs with POs & PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	3	3	2	-	-	-	-	-
CO2	-	-	-	-	-	-	3	3	2	-	-	-	-	-
CO3	-	-	-	-	-	-	3	3	2	-	-	-	-	-
CO4	-	-	-	-	-	-	3	3	2	-	-	-	-	-
CO5	-	-	-	-	-	-	3	3	-	-	-	-	-	-
Average	-	-	-	-	-	-	3	3	2	-	-	-	-	-
Level of correlation	-	-	-	-	-	-	3	3	2	-	-	-	-	-

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

II B. Tech - I Semester (ME)

L	T	P	C
2	0	0	2

23AME03 THERMODYNAMICS

Course Outcomes:

CO1: Explain the importance of thermodynamic properties related to conversion of heat energy into work.
CO2: Apply the Zeroeth and First Law of Thermodynamics.
CO3: Understand Second Law of Thermodynamics.
CO4: Analyze the Mollier charts, T-S and h-s diagrams, Steam calorimetry, Phase Transformations.
CO5: Evaluate the COP of refrigerating systems and properties, processes of psychrometry and sensible and latent heat loads.

UNIT I

Introduction: Basic Concepts: System, boundary, Surrounding, control volume, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Cycle – Reversibility – Quasi static Process, Irreversible Process, Causes of Irreversibility.

UNIT II

Energy in State and in Transition, Types, Work and Heat, Point and Path function. Zeroth Law of Thermodynamics – PMM-I, Joule's Experiment – First law of Thermodynamics and applications. Limitations of the First Law – Enthalpy, Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance.

UNIT III

Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries, PMM-II, Carnot's principle, Carnot cycle and its specialties, Thermodynamic scale of Temperature, Clausius Inequality, Entropy, Principle of Entropy Increase – Energy Equation, Availability and Irreversibility – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations – Elementary Treatment of the Third Law of Thermodynamics

UNIT IV

Pure Substances, P-V-T- surfaces, T-S and h-s diagrams, Mollier Charts, Phase Transformations – Triple point at critical state properties during change of phase, Dryness Fraction – Clausius – Clapeyron Equation Property tables. Mollier charts – Various Thermodynamic processes and energy Transfer – Steam Calorimetry.

UNIT V

Introduction to Refrigeration: working of Air, Vapour compression, VCR system Components, COP Refrigerants.

Introduction to Air Conditioning: Psychrometric properties & processes – characterization of sensible and latent heat loads – load concepts of SHF. Requirements of human comfort and concept of effective temperature-comfort chart – comfort air conditioning, and load calculations.

Textbooks:

1. P. K. Nag, Engineering Thermodynamics, 5/e, Tata McGraw Hill, 2013.
2. Claus Borgnakke Richard E. Sonntag, Fundamentals of Thermodynamics, 7/e, Wiley, 2009

Reference Books:

1. J.B. Jones, and R.E. Dugan, Engineering Thermodynamics, 1/e, Prentice Hall, 1995.
2. Y. A. Cengel & M.A. Boles, Thermodynamics – An Engineering Approach, 7/e, McGraw Hill, 2010.
3. P. Chattopadhyay, Engineering Thermodynamics, 1/e, Oxford University Press, 2011.
4. CP Arora, Refrigeration and Air-conditioning, 4/e, McGraw Hill, 2021.

Online Learning Resources:

1. https://www.edx.org/learn/thermodynamics.
2. https://www.youtube.com/watch?v=7NI5P4KqrAs&t=1s
3. https://kp.kiit.ac.in/pdf_files/02/Study-Material_3rdSemester_Winter_2021_Mechanical-Engg. Thermal-Engineering-1_AbhijitSamant.pdf
4. https://www.coursera.org/learn/thermodynamics-intr

Mapping of COs with POs & PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	1	-	1	-	-	-	-	-	3	2
CO2	3	2	2	-	-	-	-	-	-	-	-	-	3	2
CO3	3	2	2	-	1	-	-	-	-	-	-	-	3	2
CO4	3	2	2	-	1	-	-	-	-	-	-	-	3	2
CO5	3	2	2	-	1	-	-	-	-	-	-	-	3	2
Average	3	2	2	-	1	-	1	-	-	-	-	-	3	2
Level of correlation	3	2	2	-	1	-	1	-	-	-	-	-	3	2

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

II B. Tech - I Semester (ME)

L	T	P	C
3	0	0	3

23ACE08 MECHANICS OF SOLIDS

Course Outcomes:

CO1. Learn all the methods to analyze beams, columns, frames for normal, shear, and torsion stresses and to solve deflection problems in preparation for the design of such structural components.
CO2: Analyse beams and draw correct and complete shear and bending moment diagrams for beams.
CO3: Apply the concept of stress and strain to analyze and design structural members and machine parts under axial, shear and bending loads, and moments.
CO4: Model & analyze the behavior of basic structural members subjected to various load.
CO5: Design and analysis of Industrial components like pressure vessels.

UNIT I

Simple Stresses & Strains : Elasticity and plasticity – Types of stresses & strains–Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio & volumetric strain – Bars of varying section – composite bars – Temperature stresses- Complex Stresses - Stresses on an inclined plane under different uniaxial and biaxial stress conditions - Principal planes and principal stresses - Mohr's circle - Relation between elastic constants, Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

UNIT II

Shear Force and Bending Moment: Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l, uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT III

Flexural Stresses: Theory of simple bending, Derivation of bending equation, Determination of bending stresses – section modulus of rectangular, circular, I and T sections– Design of simple beam sections.
Shear Stresses: Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I and T sections.

UNIT IV

Deflection of Beams: Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, UDL and UVL. Mohr's theorem and Moment area method – application to simple cases.
Torsion: Introduction-Derivation- Torsion of Circular shafts- Pure Shear-Transmission of power by circular shafts, Shafts in series, Shafts in parallel.

UNIT V

Thin and Thick Cylinders: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in dia, and volume of thin cylinders– Thin spherical shells. Wire wound thin cylinders. Lame's equation – cylinders subjected to inside & outside pressures – compound cylinders.
COLUMNS: Buckling and Stability, Columns with Pinned ends, Columns with other support Conditions, Limitations of Euler's Formula, Rankine's Formula.

Textbooks:

1. GH Ryder, Strength of materials, Palgrave Macmillan publishers India Ltd, 1961.
2. B.C. Punmia, Strength of materials,10/e, Lakshmi publications Pvt. Ltd, New Delhi, 2018.

Reference Books:

1. Gere &Timoshenko, Mechanics of materials, 2/e, CBS publications, 2004.
2. U.C. Jindal, Strength of Materials, 2/e, Pearson Education, 2017.
3. Timoshenko, Strength of Materials Part – I& II, 3/e, CBS Publishers, 2004.
4. Andrew Pytel and Ferdinand L. Singer, Strength of Materials,4/e, Longman Publications, 1990.
5. Popov, Mechanics of Solids, 2/e, New Pearson Education, 2015.

Online Learning Resources:

- https://onlinecourses.nptel.ac.in/noc19_ce18/preview.
- https://youtube/iY_ypychVNY?si=310htc4ksTQJ8Fv6.
- https://www.youtube.com/watch?v=WEy939Rkd_M&t=2s
- https://www.classcentral.com/course/swayam-strength-of-materials-iitm-184204
- https://www.coursera.org/learn/mechanics-1
- https://archive.nptel.ac.in/courses/112/107/112107146

Mapping of COs with POs & PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	2
CO2	3	3	-	-	-	-	-	-	-	-	-	-	-	2
CO3	3	3	-	-	-	-	-	-	-	-	-	-	-	2
CO4	3	3	-	-	-	-	-	-	-	-	-	-	-	2
CO5	3	3	-	-	-	-	-	-	-	-	-	-	-	2
Average	3	3	-	-	-	-	-	-	-	-	-	-	-	2
Level of correlation	3	3	-	-	-	-	-	-	-	-	-	-	-	2

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

II B. Tech - I Semester (ME)

L	T	P	C
3	0	0	3

23AME04 MATERIAL SCIENCE & METALLURGY

Course Outcomes:

CO1. Understand the crystalline structure of different metals and study the stability of phases in different alloy systems.
CO2: Study the behavior of ferrous and non-ferrous metals and alloys and their application in different domains.
CO3: Understand the effect of heat treatment, addition of alloying elements on properties of ferrous metals.
CO4: Grasp the methods of making of metal powders and applications of powder metallurgy.
CO5: Comprehend the properties and applications of ceramic, composites and other advanced methods.

UNIT I

Structure of Metals and Constitution of alloys: Crystallization of metals, Packing Factor - SC, BCC, FCC& HCP-line density, plane density. Grain and grain boundaries, effect of grain boundaries–determination of grain size. Imperfections, Slip and Twinning. Necessity of alloying, types of solid solutions, Hume Rothay's rules, intermediate alloy phases, and electron compounds

Equilibrium Diagrams: Experimental methods of construction of equilibrium diagrams, Isomorphs alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, paratactic reaction. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of binary phase diagrams such as Cu-Ni and Fe-Fe3C.

UNIT II

Ferrous metals and alloys: Structure and properties of White Cast iron, Malleable Cast iron, grey cast-iron, Spheroidal graphite cast-iron, Alloy cast-iron. Classification of steels, structure and properties of plain carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels. Non-ferrous Metals and Alloys: Structure and properties of copper and its alloys, Aluminium and its alloys, Titanium and its alloys, Magnesium and its alloys, Super alloys.

UNIT III

Heat treatment of Steels: Effect of alloying elements on Fe-Fe3C system, annealing, normalizing, hardening, TTT diagrams, tempering, hardenability, surface - hardening methods, age hardening treatment, Cryogenic treatment.

UNIT IV

Powder Metallurgy: Basic processes- Methods of producing metal powders- milling atomization-Granulation-Reduction-Electrolytic Deposition. Compacting methods – Sintering - Methods of manufacturing sintered parts. Secondary operations, Applications of powder metallurgical products.

UNIT V

Ceramic and Advanced materials: Crystalline ceramics, glasses, cermets, abrasive materials, Classification of composites, manufacturing methods, particle reinforced composites, fiber reinforced composites, PMC, MMC, CMC and CCCs. Introduction to Nanomaterials and smart materials.

Textbooks:

1. S. H. Avner, Introduction to Physical Metallurgy, 2/e, Tata McGraw- Hill, 1997.
2. Donald R. Askeland, Essentials of Materials science and Engineering, 4/e, CL Engineering publications, 2018.

Reference Books:

1. Dr. V. D. kodgire, Material Science and Metallurgy, 39/e, Everest Publishing House, 2017.
2. V. Raghavan, Material Science and Engineering, 5/e, Prentice Hall of India, 2004.
3. William D. Callister Jr, Materials Science and Engineering: An Introduction, 8/e, John Wiley and Sons, 2009.

4. George E. Dieter, Mechanical Metallurgy, 3/e, McGraw-Hill, 2013.
5. Yip-Wah Chung, Introduction to Material Science and Engineering, 2/e, CRC Press, 2022.
6. A V K Suryanarayana, Material Science and Metallurgy, B S Publications, 2014.
7.. U. C. Jindal, Material Science and Metallurgy, 1/e, Pearson Publications, 2011.

Online Learning Resources:

1. https://archive.nptel.ac.in/courses/113/106/113106032/
2. https://www.edx.org/learn/mechanics/massachusetts-institute-of-technologymechanical-behavior-of-materials-part-3-time-dependent-behavior.
3. https://www.youtube.com/watch?v=9Sf278j1GTU
4. https://www.coursera.org/learn/fundamentals-of-materials-science
5. https://www.coursera.org/learn/material-behavior.

Mapping of COs with POs & PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	3	3
CO3	3	3	-	-	-	-	-	-	-	-	-	-	3	3
CO4	3	3	-	-	-	-	-	-	-	-	-	-	3	3
CO5	3	3	-	-	-	-	-	-	-	-	-	-	3	3
Average	3	3	-	-	-	-	-	-	-	-	-	-	3	3
Level of correlation	3	3	-	-	-	-	-	-	-	-	-	-	3	3

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

II B. Tech - I Semester (ME)

L	T	P	C
0	0	3	1.5

23ACE12 MECHANICS OF SOLIDS & MATERIAL SCIENCE LAB

Course Outcomes:

CO1: Understand the stress strain behavior of different materials.
CO2: Evaluate the hardness of different materials.
CO3: Explain the relation between elastic constants and hardness of materials.
CO4: Identify various microstructures of steels and cast irons.
CO5: Evaluate hardness of treated and untreated steels.

NOTE: Any 6 experiments from each section A and B.

A) MECHANICSOFSOLIDSLAB:

1. Tensile test
2. Bending test on a) Simply supported beam b) Cantilever beam
3. Torsion test
4. Hardness test a) Brinell's hardness test b) Rockwell hardness test c) Vickers hardness test
5. Test on springs
6. Impact test a) Charpy test b) Izod test
7. Punch shear test
8. Liquid penetration test

B) MATERIAL SCIENCELAB:

1. Preparation and study of the Microstructure of pure metals.
2. Preparation and study of the Microstructure of Mild steel, medium carbon steels, and High carbon steels.
3. Study of the Microstructures of Cast Irons.
4. Study of the Microstructures of Non-Ferrous alloys.
5. Study of the Microstructures of Heat-treated steels.
6. Hardenability of steels by Jominy End Quench Test.

Virtual lab:

1. To investigate the principal stresses σa and σb at any given point of a structural element or machine component when it is in a state of plane stress.
(https://virtuallabs.github.io/exp-rockwell-hardness-experiment-iiith/objective.html)

2. To find the impact resistance of mild steel and cast iron.
(https://smnitk.vlabs.ac.in/exp/izod-impact-test).

3. To find the impact resistance of mild steel.
(https://sm-nitk.vlabs.ac.in/exp/charpyimpact-test/index.html)

4. To find the Rockwell hardness number of mild steel, cast iron, brass, aluminum and spring steel etc.
(https://sm-nitk.vlabs.ac.in/exp/rockwell-hardness-test)

5. To determine the indentation hardness of mild steel, brass, aluminum etc. using Vickers hardness testing machine.
(https://sm-nitk.vlabs.ac.in/exp/vickers-hardnesstes

Mapping of COs with POs & PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	3	-	-	-	3	3
CO2	3	3	-	-	3	-	-	-	3	-	-	-	3	3
CO3	3	3	-	-	3	-	-	-	3	-	-	-	3	3
CO4	3	3	-	-	3	-	-	-	3	-	-	-	3	3
CO5	3	3	-	-	3	-	-	-	3	-	-	-	3	3
Average	3	3	-	-	3	-	-	-	3	-	-	-	3	3
Level of correlation	3	3	-	-	3	-	-	-	3	-	-	-	3	3

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

II B. Tech - I Semester (ME)

L	T	P	C
0	0	3	1.5

23AME06 COMPUTER-AIDED MACHINE DRAWING

Course Outcomes:

CO1: Demonstrate the conventional representations of materials and machine components.
CO2: Model riveted, welded and key joints using CAD system.
CO3: Create solid models and sectional views of machine components
CO4: Generate solid models of machine parts and assemble them.
CO5: Translate 3D assemblies into 2D drawings.

The following are to be done by any 2D software package

Conventional representation of materials and components:
Detachable joints: Drawing of thread profiles, hexagonal and square-headed bolts and nuts, bolted joint with washer and locknut, stud joint, screw joint and foundation bolts.
Riveted joints: Drawing of rivet, lap joint, butt joint with single strap, single riveted, double riveted double strap joints.
Welded joints: Lap joint and T joint with fillet, butt joint with conventions.
Keys: Taper key, sunk taper key, round key, saddle key, feather key, woodruff key.
Couplings: rigid – Muff, flange; flexible – bushed pin-type flange coupling, universal coupling, Oldham's' coupling.

The following exercises are to be done by any 3D software package:

Sectional views:
Creating solid models of complex machine parts and sectional views.
Assembly drawings:(Any four of the following using solid model software)
Lathe tool post, tool head of shaping machine, tail-stock, machine vice, gate valve, carburetor, piston, connecting rod, eccentric, screw jack, plumber block, axle bearing, pipe vice, clamping device, Geneva cam, universal coupling.

Production drawing:
Representation of limits, fits and tolerances for mating parts. Use any four parts of above assembly drawings and prepare manufacturing drawing with dimensional and geometric tolerances.

Textbooks:
1. Machine Drawing by K .L. Narayana, P. Kannaiah and K. Venkat Reddy, New Age International Publishers, 3/e, 2014
2. Machine drawing by N. Sideshwar, P. Kannaiah, V. V. S. Sastry, TMH Publishers. 2014.

Reference Books:
1. Cecil Jensen, Jay Helsel and Donald D. Voisinet, Computer Aided Engineering Drawing, Tata McGraw- Hill, NY, 2000.
2. James Barclay, Brain Griffiths, Engineering Drawing for Manufacture, Kogan Page Science, 2003.
3. N. D. Bhatt, Machine Drawing, Charotar Publishers, 50/e, 2014.

Online Learning Resources:
- https://eeedocs.wordpress.com/wp-content/uploads/2014/02/machinedrawing.pdf
- https://archive.nptel.ac.in/courses/112/105/112105294/
- https://www.youtube.com/watch?v=0bQkS3_3Fq

Mapping of COs with POs & PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	3	-	-	-	3	-	-	-	3	3
CO2	3	3	3	-	3	-	-	-	3	-	-	-	3	3
CO3	3	3	3	-	3	-	-	-	3	-	-	-	3	3
CO4	3	3	3	-	3	-	-	-	3	-	-	-	3	3
CO5	3	3	3	-	3	-	-	-	3	-	-	-	3	3
Average	3	3	3	-	3	-	-	-	3	-	-	-	3	3
Level of correlation	3	3	3	-	3	-	-	-	3	-	-	-	3	3

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

II B. Tech - I Semester (ME)

L	T	P	C
0	0	2	1

23AEC07 EMBEDDED SYSTEMS and IoT

Course Outcomes:

CO1: Comprehend Microcontroller-Transducers Interface techniques.
CO2: Establish Serial Communication link with Arduino
CO3: Analyse basics of SPI interface.
CO4: Understand the concept of M2M (machine to machine) with necessary protocols and get awareness in implementation of distance sensor.
CO5: Realize the revolution of internet in mobile devices, cloud and sensor networks.

Embedded Systems Experiments: (Any 5 experiments from the following)

1. Measure Analog signal from Temperature Sensor.
2. Generate PWM output.
3. Drive single character generation on Hyper Terminal.
4. Drive a given string on Hyper Terminal.
5. Full duplex Link establishment using Hyper terminal.
6. Drive a given value on a 8 bit DAC consisting of SPI.
7. Drive Stepper motor using Analog GPIOs.
8. Drive Accelerometer and Display the readings on Hyper Terminal.

COMPONENTS/ BOARDS: 1. Arduino Duemilanove Board 2. Arduino Software ID

Text Books:

1. Embedded Systems Architecture- By Tammy Noergaard, Elsevier Publications, 2013.
2. Embedded Systems-By Shibu. K.V-Tata McGraw Hill Education Private Limited, 2013.
3. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley Publications, 2013.
4. Embedded Systems-Lyla B. Das-Pearson Publications, 2013.

Internet of Things Experiments: (Any 5 experiments from the following)

1. Getting started with Raspberry Pi, Install Raspian on your SD card.
2. Python-based IDE (integrated development environments) for the Raspberry Pi and how to trace
3. and debug Python code on the device.
4. Using Raspberry pi a. Calculate the distance using distance sensor. b. Basic LED functionality.
5. Raspberry Pi interacts with online services through the use of public APIs and SDKs.
6. Study and Install IDE of Arduino and different types of Arduinos.
7. Study and Implement Zigbee Protocol using Arduino / Raspberry Pi.
8. Calculate the distance using distance sensor Using Arduino.
9. Basic LED functionality Using Arduino and Node MCU.
10. Calculate the moisture content in the soil using Arduino and Node MCU.
11. Calculate the distance using distance sensor Using Node MCU.
12. Basic LED functionality Using Node MCU

Mapping of COs with POs & PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	3	-	-	-	3	-	-	-	3	3
CO2	3	3	3	-	3	-	-	-	3	-	-	-	3	3
CO3	3	3	3	-	3	-	-	-	3	-	-	-	3	3
CO4	3	3	3	-	3	-	-	-	3	-	-	-	3	3
CO5	3	3	3	-	3	-	-	-	3	-	-	-	3	3
Average	3	3	3	-	3	-	-	-	3	-	-	-	3	3
Level of correlation	3	3	3	-	3	-	-	-	3	-	-	-	3	3

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

II B. Tech - I Semester (ME)

L	T	P	C
0	0	2	1

23ACS09 PYTHON PROGRAMMING (SKILL ENHANCEMENT COURSE)

Course Outcomes:

CO1: Classify data structures of Python.

CO2: Apply Python programming concepts to solve a variety of computational problems.

CO3: Understand the principles of object-oriented programming (OOP) in Python, including classes, objects, inheritance, polymorphism, and encapsulation, and apply them to design and implement Python programs.

CO4: Become proficient in using commonly used Python libraries and frameworks such as JSON, XML, NumPy, pandas.

CO5: Exhibit competence in implementing and manipulating fundamental data structures such as lists, tuples, sets, dictionaries.

CO6: Propose new solutions to computational problems.

UNIT I

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

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

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

Sample Experiments:

1. Write a program to find the largest element among three Numbers.
2. Write a Program to display all prime numbers within an interval
3. Write a program to swap two numbers without using a temporary variable.
4. Demonstrate the following Operators in Python with suitable examples.

i) Arithmetic Operators ii) Relational Operators iii) Assignment Operators iv) Logical Operators v) Bit wise Operators vi) Ternary Operator vii) Membership Operators viii) Identity Operators

5. Write a program to add and multiply complex numbers
6. Write a program to print multiplication table of a given number.

UNIT II

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

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

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

Sample Experiments:

7. Write a program to define a function with multiple return values.
8. Write a program to define a function using default arguments.
9. Write a program to find the length of the string without using any library functions.
10. Write a program to check if the substring is present in a given string or not.
11. Write a program to perform the given operations on a list:

i. Addition ii. Insertion iii. slicing

UNIT III

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

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

Sample Experiments:

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

UNIT IV

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

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

Sample Experiments:

18. Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper-case words from source must be lowered.
19. Python program to print each line of a file in reverse order.
20. Python program to compute the number of characters, words and lines in a file.
21. Write a program to create, display, append, insert and reverse the order of the items in the array.
22. Write a program to add, transpose and multiply two matrices.
23. Write a Python program to create a class that represents a shape. Include methods to calculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square.

UNIT V

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

Sample Experiments:

24. Python program to check whether a JSON string contains complex object or not.
25. Python Program to demonstrate NumPy arrays creation using array () function.
26. Python program to demonstrate use of ndim, shape, size, dtype.
27. Python program to demonstrate basic slicing, integer and Boolean indexing.
28. Python program to find min, max, sum, cumulative sum of array
29. Create a dictionary with at least five keys and each key represent value as a list where this list contains at least ten values and convert this dictionary as a pandas data frame and explore the data through the data frame as follows:
    a) Apply head () function to the pandas data frame
    b) Perform various data selection operations on Data Frame
30. Select any two columns from the above data frame, and observe the change in one attribute with respect to other attribute with scatter and plot operations in matplotlibe.

Text Books:

1. Arsheep Bahga &Vijay Madisetti, Internet of Things - A Hands-on Approach, 1/e, Orient Blackswan Private Limited - New Delhi, 2015.
2. Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015.
3. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014.

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.
4. Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015.

5. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014.

Online Learning Resources/Virtual Labs:

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

Online Learning Sources

1. https://onlinecourses.nptel.ac.in/noc20_ee98/preview
2. https://archive.nptel.ac.in/courses/108/105/108105057/
3. Virtual Labs - http://vlabs.iitkgp.ac.in/rtes/
4. Virtual Labs -https://cse02-iiith.vlabs.ac.in/
5. Virtual Labs - https://iotvirtuallab.github.io/vlab/Experiments/index.html

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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CO2	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	3	3	3	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO6	3	3	-	-	-	-	-	-	-	-	-	-	-	-
Average	3	3	3	2.5	3	-	-	-	-	-	-	-	-	-
Level of correlation	3	3	3	3	3	-	-	-	-	-	-	-	-	-

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

II B. Tech - I Semester (ME)

L	T	P	C
2	0	0	0

23AHS18 ENVIRONMENTAL SCIENCE

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 resource.

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, 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.

Text Books:

1. Textbook of Environmental Studies for Undergraduate Courses Erach Bharucha for University Grants Commission, Universities Press.
2. Palaniswamy, "Environmental Studies", Pearson education
3. S. Azeem Unnisa, "Environmental Studies" Academic Publishing Company
4. K. Raghavan Nambiar, "Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus", Scitech Publications (India), Pvt. Ltd.

Reference Books:

1. Deeksha Dave and E. Sai Baba Reddy, "Textbook of Environmental Science", Cengage Publications.
2. M. Anji Reddy, "Text book of Environmental Sciences and Technology", BS Publication.
3. J. P. Sharma, Comprehensive Environmental studies, Laxmi publications.
4. J. Glynn Henry and Gary W. Heinke, "Environmental Sciences and Engineering", Prentice hall of India Private limited.
5. G. R. Chatwal, "A Text Book of Environmental Studies" Himalaya Publishing House
6. Gilbert M. Masters and Wendell P. Ela, "Introduction to Environmental Engineering and Science, Prentice hall of India Private limited.

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	-	3	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	3	-	-	-	-	-	-	-
CO3	2	-	-	-	-	-	3	-	-	-	-	-	-	-
CO4	2	-	-	-	-	-	3	-	-	-	-	-		
Average	2	-	-	-	-	-	3	-	-	-	-	-	-	-
Level of correlation	2	-	-	-	-	-	3	-	-	-	-	-	-	-

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

II B. Tech - I Semester (Common to All Branches)

L	T	P	C
2	0	0	0

23AHS24 QUANTITATIVE APTITUDE AND REASONING - I

Course Outcomes:

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

1. Develop the thinking ability to meet the challenges in solving Logical Reasoningproblems.
2. Solve campus placements aptitude papers covering Quantitative Ability and VerbalAbility.
3. Apply different placement practice techniques.

UNIT- I **6 Hours**

QUANTITATIVE ABILITY – I: Vedic Maths – Square - Square root – Cube - Cube root –Higher Roots - Fractions (+, -, ×, ÷)– Decimal Fractions(+, -, ×, ÷) –LCM and HCF – VBODMAS Rule - Simplifications - Number System [Introduction –p/q forms –Factors – Multiples – Prime Numbers – Composite Numbers – Twin Primes – Co-Primes, Different Types of Numbers, Number of factors – Sum of factors – Unit's place value – Remainder theorem – Number of Zeros at the end of the product - Divisibility Rules –Prime Number Checking –Relation among Quotient, Divident, Divisor & Remainder - Formulae, Application type of problems]

UNIT-II **6 Hours**

QUANTITATIVE ABILITY – II: Ratio, Proportion & Variation [Definition of ratio, Types of Ratios, Principles of Ratios, Comparison of Ratios, Definition of Proportion, Types of Proportion, Principle of Proportion, Properties of Proportion, Variation & Types of variations]– Partnership & Share[Definition of partnership, Types of partnership, Simple Partnership & Compound Partnership, profits ratio, Application type of problems] – Average & Ages[Definition of Average, Average of Natural Numbers, Even Numbers, Odd Numbers, Prime Numbers, Application type of problems] – Mixture & Alligation [Definition of Mixture & Alligation, Mixture Formula, Alligation Rule, Application type of Problems]

UNIT-III **6 Hours**

REASONING ABILITY I: Number Series – Number Analogy – Number Odd Man Out – Wrong Number – Letter Series – Letter Analogy – Letter Odd Man

UNIT-IV **6 Hours**

VERBAL I: Verbal analogy - Types - Parts of Speech – Noun, Pronoun, Adjective, Verb, Adverb, Preposition, Conjunction and Interjection - Prepositions –Preposition of Place, Preposition of Placement, Preposition of Time and Preposition of Duration - Articles – Usage of a, an, the, Omission of articles - Sentences - Pattern and Types.

UNIT-V **6Hours**

SOFT SKILL I: Communication Skills - Self-Confidence - Introductions & Greetings - Presentation Skills - Self-Motivation

Text Books:

1. Quantitative Aptitude, Logic Reasoning & Verbal Reasoning, R S Agarwal, S. ChandPublications-2022
2. Quantitative Aptitude for Competitive Examinations, R S Agarwal, S. Chand Publications-2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Average	**2.3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Level of correlation	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

II B. Tech - II Semester (ME)

L	T	P	C
2	0	0	2

23AME07 INDUSTRIAL MANAGEMENT

Course Outcomes:

CO1: Learn about how to design the optimal layout.
CO2: Demonstrate work study methods.
CO3: Explain Quality Control techniques.
CO4: Discuss the financial management aspects.
CO5: Understand the human resource management methods.

UNIT I

Introduction: Definition of industrial engineering (I.E), development, applications, role of an industrial engineer, Quantitative tools of IE and productivity measurement. Concepts of management, importance, function so management, scientific management, Taylor's principles, Fayal's principles of management.
Plant layout: Factors governing plant location, types of production layouts, advantages and disadvantages of process layout and product layout, applications, quantitative techniques for optimal design of layouts.

UNIT II

Work Study: Importance, types of production, applications, work study, method study and Time study, work sampling, PMTS, micromotion study, rating techniques, MTM, work factor system, principles of Ergonomics, flow process charts, string diagrams and Therbligs.

UNIT III

Statistical Quality Control: Quality control, Queuing assurance and its importance, SQC, attribute sampling inspection with single and double sampling, Control charts – X and R –charts X and S charts and their applications, simple numerical examples.
Total Quality Management: Elements of TQM – Continuous Improvement – zero defect concept, quality circles, implementation, applications, ISO quality systems. Six Sigma– definition, basic concepts.

UNIT IV

Financial Management: Scope and nature of financial management, Sources of finance, Management of working capital, estimation of working capital requirements, budget and budgetary control, Capital budgeting – Nature of Investment Decisions– Investment Evaluation criteria-NPV, IRR, PI, Payback Period, and ARR, numerical problems.

UNIT V

Human Resource Management: Concept of human resource management, per sonnet management and industrial relations, functions of personnel management, Job evaluation, its importance and types, merit rating, quantitative methods, wage incentive plans, and types.
Value Analysis: Value engineering, implementation procedure, enterprise resource planning and supply chain management.

Text Books:

1. O. P Khanna, Industrial Engineering and Management, Dhanpat Rai Publications (P)Ltd.
2. Martand Telsang, Industrial Engineering and Production Management, S. Chand & Company Ltd. New Delhi.

Reference Books:

1. Bhattacharya DK, Industrial Management, S.Chand, publishers.
2. J.G Monks, Operations Management, 3/e, McGraw Hill Publishers.
3. T.R. Banga, S.C. Sharma, N. K. Agarwal, Industrial Engineering and Management Science, Khanna Publishers.

4. Koontz O'Donnell, Principles of Management, McGraw Hill Publishers.
5. R.C. Gupta, Statistical Quality Control, Khanna Publishers.
6. NVS Raju, Industrial Engineering and Management, Cengage India Private Limited.

Online Learning Sources

- https://onlinecourses.nptel.ac.in/noc21_me15/preview
- https://onlinecourses.nptel.ac.in/noc20_mg43/preview
- https://www.edx.org/learn/industrial-engineering
- https://youtube.com/playlist?list=PL299B5CC87110A6E7&si=TghLCbEobuxjEaXi
- https://youtube.com/playlist?list=PLbjTnjt5Gkl0z3OHOGK5RB9mvNYvnImW&si=oaX_5RG69hS3v2ll

Mapping of COs with POs & PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	2	-	-	-	-	3	-	-	-
CO2	-	-	2	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	2	-	-	-	-	3	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	3	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	3	-	-	-
Average	-	-	2	-	-	2	-	-	-	-	3	-	-	-
Level of correlation	-	-	2	-	-	2	-	-	-	-	3	-	-	-

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

II B. Tech - II Semester (ME)

L	T	P	C
3	0	0	3

23AHS19 COMPLEX VARIABLES, PROBABILITY AND STATISTICS

Course Outcomes:

CO1: Analyze limit, continuity and differentiation of functions of complex variables and Understand Cauchy-Riemann equations, analytic functions and various properties of analytic functions.

CO2: Understand Cauchy theorem, Cauchy integral formulas and apply these to evaluate complex contour integrals. Classify singularities and poles; find residues and evaluate complex integrals using the residue theorem.

CO3: Apply Probability theory to find the chances of happening of events.

CO4: Understand various probability distributions and calculate their statistical constants.

UNIT I

Complex Variable – Differentiation

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

UNIT II

Complex Variable – Integration

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

UNIT III

Probability theory

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

UNIT IV

Random variables & Distributions

Random variables (discrete and continuous), probability density functions, properties, mathematical expectation Probability distribution - Binomial, Poisson approximation to the binomial distribution, Normal distribution and their properties.

UNIT V

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.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, KhannaPublishers,2017, 44th Edition.
2. Miller and Freunds, Probability and Statistics for Engineers,7/e, Pearson, 2008.

Reference Books:

1. R.K. Jainand S.R.K. Iyengar, Advanced Engineering Mathematics, Alpha Science International Ltd.,2021 5th Edition (9th reprint).
2. B.V. Ramana, Higher Engineering Mathematics, Mc Graw Hill publishers
3. W. Feller, an Introduction to Probability Theory and its Applications, 1/e, Wiley, 1968.

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc20_ma50/preview
2. https://archive.nptel.ac.in/courses/111/106/111106111

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	1	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-		
Average	3	2.5	-	1	-	-	-	-	-	-	-	-	-	-
Level of correlation	3	3	-	1	-	-	-	-	-	-	-	-	-	-

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

II B. Tech - II Semester (ME)

L	T	P	C
3	0	0	3

23AME08 MANUFACTURING PROCESSES

Course Outcomes:

CO1: Design the patterns and core boxes for metal casting processes.
CO2: Design the patterns and core boxes for metal casting processes.
CO3: Demonstrate the different types of bulk forming processes
CO4: Understand sheet metal forming processes.
CO5: Learn about the different types of additive manufacturing processes

UNIT I

Casting: Steps involved in making a casting – Advantage of casting and its applications. Patterns and Pattern making – Types of patterns – Materials used for patterns, pattern allowances and their construction, Molding, different types of cores, Principles of Gating, Risers, casting design considerations. Methods of melting and types of furnaces, Solidification of castings and casting defects- causes and remedies. Basic principles and applications of special casting processes - Centrifugal casting, Die casting, Investment casting and shell molding.

UNIT II

Welding: Classification of welding processes, types of welded joints and their characteristics, Gas welding, Different types of flames and uses, Oxy – Acetylene Gas cutting. Basic principles of Arc welding, power characteristics, Manual metal arc welding, submerged arc welding, TIG & MIG welding. Electro–slag welding. Resistance welding, Friction welding, Friction stir welding, Forge welding, Explosive welding; Thermit welding, Plasma Arc welding, Laser welding, electron beam welding, Soldering &Brazing. Heat affected zones in welding; pre & post heating, welding defects –causes and remedies.

UNIT III

Bulk Forming: Plastic deformation in metals and alloys-recovery, recrystallization and grain growth. Hot working and Cold Working-Strain hardening and Annealing. Bulk forming processes: Forging-Types of Forging, forging defects and remedies; Rolling – fundamentals, types of rolling mills and products, Forces in rolling and power requirements. Extrusion and its characteristics. Types of extrusion, Impact extrusion, Hydrostatic extrusion; Wire drawing and Tube drawing.

UNIT IV

Sheet metal Forming: Blanking and piercing, Forces and power requirement in these operations, Deep drawing, Stretch forming, Bending, Spring back and its remedies, Coining, Spinning, Types of presses and press tools. High energy rate forming processes: Principles of explosive forming, electromagnetic forming, Electrohydraulic forming, rubber pad forming, advantages and limitations.

UNIT V

Additive manufacturing: Steps in Additive Manufacturing (AM), Classification of AM processes, Advantages of AM, and types of materials for AM, VAT photo polymerization AM Processes, Extrusion - Based AM Processes, Powder Bed Fusion AM Processes, Direct Energy Deposition AM Processes, Post Processing of AM Parts, Applications.

Text Books:

1. Kalpak Jain S and Steven R Schmid, Manufacturing Processes for Engineering Materials, 5/e, Pearson Publications, 2007.
2. P.N. Rao, Manufacturing Technology -Vol I, 5/e, McGraw Hill Education, 2018.

Reference Books:

1. A. Ghosh & A. K. Malik, Manufacturing Science, East West Press Pvt. Ltd, 2010.
2. Lindberg and Roy, Processes and materials of manufacture, 4/e, Prentice Hall India Learning Private Limited, 1990.
3. R.K. Jain, Production Technology, Khanna Publishers, 2022.

4. Sharma P.C., A Text book of Production Technology, 8/e, S Chand Publishing, 2014.
5. H.S. Shaun, Manufacturing Processes, 1/e, Pearson Publishers, 2012.
6. WAJ Chapman, Workshop Technology, 5/e, CBS Publishers & Distributors Pvt. Ltd, 2001.
7. Hindustan Machine Tools, Production Technology, Tata McGraw Hill Publishers, 2017.
8. Ian Gibson, David W Rosen, Brent Stucker., Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, 2/e, Springer, 2015

Online Learning Resources:

1. https://www.edx.org/learn/manufacturing/massachusetts-institute-of-technologyfundamentals-of-manufacturing-processes
2. https://onlinecourses.nptel.ac.in/noc21_me81/preview
3. www.coursera.org/learn/introduction-to-additive-manufacturing-processessera
4. https://archive.nptel.ac.in/courses/112/103/112103263/
5. https://elearn.nptel.ac.in/shop/nptel/principles-of-metal-formingtechnology/?v=c86ee0d9d7ed

Mapping of COs with POs & PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	-	-	-	-	-	-	-	-	3	3
CO2	3	2	-	-	-	-	-	-	-	-	-	-	3	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	3	-
CO4	3		-	-	-	-	-	-	-	-	-	-	3	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-	3	-
Average	3	2	2	-	-	-	-	-	-	-	-	-	3	3
Level of correlation	3	2	2	-	-	-	-	-	-	-	-	-	3	3

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

II B. Tech - II Semester (ME)

L	T	P	C
3	0	0	3

23ACE17 FLUIDMECHANICS & HYDRAULIC MACHINES

Course Outcomes:

CO1: Understand the basic concepts of fluid properties.
CO2: Estimate the mechanics of fluids in static and dynamic conditions.
CO3: Apply the Boundary layer theory, flow separation and dimensional analysis.
CO4: Estimate the hydrodynamic forces of jet on vanes in different positions.
CO5: Understand the working Principles and performance evaluation of hydraulic pump and turbine.

UNIT I

Fluid statics: Dimensions and units: physical properties of fluids - specific gravity, viscosity and its significance, surface tension, capillarity, vapor pressure. Atmospheric, gauge and vacuum pressure, Measurement of pressure – Manometers - Piezometer, U-tube, inverted and differential manometers. Pascal's & hydrostatic laws.

Buoyancy and floatation: Meta center, stability of floating body. Submerged bodies. Calculation of metacenter height. Stability analysis and applications.

UNIT II

Fluid kinematics: Introduction, flow types. Equation of continuity for one dimensional flow, circulation and vorticity, Stream line, path line and streak lines and stream tube. Stream function and velocity potential function, differences and relation between them. Condition for irrational flow, flow net, source and sink, doublet and vortex flow.

Fluid dynamics: surface and body forces –Euler's and Bernoulli's equations for flow along a streamline, momentum equation and its applications, force on pipe bend.

Closed conduit flow: Reynold's experiment- Darcy Weisbach equation- Minor losses in pipes-pipesinseriesandpipesinparallel-totalenergyline-hydraulicgradientline.

UNIT III

Boundary Layer Theory: Introduction, momentum integral equation, displacement, momentum and energy thickness, separation of boundary layer, control of flow separation, Stream lined body, Bluff body and its applications, basic concepts of velocity profiles.

Dimensional Analysis: Dimensions and Units, Dimensional Homogeneity, Non-dimensionalization of equations, Method of repeating variables and Buckingham Pi Theorem.

UNIT IV

Basics of turbo machinery: hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jets tricking centrally and at tip, velocity diagrams, work done a deficiency, flow Over radial vanes.

Hydraulic Turbines: classification f turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design – draft tube-theory-functions and efficiency.

UNIT V

Performance of hydraulic turbines: Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer. Hydraulic systems- hydraulic ram, hydraulic lift, hydraulic coupling. Fluidics – amplifiers, sensors and oscillators. Advantages, limitations and applications.

Centrifugal pumps: classification, working, work done – monomeric head- losses and efficiencies-specific speed- pumps in series and parallel-performance characteristic curves, cavitation & NPSH.

Reciprocating pumps: Working, Discharge, slip, Indicator diagram.

Text Books:

1. Y.A. Cengel, J.M. Cimbala, Fluid Mechanics, Fundamentals and Applications,6/e, McGraw Hill Publications, 2019.

2. Dixon, Fluid Mechanics and Thermodynamics of Turbomachinery,7/e, Elsevier Publishers, 2014.

Reference Books:

1. P N Modi and S M Seth, Hydraulics & Fluid Mechanics including Hydraulics Machines, Standard Book House, 2017.
2. RK Bansal, Fluid Mechanics and Hydraulic Machines, 10/e, Laxmi Publication s(P)Ltd, 2019.
3. Rajput, Fluid Mechanics and Hydraulic Machines, S Chand & Company, 2016.
4. D.S. Kumar, Fluid Mechanics and Fluid Power Engineering, S K Kataria &Sons, 2013.
5. D.Rama Durgaiah,Fluid Mechanics and Machinery,1/e, New Age International, 2002.

Online Learning Resources:

1. https://archive.nptel.ac.in/courses/112/105/112105206/
2. https://archive.nptel.ac.in/courses/112/104/112104118/
3. https://www.edx.org/learn/fluid-mechanics
4. https://onlinecourses.nptel.ac.in/noc20_ce30/previewnptel.ac.in
5. www.coursera.org/learn/fluid-powerer

Mapping of COs with POs & PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-	-	-
Average	3	3	2.33	-	-	-	-	-	-	-	-	-	-	-
Level of correlation	3	3	2	-	-	-	-	-	-	-	-	-	-	-

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

II B. Tech - II Semester (ME)

L	T	P	C
3	0	0	3

23AME09 THEORY OF MACHINES

Course Outcomes:

CO1: Understand different mechanisms and their inversions.
CO2: Calculate velocity and acceleration of different links in a mechanism.
CO3: Apply the effects of gyroscopic couple in ships, aero planes and road vehicles.
CO4: Evaluate unbalance mass in rotating machines.
CO5: Analyze free and forced vibrations of single degree freedom systems.

UNIT I

Simple Mechanisms: Classification of mechanisms – Basic kinematic concepts and definitions – Degree of freedom, mobility – Grashof's law, kinematic inversions of four bar chain and slider crank chains- Limit positions – Mechanical advantage- Transmission angle- Description of some common mechanisms- Quick return mechanism, straight line mechanisms – Universal Joint – Rocker mechanisms.

UNIT II

Plane and motion analysis: Displacement, velocity and acceleration analysis of simple mechanisms, graphical velocity analysis using instantaneous centers, velocity and acceleration analysis using loop closure equations – kinematic analysis of simple mechanisms – slider crank mechanism dynamics – Coincident points – Coriolis component of acceleration.

UNIT III

Gyroscope & Gear Profile

Gyroscope: Principle of gyroscope, gyroscopic effect in an aero plane, ship, car and two-wheeler, simple problems

Gear Profile: Involute and cycloidal gear profiles, gear parameters, fundamental law of gearing and conjugate action, spur gear contact ratio and interference/undercutting – helical, bevel, worm, rack & pinion gears, epicyclic and regular gear train kinematics.

UNIT IV

Balancing of Rotating masses & Cams

Balancing of Rotating masses: Need for balancing, balancing of single mass and several masses in different planes, using analytical and graphical methods.

Cams: Classification of cams and followers- Terminology and definitions – Displacement diagrams – Uniform velocity, parabolic, simple harmonic and cycloidal motions – derivatives of follower motions- specified contour cams- circular and tangent cams –pressure angle and undercutting.

UNIT V

Vibrations & Turning Moment Diagrams and Flywheels

Vibrations: Introduction, degree of freedom, types of vibrations, free natural vibrations, Newton method and energy method for single degree of freedom. Damped vibrations- under damped, critically damped; and over damped systems, forced vibrations with and without damping in single degree of freedom; Vibration isolation and transmissibility.

Turning Moment Diagrams and Flywheels: Turning moment diagrams for steam engine, I.C engine and Multi Cylinder Engine. Crank effort – coefficient of fluctuation of energy, coefficient of fluctuation of speed – Fly Wheel and their design, fly wheels for punching press.

Text Books:

1. S.S. Rattan, Theory of Machines, 4/e, Tata Mc-Graw Hill, 2014.
2. P.L. Ballaney, Theory of Machines & Mechanisms, 25/e, Khanna Publishers, Delhi, 2003.

Reference Books:

1. F. Haidery, Dynamics of Machines, 5/e, Nirali Prakashan, Pune, 2003.
2. J. E. Shigley, Theory of Machines and Mechanisms, 4/e, Oxford, 2014.

3. G. K. Groover, Mechanical Vibrations, 8/e, Nemchand Bros, 2009.
4. Norton, R.L., Design of Machinery – An Introduction to Synthesis and Analysis of Mechanisms and Machines, 2/e, McGraw Hill, New York, 2000.
5. William T. Thomson, Theory of vibration with applications, 4/e, Englewood Cliffs, N.J.: Prentice Hall, 1993.

Mapping of Cos with Pos & PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO2	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO3	3	3	3	3	-	-	-	-	-	-	-	-	3	3
CO4	3	3	3	3	-	-	-	-	-	-	-	-	3	3
CO5	3	3	3	3	-	-	-	-	-	-	-	-	3	3
Average	3	3	3	3	-	-	-	-	-	-	-	-	3	3
Level of correlation	3	3	3	3	-	-	-	-	-	-	-	-	3	3

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

II B. Tech - II Semester (ME)

L	T	P	C
0	0	3	1.5

23ACE20 FLUID MECHANICS & HYDRAULIC MACHINERY LAB

Course Outcomes:

CO1: Demonstrate the devices used for measuring flow.
CO2: Compute major losses in pipes.
CO3: Illustrate the operating parameters of turbines.
CO4: Explain the working of different types of pumps
CO5: Explain the devices used for measuring flow

List of Experiments

1. Impact of jets on Vanes.
2. Performance Test on Pelton Wheel.
3. Performance Test on Francis Turbine.
4. Performance Test on Kaplan Turbine.
5. Performance Test on Single Stage Centrifugal Pump.
6. Performance Test on Multi Stage Centrifugal Pump.
7. Performance Test on Reciprocating Pump.
8. Calibration of Venturi meter.
9. Calibration of Orifice meter.
10. Determination of friction factor for a given pipeline.
11. Determination of loss of head due to sudden contraction in a pipeline.
12. Turbine flow meter.

Virtual Lab:

1. To study different patterns of a flow through a pipe and correlate them with the Reynolds number of the flow.
(https://me.iitp.ac.in/Virtual-FluidLaboratory/reynolds/introduction.html)
2. To calculate Total Energy at different points of venture meter.
(https://me.iitp.ac.in/Virtual-Fluid-Laboratory/bernoulli/introduction.html).
3. To calculate the flow (or point) velocity at center of the given tube using different flow rates.
(https://me.iitp.ac.in/Virtual-FluidLaboratory/pitot/introduction.html)
4. To determine the hydrostatic force on a plane surface under partial submerge and full submerge condition.
(https://me.iitp.ac.in/Virtual-FluidLaboratory/cop/introduction.html).
5. To determine the discharge coefficient of a triangular notch.
(https://me.iitp.ac.in/Virtual-Fluid-Laboratory/notch/introduction.html)
6. To determine the coefficient of impact of jet on vanes.
(https://fmnitk.vlabs.ac.in/exp/impact-of-jet).
7. To determine friction in pipes.
(https://fm-nitk.vlabs.ac.in/exp/friction-inpipes/index.html).

Mapping of COs with POs & PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	3	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	3	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	3	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	3	-	-	-	-	-
CO5	3	3	-	-	-	-	-	-	3	-	-	-	-	-
Average	3	3	-	-	-	-	-	-	3	-	-	-	-	-
Level of correlation	3	3	-	-	-	-	-	-	3	-	-	-	-	-

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

II B. Tech - II Semester (ME)

L	T	P	C
0	0	3	1.5

23AME10 MANUFACTURING PROCESSES LAB

Course Outcomes:

CO1: Make moulds for sand casting.
CO2: Fabricate different types of components using various manufacturing techniques.
CO3: Adapt unconventional manufacturing methods.
CO4: Develop Different Weld joints
CO5: Explain different types of 3d Printing techniques.

List of Experiments

1. Design and making of pattern
i. Single piece pattern
ii. Split pattern
2. Sand properties testing
i. Sieve analysis (dry sand)
ii. Clay content test
iii. Moisture content test
iv. Strength test (Compression test & Shear test)
v. Permeability test
3. Mould preparation
i. Straight pipe
ii. Bent pipe
iii. Dumble
iv. Gear blank
4. Gas cutting and welding
5. Manual metal arc welding
i. Lap joint
ii. Butt joint
6. Injection Molding
7. Blow Molding
8. Simple models using sheet metal operations
9. Study of deep drawing and extrusion operations
10. To make weldments using TIG/MIG welding
11. To weld using Spot welding machine
12. To join using Brazing and Soldering
13. To make simple parts on a 3D printing machine
14. Demonstration of metal casting.

Virtual Lab:

1. To study and observe various stages of casting through demonstration of casting process. (https://virtual-labs.github.io/exp-sand-casting-processdei/theory.html)
2. To weld and cut metals using an oxyacetylene welding setup. (https://virtuallabs.github.io/exp-gas-cutting-processes-iitkgp/index.html).
3. To simulate Fused deposition modelling process (FDM) (https://3dpdei.vlabs.ac.in/exp/simulation-modelling-process)
4. https://altair.com/inspire-mold/
5. https://virtual-labs.github.io/exp-simulation-cartesian-system-dei/theory.htm

Mapping of COs with POs & PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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CO2	3	3	-	3	-	-	-	-	3	-	-	-	3	3
CO3	3	3	-	3	3	-	-	-	3	-	-	-	3	3
CO4	3	3	-	3	3	-	-	-	3	-	-	-	3	3
CO5	3	3	-	3	3	-	-	-	3	-	-	-	3	3
Average	3	3	-	3	3	-	-	-	3	-	-	-	3	3
Level of correlation	3	3	-	3	3	-	-	-	3	-	-	-	3	3

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

II B. Tech - II Semester (ME)

L	T	P	C
0	1	2	2

23AHS20 SOFT SKILLS

Course Outcomes:

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 workplace atmosphere using social and work-life skills ensuring personal and emotional well-being.

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.

Text Books:

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

Reference Books:

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

Online Learning Resources:

1. https://youtu.be/DUlsNJtg2L8?list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q
2. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ
3. https://youtu.be/-Y-R9hDl7lU
4. https://youtu.be/gkLsn4ddmTs
5. https://youtu.be/2bf9K2rRWwo
6. https://youtu.be/FchfE3c2jzc
7. https://onlinecourses.nptel.ac.in/noc24_hs15/preview
8. https://onlinecourses.nptel.ac.in/noc21_hs76/preview

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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CO2	-	2	3	-	-	-	-	-	-	-	3	-	-	3
CO3	-	-	3	-	-	-	-	-	-	-	-	-	-	3
CO4	-	-	3	2	-	-	-	-	-	-	-	-	-	3
CO5	-	2	3	2	-	-	-	-	-	-	-	-	-	3
CO6	-	2	3	2	-	-	-	-	-	-	3	-	-	3
Average	-	2	3	2	-	-	-	-	-	-	3	-	-	3
Level of correlation	-	2	3	2	-	-	-	-	-	-	3	-	-	3

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

II B. Tech - II Semester (ME)

L	T	P	C
1	0	2	2

23AMB05 DESIGN THINKING & INNOVATION

Course Outcomes:

CO1: Define the concepts related to design thinking.
CO2: Explain the fundamentals of Design Thinking and innovation.
CO3: Apply the design thinking techniques for solving problems in various sectors.
CO4: Analyse to work in a multidisciplinary environment.
CO5: Evaluate the value of creativity.
CO6: Formulate specific problem statements of real time issues.

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

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

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

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

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

UNIT IV
Product Design
Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications- Innovation towards product design- Case studies
Activity: Importance of modelling, how to set specifications, Explaining their own product design.

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

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

Text Books:

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

Reference Books:

1. David Lee, Design Thinking in the Classroom, Ulysses press
2. 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.

Online Learning Resources:

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

Mapping of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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CO2	-	2	3	-	-	-	-	-	-	-	3	-	-	3
CO3	-	-	3	-	-	-	-	-	-	-	-	-	-	3
CO4	-	-	3	2	-	-	-	-	-	-	-	-	-	3
CO5	-	2	3	2	-	-	-	-	-	-	-	-	-	3
CO6	-	2	3	2	-	-	-	-	-	-	3	-	-	3
Average	-	2	3	2	-	-	-	-	-	-	3	-	-	3
Level of correlation	-	2	3	2	-	-	-	-	-	-	3	-	-	3

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

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 level- observation.

Complementing 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 programmers
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 student's 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

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II B. Tech - II Semester (Common to All Branches)

L	T	P	C
4	0	0	0

23AHS25 QUANTITATIVE APTITUDE AND REASONING - II

Course Outcomes:

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

1. Develop the thinking ability to meet the challenges in solving Logical Reasoning problems.
2. Solve campus placements aptitude papers covering Quantitative Ability and Verbal Ability.
3. Apply different placement practice techniques.

UNIT-I **6 Hours**

QUANTITATIVE ABILITY III: Percentage [Percentage values from ½ to 1/30 , Successive increase / Decrease, Increased / Decreased percentage, How much % more / less, Population Problems, Election Problems, Application type of problems] – Profit & Loss[Cost Price , Selling Price , Retail Price , Marked Price / List Price / Printed price, Discounts, Error problems, Application type of problems] –Simple Interest[Principle, Time period, Rate of interest, Interest, Amount, Annual Payment, Application type of problems]- Compound Interest[Principle, Time period, Rate of interest, Interest, Different formulae of amount, Annual Payment, Differences between C.I & S.I for 1 year, 2years & 3years]

UNIT-II **6 Hours**

QUANTITATIVE ABILITY IV: Time and Work [One person is working, 2 persons are working, 3 persons are working, Relation among Men, days, hours & Work, Alternate days, Graphical method, Application type of problems] – Pipes & Cisterns[Inlet, Outlet or leakage, Alternate hours, Application type of problems] – Time, Speed and Distance[Relation among time, speed & distance, Relative Speed, Average Speed, Problems on trains, Application type of problems] –Boats and Streams[Still water, Stream, Current rate, Boat's rate, Downstream, Upstream, Downstream Speed, Upstream speed, Application type of problems] – Races & Circular Tracks [2 persons are running around a circular track, 3 persons are running around a circular track]

UNIT-III **6 Hours**

REASONING ABILITY II: Alphabet - Coding & Decoding - Directions - Ranking Test – Blood Relations - Inserting the missing number – Venn diagrams – Symbols and Notations - Syllogism – Statement and Conclusion– Data Arrangement – Linear and Circular arrangement

UNIT-IV **6 Hours**

VERBAL II: Tense – Present Tense, Past Tense, Future Tense - Voice – Active voice, Passive voice and Active to Passive Voice Conversion Rules – Speech – Direct Speech, Indirect Speech and Direct to Indirect Speech Conversion Rules –Essay Writing – Types, Steps, Format.

UNIT V **6 Hours**

SOFT SKILL II: Time Management - Stress Management - Team Work - Accent and Voice Communication - Interview Skills.

Text Books:

1. Quantitative Aptitude, Logic Reasoning & Verbal Reasoning, R S Agarwal, S.ChandPublications-2022.
2. Quantitative Aptitude for Competitive Examinations, R S Agarwal, S. ChandPublications-2022.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Average	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Level of correlation	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

3-High Mapping **2- Medium Mapping** **1-Low Mapping**

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III B. Tech - I Semester (ME)

L	T	P	C
3	0	0	3

23AME11: MACHINING PROCESSES
(Professional Core)

Course Outcomes:

CO1: Operation of various machines like lathe, drilling, grinding, slotting, shaping, milling etc
CO2: Practical exposure on flat surface machining, milling and grinding operations.
CO3: Illustrate advanced machining processes, cutting tools and cutting fluids for a specific material and part features.
CO4: Differentiate Electrical Energy Based machining processes, mechanism of metal removal, machine tool selection.
CO5: Interpret Electro Chemical machining process, economic aspects of ECM

UNIT I

Elementary treatment of metal cutting theory – Elements of cutting process – Geometry of single point tool and angles, chip formation and types of chips – built up edge and its effects, chip breakers. Mechanics of orthogonal cutting –Merchant's Force diagram, cutting forces – cutting speeds, feed, depth of cut, heat generation, tool life, coolants, machinability –economics of machining. cutting Tool materials and cutting fluids –types and characteristics.

UNIT II

Engine lathe – Principle of working- specification of lathe – types of lathes – work holders and tool holders – Taper turning, thread cutting operations and attachments for Lathes.
Drilling, Boring Machines, Shaping, Slotting and planning machines - Principles of working, specifications, types, Tools and tool holding devices – operations performed, machining time calculation.

UNIT III

Milling machine – Principles of working – specifications – classifications of milling machines – methods of indexing, milling cutters - machining operation, Accessories to milling machines.
Grinding machine –Theory of grinding – classification– cylindrical and surface grinding machine – Tool and cutter grinding machine – Grinding wheel specification - types of abrasives – bonds, Truing and Dressing of wheels. Lapping, Honing and Broaching machines – comparison of grinding, lapping and honing. Principles of design of Jigs and fixtures and uses, Classification of Jigs & Fixtures – Principles of location and clamping –types.

UNIT IV

Mechanical Energy Based Processes: Abrasive Jet Machining, Water Jet Machining, Abrasive Water Jet Machining, Ultra Sonic Machining – Working Principle, Description of Equipment, Process Parameters, Metal Removal Rate, Applications, Advantages and Limitations.
Electrical Energy Based Processes: Electric Discharge Machining – Wire cut EDM - Working Principles, Process Parameters, Applications Advantages and Limitations.

UNIT V

Chemical and Electro Chemical Energy Based Processes: Chemical Machining and Electro Chemical Machining – Working Principle, Etchants, Maskants, Techniques of Applying - Process Parameters, Electro Chemical Grinding, Electro Chemical Honing, Applications, Advantages and Limitations
Thermal Energy Based Processes: Laser Beam Machining and Drilling, Plasma Arc Machining, Electron Beam Machining – Working Principle, Process Parameters, Applications, Advantages and Limitations.

Text Books:

1. Manufacturing Technology-Kalpakzian- Pearson Seventh edition. (2018)
2. Production Technology by R.K. Jain and S.C. Gupta, Khanna Publishers, 17th edition.
3. Jain V.K., Advanced Machining Processes, 1st Edition, Allied Publishers Pvt. Ltd., New Delhi, 2007.

Reference Books:

1. Pandey P.C and Shan H.S., Modern Machining Processes, 1/e, McGraw Hill, New Delhi, 2007.
2. Benedict G.F., Non-traditional Manufacturing Processes, 1/e, CRC Press, 1987.
3. Production Technology by H.M.T. (Hindustan Machine Tools), TMH, 1st edition, 2001
4. Manufacturing Technology Vol II by P.N. Rao, Tata McGraw Hill, 4th edition, 2013
5. Machine Technology Machine tools and operations by Halmi A Yousuf & Harson, CRC Press Taylor and Francies.
6. Workshop Technology – Vol II, B. S. Raghu Vamshi, Dhanpat Rai & Co, 10th edition, 2013

Online Learning Resources:

- https://nptel.ac.in/courses/112/107/112107078/
- https://youtu.be/t3y_Ys3LgGM
- https://www.youtube.com/watch?v=E4VZ_rFqpG4&t=1s
- https://youtu.be/-tcaR7oSx_w
- https://youtu.be/Uybg6VDLoRQ
- https://youtu.be/Uybg6VDLoRQ
- https://youtu.be/aWQsEX1TrSI

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III B. Tech - I Semester (ME)

L	T	P	C
3	0	0	3

23AME12: THERMAL ENGINEERING
(Professional Core)

Course Outcomes:

CO1: Understand working of different I.C Engines and recognize basic elements and subsystems of an I.C. Engine

CO2: Investigate S.I Engine fuel air requirements, evaluate fuel supply systems in an S.I Engine, create necessary cooling modes and differentiate different ignition systems.

CO3: Analyze the Flame Speed and Effect of Engine Variables and evaluate the abnormal combustion effects and its causes.

CO4: Applying of different input parameters to analyze and create the best performance in S.I and C.I Engines and resolve the influence of normal and abnormal combustions.

CO5: Familiarized the working principle of various types of air compressors and solve problems related to reciprocating air compressor.

UNIT-I

I.C. ENGINES: Definition of Engine and Heat Engine, I.C Engine Classification – Parts of I.C. Engines, Working of I.C. Engines, Two Stroke & Four Stroke I.C. Engines SI & CI Engines, Valve and Port Timing Diagrams.

UNIT-II

Fuel System: S.I. Engine: Fuel Supply Systems, carburetor types Air Filters, Mechanical and Electrical Fuel Pump – Filters– Gasoline Injection Systems.

Cooling & Lubrication Systems: Cooling Requirements, Air Cooling, Liquid Cooling, Thermo Siphon, Water And Forced Circulation System, Lubrication Systems-Flash, Pressurized and Mist Lubrication.

Ignition System: Function of an Ignition System, Battery coil Ignition System, Magneto Coil Ignition System, Electronic Ignition System using Contact Breaker, Electronic Ignition using Contact Triggers – Spark Advance and Retard Mechanism.

UNIT-III

Fuels and Combustion:

S I engine : Normal Combustion and Abnormal Combustion – Importance of Flame Speed and Effect of Engine Variables – Type of Abnormal Combustion, Pre-Ignition and Knocking (Explanation) – Fuel Requirements and Fuel Rating, Anti Knock Additives, Combustion Chambers.

Engines: Stages Of Combustion – Delay Period And Its Importance – Effect Of Engine Variables – Diesel Knock– Combustion Chambers (DI And IDI), Fuel Requirements and Fuel Rating.

UNIT – IV

Testing and Performance : Parameters of Performance - Measurement of Cylinder Pressure, Fuel Consumption, Air Intake, Exhaust Gas Composition, Brake Power – Determination of Frictional Losses And Indicated Power – Performance Test – Heat Balance Sheet and Chart.

UNIT-V

Air Compressors: Reciprocating Compressors, Effect of Clearance volume in Compressors, Volumetric Efficiency, Single Stage and Multi Stage Compressors, Effect of Inter cooling and Pressure Drop in Multi - Stage Compressors, Problems Related to Reciprocating Compressors, Working principles of Roots blower, Vane type Blower, Centrifugal Compressor - Axial Flow Compressors.

Text Books:

1. I.C. Engines / V. Ganesan- TMH fourth edition (2017)
2. Thermal Engineering / Rajput / Lakshmi Publications 11th edition (2020)
3. Internal Combustion Engine Fundamentals John B. Heywood TMH (2017)

Reference Books:

1. IC Engines – Mathur& Sharma – DhanpathRai& Sons (2017)
2. Engineering fundamentals of IC Engines – Pulkrabek, Pearson, PHI 2nd edition (2015)
3. Thermal Engineering, Rudramoorthy – TMH First edition (2017)
4. Thermodynamics & Heat Engines, B. Yadav, Central Book Depot., Allahabad (2002)
5. Thermal Engineering / Rajput / Lakshmi Publications 11th edition (2020)

Online Learning Resources:

- https://youtube.com/playlist?list=PLwdnzlV3ogoWVn1YItO933MxgPXfEiM&si=QcuZlil5MRldeTiD
- https://youtu.be/FDmYCI_xYlA?si=vS1kdhqc5WCRnl21
- https://youtube.com/playlist?list=PLfq4fiRrJSn5leKEZoUF2vBkMG37iGs8&si=nZVdvgmACy-lVvSC
- https://nptel.ac.in/courses/112103316

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III B. Tech - I Semester (ME)

L	T	P	C
3	0	0	3

23AME13: METROLOGY AND MEASUREMENTS
(Professional Core)

Course Outcomes:

CO1: Demonstrate the concept of different types of dimensional tolerances and chose the desire limits and fit component to solve the required fit.

CO2: Explain the basic standards of measurements and also apply the desired flatness and surface gauges to analyze the dimensions.

CO3: Evaluate engineering parts with various precision instruments and choose the required surface roughness instrument to compare the parts.

CO4: List out various measuring techniques for Displacement and Strain. Define the various instruments for measuring the displacement and calibrate the strain.

CO5: Estimate the Instruments accuracy and Perform calibration of Force, Torque and pressure measuring instruments

UNIT I

Concept of measurement

Concept of Measurement: Concept of feedback Control systems -generalized measurement system, units and standards, measuring instruments, sensitivity, readability, range of accuracy, precision, static and dynamic response, repeatability, systematic and random errors, correction, calibration, terminology and limits fits and tolerances, hole basis and shaft basis system, interchangeability.

Limit Gauges and Gauge Design: Plug, Ring, Snap, Gap, Taper gauges. Taylor's principle. Design of Go and No-Go gauges.

Linear and Angular Measurement: Linear measuring instruments: Vernier instruments, micrometers, slip gauges, tool makers microscope. Comparators: Mechanical, pneumatic and electrical.

Angular measurements: Sine bar, bevel protractor and angle dekkor, rollers and spheres used to determine the tapers.

UNIT – II

Flatness and Surface Roughness measurement

Flatness Measurement: Measurement of flatness – straight edges – surface plates, optical flat and autocollimators, interferometers and their applications.

Surface Roughness Measurement: Terminology systems, differences between surface roughness and surface waviness- Numerical assessment of surface finish - CLA, R.M.S Value-R_a, R_Z values, Methods of measurement of surface finish-profilograph, talysurf, BIS symbols for indication of surface roughness.

UNIT – III

Screw Thread and Gear Measurement

Screw thread measurements: Elements of threads, errors in screw threads, various methods for measuring external and internal screw threads, screw thread gauges.

Gear Measurement: Gear tooth terminology, measurement of gear elements-run out, lead, pitch backlash, profile, pressure angle, tooth thickness, diameter of gear, constant chord and base tangent method.

Coordinate Measuring Machine (CMM)- Construction and features.

UNIT – IV

Measurement of Displacement and Strain

Measurement of Displacement: Theory and construction of various transducers to measure displacement – Piezo-electric, inductive, capacitance, resistance, ionization and photoelectric transducers, calibration procedures.

Measurements of Strain: Various types of electrical strain gauges, gauge factor, method of usage of resistance strain gauge for bending, compressive and tensile strains, usage for measuring torque, strain gauge rosettes.

UNIT – V

Measurement of Force, Torque and Pressure

Measurement of Force: Direct method - analytical balance, platform balance; elastic members – load cells, cantilever beams and proving rings.

Measurement of Torque: Torsion bar dynamometer, servo- controlled dynamometer and absorption dynamometer.

Measurement of Pressure: Standards and calibration, basic methods of pressure measurement, dead weight gauges and manometers, High- and low-pressure measurement, Elastic transducers.

Text Books:

1. Beckwith, Marangoni, Line hard, Mechanical Measurements, 6/e, PHI, 2013.
2. R.K. Jain, Engineering Metrology, 20/e, Khanna Publishers, 2013.

Reference Books:

1. Mahajan, Engineering Metrology, 2/e, Dhanpat Rai, 2013.
2. S. Bhaskar, Basic Principles - Measurements and Control Systems, Anuradha Publications, 2014.
3. Anand K Bewoor& Vinay A Kulkarni, Metrology & Measurement, 15/e, McGraw Hill, 2015.
4. D.S. Kumar, Mechanical Measurements & Control, Metropolitan Publishers, 5/e, 2015.

Online Learning Resources:

- https://nitsri.ac.in/Department/Mechanical%20Engineering/MEC_405_Book_2,_for_Unit_2 B.pdf.
- https://www.digimat.in/nptel/courses/video/112104250/L47.html
- https://www.digimat.in/nptel/courses/video/112106138/L01.ht ml
- https://www.digimat.in/nptel/courses/video/112106179/L01
- https://www.youtube.com/watch?v=tczyyM4Dykc
- https://www.youtube.com/watch?v=_UsAiZmRC1M
- https://www.youtube.com/watch?v=oCkax I19X8

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23AME14: TOOL DESIGN
(Professional Elective I)

Course Outcomes:

CO1: Understand tool design fundamentals, select appropriate materials, and design effective tools to develop durable, precise tools for various manufacturing applications.
CO2: Define Oblique and orthogonal cutting**,** Apply the mechanics of metal cutting to design basic cutting tools like single-point, milling, and broaching tools.
CO3: Demonstrate basic principles of drill jigs and various fixtures and design the jigs and fixtures by applying principles of location and clamping.
CO4: Calculate clearance, cutting forces, and develop designs for press tool dies (blanking, piercing, bending, and drawing).
CO5: Evaluate and Develop tool holding, fixture systems, and automation features like ATC for CNC machine tools.

UNIT I
INTRODUCTION TO TOOL DESIGN
Introduction –Tool Engineering – Tool Classifications– Tool Design Objectives – Tool Design in manufacturing- Challenges and requirements- Standards in tool design-Tool drawings -Surface finish – Fits and Tolerances - Tooling Materials- Ferrous and Non-ferrous Tooling Materials- Carbides, Ceramics and Diamond -Non-metallic tool materials-Designing with relation to heat treatment.

UNIT II
DESIGN OF CUTTING TOOLS
Mechanics of Metal cutting –Oblique and orthogonal cutting- Chip formation and shear angle - Single-point cutting tools – Milling cutters – Hole making cutting tools- Broaching Tools - Design of Form relieved and profile relieved cutters-Design of gear and thread milling cutters.

UNIT III
DESIGN OF JIGS AND FIXTURES
Introduction – Fixed Gages – Gage Tolerances –selection of material for Gauges – Indicating Gages – Automatic gages – Principles of location – Locating methods and devices – Principles of clamping – Drill jigs – General considerations in the design of drill jigs – Drill bushings – Methods of construction –Types of Fixtures – Vice Fixtures – Milling Fixtures – Boring Fixtures – Broaching Fixtures.

UNIT IV
DESIGN OF PRESS TOOL DIES
Types of Dies –Method of Die operation–Clearance and cutting force calculations- Blanking and Piercing die design – Pilots – Strippers and pressure pads- Presswork materials – Centre of pressure -Strip layout – Short-run tooling for Piercing – Bending dies – Drawing Dies-Design and drafting.

UNIT V
TOOL DESIGN FOR CNC MACHINE TOOLS
Introduction –Tooling requirements for Numerical control systems – Fixture design for CNC machine tools-Sub plate and tombstone fixtures-Universal fixtures– Cutting tools– Tool holding methods– Automatic tool changers and tool positioners – Tool presetting– General explanation of the Brown and Sharp machine.

Text Books:

1. Cyrll Donaldson, George H. LeCain, V.C. Goold, ―Tool Design‖, Tata McGraw Hill Publishing Company Ltd., 2000.
2. E. G. Hoffman, ‖ Jig and Fixture Design‖, Thomson Asia Pvt Ltd, Singapore, 2004.

Reference Books:

1. P. C. Sharma, A Text book of Production Engineering, S. Chand Publications, 1999.
2. Prakash Hiralal Joshi, ―Tooling data‖, Wheeler Publishing, 2000
3. Venkataraman K., ―Design of Jigs, Fixtures and Press tools, TMH, 2005.
4. Haslehurst M., ―Manufacturing Technology‖, The ELBS, 1978.

Online Learning Resources:

- https://www.iare.ac.in/sites/default/files/lecture_notes/TOOL%20DESIGN_Lecture_Notes.pdf
- https://www.cet.edu.in/noticefiles/261_MMP%20Lecture%20Notes-ilovepdf-compressed.pdf
- https://www.vssut.ac.in/lecture-notes.php?url=production-engineering
- https://nptel.ac.in/courses/112/105/112105233/
- https://www.youtube.com/watch?v=7MkX-sW97rI
- https://nptel.ac.in/courses/112/105/112105126/#

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III B. Tech - I Semester (ME)

L	T	P	C
3	0	0	3

23AME15: AUTOMOBILE ENGINEERING
(Professional Elective I)

Course Outcomes:

CO1: Find the different parts and develop the automobile systems to analyze engine components.
CO2: Identify the working of various parts in ignition system to apply the different vehicles and design the ignition and fuel injection systems.
CO3: Demonstrate how the steering and the suspension systems works, types of steering and suspension systems and its applications.
CO4: Recognize the different types of wheels and breaking systems. Choose the suitable tyres and brakes for different applications.
CO5: Utilize different electrical systems in automobiles. Apply advanced electrical circuits. create advanced Global Positioning System (GPS), Hybrid vehicle, Fuel Cell.

UNIT I

Introduction to vehicle structure and engine components

Vehicle construction - Chassis and body - Specifications - Engine - Types - Construction - Location of engine - Cylinder arrangement - Construction details - Cylinder block - Cylinder head - Cylinder liners - Piston – piston rings - Piston pin - Connecting rod - Crankshaft - Valves. Lubrication system - Types - Oil pumps - Filters. Crankcase ventilation.

UNIT II

Ignition and fuel supply systems

Ignition system - Coil and Magneto - Spark plug - Distributor – Electronic ignition system - Fuel system - Carburetor - Fuel pumps - Fuel injection systems - Mono point and Multi point – Unit Injector – Nozzle types - Electronic Fuel Injection system (EFI) – GDI, MPFI, DTSI.

UNIT – III

Steering and suspension system

Principle of steering - Steering Geometry and wheel alignment - Steering linkages – Steering gearboxes - Power steering - front axle - Suspension system - Independent and Solid axle – coil, leaf spring and air suspensions - torsion bar - shock absorbers.

UNIT – IV

Wheels, Tyres and Braking System

Wheels and Tyres - Construction - Type and specification - Tyre wear and causes - Brakes - Needs – Classification –Drum and Disc Mechanical - Hydraulic and pneumatic - Vacuum assist – Retarders – Anti-lock Braking System (ABS).

UNIT – V

Automobile electrical systems and advances in automobile engineering

Battery-General electrical circuits- Active Suspension System (ASS) - Electronic Brake Distribution (EBD) – Electronic Stability Program (ESP), Traction Control System (TCS) - Global Positioning System (GPS), Hybrid vehicle, Fuel Cell.

Text Books:

1. Kirpal Singh, Automobile Engineering, Vol.1&2, Standard Publications, 13/e, 2020.
2. William. H. Crouse, Automotive Mechanics, 10/e , McGraw-Hill, 2006.
3. David A. Corolla, Automotive Engineering: Powertrain, Chassis System and Vehicle Body, Butterworth-Heinemann Publishing Ltd, 2009.

Reference Books:

1. Bosch, Automotive Hand Book, 6/e, SAE Publications, 2007.
2. K. Newton and W. Steeds, The motor vehicle, 13/e, Butterworth-Heinemann Publishing Ltd, 1989.
3. Joseph Heitner, Automotive Mechanics Principles and Practices, 2/e, CBS publishing 2004.
4. Richard Stone, Jeffrey K. Ball, Automotive Engineering Fundamentals" SAE International, 2004.

Online Learning Resources:

- https://nptel.ac.in/courses/107106088
- https://nptel.ac.in/courses/107106080
- https://hindustanuniv.ac.in/assets/pdf/ug/CBCS/cbcs-automobile-2018.pdf
- https://ed.iitm.ac.in/~shankarram/Course_Files/ED5160/ED5160.htm
- https://dbatu.ac.in/wp-content/uploads/2020/07/B-Tech-Automobile_Final-Yr_22.06.2020-pdf
- https://www.youtube.com/channel/UCGLlbmSTaLNUPhDwsMe-SgQ

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III B. Tech - I Semester (ME)

L	T	P	C
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23AME16: MECHANICAL BEHAVIOUR OF MATERIALS
(Professional Elective I)

Course Outcomes:

CO1: Dictate the elastic behaviour of engineering materials, recall Hooke 's law and apply the dislocation theory, forces on and between dislocations.
CO2: Apply dispersion strengthening and fibre strengthening mechanisms, differentiate strain aging and dynamic strain aging and create grain size strengthening and solid solution strengthening
CO3: List various modes of fracture and clarify the basic mechanism of ductile and brittle fracture, Identify importance of Griffith 's theory. Calculate factors effecting on DBTT.
CO4: Explain fatigue behaviour and testing. Discuss the factors affecting fatigue. Apply fracture mechanics in design.
CO5: Identify and describe various structural changes during creep. Evaluate and predict the metallurgical factors affecting creep and creep different testing.

UNIT – I

Elastic and plastic behavior: Elastic behavior of materials – Hooke's law, plastic behavior: dislocation theory – Burger's vectors and dislocation loops, dislocations in FCC, HCP and BCC lattice, stress fields and energies of dislocations, forces on and between dislocations, slip and twinning.

UNIT – II

Strengthening mechanisms: Cold Working, Grain Size Strengthening, Solid Solution Strengthening, Martensitic Strengthening, Precipitation Strengthening, Dispersion Strengthening, Fibre Strengthening, Examples. Yield Point Phenomenon, Strain aging and Dynamic strain aging.

UNIT – III

Fracture and fracture mechanics: Types of Fracture, Basic Mechanism of Ductile and Brittle Fracture, Griffith's Theory of Brittle Fracture, Ductile to Brittle Transition Temperature (DBTT), Factors Affecting DBTT, Determination of DBTT. Fracture Mechanics-Introduction, Modes of Fracture, Stress Intensity Factor, Strain Energy Release Rate, Fracture Toughness and Determination of KIC.

UNIT - IV

Fatigue behaviour and testing: Stress Cycles, S-N Curves, Effect of Mean Stress, Factors Affecting Fatigue, Structural Changes Accompanying Fatigue, Cumulative Damage, HCF / LCF, Thermo-mechanical Fatigue, Application of Fracture Mechanics to Fatigue Crack Propagation-Paris law- Fatigue Testing Machines.

UNIT - V

Creep behavior and testing: Creep Curve, Stages in Creep Curve and Explanation, Structural Changes during Creep, Creep Mechanisms, Metallurgical Factors Affecting Creep, High Temperature Alloys, Stress Rupture Testing, Creep Testing Machines.

Text Books:

1. Dieter, G.E., ―Mechanical Metallurgy‖, McGraw-Hill, SI Edition, 1995.
2. Davis. H. E., Troxell G.E., Hauck.G. E. W., ―The Testing Of Engineering Materials‖, McGraw-Hill, 1982.

Reference Books:

1. Wulff, The Structure and Properties of Materials, Vol. III ―Mechanical Behavior of Materials‖, John Wiley and Sons, 1983.
2. Honey Combe R. W. K., ―Plastic Deformation of Materials‖, Edward Arnold Publishers, 1984.
3. Suryanarayana, A. V. K., ―Testing of Metallic Materials‖, Prentice Hall India, 1979.

Online Learning Resources:

- https://nptel.ac.in/courses/113104105
- https://nptel.ac.in/courses/113104104
- https://youtube.com/playlist?list=PLyqSpQzTE6M9QPU_tubmtQ97e7zRpaMlD&si=H5qNNyv3nYL8jztY
- https://youtube.com/playlist?list=PLxQw8LdroTlPNimLKWMWldJQHVLBESGs&si=ULCr6KGQwMPXhNC2
- https://youtube.com/playlist?list=PLg1KbXtGBBvF3G4lQuY0zSGBFHh45kF&si=47R1eQ_zAWcO-9A_

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III B. Tech - I Semester (ME)

L	T	P	C
3	0	0	3

23AME17: WORK STUDY AND ERGONOMICS
(Professional Elective I)

Course Outcomes:

CO1: Recollect the basic concepts of productivity, work content and work study and define the objective and scope of Work Study.

CO2: Define the various charts and to construct the charts on the basis of present method and develop a new / proposed method and identify the unnecessary movements.

CO3: Explain the basic work measurement techniques and to gain knowledge of measurement of work, rating and imbibe the concept of allowance in estimating Standard Time

CO4: Determine the basic concepts of Ergonomics and demonstrate a sound knowledge of Ergonomics in engineering applications.

CO5: Demonstrate a sound knowledge of Man-Machine Interfaces and design of displays and controls in engineering systems

UNIT – I

Productivity and Work Study: Definition of productivity, task of management, productivity of materials, land, building, machine and power, factors affecting the productivity, work content, basic work content, excess work content, how manufacturing job is made up, work content due to excess product and process, ineffective time due to short comings on part of the management. Definition, Objective and scope of Work Study: Work study and management, work study and work.

UNIT – II

Method Study: Definition, objective and scope of method study, activity recording and tools, Recording tools: Out Line Process Chart, Flow Process Chart, Flow diagram, String Diagram, Travel Chart, Multiple Activity Chart, Two- Handed process chart. Principles of Motion Economy: Introduction, Classification of movements. Two- hand process chart, Micromotion study, Therbligs, SIMO Chart. Special Charts: Cyclegraph and Chronocycle graph - development, definition and installation of the improved method. Work Measurement: Definition, objectives, work measurement techniques.

Work sampling – Need, confidence levels, and sample size determination, conducting study with problems

UNIT – III

Time study - Definition, time study equipment, selection of job, steps in time study. Breaking jobs into elements, recording information. Rating: Systems of rating, standard rating, standard performance, scales of rating. Allowances: Standard time determination, predetermined motion time study (PMTS), factors affecting rate of working, problems on allowances.

UNIT – IV

Introduction to Ergonomics: Human factors and ergonomics, psychology, engineering, bio mechanics, industrial design, graphics design, statistics, operation research and anthropometry Morphology of design and its relationship with cognitive abilities of human being. Physical Ergonomics : human anatomy, and some of the anthropometric, physiological and bio mechanical characteristics as they relate to physical activity. Cognitive: mental processes, such as perception, memory, reasoning, and motor response, mental workload, and decision-making. Organizational ergonomics: optimization of socio-technical systems, including their organizational structures, policies, processes. Communication, work design, design of working times, teamwork, cooperative work, and new work programs. Environmental ergonomics: human interaction with the environment- characterized by climate, temperature, pressure, vibration, light.

UNIT – V

Man-Machine Interaction; Man-Machine interaction cycle, Man-machine interfaces, Displays factors that control choice of display, visual displays- qualitative displays; moving pointer displays, moving scale displays, digital displays Indicators, auditory displays, tactile displays. Factors affecting effectiveness of displays. Quantitative displays, check- reading displays, representational displays. Types of controls and their integration with displays.

Design guidelines for displays and controls: viewing distance, Illumination, angle of view, reach etc., general design checklist for displays and controls. Standards for ergonomics in engineering and design, displays and controls.

Text Books:

1. Introduction to Work Study – ILO, 4th edition 1992
2. Mark. S. Sanders and Ernest. J McCornick. ―Human Factor in Engineering and Design‖, McGraw- Hill Book Co., Inc., New York, 1993

Reference Books:

1. S. Dalela and Sourabh, ―Work Study and Ergonomics‖. Standard publishers 2013
2. Wesley Woodson, Peggy Tillman and Barry Tillman, ―Human Factors Design Handbook‖, McGraw-Hill; 2ndedition, 1992
3. Ralph M. Barnes, ―Motion and Time Study‖, Wiley International, 7th Edition.
4. Mark S. Sanders and Ernest J. McCormick, ―Human Factors in Engineering Design‖ 4th edition, 2013.
5. B. Niebel and Freivalds, Niebel ‘s Methods Standards and Work Design, McGraw-Hill, 12th Edition, 2009,

Online Learning Resources:

- https://youtu.be/b05FPBjFH6A?si=dWB1YOLOmSMRBSX7
- https://youtube.com/playlist?list=PLLy_2iUCG87BbIF6sF5sy_ZZLFoUcnncb&si=n1NAnFTtiocc9vtK
- https://youtube.com/playlist?list=PLuF8VVHesRxXBZzQpQSzvJI7eM_SduxwR&si=j2vyTNYybgvXrDiyc

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III B. Tech - I Semester (ME)

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23AME18: NANO TECHNOLOGY
(Professional Elective I)

Course Outcomes:

CO1: Define and classify nanomaterials. Explain the historical development and scope of Nano science, and nanotechnology. Analyze the band structure and electronic behavior of nanomaterials.

CO2: Explain the synthesis processes for bulk polycrystalline and single crystal materials. Differentiate between bottom-up and top-down fabrication approaches. Identify and select the requirements for semiconductor nanostructure fabrication and techniques

CO3: Understand and explain the principles and applications of X-ray diffraction (XRD). Analyze optical properties of nanomaterials. Evaluate appropriate characterization technique.

CO4: Discuss and characterize various carbon nanomaterials and its applications to analyze the types, synthesis methods, and evaluate the impact of carbon nanomaterials in emerging technologies.

CO5: Identify and describe major applications, evaluate the impact in energy production, conversion, and environmental sustainability and analyze their applications and explore interdisciplinary applications of nano materials.

UNIT-I

INTRODUCTION: History of nano science, definition of nano meter, nano materials, nano technology. Classification of nano materials. Crystal symmetries, crystal directions, crystal planes. Band structure.

PROPERTIES OF MATERIALS:

Mechanical properties, electrical properties, dielectric properties, thermal properties, magnetic properties, opto electronic properties. Effect of size reduction on properties, electronic structure of nano materials.

UNIT-II

SYNTHESIS AND FABRICATION: Synthesis of bulk polycrystalline samples, growth of single crystals. Synthesis techniques for preparation of nano particle – Bottom-Up Approach – sol gel synthesis, hydro thermal growth, thin film growth, PVD and CVD; Top-Down Approach – Ball milling, micro fabrication, lithography. Requirements for realizing semiconductor nano structures, growth techniques for nano structures.

UNIT-III

CHARECTERIZATION TECHNIQUES: X-Ray diffraction and Scherrer method, scanning electron microscopy, transmission electron microscopy, scanning probe microscopy, atomic force microscopy, piezoresponse microscopy, X-ray photoelectron spectroscopy, XANES and XAFS, angle resolved photoemission spectroscopy, diffuse reflectance spectra, photoluminescence spectra, Raman spectroscopy.

UNIT-IV

CARBON NANO TECHNOLOGY:

Characterization of carbon allotropes, synthesis of diamond – nucleation of diamond, growth and morphology. Applications of nano crystalling diamond films, grapheme, applications of carbon nano tubes.

UNIT-V

APPLICATIONS OF NANO TECHNOLOGY:

Applications in material science, biology and medicine, surface science, energy and environment. Applications of nano structured thin fins, applications of quantum dots.

Text Books:

1. Nano science and nano technology / M.S Ramachandra Rao, Shubra Singh/Wiley publishers.
2. Introduction to Nanotechnology by Risal Singh, Shipra Mital Gupta, Oxford Higher Education, First Publication 2016.

Reference Books:

1. Introduction to Nano Technology /Charles P. Poole, Jr., Frank J. Owens/Wiley publishers. Nanotechnology /Jermy J Ramsden/Elsevier publishers (2015)
2. Nano Materials/A. K. Bandyopadhyay/ New Age Nano The Essentials, T. Pradeep, McGraw Hill, 2014
3. Nanotechnology the Science of Small / M.A Shah, K.A Shah/Wiley Publishers.

Online Learning Resources:

- https://youtube.com/playlist?list=PLyqSpQzTE6M8682dGkNTN8936vSY4CbqZ&si=8S682KjXK7_xITpT
- https://youtu.be/OLa8DQkKlyU?si=I6R1Of59MArQyPUb
- https://youtu.be/u1ojNgPCHGs?si=mlIgQm4OdwZnHUo3

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III B. Tech - I Semester (ME)

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23ACS27: INTRODUCTION TO QUANTUM TECHNOLOGIES AND APPLICATIONS
(Professional Core)

Course Outcomes:

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.

Unit I: Introduction to Quantum Theory and Technologies

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

Unit II: Theoretical Structure of Quantum Information Systems

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

Unit III: Building a Quantum Computer – Theoretical Challenges and Requirements

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

Unit IV: Quantum Communication and Computing – Theoretical Perspective

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

Unit V: Applications, Use Cases, and the Quantum Future

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

Text Books:

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

Reference Books:

1. David McMahon, Quantum Computing Explained, Wiley, 2008.
2. Phillip Kaye, Raymond Laflamme, Michele Mosca, An Introduction to Quantum Computing, Oxford University Press, 2007.
3. Scott Aaronson, Quantum Computing Since Democritus, Cambridge University Press, 2013.
4. Alastair I.M. Rae, Quantum Physics: A Beginner's Guide, Oneworld Publications, Revised Edition, 2005.
5. Eleanor G. Rieffel, Wolfgang H. Polak, Quantum Computing: A Gentle Introduction, MIT Press, 2011.
6. Leonard Susskind, Art Friedman, Quantum Mechanics: The Theoretical Minimum, Basic Books, 2014.
7. Bruce Rosenblum, Fred Kuttner, Quantum Enigma: Physics Encounters Consciousness, Oxford University Press, 2nd Edition, 2011.
8. Giuliano Benenti, Giulio Casati, Giuliano Strini, Principles of Quantum Computation and Information, Volume I: Basic Concepts, World Scientific Publishing, 2004.
9. K.B. Whaley et al., Quantum Technologies and Industrial Applications: European Roadmap and Strategy Document, Quantum Flagship, European Commission, 2020.
10. Department of Science & Technology (DST), Government of India, National Mission on Quantum Technologies & Applications – Official Reports and Whitepapers, MeitY/DST Publications, 2020 onward.

Online Learning Resources:

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

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23ACE30: GREEN BUILDING
(Open Elective I)

Course Outcomes:

CO1: Understand the importance of green buildings, their necessity, and sustainable features.
CO2: Analyze various green building practices, rating systems, and their impact on environmental sustainability.
CO3: Apply principles of green building design to enhance energy efficiency and incorporate renewable energy sources.
CO4: Evaluate HVAC systems, energy-efficient air conditioning techniques, and their role in sustainable building design.
CO5: Assess material conservation techniques, waste reduction strategies, and in door air quality management in green buildings.

UNIT– I

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

UNIT– II

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

UNIT– III

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

UNIT– IV

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

UNIT– V

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

Text Books:

1. Handbook on Green Practices published by Indian Society of Heating Refrigerating and Air conditioning Engineers, 2009.
2. Green Building Hand Book by Tomwoolley and Samkimings, 2009.

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

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23ACE31: CONSTRUCTION TECHNOLOGY AND MANAGEMENT
(Open Elective I)

Course Outcomes:

CO1: Understand project management fundamentals, organizational structures, and leadership principles in construction.

CO2: 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 aspects in construction management.

CO5: Assess safety management practices, accident prevention strategies, and quality management systems in construction.

UNIT– I

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

UNIT– II

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

UNIT– III

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

UNIT– IV

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

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

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III B. Tech - I Semester (ME)

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23AEE23: ELECTRICAL SAFETY PRACTICES AND STANDARDS
(Open Elective I)

Course Outcomes:

CO1: Understanding the Fundamentals of Electrical Safety.
CO2: Identifying and Applying Safety Components.
CO3: Design an illumination system for the proper lighting system.
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.

Reference Books:

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.

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III B. Tech - I Semester (ME)

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23AEC30: ELECTRONIC CIRCUITS
(Open Elective I)

Course Outcomes:

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.

UNIT I

Semiconductor Diode and Applications: Diode as a switch and Diode as a rectifier, Positive and Negative Clipping and Clamping circuits (Qualitative treatment only).
Special Diodes: Principle of operation and characteristics of Tunnel Diode, Varactor Diode, Silicon Control Rectifier (SCR), Uni-Junction Transistor (UJT), Semiconductor photo devices-LED & Photo Diode.

UNIT II

Bipolar Junction Transistor (BJT): Transistor Biasing and Stabilization - Operating point, DC & AC load lines, Biasing - Fixed Bias, Self Bias, Bias Stability, Bias Compensation using Diodes.
Field Effect Transistors: The Junction Field-Effect Transistor, The JFET Volt-Ampere Characteristics, The FET as a Voltage Variable Resistor (VVR), Comparison of JFET and BJT, The Metal Oxide Semiconductor Field Effect Transistor (MOSFET)-Enhancement and Depletion Modes-Construction and Volt-Ampere characteristics. (Qualitative treatment only).

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

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23ACS06: OBJECT-ORIENTED PROGRAMMING THROUGH JAVA
(Open Elective I)

Course Outcomes:

CO1: Analyze problems, design solutions using OOP principles, and implement them efficiently in Java.
CO2: Design and implement classes to model real-world entities, with a focus on attributes, behaviors, and relationships between objects.
CO3: Demonstrate an understanding of inheritance hierarchies and polymorphic behaviour, including method overriding and dynamic method dispatch.
CO4: Apply Competence in handling exceptions and errors to write robust and fault-tolerant code.
CO5: Perform file input/output operations, including reading from and writing to files using Java I/O classes, graphical user interface (GUI) programming using JavaFX.
CO6: Choose appropriate data structure of Java to solve a problem.

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)

Text Books:

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

References Books:

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

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

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23ACA13: FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE
(Open Elective I)

Course Outcomes:

CO1: Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.
CO2: Learn different knowledge representation techniques.
CO3: Understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
CO4: Comprehend the applications of Probabilistic Reasoning and Bayesian Networks.
CO5: Analyze Supervised Learning Vs. Learning Decision Trees.

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

Probabilistic Reasoning:

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

Text Books:

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

Reference Books:

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

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3	0	0	3

23AHS26: MATHEMATICS FOR MACHINE LEARNING AND AI
(Open Elective I)

Course Outcomes:

- **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).

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).

Text Books:

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

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

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L	T	P	C
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23AHS27: MATERIALS CHARACTERIZATION TECHNIQUES
(Open Elective I)

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.

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 Microscope

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.

Text Books:

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

Reference Books:

1. Fundamentals of Molecular Spectroscopy–I VEd.–Colin Neville Banwell and Elaine M. McCash, Tata McGraw-Hill,2008.

2. Elements of X-ray diffraction–Bernard Dennis Cullity & Stuart R stocks, Prentice Hall, 2001 – Science.
3. Practical Guide to Materials Characterization: Techniques and Applications - Khalid Sultan – Wiley – 2021.
4. Materials Characterization Techniques-Sam Zhang, Lin Li, Ashok Kumar-CRC Press – 2008

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/

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3	0	0	3

23AHS28: CHEMISTRY OF ENERGY SYSTEMS
(Open Elective I)

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 photo chemical cells, Identify the applications of photo chemical reactions, Interpret advantages of photo electron 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 liquefaction methods.

Unit - I: Electrochemical Systems

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

Unit - II: Fuel Cells

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

Unit - III: Photo and Photo electrochemical Conversions

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

Unit - IV: Solar Energy

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

Unit - V: Hydrogen Storage

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

Text Books:

1. Physical chemistry by Ira N. Levine.
2. Essentials of Physical Chemistry, Bahland 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. Handbook of solar energy and applications by Arvind Tiwari and Shyam.
3. Solar energy fundamental, technology and systems by Klaus Jagaret.al.
4. Hydrogen storage by Levine K leb on off.

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23AHS29: ENGLISH FOR COMPETITIVE EXAMINATIONS
(Open Elective I)

Course Outcomes:

CO1: Identify the basics of English grammar and its importance.
CO2: Explain the use of grammatical structures in sentences.
CO3: Demonstrate the ability to use various concepts in grammar and vocabulary and their applications in everyday use and in competitive exams.
CO4: Analyze an unknown passage and reach conclusions about it.
CO5: Choose the appropriate form of verbs in framing sentences.
CO6: Develop speed reading and comprehending ability thereby perform better in competitive exams.

Unit - I: GRAMMAR-1

Noun s- 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: 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 - III: 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 - IV: READING COMPREHENSION AND VOCUBULARY

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

Unit - V: WRITING FOR COMPETITIVE EXAMINATIONS

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

Text Books:

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

Reference Books:

1. Hari Mohan Prasad, *Objective English for Competitive Examination,* Tata McGraw Hill, New Delhi, 2014.
2. Philip Sunil Solomon, *English for Success in Competitive Exams*, Oxford 2016
3. Shalini Verma, *Word Power Made Handy*, S Chand Publications
4. Neira, Anjana Dev & Co. *Creative Writing: A Beginner's Manual.* Pearson Education India, 2008.

5. Abhishek Jain, Vocabulary Learning Techniques Vol.I & II, RR Global Publishers 2013.

Online Resources:

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

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3	0	0	3

23AMB06: ENTREPRENEURSHIP AND NEW VENTURE CREATION
(Open Elective I)

Course Outcomes:

CO1: Develop an entrepreneurial mindset and appreciate the concepts of entrepreneurship.
CO2: Comprehend the process of problem-opportunity identification through design thinking, identify market potential and customers while developing a compelling value proposition solution.
CO3: Analyse and refine business models to ensure sustainability and profitability.
CO4: Build Prototype for Proof of Concept and validate MVP of their practice venture idea.
CO5: Create business plan, conduct financial analysis and feasibility analysis to assess the financial viability of a venture.

Unit - I: Entrepreneurship Fundamentals & 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.

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.

Unit - III: Solution design, Prototyping & Opportunity Assessment and Sizing

Understanding Customer Jobs-to-be 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.

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.

Text Books:

1. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha (2020). Entrepreneurship, McGrawHill, 11th Edition.
2. Ries, E. (2011). The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Crown Business
3. Osterwalder, A., & Pigneur, Y. (2010). Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. John Wiley & Sons.

Reference Books:

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

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23AME19: THERMAL ENGINEERING LAB

Course Outcomes:

CO1: Performance Test on 4-Stroke Diesel and 2-Stroke Petrol engine.
CO2: Discuss the storage methods in PV systems
CO3: Able to evaluate the Engine friction of 4-Stroke Multi cylinder Engine and Air/Fuel ratio and Volumetric efficiency of I.C. Engines.
CO4: To calculate the efficiencies and performance characteristics of the engines.
CO5: Study the boilers and identify parts of the engine parts.

List of Experiments:

1. Valve / Port Timing Diagrams of an I.C. Engines
2. Performance Test on a 4 -Stroke Diesel Engines
3. Performance Test on 2-Stroke Petrol engine
4. Evaluation of Engine friction by conducting Morse test on 4-Stroke Multi cylinder Engine
5. Retardation and motoring test on 4- stroke engine
6. Heat Balance of an I.C. Engine.
7. Air/Fuel Ratio and Volumetric Efficiency of an I.C. Engines.
8. Performance Test on Variable Compression Ratio Engines, economical speed test.
9. Performance Test on Reciprocating Air – Compressor Unit
10. Study of Boilers
11. Dismantling / Assembly of Engines to identify the parts and their position in an engine.
12. Exhaust Emission test on IC Engines.

Online Learning Resources:

- https://www.youtube.com/watch?v=i4SF47hjnjQ&list=PL0AQx5JlTK3WUCXXkA9Hev3FFLz4sESSg
- https://www.youtube.com/watch?v=B-rFIdOiNo&list=PLkUEX3IbW7lfdC2ieft9FH5zAAvUfZAn

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0	0	3	1.5

23AME20: DYNAMICS LAB

Course Outcomes:

CO1: Ability to demonstrate the principles of kinematics and dynamics of machinery
CO2: Determine the Mass moment of inertia, Range sensitivity
CO3: Drawing of Cam profile, determination of torsional, undamped and damped natural frequencies
CO4: Determining of influence of coefficient and balancing of rotating, reciprocating masses.
CO5: Verify the laws of springs and forced vibration of cantilever beam.

LIST OF EXPERIMENTS

1. Kinematics of Four Bar, Slider Crank, Crank Rocker, Double crank, Double rocker, Oscillating cylinder Mechanisms.
2. Determination of Mass moment of inertia of Fly wheel and Axle system.
3. Determination of range sensitivity, effort etc., for Watts, Porter, Proell, and Hartnell Governors.
4. Cams – Cam profile drawing, Motion curves and study of jump phenomenon.
5. Determination of torsional natural frequency of single Rotor systems. Un damped and Damped Natural frequencies.
6. Determination of torsional natural frequency of Double Rotor systems. Un damped and Damped Natural frequencies.
7. Multi degree freedom suspension system – Determination of influence coefficient.
8. Determination of torsional natural frequency of single and Double Rotor systems - Un damped and Damped Natural frequencies.
9. Balancing of rotating masses.
10. Balancing of reciprocating masses.
11. Determination of natural Frequency and verification of Laws of springs
12. Forced Vibration of Cantilever beam – Mode shapes and natural frequencies.

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23AME21: Machine Tools & Metrology lab

Course Outcomes:

CO1: Gain knowledge about the parts of various machine tools and about different shapes of products that can be produced on them.
CO2: Learn measure bores, angles and tapers
CO3: Perform alignment tests on various machines

Note: The students have to conduct at least 6 experiments from each lab

MACHINE TOOLS LAB

1. Introduction of general-purpose machines -Lathe, Drilling machine, Milling machine, Shaper, Planing machine, Slotting machine, Cylindrical grinder, Surface grinder and Tool and cutter grinder.
2. Operations on Lathe machines- Step turning, Knurling, Taper turning, Thread cutting and Drilling
3. Operations on Drilling machine - Drilling, reaming, tapping, rectangular drilling, circumferential drilling
4. Operations on Shaping machine - (i) Round to square (ii) Round to Hexagonal
5. Operations on Slotter - (i) Keyway (T –slot) (ii) Keyway cutting
6. Operations on milling machines - (i) Indexing (ii) Gear manufacturing

METROLOGY LAB

1. Calibration of vernier calipers, micrometers, vernier height gauge and dial gauges.
2. Measurement of bores by internal micrometers and dial bore indicators.
3. Use of gear tooth vernier caliper for tooth thickness inspection and flange micrometer for checking the chordal thickness of spur gear.
4. Machine tool alignment test on the lathe.
5. Machine tool alignment test on drilling machine.
6. Machine tool alignment test on milling machine.
7. Angle and taper measurements with bevel protractor, Sine bar, rollers and balls.
8. Use of spirit level in finding the straightness of a bed and flatness of a surface.
9. Thread inspection with two wire/ three wire method & tool makers microscope.
10. Surface roughness measurement with roughness measuring instrument.

Online Learning Resources:

- https://www.youtube.com/watch?v=sG6GCfX7L3c&pp=ygUeTWFjaGluZSBUb29scyAgbGFiIGV4c GVyaW1lbnRz
- https://www.youtube.com/watch?v=mafthRhz1iM&pp=ygUeTWFjaGluZSBUb29scyAgbGFiIGV4cG VyaW1lbnRz
- https://www.youtube.com/watch?v=5--saq-oYBE&list=PLrcSDk_gQ7jiQCfWEzw93ZMaxHkg2v- CC
- https://www.youtube.com/watch?v=m60m2TcbTgc&pp=ygUZbWV0cm9sb2d5IGxhYiBleHBlcmltZ W50cw%3D%3D

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0	0	1	1

23ACO03: TINKERING LAB

Course Outcomes:

The students will be able to experiment, innovate, and solve real-world challenges.

CO1: Construct and analyze basic electrical circuits (series and parallel) using breadboards for simple applications.

CO2: Develop and simulate microcontroller-based projects using Arduino and ESP32 to interface sensors, actuators, and control devices.

CO3: Demonstrate wireless control of electronic components through mobile applications and IoT-based systems.

CO4: Design and fabricate simple robotic and aerospace structures using 3D modeling and printing techniques.

CO5: Apply the design thinking process to ideate, prototype, and present innovative solutions for real-world product redesign challenges.

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.

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0	0	0	2

23AME22: 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 be benefited 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 also 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 the 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 the 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, house-wives, etc
- A log book has to be maintained by each of the student, where the activities undertaken/involved to be recorded.
- The logbook has to be countersigned by the concerned mentor/faculty in charge.

- 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 programmes of NSS/NCC/Green Corps/Red Ribbon Club, etc.
- Minor project report 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, so as 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 projects. 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 projects. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting shall 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 level- 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 programmes are;

Programmes for School Children

1. Reading Skill Programme (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 Programme on Good Touch and Bad Touch (Sexual abuse)
7. Awareness Programme on Socially relevant themes.

Programmes for Women Empowerment

1. Government Guidelines and Policy Guidelines
2. Womens' 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. Programmes on Environment
10. Health and Hygiene
11. Hand wash programmes
12. Commemoration and Celebration of important days

Programmes for Youth Empowerment

1. Leadership
2. Anti-alcoholism and Drug addiction
3. Anti-tobacco
4. Awareness on Competitive Examinations
5. Personality Development

Common Programmes

1. Awareness on RTI
2. Health intervention programmes
3. Yoga
4. Tree plantation
5. Programmes 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 programme is rolled out, the District Administration could be roped in for the successful deployment of the programme.
- An in-house training and induction programme 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 secreteriats 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 the experiential learning about the community and its dynamics. Programmes 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 work 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 particular 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 log-book 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.

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23AHS30: QUANTITATIVE APTITUDE AND REASONING – III
(Audit Course)

Course Outcomes:

CO1: Develop the thinking ability to meet the challenges in solving Logical Reasoning problems.
CO2: Solve campus placements aptitude papers covering Quantitative Ability and Verbal Ability.
CO3 Apply different placement practice techniques.

UNIT 1
QUANTITATIVE ABILITY V
Time and Work – Equal Efficiency – Different Efficiency – Combined work – Alternate work – Partial work – Negative work - Pipes and Cistern – Simple Interest – Compound Interest - Year Zero – Difference between SI and CI – Clocks – Angle of the Clock –Minutes hand Loss or Gain – Calendars – Leap Year – Non-Leap year – Odd days – Days of the week

UNIT 2
QUANTITATIVE ABILITY VI
Mensuration 2D – Area and Perimeter - Mensuration 3D – Volume - Total Surface area – Lateral Surface Area – Statistics- Mean - Mean Deviation – Median – Mode - Range – Variance - – Standard Deviation - Set theory

UNIT 3
REASONING ABILITY III
Puzzles – Cubes & Dices – Algebra – Selection Decision table – Visual reasoning - Inequalities

UNIT 4
VERBAL III
Vocabulary - Synonyms, Antonyms, One Word Substitution, and Spelling - Sentence Correction - Sentence Selection, Error Identification, Sentence Improvement, Sentence completion – Cloze Test, Types, Strategies - Para jumbles- Types, Strategies.

UNIT 5
SOFT SKILLS III
Written Communication - Listening Skills - Mentoring & Coaching - Decision Making - Competitiveness - Inspiring & Motivating.

Text Books:

1. Quantitative Aptitude, Logic Reasoning & Verbal Reasoning, R S Agarwal, S. Chand Publications -2022.
2. Quantitative Aptitude for Competitive Examinations, R S Agarwal, S. Chand Publications -2022.

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23AHS31: FRENCH LANGUAGE
(Audit Course)

Course Outcomes:

CO1: Understand basic knowledge of French language and several core competencies.
CO2: Develop and improve comprehensive capabilities and apply simple phrases & sentences in real-life conversation.
CO3: Analyze ability to ask and answer questions about the self, personal interest, everyday life, and the immediate environment.
CO4: Demonstrate knowledge of tenses in making sentences for day-to-day conversations in different time frame.

UNIT-I

INTRODUCTION & PRESENTATION:

Introduction, Alphabets & Accents Culture, Formal & Informal – Use of 'tu' and 'vous', Map of France: Geographical, Administrative Greeting, Presenting oneself & others, Asking & giving identity, Days of the week, Months of the year, Numbers, Nationality, Profession, Making a visiting card salutations, Gestures & Handshakes.

UNIT-II
RENDEZVOUS:
Conversations, approaching someone, Tele conversation, Buying a train ticket, Numbers the formula to write a post card, Culture and Life in France.

UNIT-III
AGENDA & INVITATION:
Conversations, Time, Fixing a meeting, Alimentation, Moments of the day (from morning to night), Punctuality, Good moments of the day, Inviting someone, Accepting & Refusing Invitations, Family tree, Describing a house interior.

UNIT-IV
VACATION & SHOPPING:
Describing an event, Reservations at a Hotel, Describing a person, Expressing opinion, Indication of time: Depuis & pendant, Gestures: Polite & Impolite, A French vacation, Culture, Making a purchase, Choosing & Paying, Trying a dress on, Talking about weather, Understanding a Weather Bulletin, Comparison, Dress & weather, Dialogue between a client and an employee of a store and Money in everyday life in France: Parking ticket / telephone card.

UNIT-V
ITINERARY, EXCURSION & WEEKEND:
Asking for & giving directions, Giving order / advice / prohibition, Reservation at a restaurant, Taking an order, Asking for bill at a Restaurant, Expression of Quantity, Alimentation: Shopping list (portions), Making Suggestion & Proposal, Going for an outing, Acceptance & Refusal of an invitation, Giving arguments: favour & against, A French Weekend.

Text Books:

1. CAMPUS 1 Methode de Francais, Jacky Girardet, CLE International Paris, Nouvelle Edition, 2002.
2. La France de toujours: Civilisation, Nelly Mauchamp; CLE International, 2004.

Reference Books:

1. Declic 1: method francais ; Jacques Balnc, Jean-Michel Cartier, Pierre Lederlion ; CLE International, 2004.
2. Nouveau Sans Frontieres; P Dominique, Jacky Girardet , et al.– Vols. 1, 2 & 3. French Edition, 1989.

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23AHS32: GERMAN LANGUAGE
(Audit Course)

Course Outcomes:

CO1: Understand fundamentals of German language, sounds, pronunciations, sentence structures and the verb conjugation.

CO2: Comprehend and apply the knowledge of vocabulary and phrases in day-to-day real-life conversation.

CO3: Analyze various sentence structures by examining the rules of grammar in speaking and writing.

CO4: Demonstrate various verb structures of English and German language effectively in professional writing.

UNIT- I: GERMAN SOUNDS

Vowels, consonants, diphthongs, umlaut, the nouns, gender distinctions, cases, definite and indefinite articles, conjugation of verbs, verbs with separable and inseparable prefixes, modal verbs, personal pronouns, possessive pronouns, reflexive pronouns, cases nominative, accusative and dative. Structure of sentence and categories of sentences, subordinate clause, causative and conditional sentences; A very interesting slideshow presentation is held to enlighten the students about the culture, people, and lifestyle in Germany.

UNIT- II: SENTENCE FORMATION

Infinite sentences, use of conjunctive-I and conjunctive-II, plusquam perfect, modal verb, Conjunction, temporal, subordinate clauses & complex sentences.

UNIT- III: GERMAN BASIC GRAMMAR

Verbs: Different forms, past tense and present perfect tense, adjectives and their declension, degrees of comparison; Prepositions, genitive case conjunctive. Different conjunctions (coordinating and subordinating), simple, complex and compound sentences, active and passive voice, relative pronouns.

UNIT- IV: PURPOSE OF LANGUAGE STUDY

Pictures and perceptions, conflicts and solutions, change and the future, the purpose of the study of the German language, listening, understanding, reacting, speaking, communicating, use of language, pronunciation and intonation, reading, reading and understanding, writing, text writing, text forming, use of language, language reflection, building up the language, language comparison, culture reflection, other cultures and cultural identity.

UNIT- V: GERMAN ADVANCED COMMUNICATION LEVEL - 1

The significance of language study, Speaking and thinking, Self – discovery, Communication, Language Competence, Language and culture, Language changes, Connection with other areas of study, The mother language and the other languages.

Text Books:

1.Korbinian, Lorenz Nieder Deutschals Fremdsprache IA. Ausländer, “German Language”, Perfect Paperback Publishers, 1st Edition, 1992.

2.Deutschals Fremdsprache, IB, Erganzungskurs, “German Language”, Front Cover. Klett, Glossar Deutsch-Spanisch Publishers, 1st Edition, 1981.

Reference Books:

1.Griesbach, “Moderner Gebrauch der deutschen Sprache”, Schulz Publishers, 10th Edition, 2011.

2.Anna Quick, Hermann Glaser U.A, “Intermediate German: A Grammar and workbook”, Paperback, 1st Edition, 2006

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23AHS33: JAPANESE LANGUAGE
(Audit Course)

Course Outcomes:

CO1: Remember and understand Japanese alphabet and demonstrate basic structures of sentences in reading and writing.

CO2: Examine the limitations of language by examining pronouns, verbs form, adjectives and conjunctions.

CO3: Analyze the skills of vocabulary and apply it to learn time and dates and express them in Japanese.

CO4: Demonstrate the formation of simple questions and answers in Japanese to know the Japanese culture and etiquette.

UNIT – I

INTRODUCTION TO JAPANESE SYLLABLES AND GREETINGS – Introduction of Japanese language, alphabets; Hiragana, katakana, and Kanji Pronunciation, vowels and consonants. Hiragana – writing and reading; Vocabulary: 50 Nouns and 20pronouns, Greetings.

UNIT – II

DEMONSTRATIVE PRONOUNS, VERBS AND SENTENCE FORMATION - Grammar: N1 wa N2 desu, Japanese Numerals, Demonstrative pronoun - Kore, Sore, Are and Dore (This, That, Over there, which) Kono, sono, Ano and Dono (this, that, over there, which) Kochira, Sochira, Achira and Dochira. this way....) Koko, Soko, Asoko and Doko (Here, There,...location), Classification of verbs Be verb desu Present and Present negative Basic structure of sentence (Subject+ Object+ Verb) Katakana- reading and writing.

UNIT - III

CONJUNCTION, ADJECTIVES, VOCABULARY AND ITS MEANING - Conjunction- Ya…..nado Classification of Adjectives 'I' and 'na'-ending Set phrase – Onegaishimasu – Sumimasen, wakarimasen Particle –Wa, Particle-Ni 'Ga imasu' and 'Ga arimasu' for Existence of living things and non-living things Particle- Ka, Ni, Ga, Days/ Months /Year/Week (Current, Previous, Next, Next to Next); Nation, People and Language Relationship of family (look and learn); Simple kanji recognition.

UNIT - IV

FORMING QUESTIONS AND GIVING ANSWERS - Classification of Question words (Dare, Nani, Itsu, Doyatte, dooshite, Ikutsu, Ikura); Classification of Te forms, Polite form of verbs.

UNIT - 5

EXPRESSING TIME, POSITION AND DIRECTIONS – Classification of question words (Doko, Dore, Dono, Dochira); Time expressions (Jikan), Number of hours, Number of months, calendar of a month; Visiting the departmental store, railway stations, Hospital (Byoki), office and University.

Text Book:

1. Easy Japanese: Learn to Speak Japanese Quickly, Emiko Koromi, Tuttle Publishing, 2018.

Reference Book:

1. Japanese Hiragana and Katakana Made Easy: An Easy Step-By-Step Workbook to Learn the Japanese Writing System, Lingo Mastery, 2022.

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23AME24: HEAT TRANSFER
(Professional Core)

Course Outcomes:

CO1: Analyze and solve heat conduction problems in various systems, including steady and transient conditions, using appropriate mathematical models and charts.
CO2: Evaluate convective heat transfer in various systems by applying boundary layer theory and empirical correlations for practical engineering problems.
CO3: Analyze and distinguish between different boiling regimes and condensation modes, and solve related heat transfer problems in engineering applications.
CO4: Design and evaluation different heat exchanger configurations, by analysing appropriate methods.
CO5: Apply radiation laws and mass transfer principles to analyze and solve problems involving radiative heat exchange and diffusive transport in engineering systems.

UNIT I: Introduction

Basic modes of heat transfer- rate equations- generalized heat conduction equation-various forms - steady state heat conduction solution for plane and composite slabs - cylinders - critical thickness of insulation- heat conduction through fins of uniform cross section- fin effectiveness and efficiency.
Unsteady State Heat Transfer Conduction- Transient heat conduction- lumped system analysis and use of Heisler charts.

UNIT II : Convection

Convection: Basic concepts of convection–heat transfer coefficients - types of convection – forced convection and free convection.

Free Convection: development of hydrodynamic and thermal boundary layer along a vertical plate – use of empirical relations for convective heat transfer on plates and cylinders in horizontal and vertical orientation

Forced convection: In external flow–concepts of hydrodynamic and thermal boundary layer- use of empirical correlations for flow over plates and cylinders. Fluid friction – heat transfer analogy, approximate solution to laminar boundary layer equation for external flow. Internal flow – Use of empirical relations for convective heat transfer in horizontal pipe flow-problems.

UNIT III

Boiling and Condensation

Different regimes of boiling- nucleate, transition and film boiling – condensation – film wise and drop wise condensation-problems.

UNIT IV

Heat Exchangers

Types of heat exchangers- parallel flow- counter flow- cross flow heat exchangers- overall heat transfer coefficient- LMTD and NTU methods- fouling in heat exchangers-problems.

UNIT V

Radiation: Radiation heat transfer – thermal radiation – laws of radiation - Black and Gray bodies – shape factor-radiation exchange between surfaces - Radiation shields - Greenhouse effect- simple problems.
Mass Transfer: Conservation laws and constitutive equations - Fick's law of diffusion, isothermal equi-mass - Equimolal diffusion- - diffusion of gases and liquids- mass transfer coefficient.

Text Books:

1. P.K. Nag, Heat Transfer, 3/e, Tata McGraw-Hill, 2011.
2. J.P.Holman, Heat Transfer, 9/e, Tata McGraw-Hill, 2008.
3. R.C.Sachdeva, Fundamentals of Engineering Heat & Mass transfer, New Age International Publishers, 2017.

Reference Books:

1. F. P. Incropera and D.P. Dewitt, Fundamentals of Heat and Mass Transfer, 6/e, John Wiley, 2007.
2. Cengel. A. Yunus, Heat Transfer- A Practical Approach, 4/e, Tata McGraw-Hill, 2007.
3. S.P. Sukhatme, A Text book of Heat Transfer, Universities Press, 2005.
4. S. C. Arora& S. Domkundwar, A Course in Heat and Mass Transfer, Dhan pat Rai & CO.(P) LTD-Delhi, 2007.
5. C.P. Kothandaraman and S. Subramanyan, Heat and Mass Transfer data book, New Age Publications, 2014.
6. Er.R.K.Rajput, A Text book of Heat & Mass Transfer, S.Chand publishers,1/e,2018.

Online Learning Resources:

- https://ocw.mit.edu/courses/mechanical-engineering/2-051-introduction-to-heat- transfer-fall- 2015/
- https://www.udemy.com/topic/heat-transfer/
- https://www.youtube.com/watch?v=TWTQx3W-2k8
- https://onlinecourses.nptel.ac.in/noc20_ch21/preview
- https://ekeeda.com/degree-courses/mechanical-engineering/heat-transfer
- https://www.coursera.org/lecture/thermodynamics-intro/02-04-heat-transfer-gyDfJ
- https://www.youtube.com/watch?v=cjJ2LV5lkB8

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23AME25: CAD/CAM
(Professional Core)

Course Outcomes:

CO1: Apply and Evaluate the CAD/CAM principles to design and manufacturing processes. Create and manipulate CAD models using appropriate software tools.

CO2: Analyze and differentiate between Hermite, Bezier, and B-spline curves and construct and manipulate surface models. Evaluate the effectiveness of Boolean operations and create complex geometric models.

CO3: Identify and analyze key components of NC and CNC systems in manufacturing processes. Evaluate the performance of DNC systems in a manufacturing environment.

CO4: Explain the structure and functioning of NC/CNC/DNC machine tools and adaptive control systems. Develop part programs using standard codes and APT for basic machining operations.

CO5: Understand and evaluate the role of robotics, group technology, and CIM in modern manufacturing systems, and explain emerging technologies like VR, AR, and AI.

UNIT –I

Overview of CAD/CAM: Product cycle, CAD, CAM and CIM. CAD Tools, CAM Tools, Utilization in an Industrial Environment, Evaluation criteria. CAD data structure, Data base management systems.

Computer Graphics: Co-ordinate systems, Graphics package functions, 2D and 3D transformations, clipping, hidden line / surface removal color, shading.

UNIT –II

Geometric Modeling: Representation techniques, Parametric and non-parametric representation, various construction methods, wire frame modeling, synthetic curves and their representations, surface modeling, synthetics surfaces and their representations. Solid modeling, solid representation, fundamentals, introduction to boundary representations, constructive solid geometry representations

UNIT- III

Numerical Control: NC, NC Modes, NC Elements, NC Machine tools and their structure, Machining center, types and features. Controls in NC, CNC systems, DNC systems. Adaptive control machining systems, types of adaptive control.

CNC Part Programming: Fundamentals, NC word, NC Nodes, canned cycles, cutter radius compensation, length compensation, computed assisted part programming using APT: Geometry statements, motion statements, post process statements, auxiliary statements, macro statement program for simple components.

UNIT -IV

Group Technology & FMS: Part Family, Classification and Coding, advantages & limitations, Group technology machine cells, benefits. FMS: Introduction, components of FMS, material handling systems, Computer control systems, advantages.

Computer Aided Quality Control: Terminology in Quality control, Inspection and testing, Contact inspection methods - optical and non-optical, integration of CAQC with CAD and CIM.

UNIT- V

Computer Aided Processes Planning: Retrieval type and Generative type, benefits Machinability data systems, Computer generated time standards.

Computer integrated production planning: Capacity planning, shop floor control, MRP-I, MRP- II, CIMS benefits.

Trends in manufacturing systems: Concepts of Reconfigurable manufacturing, Sustainable manufacturing and lean manufacturing.

Text Books:

1. Mikell P. Groover, Emory W. Zimmers , CAD/CAM, 5/e, Pearson Prentice Hall of India, Delhi, 2008.
2. Ibrahim Zeid, R.Siva Subramanian, CAD/CAM: Theory and Practice, 2/e, Tata McGraw-Hill, Delhi, 2009.

Reference Books:

1. P. N. Rao, CAD/CAM: Principles and applications, 3/e, Tata McGraw-Hill, Delhi, 2017.
2. P. Radhakrishnan, S. Subramanyan& V. Raju, CAD/CAM/CIM, 3/e, New Age International Publishers, 2008.
3. Computer Aided Manufacturing, 3/e, Tien Chien Chang, Pearson, 2008.

Online Learning Resources:

- https://onlinecourses.nptel.ac.in/noc20_me44/preview
- https://www.youtube.com/watch?v=EgKc9L7cbKc
- https://www.youtube.com/watch?v=KXFpTb9cBpY
- https://web.iitd.ac.in/~hegde/cad/lecture/L01_Introduction.pdf
- https://www.vssut.ac.in/lecture_notes/lecture1530947994.pdf
- https://www.iare.ac.in/sites/default/files/lecture_notes/CAD_CAM_LECTURE_NOTES.pdf

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23AME26: DESIGN OF MACHINE MEMBERS
(Professional Core)

Course Outcomes:

CO1: Apply design principles for components subjected to static and dynamic loads, analyze and design for fatigue failure using relevant criteria.

CO2: Design and analyze bolted and welded joints, considering factors such as different types of loads, including eccentric loading scenarios.

CO3: Design power transmission shafts and couplings for fluctuating loads, and selecting appropriate couplings such as flange, bushed pin, and universal couplings.

CO4: Design friction clutches, brakes, and springs, applying the various theories and analyze the working for mechanical applications.

CO5: Design and analyze the sliding and rolling contact bearings, spur gears, considering beam strength, dynamic, and wear load factors.

UNIT I

Introduction, Design for Static and Dynamic loads

Mechanical Engineering Design: Design process, design considerations, codes and standards of designation of materials, selection of materials.

Design for Static Loads: Modes of failure, design of components subjected to axial, bending, torsional and impact loads. Theories of failure for static loads.

Design for Dynamic Loads: Endurance limit, fatigue strength under axial, bending and torsion, stress concentration, notch sensitivity. Types of fluctuating loads, fatigue design for infinite life. Soderberg, Goodman and modified Goodman criterion for fatigue failure. Fatigue design under combined stresses.

UNIT II

Design of Bolted and Welded Joints

Design of Bolted Joints: Threaded fasteners, preload of bolts, various stresses induced in the bolts. Torque requirement for bolt tightening, gasketed joints and eccentrically loaded bolted joints.

Welded Joints: Strength of lap and butt welds, Joints subjected to bending and torsion. Eccentrically loaded welded joints.

UNIT III

Power transmission shafts and Couplings

Power Transmission Shafts: Design of shafts subjected to bending, torsion and axial loading. Shafts subjected to fluctuating loads using shock factors.

Couplings: Design of flange and bushed pin couplings, universal coupling.

UNIT IV

Design of Clutches, Brakes and Springs

Friction Clutches: Torque transmitting capacity of disc and centrifugal clutches. Uniform wear theory and uniform pressure theory.

Brakes: Different types of brakes. Concept of self-energizing and self-locking of brake. Band and block brakes, disc brakes.

Springs: Design of helical compression, tension, torsion and leaf springs.

UNITV

Design of Bearings and Gears

Design of Sliding Contact Bearings: Lubrication modes, bearing modulus, McKee's equations, design of journal bearing. Bearing Failures.

Design of Rolling Contact Bearings: Static and dynamic load capacity, Stribeck's Equation, equivalent bearing load, load-life relationships, load factor, selection of bearings from manufacturer's catalogue.

Design of Gears: Spur gears, beam strength, Lewis equation, design for dynamic and wear loads.

Text Books:

1. R.L. Norton, Machine Design an Integrated approach, 2/e, Pearson Education, 2004.
2. V.B. Bhandari, Design of Machine Elements, 3/e, Tata McGraw Hill, 2010.

Reference Books:

1. R.K. Jain, Machine Design, Khanna Publications, 1978.
2. J.E. Shigley, Mechanical Engineering Design, 2/e, Tata McGraw Hill, 1986.
3. M.F. Spotts and T.E. Shoup, Design of Machine Elements, 3/e, Prentice Hall (Pearson Education), 2013.
4. K. Mahadevan & K. Balaveera Reddy, Design data handbook, CBS Publications, 4/e, 2018.
5. Dr. N. C. Pandya & Dr. C. S. Shah, Machine design, 17/e, Charotar Publishing House Pvt. Ltd, 2009.

Online Learning Resources:

- https://www.yumpu.com/en/document/view/18818306/lesson-3-course-name-design-of-machine-elements-1-nptel
- https://www.digimat.in/nptel/courses/video/112105124/L01.html
- https://dokumen.tips/documents/nptel-design-of-machine-elements-1.html
- http://www.nitttrc.edu.in/nptel/courses/video/112105124/L25.html

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23AME27: ENGINEERING FRACTURE MECHANICS
(Professional Elective II)

Course Outcomes:

CO1: Apply LEFM, EPFM, and fatigue crack growth models to assess and prevent catastrophic structural failures at different loads.

CO2: Apply Griffith's theory, calculate energy release rates, and analyze crack propagation mechanisms in materials to predict and prevent fractures in engineering applications.

CO3: Analyze and apply the theory of elasticity and displacement in Mode I fracture, and understand the connection between the stress intensity factor (K) and the energy release rate (G).

CO4: Analyze and calculate multi-parameter stress fields for different fracture modes and apply Irwin's and Dugdale's models to understand deformation around crack tips.

CO5: Perform fracture toughness testing, apply crack growth models, and understand crack closure and failure assessment diagrams.

UNIT 1

EFM Course outline and Spectacular Failures, Introduction to LEFM and EPFM, Fatigue Crack Growth Model

UNIT 2

Crack Growth and Fracture Mechanisms, Griffith TMs Theory of Fracture, Energy Release Rate

UNIT 3

Review of Theory of Elasticity, Westergaard Solution for Stress and Displacements for Mode I, Relationship between K and G

UNIT 4

Introduction to multi parameter stress field for Mode I, Mode II and Mixed Modes, SIF for Various Geometries, Modeling Plastic Deformation, Irwin TMs model, Dugdale Model

UNIT 5

Fracture Toughness Testing, Paris Law and Sigmoidal curve, Crack Closure, Crack Growth Models, J-Integral, Failure Assessment Diagram, Mixed Mode Fracture, Crack Arrest and Repair Methodologies

Text Books

1. Prashant Kumar, Elements of Fracture Mechanics, Tata McGraw Hill, New Delhi, India, 2009.
2. K. R.Y. Simha, Fracture Mechanics for Modern Engineering Design, Universities Press (India) Limited,2001.

Reference Books

1. D. Broek, Elementary Engineering Fracture Mechanics, Kluwer Academic Publishers, Dordrecht, 1986.
2. T.L. Anderson, Fracture Mechanics "Fundamentals and Applications, 3rd Edition, Taylor and Francis Group, 2005.
3. K. Ramesh, e-Book on Engineering Fracture Mechanics, IIT Madras, 2007.

Online Learning Resources:

1. https://nptel.ac.in/courses/112106065
2. https://youtube.com/playlist?list=PLA218B83235A4AD5C&si=XI175OWGIvdMCQH9
3. https://youtube.com/playlist?list=PLA218B83235A4AD5C&si=ruHP1MIsJGNAyMYV
4. https://youtube.com/playlist?list=PLfIFNJ1DPG4ks5AjeCgpbm8nLGM1Pgxer&si=F-fj413KzPAkjPSs

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23AME28: INTRODUCTION TO TURBO MACHINERY
(Professional Elective II)

Course Outcomes:

CO1: Analyze and apply the fundamental concepts of fluid motion in rotating systems to design and evaluate the performance of various turbo machines.

CO2: Compare, Analyze, and evaluate various gas turbine cycles and engine configurations for optimum propulsion and power generation applications.

CO3: Apply similarity principles and cascade analysis techniques to evaluate blade performance, estimate aerodynamic losses, and optimize turbo machine blade designs.

CO4: Design, analyze, and evaluate the performance of axial and centrifugal compressors and pumps, and thermodynamic principles for improved efficiency and functionality.

CO5: Create and evaluate axial flow turbines and apply CFD techniques to simulate and analyze fluid flow and thermal behavior in turbo machinery systems.

UNIT 1

Introduction and Classification: Axial flow, radial flow and mixed flow machines, the equations of motion in rotating frame of reference, effects of Coriolis and Centrifugal forces, momentum and energy equation, Euler work and illustrative examples.

UNIT 2

Gas Turbine Cycle: Brayton Cycle, regenerative cycle, reheat, inter-cooling, turboprop, turbojet and turbofan engine, thrust augmentation and illustrative examples.

UNIT 3

Similarity Analysis: Similarity rules, specific speed, Cordier diagram and illustrative examples. Cascade Analysis: Two-dimensional cascade theory, lift and drag, blade efficiency, estimation of loss, compressor and turbine cascade, blade geometry and illustrative examples.

UNIT 4

Axial Flow Compressor: Two-dimensional pitch line design and analysis, h-s diagram, degree of reaction, the effect of Mach number, performance and efficiency, three-dimensional flow, tip clearance, losses, compressor performance and illustrative examples.

Centrifugal Pump and Compressor: Theoretical analysis and design, the effect of circulation and Coriolis forces, reversal eddies, slip factor, head and efficiency, diffuser, introduction to the combustion system and illustrative examples.

UNIT 5

Axial Flow Turbine: Two-dimensional pitch line design, stage loading capacity, degree of reaction, stage efficiency, turbine performance, blade cooling, and illustrative examples. CFD Applied to Turbomachinery Flows: Governing equations, numerical methods, and test cases illustrating flow and heat transfer related to turbo machines.

Text Books:

1. Fluid Mechanics and Thermodynamics of Turbomachinery, S. L. Dixon and C. A. Hall, Butterworth-Heinemann, Seventh Edition, 2014.
2. Gas Turbine Theory, H. Cohen, GFC Rogers and HIH Saravanamuttoo, Addison Wesley Longman Limited, 4th Edition, 1996.

Reference Books:

1. Fundamentals of Turbomachinery, Venkanna B. K Prentice Hall India Learning Private Limited, 2009.
2. Principles of Turbomachinery, Seppo A. Korpela, 2nd Edition, (2019) John Wiley and Son's, USA.

Online Learning Resources:

1. https://youtube.com/playlist?list=PLbMVogVj5nJQQp3QLuzbcHrt0XncZZTiE&si=ts0mwl6etWcmKO1i
2. https://youtube.com/playlist?list=PLWCscP8J8VQ4i0BoPCAgP5mXQh9VWmyuS&si=cLzUxZke5BJV-lUg
3. https://youtube.com/playlist?list=PLbMVogVj5nJQQp3QLuzbcHrt0XncZZTiE&si=Rzs-PEl9nqP45rKe

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III B. Tech - II Semester (ME)

L	T	P	C
3	0	0	3

23AEE14: CONTROL SYSTEMS
(Professional Elective II)

Course Outcomes:

CO1: Model dynamic systems, distinguish between loop controls, analyze feedback effects, and derive transfer functions for DC/AC servo motors and synchro devices.

CO2: Analyze and simplify control systems, and create effective controllers such as lag, lead, lead-lag, and PID to meet system performance specifications.

CO3: Analyze and simplify control systems using block diagrams and signal flow graphs, and design appropriate controllers to achieve desired system performance.

CO4: Analyze the frequency response of control systems using Bode, polar, and evaluate system stability and performance such as gain margin and phase margin.

CO5: Develop state-space models from block diagrams, analyze system controllability and observability, and solve time-invariant state equations using the state transition matrix.

UNIT - I

BASICS IN CONTROL SYSTEM AND TRANSFER FUNCTION: Introduction of Control Systems, Various types of systems (Open Loop and closed loop) and their differences- Classification and Feed-Back Characteristics of control system- Effects of feedback. Mathematical models – Differential equations, Translational and Rotational mechanical systems. Transfer Function of DC Servo motor - AC Servo motor- Synchro transmitter and Receiver.

UNIT - II

REPRESENTATION OF TRANSFER FUNCTION AND CONTROL DESIGN TECHNIQUES: Block diagram representation of systems considering electrical systems as examples. Block diagram algebra – Representation by Signal flow graph - Reduction using Mason's gain formula. Compensation techniques – Lag, Lead, Lead-Lag Controllers design, PID Controllers.

UNIT - III

TIME RESPONSE ANALYSIS: Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems. STABILITY ANALYSIS: The concept of stability – Routh's stability criterion – qualitative stability and conditional stability – limitations of Routh's stability. The root locus concept - construction of root loci effects of adding poles and zeros to G(s) H(s) on the root loci.

UNIT - IV

FREQUENCY RESPONSE ANALYSIS: Introduction, Frequency domain Specifications-Bode diagrams Determination of Frequency domain specifications and transfer function from the Bode Diagram-Phase margin and Gain margin Stability Analysis from Bode Plots. STABILITY ANALYSIS IN FREQUENCY DOMAIN: Polar Plots-Nyquist Plots-Stability Analysis.

UNIT - V

STATE SPACE ANALYSIS: Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and it's Properties – Concepts of Controllability and Observability.

Text Books:

1. I. J. Nagrath, M. Gopal (2011), Control Systems Engineering, 5th edition, New Age International (P) Limited, New Delhi, India.
2. Benjamin. C. Kuo (2003), Automatic Control Systems, 8th edition, John Wiley and Son's, USA.

Reference Books:

1. K. Ogata (2008), Modern Control Engineering, 4th edition, Prentice Hall of India Pvt. Ltd, New Delhi.
2. N. K. Sinha (2008), Control System.

3. Prof. Vishwajit K. Barbudhe Control System Engineering National Press (2020)
4. Richard Dorf and Robert Bishop Modern Control Systems Pear son, 13th edition (2016)

Online Learning Resources:

1. https://nptel.ac.in/courses/107106081
2. https://nptel.ac.in/courses/108107115
3. https://nptel.ac.in/courses/108103007
4. https://nptel.ac.in/courses/115108104

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III B. Tech - II Semester (ME)

L	T	P	C
3	0	0	3

23AME29: OPERATIONS RESEARCH
(Professional Elective II)

Course Outcomes:

CO1: Build and compare different mathematical models of the real time situations by using different Research models. Solve the LP problems and find Multiple Optimal Solutions.
CO2: Implement Transportation and Assignment problems to solve the real time industry needs.
CO3: Choose the best strategy of Game theory and capable of identifying the suitable techniques Solve the Job Sequencing Problem.
CO4: Apply different Queuing models to optimize the queuing length. Define the queuing and inventory terminology to solve the different inventory and queuing problems.
CO5: Apply concepts of replacement and maintenance analysis and solve optimization problems using dynamic programming techniques.

UNIT I
Introduction to OR
Introduction to Operations Research (OR): OR definition - Classification of Models, modeling – Methods of solving OR Models, limitations and applications of OR models
Linear Programming (LP): Problem Formulation, Graphical Method, Simplex Method, Big-M Method, Two–Phase Simplex Method, Special Cases of LP- Degeneracy, Infeasibility and Multiple Optimal Solutions; Concept of dual theorem

UNIT – II
Transportation and Assignment Problems
Transportation Problem – Formulation; Different Methods of Obtaining Initial Basic Feasible Solution –North West Corner Rule, Least Cost Method, Vogel's Approximation Method; Optimality Method – Modified Distribution (MODI) Method; Special Cases – Unbalanced Transportation Problem, Degenerate Problem. Assignment Problem – Formulation, Hungarian Method for Solving Assignment Problems, Traveling Salesman problem.

UNIT – III
Game theory & Job Sequencing
Game theory: Optimal solution of two-person zero sum games, the max min and min max principle. Games without saddle points, mixed strategies. Reduction by principles of dominance, arithmetic, algebraic method and graphical method.
Job Sequencing: Introduction to Job shop Scheduling and flow shop scheduling, Solution of Job Sequencing Problem, Processing of n Jobs through two machines, Processing of n Jobs through m machines, graphical method.

UNIT – IV
Queuing Theory & Inventory Control
Queuing Theory: Introduction – Terminology, Arrival Pattern, Service Channel, Population, Departure Pattern, Queue Discipline, Birth & Death Process, Single Channel Models with Poisson Arrivals, Exponential Service Times with infinite and finite queue length; Multichannel Models with Poisson Arrivals, Exponential Service Times with infinite queue length.
Inventory Control: Introduction, Deterministic models – EOQ model with and without shortages, Production model, Buffer stock and discount inventory models with single price breaks. Selective inventory control.

UNIT – V
Replacement and Maintenance Analysis & DP
Replacement and Maintenance Analysis: Introduction – Types of Maintenance, Make or buy decision. Types of Replacement Problems, Determination of Economic Life of an Asset, and Simple Probabilistic Model for Items which completely fail-Individual Replacement Model, Group Replacement Model. Dynamic Programming (DP): Introduction –Bellman's Principle of Optimality – Applications of Dynamic Programming – Shortest Path Problem – Capital Budgeting Problem – Solution of Linear Programming Problem by DP.

Text Books:
1. Sharma S.D., Operations Research: Theory, Methods and Applications, 15/e, Kedar Nath Ram Nath, 2010
2. Taha H.A., Operations Research, 9/e, Prentice Hall of India, New Delhi, 2010.

Reference Books:
1. Hiller F.S., and Liberman G.J., Introduction to Operations Research, 7/e, Tata McGraw Hill, 2010.
2. Sharma J.K., Operations Research: Theory and Applications, 4/e, Laxmi Publications, 2009.
3. Prem kumar Gupta and Hira, Operations Research, 3/e, S Chand Company Ltd., New Delhi, 2003.
4. Pannerselvam R., Operations Research, 2/e, Pentice Hall of India, New Delhi, 2006.
5. Sundaresan.V, and Ganapathy Subramanian.K.S, Resource Management Techniques: Operations Research, A.R Publications, 2015.

Online Learning Resources:
- http://www2.informs.org/Resources/
- http://www.mit.edu/~orc/
- http://www.ieor.columbia.edu/
- http://www.universalteacherpublications.com/univ/ebooks/or/Ch1/origin.htm
- http://www.wolfram.com/solutions/OperationsResearch/

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L	T	P	C
3	0	0	3

23AME30: SMART MATERIALS
(Professional Elective II)

Course Outcomes:

CO1: Understand and distinguish between traditional engineering materials and smart materials, and identify appropriate smart materials for various engineering applications.
CO2: Explain the working principles, properties, and applications of different smart materials and evaluate their suitability for specific engineering and technological applications.
CO3: Understand and apply suitable processing and fabrication techniques for different smart materials in engineering applications.
CO4: Identify, describe, and equate different sensor technologies and select appropriate sensors for engineering applications.
CO5: Demonstrate the working mechanisms of various actuators compare and select suitable actuation methods for different smart materials for create system applications.

UNIT-1
Introduction
Characteristics of metals, polymers and ceramics. Introduction to smart materials. Classification of smart materials, Components of a smart System, Applications of smart material.

UNIT-2
Smart Materials Piezoelectric materials, Electro strictive Materials, Magneto strictive materials, Magnetoelectric materials, Magnetorheological Electrorheological fluids, Shape Memory materials.

UNIT-3
Processing of Smart Materials Semiconductors and their processing, Metals and metallization techniques, Ceramics and their processing, Polymers and their synthesis, UV radiation curing of polymers, fluids.

UNIT-4
Sensors Introduction, Conductometric sensors, Capacitive sensors, Piezoelectric sensors, Magneto strictive sensors, Piezoresistive sensors, Optical sensors, Resonant sensors, semiconductor- based sensors, Acoustic sensors, polymerize sensors, Carbon nanotube sensors.

UNIT-5
Actuators Introduction, Electrostatic transducers, Electromagnetic transducers, Electrodynamic transducers, Piezoelectric transducers, Electro-strictive transducers, Magneto-strictive transducers, Electro thermal actuators, Comparison of actuation, Applications

Text Books:
1. Smart Material Systems and MEMS: Design and Development Methodologies, V. K. Varadan, K. J. Vinoy, S. Gopalakrishnan, John Wiley and Sons, England, 2006.
2. Smart Structures and Materials, Brain Culshaw, Artech House, London, 1996.
3. Smart Materials and Structures, Mukesh V. Gandhi, Brian S. Thompson, , Springer, May- 1992.

Reference Books:
1. Smart Structures: Analysis and Design, A. V. Srinivasan, Cambridge University Press, Cambridge, New York, 2001.
2. Smart Structures, P. Gauenzi, Wiley, 2009.
3. Piezoelectric Sensorics: Force, Strain, Pressure, Acceleration and Acoustic Emission Sensors, Materials and Amplifiers, G. Gautschi, Springer, Berlin, New York, 2002.
4. Analysis and Performance of Fiber Composites, B. D. Agarwal and L. J. Broutman, John Wiley & Sons.
5. Engineering aspects of Shape memory Alloys, T. W. Duerig, K. N. Melton, D. Stockel, C.
6. Mayman, Butterworth – Heinemann, 1990.

Online Learning Resources:

1. https://nptel.ac.in/courses/112104173/
2. www.iop.org/EJ/article/0964-1726/5/3/002/sm6301.ps.gz
3. https://nptel.ac.in/courses/112104173/
4. https://nptel.ac.in/courses/112104251/

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3	0	0	3

23AME31: APPLICATIONS OF COMPUTATIONAL FLUID DYNAMICS
(Professional Elective III)

Course Outcomes:

CO1: Formulate and solve partial differential equations using finite element methods, apply and analyze the stability, accuracy of explicit and implicit methods.

CO2: Apply and analyze explicit and implicit numerical schemes, solve nonlinear and second-order PDEs, using appropriate numerical techniques.

CO3: Create and solve incompressible and compressible viscous flow problems, apply appropriate boundary conditions.

CO4: Develop and implement finite volume formulations based on finite difference methods, ensuring accurate and conservative solutions in CFD applications.

CO5: Analyze and solve linear fluid flow problems, using appropriate numerical methods and interpret the physical significance of the computed results.

UNIT I

Introduction and Solution methods

Introduction: Finite difference method, finite volume method, finite element method, governing equations and boundary conditions, Derivation of finite difference equations.

Solution methods: Solution methods of elliptical equations — finite difference formulations, interactive solution methods, direct method with Gaussian elimination. Parabolic equations-explicit schemes and Von Neumann stability analysis, implicit schemes, alternating direction implicit schemes, approximate factorization, fractional step methods, direct method with tridiagonal matrix algorithm.

UNIT II

Hyperbolic equations:

Hyperbolic equations: explicit schemes and Von Neumann stability analysis, implicit schemes, multi-step methods, nonlinear problems, second order one-dimensional wave equations. Burger's equations: Explicit and implicit schemes, Runge-Kutta method.

UNIT III

Formulations Of Incompressible Viscous Flows: Formulations of incompressible viscous flows by finite difference methods, pressure correction methods, vortex methods.

Treatment of compressible flows: potential equation, Euler equations, Navier-stokes system of equations, flow field-dependent variation methods, boundary conditions, example problems.

UNIT IV

Finite Volume Method:

Finite Volume Method Finite volume method via finite difference method, formulations for two and three-dimensional problems.

UNIT V

Standard Variational Methods:

Standard Variational Methods Linear fluid flow problems, steady state problems, Transient problems.

Text books:

1. T. J. Chung, Computational fluid dynamics, Cambridge University press,2002.
2. John D. Anderson, Computational Fluid Dynamics: Basics with applications, Mc Graw Hill. 2017

Reference Books:

1. Frank Choriton, Text book of fluid dynamics, CBS Publishers & distributors, 1985.
2. Suhas V. Patankar, Numerical heat transfer and fluid flow, Hema shava Publishers corporation & Mc Graw Hill, 1990.
3. Muralidaran, Computational Fluid Flow and Heat Transfer, Narosa Publications, 2003.
4. Tapan K. Sengupta, Fundamentals of Computational Fluid Dynamics, Universities Press, 2004.

5. C. Pozrikidis, Introduction to Theoretical and Computational Fluid Dynamics, Oxford University press, 2/e, 2012.

Online Learning Resources:

- https://nptel.ac.in/courses/112107079
- https://www.youtube.com/watch?v=3QFT7pGx03I
- https://www.youtube.com/watch?v=t7jS7V_6TGQ
- https://nptel.ac.in/courses/112107080

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3	0	0	3

23AME32: INDUSTRIAL SAFETY
(Professional Elective III)

Course Outcomes:

CO1: Students learn the concepts of industrial safety and management.
CO2: Learn about the smart machines and smart sensors.
CO3: Apply IoT to Industry 4.0 and they are able to make a system tailor-made as per requirement of the industry.
CO4: Students learn about fire prevention and protection systems.
CO5: Students learn and apply the fire safety principles in buildings

UNIT-I

INTRODUCTION TO THE DEVELOPMENT OF INDUSTRIAL SAFETY AND MANAGEMENT: History and development of Industrial safety: Implementation of factories act, Safety and productivity, Safety organizations. Safety committees and structure, Role of management and role of Govt.in industrial safety.

UNIT-II

ACCIDENT PREVENTIONS AND PROTECTIVE EQUIPMENT: Personal protective equipment, Survey the plant for locations, Part of body to be protected, Education and training in safety, Prevention causes and cost of accident, Housekeeping, First aid, Accident reporting, Investigations. Industrial psychology in accident prevention, Safety trials, Safety related to operations.

UNIT-III

SAFETY ACTS: Features of Factory Act, Introduction of Explosive Act, Boiler Act, ESI Act, Workman's compensation Act, Industrial hygiene, Occupational safety, Diseases prevention, Ergonomics, Occupational diseases, stress, fatigue, health, safety and the physical environment, Engineering methods of controlling chemical hazards, safety and the physical environment, Control of industrial noise and protection against it, Code and regulations for worker safety and health, codes for safety of systems.

UNIT-IV

FIRE PREVENTION AND PROTECTION: Sources of ignition – fire triangle – principles of fire extinguishing – active and passive fire protection systems – various classes of fires – A, B, C, D, E-Fire extinguishing agents-Water, Foam, Dry chemical powder, Carbon-dioxide Halon alternatives Halocarbon compounds-Inert gases, dry powders – types of fire extinguishers – fire stoppers –hydrant pipes – hoses – monitors – fire watchers – layout of stand pipes – fire station-fire alarms and sirens – maintenance of fire trucks – foam generators – escape from fire rescue operations – fire drills –first aid for burns.

UNIT-V

BUILDING FIRE SAFETY: Objectives of fire safe building design, Fire load, fire resistant material and fire testing – structural fire protection – structural integrity – concept of egress design -exit– width calculations – fire certificates – fire safety requirements for high rise buildings.

Text Books:

1. Occupational Safety Management and Engineering Willie Hammer–Prentice Hall (2000)
2. Purandare D. D & Abhay D. Purandare, ―Handbook on Industrial Fire Safety‖ P&A publications, New Delhi, 2006.

Reference Books:

1. Installation, Servicing and Maintenance Bhattacharya, S.N.-S. Chand and Co.
2. Jain VK ―Fire Safety in Building‖ New Age International 1996.
3. Reliability, Maintenance and Safety Engineering by Dr. A. K. Guptha.
4. A Text book of Reliability and Maintenance Engineering by Alakesh Manna
5. McElroy, Frank E, Accident Prevention Manual for Industrial Operations‖, NSC, Chicago, 1988.

6. Green, A.E., High Risk Safety Technology‖, John Wiley and Sons, 1984.

Online Learning Resources:

- https://nptel.ac.in/courses/110105094
- https://youtube.com/playlist?list=PLbRMhDVUMngdXebaRB59KdKwstzuAovua&si=FcbDQzZK6i_3TASD
- https://youtube.com/playlist?list=PLbRMhDVUMngdXebaRB59KdKwstzuAovua&si=6RaMiYhEkp5-EfAH
- https://youtube.com/playlist?list=PLln3BHg93SQ8RYKhe9czOHq1hVjpEWMts&si=5y0WMqX3wrvvispq

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III B. Tech - II Semester (ME)

L	T	P	C
3	0	0	3

23AME33: DESIGN OF AUTOMOBILE TRANSMISSION SYSTEMS
(Professional Elective III)

Course Outcomes:

CO1: Design and select suitable flexible power transmission elements and analyze the load conditions, and performance requirements.

CO2: Analyze spur gear geometry and kinematics, and design spur gears for desired power transmission capacity based on bending and contact stress criteria.

CO3: Analyze and design different types of gears by evaluating their efficiency, ensuring reliable performance in mechanical power transmission systems.

CO4: Create speed reducers and multi-speed gearboxes by developing structural and ray diagrams, selecting appropriate gear combinations for various mechanical applications.

CO5: Select, and design various types of clutches and brakes, analyze and choose appropriate friction materials for effective motion control.

UNIT I

Flexible power transmission systems: Design of Belts – Flat Belts and Pulleys – V Belts and Pulleys – Design of chain drives – Wire ropes.

Design of bearing: Lubrication- hydrodynamic lubrication theory, Design of sliding contact bearing using Sommer field number – Design using Mckee's equation – Selection of rolling contact bearings.

UNIT II

Spur gear: Gear geometry – Kinematics – Forces on gear tooth – Stresses in Gear tooth – Selection of gear material based on bending stress and contact stress – Design of Spur gear – Power transmitting capacity.

UNIT III

Helical, bevel and worm gears: Parallel Helical Gears – Kinematics – Tooth proportions – Force analysis – Stresses in Helical gear – Design of helical gear – Crossed Helical gears – Straight Bevel gears – Kinematics – Force analysis – Stresses in straight bevel gear tooth – Design of bevel gear – Worm gearing – Kinematics – Forces - Friction and Efficiencies – Stresses in worm gear tooth.

UNIT IV

Design of gear boxes: Design of Speed reducers – Design of multi speed gear boxes for machine tools – Structural and ray diagrams.

UNIT V

Elements of motion control: Internal – Expanding Rim clutches and Brakes – External – Contracting Rim clutches and Brakes – Band type Clutches – Cone clutches and Brakes – Energy considerations – Temperature rise – Friction materials.

Text Books:

1. Joseph Edward Shigley and Charles, R. Mischke, ―Mechanical Engineering Design‖, McGraw –Hill International Editions, 2000.
2. Robert L. Norton, ―Machine Design‖- an integrated approach, (5th Edition) Pearson publisher, 2000

Reference Books:

1. Design Data‖, PSG College of Technology, DPV Printers, Coimbatore, 2005.
2. Malisa, Hand Book of Gear Design‖, Tata Mc Graw Hill, International Edition, 2000.
3. V.B. Bhandari, Design of Machine Elements‖, Tata Mc Graw Hill, 2001

Online Learning Resources:

- https://youtube.com/playlist?list=PLyqSpQzTE6M-7nTyaGekZRTLLUzGfRPMo&si=Jvicxjkhv8LS6Lt
- https://youtube.com/playlist?list=PLyqSpQzTE6M-7nTyaGekZRTLLUzGfRPMo&si=aFp27b3qPylydj CV

- https://youtu.be/ftJKqKuppF4?si=wzfkYJUOeDxWHWRW

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L	T	P	C
3	0	0	3

23AME34: MECHANICS & MANUFACTURING OF COMPOSITE MATERIALS
(Professional Elective III)

Course Outcomes:

CO1: Classify and describe the characteristics of different types of composite materials, and explain and apply various fiber-reinforced plastic processing methods.

CO2: Evaluate the elastic moduli of composite laminas, apply Hooke's law to different material types and solve numerical problems.

CO3: Analyze the failure of composite laminates, and perform macro-mechanical analysis using Classical Laminate Theory (CLT), for various laminate configurations through numerical problem-solving.

CO4: Identify and select appropriate reinforcements and base metals for MMCs, understand and apply various fabrication processes.

CO5: Analyze and evaluate the failure mechanisms of unidirectional lamina using micromechanical models and apply suitable failure theories through practical examples.

UNIT I

Introduction to Composite Materials

Introduction to Composite Materials: Definition, classification and characteristics of composite Materials – fibrous composites, laminated composites, particulate composites. Applications: Automobile, Aircrafts. missiles. Space hardware, Electrical and electronics, Marine, recreational and sports equipment, future potential of composites.

Fiber Reinforced Plastic Processing: Lay-up and curing, fabricating process, open and closed mould process, hand lay-up techniques; structural laminate bag molding, production procedures for bag molding; filament winding, pultrusion, pulforming, thermo-forming, injection molding, blow molding.

UNIT II

Micro Mechanical Analysis of a Lamina:

Micro Mechanical Analysis of a Lamina: Introduction, Evaluation of the four elastic moduli by Rule of mixture, Numerical problems.

Macro Mechanics of a Lamina: Hooke's law for different types of materials, Number of elastic constants, Two - dimensional relationship of compliance and stiffness matrix. Hooke's law for two-dimensional angle lamina, engineering constants - Numerical problems. Stress-Strain relations for lamina of arbitrary orientation, Numerical problems.

UNIT III

Biaxial Strength Theories

Maximum stress theory, Maximum strain theory, Tsai-Hill theory, Tsai, Wu tensor theory, Numerical problems.

Macro Mechanical Analysis of Laminate

Introduction, code, Kirchoff hypothesis, CL T, A, B, and D matrices (Detailed derivation) , Special cases of laminates, Numerical problems.

UNIT IV

Metal Matrix Composites:

Metal Matrix Composites: Reinforcement materials, types, characteristics and selection base metals selection. Need for production MMC's and its application.

Fabrication Process for MMC's: Powder metallurgy technique, liquid metallurgy technique and secondary processing, special fabrication techniques.

Study Properties of MMC's: Physical Mechanical, Wear, machinability and Other Properties. Effect of size, shape and distribution of particulate on properties.

UNIT V

Failure Theories

Micromechanics of Failure of Unidirectional Lamina, Anisotropic Strength and Failure Theories, Importance of Shear Strength, Choice of Failure Criteria, Examples.

Text Books:

1. K.K. Chawla, Composite Materials, Springer-Verlag, New York, 1998.
2. B.T. Astrom, Manufacturing of Polymer Composites, Chapman & Hall, 1997.
3. Stuart M Lee, J. Ian Gray, Miltz, Reference Book for Composites Technology, CRC press, 1989.

Reference Books:

1. Frank L Matthews and R D Rawlings, Composite Materials: Engineering and Science, Taylor and Francis, 2006.
2. D. Hull and T.W. Clyne, Introduction to Composite Materials, Cambridge University Press, 1996.
3. M.R. Piggott, Load Bearing Fiber Composites, Pergamon press, Oxford, 1998.
4. F. Ashby and D.R.H. Jones, Engineering Materials, Pergamon press, 1999.
5. R.W. Davidge and A. Kelly, Mechanical behavior of ceramics, Cambridge university press, 1999.
6. Andrew C. Marshall, Composite Basics, Marshall Consulting. Mode of Evaluation Quiz/Assignment/ Seminar/Written Examination, 1998.

Online Learning Resources:

- https://nptel.ac.in/courses/112104221
- https://nptel.ac.in/courses/112104229
- https://nptel.ac.in/courses/112104161
- https://onlinecourses.nptel.ac.in/noc22_me40/preview

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3	0	0	3

23AME35: INTRODUCTION TO HYBRID AND ELECTRIC VEHICLES

(Professional Elective III)

Course Outcomes:

CO1: Analyze and design electric vehicle propulsion and energy storage systems, evaluate battery performance and management strategies.

CO2: Implement electric machine operation, design and analyze control power electronic converters, and apply drive control strategies in electric vehicle applications.

CO3: Analyze hybrid and electric drivetrain configurations, evaluate and create various electric motor drives and hybrid vehicle propulsion systems.

CO4: Compare hybrid and electric vehicle architectures, understand control strategies for various drive systems, and evaluate the role of emerging technologies in improving vehicle efficiency and sustainability.

CO5: Design and evaluate hybrid and electric vehicle systems, and applying control and communication principles across various electric and hybrid vehicle architectures.

UNIT I:

Electric Vehicle Propulsion and Energy Sources

Introduction to electric vehicles, vehicle mechanics - kinetics and dynamics, roadway fundamentals propulsion system design - force velocity characteristics, calculation of tractive power and energy required, electric vehicle power source - battery capacity, state of charge and discharge, specific energy, specific power, Ragone plot. battery modeling - run time battery model, first principle model, battery management system- soc measurement, battery cell balancing. Traction batteries - nickel metal hydride battery, Li-Ion, Lipolymer battery.

UNIT II:

Electric Vehicle Power Plant and Drives

Introduction electric vehicle power plants. Induction machines, permanent magnet machines, switch reluctance machines. Power electronic converters-DC/DC converters - buck boost converter, isolated DC/DC converter. Two quadrant chopper and switching modes. AC drives- PWM, current control method. Switch reluctance machine drives - voltage control, current control.

UNIT III:

Hybrid And Electric Drive Trains

Introduction hybrid electric vehicles, history and social importance, impact of modern drive trains in energy supplies. Hybrid traction and electric traction. Hybrid and electric drive train topologies. Power flow control and energy efficiency analysis, configuration and control of DC motor drives and induction motor drives, permanent magnet motor drives, switch reluctance motor drives, drive system efficiency.

UNIT IV:

Electric and Hybrid Vehicles - Case Studies

Parallel hybrid, series hybrid -charge sustaining, charge depleting. Hybrid vehicle case study – Toyota Prius, Honda Insight, Chevrolet Volt. 42 V system for traction applications. Lightly hybridized vehicles and low voltage systems. Electric vehicle case study - GM EV1, Nissan Leaf, Mitsubishi Miev. Hybrid electric heavy-duty vehicles, fuel cell heavy duty vehicles.

UNIT V:

Electric and Hybrid Vehicle Design:

Introduction to hybrid vehicle design. Matching the electric machine and the internal combustion engine. Sizing of propulsion motor, power electronics, drive system. Selection of energy storage technology, communications, supporting subsystem. Energy management strategies in hybrid and electric vehicles - energy management strategies- classification, comparison, implementation.

Text Books:

1. Iqbal Hussein, ―Electric and Hybrid Vehicles: Design Fundamentals‖, 2nd edition, CRC Press, 2003.

2. Amir Khajepour, M. Saber Fallah, Avesta Goodarzi, ―Electric and Hybrid Vehicles: Technologies, Modeling and Control - A Mechatronic Approach‖, illustrated edition, John Wiley & Sons, 2014.

Reference Books:

1. James Larminie, John Lowry, ―Electric Vehicle Technology‖, Explained, Wiley, 2003.
2. John G. Hayes, G. Abas Goodarzi, ―Electric Powertrain: Energy Systems, Power Electronics and Drives for Hybrid, Electric and Fuel Cell Vehicles‖, 1st edition, Wiley- Blackwell, 2018.
3. Mehrdad Ehsani, YimiGao, Sebastian E. Gay, Ali Emadi, ―Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design‖, CRC Press, 2004.

Online Learning Resources:

- https://nptel.ac.in/courses/108103009
- https://youtube.com/playlist?list=PL9f9hWLZS62VF18qPQ1gC7NqIAjaClsl&si=JKUPBH9r1LPqsm9-
- https://youtu.be/h5ysddrlXLw?si=UzfPunK1x-MQOAz1
- https://youtu.be/i7Rq0bN8eig?si=iHGLGNTGOzSTaGpW

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III B. Tech - II Semester (ME)

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23ACE44: DISASTER MANAGEMENT
(Open Elective II)

Course Outcomes:

CO1: Understand the fundamental concepts of natural disasters, their occurrence, and disaster risk reduction strategies.

CO2: Analyze the impact of cyclones on structures and explore retrofitting techniques for adaptive reconstruction.

CO3: Apply wind engineering principles and computational techniques in designing wind-resistant structures.

CO4: Evaluate earthquake effects on buildings and develop strategies for seismic retrofitting.

CO5: Assess seismic safety planning, design considerations, and innovative construction materials for disaster-resistant structures.

UNIT– I

Introduction to Natural Disasters– Brief Introduction to Different Types of Natural Disasters, Occurrence of Disasters in Different Climatic and Geographical Regions, Hazard Maps (Earthquake and Cyclone) of The World and India, Regulations for Disaster Risk Reduction, Post-Disaster Recovery and Rehabilitation (Socioeconomic Consequences).

UNIT– II

Cyclones and Their Impact–Climate Change and Its Impact On Tropical Cyclones, Nature of Cyclonic Wind, Velocities and Pressure, Cyclone Effects, Storm Surges, Floods, and land slides. Behavior of Structures in Past Cyclones and Windstorms, Case Studies. Cyclonic Retrofitting, Strengthening of Structures, and Adaptive Sustainable Reconstruction. Life-Line Structures Such as Temporary Cyclone Shelters.

UNIT– III

Wind Engineering and Structural Response– Basic Wind Engineering, Aerodynamics of Bluff Bodies, Vortex Shedding, and Associated Unsteadiness Along and Across Wind forces. Lab: Wind Tunnel Testing and Its Salient Features. Introduction to Computational Fluid Dynamics (CFD). General Planning and Design Considerations Under Windstorms and Cyclones. Wind Effects On Buildings, towers, Glass Panels, Etc., and Wind-Resistant Features in Design. Codal Provisions, Design Wind Speed, Pressure Coefficients. Coastal Zoning Regulations for Construction and Reconstruction in Coastal Areas. Innovative Construction Materials and Techniques, Traditional Construction Techniques in Coastal Areas.

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.

Reference Books:

1. Ben Wisner, J.C. Gaillard, and Ilan Kelman (Editors), *Handbook of Hazards and Disaster Risk Reduction and Management*, 2nd Edition, Routledge, 2012.
2. Damon P. Coppola, *Introduction to International Disaster Management*, 4th Edition, Butterworth-Heinemann, 2020.
3. Bimal Kanti Paul, *Environmental Hazards and Disasters: Contexts, Perspectives and Management*, 2nd Edition, Wiley-Blackwell, 2020.

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23ACE45: SUSTAINABILITY IN ENGINEERING PRACTICES
(Open Elective II)

Course Outcomes:

CO1: Understand the fundamentals of sustainability, the carbon cycle, and the environmental impact of construction materials.
CO2: Analyze sustainable construction materials, their durability, and life cycle assessment.
CO3: Apply energy calculations in construction materials and assess their embodied energy.
CO4: Evaluate green building standards, energy codes, and performance ratings.
CO5: Assess the environmental effects of energy use, climate change, and global warming.

UNIT– I
INTRODUCTION
Introduction and Definition of Sustainability - Carbon Cycle - Role of Construction Material: Concrete and Steel, Etc. - 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
ENVIRONMENTALEFFECTS
Non-Renewable Sources of Energy and Environmental Impact– Energy Norm, Coal, Oil, Natural Gas-Nuclear Energy-Global Temperature, Green House Effects, Global Warming - Acid Rain: Causes, Effects and Control Methods - Regional Impacts of Temperature Change.

Text Books:

1. Charles J. Kibert, *Sustainable Construction: Green Building Design & Delivery*, 4th Edition, Wiley Publishers, 2016.
2. Steve Goodhew, *Sustainable Construction Process*, Wiley Blackwell, UK, 2016.

Reference Books:

1. Craig A. Langston & Grace K. C. Ding, *Sustainable Practices in the Built Environment*, Butterworth-Heinemann Publishers, 2011.
2. William P. Spence, *Construction Materials, Methods & Techniques* (3rd Edition), Yesdee Publication Pvt. Ltd., 2012.

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23AEE33: RENEWABLE ENERGY SOURCES
(Open Elective II)

Course Outcomes:

CO1: Understand principle operation of various renewable energy sources.
CO2: Identify site selection of various renewable energy sources.
CO3: Analyze various factors affecting on solar energy measurements, wind energy conversion techniques, Geothermal, Biomass, Tidal Wave and Fuel cell energies.
CO4: Design of Solar PV modules and considerations of horizontal and vertical axis Wind energy systems.
CO5: Apply the concepts of Geo Thermal Energy, Ocean Energy, Bio mass and Fuel Cells for generation of power.

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.

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23AEC26: DIGITAL CIRCUITS
(Open Elective II)

Course Outcomes:

CO1: Learn Boolean algebra, logic simplification techniques, and combinational circuit design.
CO2: Analyze combinational circuits like adders, subtractors, and code converters.
CO3: Explore combinational logic circuits and their applications in digital design.
CO4: Understand sequential logic circuits, including latches, flip-flops, counters, and shift registers.
CO5: Gain knowledge about programmable logic devices and digital IC's.

UNIT I

Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Introduction to Logic Gates, Ex-OR, 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, Zvi Kohavi and Nirah K. 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

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23ACD07: OPERATING SYSTEMS & SYSTEM SECURITY

(Open Elective II)

Course Outcomes:

CO1: Realize how applications interact with the operating system.
CO2: Analyze the functioning of a kernel in an Operating system.
CO3: Summarize resource management in operating systems.
CO4: Analyze various scheduling algorithms.
CO5: Examine concurrency mechanism in Operating Systems.
CO6: Apply memory management techniques in design of operating systems.
CO7: Understand the functionality of file system.
CO8: Compare and contrast memory management techniques.
CO9: Understand the deadlock prevention and avoidance.
CO10: Perform administrative tasks on Linux based systems.

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

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

Case Studies: Linux, Microsoft Windows.

Text Books:

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

Reference Books:

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

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23ACM04: MACHINE LEARNING FOR ENGINEERS

(Open Elective II)

Course Outcomes:

CO1: Identify machine learning techniques suitable for a given problem.
CO2: Solve the problems using various machine learning techniques.
CO3: Design application using machine learning techniques.
CO4: Understand and explore Supervised Learning techniques.
CO5: Understand and explore unsupervised learning techniques.

UNIT-I

Introduction to Machine Learning & Preparing to Model

Introduction: What is Human Learning? Types of Human Learning, what is Machine Learning? Types of Machine Learning, Problems Not to Be Solved Using Machine Learning, Applications of Machine Learning, State-of-The-Art Languages/Tools in Machine Learning, Issues in Machine Learning Preparing to Model: Introduction, Machine Learning Activities, Basic Types of Data in Machine Learning, Exploring Structure of Data, Data Quality and Remediation, Data Pre-Processing

UNIT-II

Modelling and Evaluation &Basics of Feature Engineering

Introduction, selecting a Model, training a Model (for Supervised Learning), Model Representation and Interpretability, Evaluating Performance of a Model, Improving Performance of a Model Basics of Feature Engineering: Introduction, Feature Transformation, Feature Subset Selection

UNIT-III

Bayesian Concept Learning & Supervised Learning: Classification Introduction, Why Bayesian Methods are Important? Byes' Theorem, Byes' Theorem and Concept Learning, Bayesian Belief Network Supervised Learning: Classification: Introduction**,** Example of Supervised Learning**,** Classification Model**,** Classification Learning Steps**,** Common Classification Algorithms-*k*-Nearest Neigh bourn (*k*NN), Decision tree, Random forest model, Support vector machines

UNIT-IV

Supervised Learning: Regression

Introduction, Example of Regression, Common Regression Algorithms-Simple linear regression, Multiple linear regression, Assumptions in Regression Analysis, Main Problems in Regression Analysis, Improving Accuracy of the Linear Regression Model, Polynomial Regression Model, Logistic Regression, Maximum Likelihood Estimation.

UNIT-V

Unsupervised Learning Introduction, Unsupervised vs Supervised Learning, Application of Unsupervised Learning, Clustering – Clustering as a machine learning task, Different types of clustering techniques, Partitioning methods, *K*- Medias: a representative object-based technique, Hierarchical clustering, Density-based methods-DBSCAN Finding Pattern using Association Rule- Definition of common terms, Association rule, The apriority algorithm for association rule learning, Build the apriority principle rules.

Text Books:

1. Machine Learning, Sialkot Duet, Subramanian Chandra mole, Amite Kumar Das, Pearson, 2019.

Reference Books:

1. Ethernet Allaying, “Introduction to Machine Learning”, MIT Press, 2004.
2. Stephen Marshland, “Machine Learning -An Algorithmic Perspective”, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series,2014.
3. Andreas C. Miller and Sarah Guido “Introduction t Machine Learning with Python: A Guide for Data Scientists”, Orally.

Online Learning Resources:

1. Andrew Ng, “Machine Learning B. Techning” https://www.deeplearning.ai/machine-learning- B.Techning/
2. Shay Shalvey - Schwartz, Shay Ben-David, “Understanding Machine Learning: From Theory to Algorithms”, Cambridge University Press https://www.cse.huji.ac.il/~shais/UnderstandingMachineLearning/index.html

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23AHS35: OPTIMIZATION TECHNIQUES AND APPLICATIONS
(Open Elective II)

Course Outcomes:

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
Introduction, Applications of Linear Programming, Standard form of a Linear Programming Problem, Geometry of Linear Programming Problems, Basic Definitions in Linear Programming. Simplex Method, Simplex Algorithm and Two-phase Simplex Method, Big-M method.

UNIT II
Linear programming II: Duality in Linear Programming
Symmetric Primal-Dual Relations, General Primal-Dual Relations, Duality Theorem, Dual Simplex Method, Transportation Problem and assignment problem, Complementary slackness Theorem

UNIT III
Non-linear programming: Unconstrained optimization techniques
Introduction: Classification of Unconstrained minimization methods,
Direct Search Methods: Random Search Methods: Descent Method and Fletcher Powell Method, Grid Search Method

UNIT IV
Non-linear programming: Constrained optimization techniques
Introduction, Characteristics of a constrained problem, Random Search Methods, complex method, Sequential linear programming, Basic approach in methods of Feasible directions, Zoutendijk's method of feasible directions: direction finding problem, determination of step length, Termination criteria.

UNIT V
Geometric Programming
Unconstrained Minimization Problems: solution of unconstrained geometric programming using differential calculus and arithmetic-geometric inequality.
Constrained minimization Problems: Solution of a constrained geometric programming problem, primal-dual programming in case of less-than inequalities, geometric programming with mixed inequality constraints.

Text Books:

1. Singiresu S Rao., Engineering Optimization: Theory and Practices, New Age Int. (P) Ltd. Publishers, New Delhi.
2. J. C. Panth, Introduction to Optimization Techniques, (7-e) Jain Brothers, New Delhi.

Reference Books:

1. Harvey M. Wagner, Principles of Operation Research, Printice-Hall of India Pvt. Ltd. New Delhi.
2. Peressimi A.L., Sullivan F.E., Vhl, J. J. Mathematics of Non-linear Programming, Springer – Verlag.

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc24_ee122/preview

2. https://archive.nptel.ac.in/courses/111/105/111105039/
3. https://onlinecourses.nptel.ac.in/noc21_ce60/preview

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23AHS36: MATHEMATICAL FOUNDATION OF QUANTUM TECHNOLOGIES
(Open Elective II)

Course Outcomes:

CO1: Understand the Transformation theory and Hilbert space.
CO2: Analyze the properties and operators of Hilbert space and apply Eigen values to it.
CO3: Apply statistics to measure theory, uncertainty relations and radiation theory.
CO4: Evaluate problems on reversibility, equilibrium and macroscopic measurements.
CO5: Formulate problems of composite system and measuring process.

UNIT I
Introductory Considerations
The origin of the Transformation Theory, The Original Formulation of Quantum Mechanics, The Equivalence of the two Theories: (i) The Transformation Theory, (ii) Hilbert Space.

UNIT II
Abstract Hilbert Space
The definition of Hilbert space, The Geometry of Hilbert space, Degression on the Conditions A-E, Closed linear Manifolds, Operators in Hilbert space, The Eigen Value Problem, Continuation, Initial Consideration concerning the Eigenvalue Problem, Degression on the Existence and Uniqueness of solutions of the Eigenvalue Problems, Cumulative operators, The Trace.

UNIT III
The Quantum Statistics
The statistical assertions of quantum mechanics, the statistical interpretation, Simultaneous Measurability and Measurability in General, Uncertainty Relations, Projections as Propositions, Radiation Theory.

UNIT IV
Deductive development of the Theory and general considerations
The fundamental basis of the statistical theory, Conclusions from Experiments.
Measurement and reversibility, Thermodynamics Considerations, Reversibility and equilibrium problems, The Macroscopic Measurement.

UNIT V: The measuring Process
Formulation of the problems, Composite systems, discussion of the Measuring process.

Text Books:

1. John von Neumann and Robert T Beyer, Mathematical Foundations of Quantum Mechanics, Princeton Univ. Press (1996).
2. Srinivas, M. D., Measurements and Quantum Probabilities, University Press, Hyderabad (2001).

Reference Books:

1. Leonard Schiff, Quantum Mechanics, Mc, Graw Hill (Education) (2010).
2. Parthasarathy. K. R., Mathematical Foundations of Quantum, Hindustan Book Agency, New Delhi.
3. Gerad Tesch, Mathematical Methods in Quantum Mechanics with application to Schrodinger operators, Graduate Studies in Mathematics, 99, AMS, Providence, 2009.

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23AHS37: PHYSICS OF ELECTRONIC MATERIALS AND DEVICES
(Open Elective II)

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.

UNIT-I
Fundamentals of Materials Science
Introduction, Phase rule, Phase Diagram, Elementary idea of Nucleation and Growth, Methods of crystal growth. The basic idea of point, line, and planar defects. Concept of thin films, preparation of thin films, Deposition of thin film using sputtering methods (RF and glow discharge).

UNIT- II
Semiconductors
Introduction, charge carriers in semiconductors, effective mass, Diffusion and drift, Diffusion and recombination, Diffusion length. The Fermi level & Fermi-Dirac distribution, Electron and Hole in quantum well, Change of electron-hole concentration - Qualitative analysis, Temperature dependency of carrier concentration, Conductivity and mobility, Effects of temperature and doping on mobility, High field effects.

UNIT– III
Physics of Semiconductor Devices
Introduction, Band structure, PN junctions and their typical characteristics under equilibrium and under bias, Heterojunctions, Transistors, MOSFETs.

UNIT- IV
Excitons and Luminescence:
Luminescence: Different types of luminescence, basic definitions, Light emission in solids, Inter- band luminescence, Direct and indirect gap materials.
Photoluminescence: General Principles of photo luminescence, Excitation and relaxation, OLED, Quantum-dot.
Electro-luminescence: General Principles of electro luminescence, light emitting diode, diode laser.

UNIT- V
Display devices
LCD, three-dimensional display: Holographic display, light-field displays: Head-mounted display, MOEMS (Micro-Opto-Electro-Mechanical Systems) and MEMS displays.

Text Books:

1. Principles of Electronic Materials and Devices- S.O. Kasap, McGraw-Hill Education (India) Pvt. Ltd., 4thedition, 2021.
2. Semi-conductor physics & devices: basic principles, 4thEdition, McGraw-Hill,2012.

Reference Books:

1. Solid State Electronic Devices- B.G. Street man and S. Banerjee, PHIL earning, 6th edition
2. Electronic Materials Science-Eugene A.Irene, Wiley, 2005
3. Electronic Components and Materials, Grover and Jamwal, Dhanpat Raiand 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

Online Learning Resources:

https://nptel.ac.in/courses/113/106/113106062/

https://onlinecourses.nptel.ac.in/noc20_ph24/preview

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23AHS38: CHEMISTRY OF POLYMERS AND APPLICATIONS
(Open Elective II)

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.

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, poly dispersity 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, and 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 Hydro gel, polymer networks, Types of polymer networks, Methods involved in hydro gel preparation, Classification, Properties of hydro gels, Applications of hydro gels 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.

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III B. Tech - II Semester (ME)

L	T	P	C
3	0	0	3

23AHS39: ACADEMIC WRITING AND PUBLIC SPEAKING
(Open Elective II)

Course Outcomes:

CO1: Understand various elements of Academic Writing.
CO2: Identify sources and avoid plagiarism.
CO3: Demonstrate the knowledge in writing a Research paper.
CO4: Analyse different types of essays.
CO5: Assess the speeches of others and know the positive strengths of speakers.
CO6: Build confidence in giving an impactful presentation to the audience.

UNIT - I Introduction to Academic Writing

Introduction to Academic Writing – Essential Features of Academic Writing – Courtesy – Clarity – Conciseness – Correctness – Coherence – Completeness – Types – Descriptive, Analytical, Persuasive, Critical writing.

UNIT - II Academic Journal Article

Art of condensation- summarizing and paraphrasing - Abstract Writing, writing Project Proposal, writing application for internship, Technical/Research/Journal Paper Writing – Conference Paper writing - Editing, Proof Reading – Plagiarism.

UNIT - III Essay & Writing Reviews

Compare and Contrast – Argumentative Essay – Exploratory Essay – Features and Analysis of Sample Essays – Writing Book Report, Summarizing, Short Story Writing Book/film Review- SoP.

UNIT - IV Public Speaking

Introduction, Nature, characteristics, significance of Public Speaking – Presentation – 4 Ps of Presentation– Stage Dynamics – Answering Strategies –Analysis of Impactful Speeches- Speeches for Academic events.

UNIT - V Public Speaking and Non-Verbal Delivery

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

Text Books:

1. Critical Thinking, Academic Writing and Presentation Skills: MG University Edition Paperback – 1 January 2010 Pearson Education; First edition (1 January 2010)
2. Pease, Allan & Barbara. The Definitive Book of Body Language RHUS Publishers, 2016

Reference Books:

1. Alice Savage, Masoud Shafiei Effective Academic Writing,2Ed.,2014. Oxford University Press
2. Shalini Verma, Body Language, S Chand Publications 2011.
3. Sanjay Kumar and Pushpalata, Communication Skills 2E 2015, Oxford.
4. Sharon Gerson, Steven Gerson, Technical Communication Process and Product, Pearson, New Delhi, 2014
5. Elbow, Peter. Writing with Power. OUP USA, 1998

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III B. Tech - II Semester (ME)

L	T	P	C
0	0	3	1.5

23AME36: HEAT TRANSFER LAB

Course Outcomes:

CO1: Explain different modes of heat transfer
CO2: Identify parameters for measurement for calculating heat transfer.
CO3: Determine effectiveness of heat exchanger
CO4: Design new equipment related to heat transfer
CO5: Apply principles of heat transfer in wide application in industries.

List of Experiments:

1. Determine the overall heat transfer coefficient across the width of composite wall
2. Determine the thermal conductivity of a metal rod
3. Determine the thermal conductivity of insulating powder material through concentric sphere apparatus
4. Determine the thermal conductivity of insulating material through lagged pipe apparatus
5. Determine the efficiency of a pin fin in natural and forced convection.
6. Determine the heat transfer coefficient for a vertical cylinder in natural convection
7. Determine the heat transfer coefficient in forced convection of air in a horizontal tube.
8. Determine the heat transfer coefficients on film and drop wise condensation apparatus.
9. Determine the effectiveness of a parallel and counter flow heat exchanger.
10. Study the pool boiling phenomenon and different regimes of pool boiling.
11. Experiment on pool boiling
12. Determine the emissivity of the test plate surface.
13. Experiment on Stefan-Boltzmann apparatus
14. Determine the heat transfer rate coefficient in fluidized bed apparatus.

Virtual Lab: -

1. Determination of thermal conductivity of a metal rod https://sites.google.com/view/vlab-bnmitmech/home/heat-transfer-lab/determination-of-thermal-conductivity-of-a-metal-rod
2. Natural Convection heat transfer https://sites.google.com/view/vlab-bnmitmech/home/heat-transfer-lab/natural-convection
3. Heat Transfer by Radiation https://vlab.amrita.edu/index.php?sub=1&brch=194&sim=802&cnt=1
4. Heat transfer by Conduction https://vlab.amrita.edu/index.php?sub=1&brch=194&sim=801&cnt=1
5. The Study of phase change https://vlab.amrita.edu/index.php?sub=1&brch=194&sim=709&cnt=1
6. Black Body Radiation: Determination of Stefan's Constant https://vlab.amrita.edu/index.php?sub=1&brch=194&sim=548&cnt=1
7. Newton's Law of Cooling https://vlab.amrita.edu/index.php?sub=1&brch=194&sim=354&cnt=1
8. Lee's Disc Apparatus https://vlab.amrita.edu/index.php?sub=1&brch=194&sim=353&cnt=1
9. Thermo Couple-See beck Effect https://vlab.amrita.edu/index.php?sub=1&brch=194&sim=351&cnt=1

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L	T	P	C
0	0	3	1.5

23AME37: CAD/CAM Lab

Course Outcomes:

CO1: Create accurate 2D technical drawings using orthographic and isometric projections, and interpret file formats like DXE and IGES.

CO2: Develop 3D part models using features such as protrude, revolve, shell, and sweep, and demonstrate and evaluate parent-child relationships.

CO3: Construct and analyze assemblies using feature-based and Boolean operations for simple mechanical systems and create complex mechanical assemblies.

CO4: Generate NC code for complex surfaces using CAM tools and study the function of various post-processors.

CO5: Transfer NC code to CNC machines. Perform and evaluate basic machining tasks such as turning and milling and generate new technics by using modern tools.

List of Experiments:

1. Drafting: Development of part drawings for various components in the form of orthographic and isometric. Representation of Dimensioning and tolerances scanning and plotting. Study of script, DXE AND IGES FILES.

2. Part Modelling: Generation of various 3D Models through Protrusion, revolve, shell sweep. Creation of various features. Study of parent child relation.

3. Assembly modelling: Feature based and Boolean based modelling surfaces, Assembly Modelling of simple components and Design of simple components.

4. CAM:

a) Study of various post processors used in NC Machines.

b) Development of NC code for free form and sculptured surfaces using CAM packages.

c) Machining of simple components on NC lathe and Mill by transferring NC Code / from a CAM packages.

Through Any Four Software Packages from the following: Use of Auto CAD, Micro Station, CATIA, Pro-E, I-DEAS, , CAEFEM, Gibbs CAM, Master CAM etc,.

4. Evaluation of Stress/Strain for a plate with a hole.

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III B. Tech - II Semester (ME)

L	T	P	C
0	1	2	2

23AME38: 3D PRINTING LAB

Course Outcomes:

CO1: Explain different types of 3d Printing techniques
CO2: Identify parameters for powder binding and jetting process
CO3: Determine effective use of ABS material for 3D Printing
CO4: Write a program for decision tree, Naïve Bayes and SVM
CO5: Apply principles of mathematics to evaluate the volume of material require.

Module 1:
Introduction to Prototyping, Working of 3D Printer, Types of 3D printing Machines:
Exp 1: Modelling of Engineering component and conversion of STL format.
Exp 2: Slicing of STL file and study of effect of process parameter like layer thickness, orientation, and infill on build time using software.
Exercise 1: Component-1 Exercise 2: Component-2

Module 2:
Exp 1: 3D Printing of modelled component by varying layer thickness.
Exp 2: 3D Printing of modelled component by varying orientation.
Exp 3: 3D Printing of modelled component by varying infill.

Module 3:
Study on effect of different materials like ABS, PLA, Resin etc, and dimensional accuracy.

Module 4:
Identifying the defects in 3D Printed components.

Module 5
Exp1: Modelling of component using 3D Scanner of real-life object of unknown dimension in reverse engineering.
Exp 2: 3D Printing of above modelled component.

References:
1. Ian Gibson, David W. Rosen, Brent Stucker, Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, 1/e, Springer, 2010.
2. Chua C.K., Leong K.F. and Lim C.S., Rapid Prototyping: Principles and Applications, 2/e, World Scientific Publishers, 2003.

Online Learning Resources/Virtual Labs:
- 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-ilovepdf-compressed.pdf
- https://www.vssut.ac.in/lecture_notes/lecture1517967201.pdf
- https://www.youtube.com/watch?v=NkC8TNts4B4

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III B. Tech - II Semester (ME)

L	T	P	C
2	0	0	-

23AMB16: TECHNICAL PAPER WRITING& IPR
(Audit Course)

Course Outcomes:

CO1: Identify key secondary literature related to their proposed technical paper writing.
CO2: Explain various principles and styles in technical writing.
CO3: Use the acquired knowledge in writing a research/technical paper.
CO4: Analyze rights & responsibilities of holder of Patent, Copyright, Trademark, international Trademark etc.
CO5: Evaluate different forms of IPR available at national & international level.

UNIT – I: **Principles of Technical Writing**

Principles of Technical Writing: styles in technical writing; clarity, precision, coherence and logical sequence in writing-avoiding ambiguity- repetition, and vague language -highlighting your findings-discussing your limitations -hedging and criticizing -plagiarism and paraphrasing.

UNIT – II: **Technical Research Paper Writing**

Technical Research Paper Writing: Abstract- Objectives-Limitations-Review of Literature- Problems and Framing Research Questions- Synopsis.

UNIT – III: **Process of research: publication mechanism**

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 to Intellectual property: Introduction, types of intellectual property, International organizations, agencies and treaties, importance of intellectual property rights Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

UNIT – V: **Law of copy rights**

Law of copy rights: Fundamentals of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law, Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer. Patent law, intellectual property audits.

Text books:

1. Deborah. E. Bouchoux, Intellectual Property Rights, Cengage Learning India, 2013
2. Meenakshi Raman, Sangeeta Sharma. Technical Communication: Principles and practices. Oxford.

Reference Books:

1. R.Myneni, Law of Intellectual Property, 9th Ed, Asia law House, 2019.
2. Prabuddha Ganguli, Intellectual Property Rights Tata McGraw Hill, 2001
3. P. Naryan, Intellectual Property Law, 3rd Ed, Eastern Law House, 2007.
4. Adrian Wallwork. English for Writing Research Papers Second Edition. Springer Cham Heidelberg New York ,2016
5. Dan Jones, Sam Dragga, Technical Writing Style

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IV B. Tech - I Semester (ME)

L	T	P	C
3	0	0	3

23ACM25: AI & ML FOR MECHANICAL ENGINEERING
(Professional Core)

Course Outcomes:

CO1: Design intelligent agents, define problems using state-space models, and apply AI techniques.
CO2: Implement and compare different search algorithms (both uniform and heuristic), apply and analyze appropriate strategies for solving AI problems.
CO3: Solve CSPs using local search methods and implement adversarial search algorithms to make optimal decisions in competitive game scenarios.
CO4: Utilize statistical and logical reasoning methods, to represent knowledge and perform forward and backward reasoning in AI applications.
CO5: Understanding and apply various machine learning techniques, along with an introduction to neural networks and deep learning.

UNIT I

Introduction to Artificial Intelligence and Problem-Solving Agent: Problems of AI, AI technique, Tic – Tac – Toe problem. Intelligent Agents, Agents & environment, nature of environment, structure of agents, goal-based agents, utility-based agents, learning agents. Defining the problem as state space search, production system, problem characteristics, and issues in the design of search programs.

UNIT II

Search Techniques: Problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies. Heuristic search strategies Greedy best -first search, A* search, AO* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search.

UNIT III

Constraint Satisfaction Problems and Game Theory: Local search for constraint satisfaction problems. Adversarial search, Games, optimal decisions & strategies in games, the minimax search procedure, alpha-beta pruning, additional refinements, iterative deepening.

UNIT IV

Knowledge & Reasoning: Statistical Reasoning: Probability and Bays' Theorem, Certainty Factors and Rule-Base Systems, Bayesian Networks, Dempster-Shafer Theory, Fuzzy Logic. AI for knowledge representation, rule-based knowledge representation, procedural and declarative knowledge, Logic programming, Forward and backward reasoning.

UNIT V

Introduction to Machine Learning: Exploring sub-discipline of AI: Machine Learning, Supervised learning, Unsupervised learning, Reinforcement learning, Classification problems, Regression problems, Clustering problems, Introduction to neural networks and deep learning.

Text Books

1. S. Russell and P. Norvig, ―Artificial Intelligence: A Modern Approach‖, Prentice Hall, Third Edition, 2015.
2. Nils J. Nilsson, ―Artificial Intelligence: A New Synthesis‖, 1st Edition, Morgan-Kaufmann, 1998.

Reference Books

1. Elaine Rich, Kevin Knight, & Shivashankar B Nair, ―Artificial Intelligence‖, McGraw Hill, 3rd ed.,2017.
2. Patterson, ―Introduction to Artificial Intelligence & Expert Systems‖, Pearson, 1st ed. 2015.
3. Saroj Kaushik, ―Logic & Prolog Programming‖, New Age International, Ist edition, 2002.
4. Joseph C. Giarratano, Gary D. Riley, ―Expert Systems: Principles and Programming‖, 4th Edition, 2007.

Online Learning Resources:

- https://nptel.ac.in/courses/113104517
- https://nptel.ac.in/courses/127104664
- https://nptel.ac.in/courses/110104164
- https://nptel.ac.in/courses/106106226

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IV B. Tech - I Semester (ME)

L	T	P	C
3	0	0	3

23AMB17: BUSINESS ETHICS AND CORPORATE GOVERNANCE
(Management Curse)

Course Outcomes:

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.

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.

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.

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.

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.

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.

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, Karunakara Readdy. 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

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IV B. Tech - I Semester (ME)

L	T	P	C
3	0	0	3

23AMB18: E-BUSINESS
(Management Curse)

Course Outcomes:

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.

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.

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

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.

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.

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)

Text Books:

1. Arati Oturkar & Sunil Khilari. E-Business. Everest Publishing House, 2022
2. P.T.S Joseph. E-Commerce, Fourth Edition, Prentice Hall of India, 2011

Reference Books:

1. Debjani, 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, Raymond Leatham Wiley India 2007.
4. S. Jaiswal. E-Commerce Galgotia Publication Pvt Ltd., 2003.

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IV B. Tech - I Semester (ME)

L	T	P	C
3	0	0	3

23AMB19: MANAGEMENT SCIENCE
(Management Curse)

Course Outcomes:

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.

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.

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.

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

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).

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.

Text Books:

1. Frederick S. Hillier, Mark S. Hillier. Introduction to Management Science, October 26, 2023.
2. A.R Aryasri, Management Science, TMH, 2019.

Reference Books:

1. Stoner, Freeman, Gilbert.Management, Pearson Education, New Delhi, 2019.
2. Koontz &Weihrich, Essentials of Management, 6/e, TMH, 2005.
3. Thomas N.Duening& John M.Ivancevich, Management Principles and Guidelines, Biztantra.
4. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2004.
5. Samuel C.Certo, Modern Management, 9/e, PHI, 2005.

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L	T	P	C
3	0	0	3

23AMB02: MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS
(Management Curse)

Course Outcomes:

- **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**: Analyze how to invest their capital and maximize returns.
- **CO5**: Evaluate the capital budgeting techniques.
- **CO6**: Develop the accounting statements and evaluate the financial performance of business entity.

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.

Text Books:

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

Reference Books:

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

Online Learning Resources:

- https://www.slideshare.net/123ps/managerial-economics-ppt
- https://www.slideshare.net/rossanz/production-and-cost-45827016
- https://www.slideshare.net/darkyla/business-organizations-19917607
- https://www.slideshare.net/balarajbl/market-and-classification-of-market

- https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
- https://www.slideshare.net/ashu1983/financial-accounting

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IV B. Tech - I Semester (ME)

L	T	P	C
3	0	0	3

23AMB03: ORGANISATIONAL BEHAVIOUR
(Management Curse)

Course Outcomes:

CO1: Define the Organizational Behaviour, its nature and scope.
CO2: Understand the nature and concept of Organizational behaviour.
CO3: Apply theories of motivation to analyse the performance problems.
CO4: Analyse the different theories of leadership.
CO5: Evaluate group dynamics.
CO6: Develop as powerful leader.

UNIT – I Introduction to Organizational Behavior

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

UNIT – II Motivation and Leading

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

UNIT – III Organizational Culture

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

UNIT – IV Group Dynamics

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

UNIT – V Organizational Change and Development

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

Text Books:

1. Luthans, Fred, Organisational Behaviour, McGraw-Hill, 12 Th edition.
2. P Subba Ran, Organisational Behaviour, Himalya Publishing House.

Reference Books:

1. McShane, Organizational Behaviour, TMH
2. Nelson, Organisational Behaviour, Thomson.
3. Robbins, P. Stephen, Timothy A. Judge, Organisational Behaviour, Pearson.
4. Aswathappa, Organisational Behaviour, Himalaya.

Online Learning Resources:

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

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
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IV B. Tech - I Semester (ME)

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23AMB04: BUSINESS ENVIRONMENT
(Management Curse)

Course Outcomes:

CO1: Define Business Environment and its Importance.
CO2: Understand various types of business environment.
CO3: Apply the knowledge of Money markets in future investment.
CO4: Analyse India's Trade Policy.
CO5: Evaluate fiscal and monitory policy.
CO6: Develop a personal synthesis and approach for identifying business opportunities.

UNIT – I Overview of Business Environment

Introduction – meaning Nature, Scope, significance, functions and advantages. Types- Internal &External, Micro and Macro. Competitive structure of industries -Environmental analysis- advantages & limitations of environmental analysis.

UNIT – II Fiscal & Monetary Policy

Introduction – Nature, meaning, significance, functions and advantages. Public Revenues - Public Expenditure - Evaluation of recent fiscal policy of GOI. Highlights of Budget- Monetary Policy - Demand and Supply of Money –RBI -Objectives of monetary and credit policy - Recent trends- Role of Finance Commission.

UNIT – III India's Trade Policy

Introduction – Nature, meaning, significance, functions and advantages. Magnitude and direction of Indian International Trade - Bilateral and Multilateral Trade Agreements - EXIM policy and role of EXIM bank - Balance of Payments– Structure & Major components - Causes for Disequilibrium in Balance of Payments - Correction measures.

UNIT – IV World Trade Organization

Introduction – Nature, significance, functions and advantages. Organization and Structure - Role and functions of WTO in promoting world trade - GATT -Agreements in the Uruguay Round – TRIPS, TRIMS - Disputes Settlement Mechanism - Dumping and Anti-dumping Measures.

UNIT – V Money Markets and Capital Markets

Introduction – Nature, meaning, significance, functions and advantages. Features and components of Indian financial systems - Objectives, features and structure of money markets and capital markets - Reforms and recent development – SEBI – Stock Exchanges - Investor protection and role of SEBI, Introduction to international finance.

Text Books:

1. Francis Cherunilam, International Business: Text and Cases, Prentice Hall of India.
2. K. Aswathappa, Essentials of Business Environment: Texts and Cases & Exercises 13th Revised Edition. HPH

Reference Books:

1. K. V. Sivayya, V. B. M Das, Indian Industrial Economy, Sultan Chand Publishers, New Delhi, India.
2. Sundaram, Black, International Business Environment Text and Cases, Prentice Hall of India, New Delhi, India.
3. Chari. S. N, International Business, Wiley India.
4. E. Bhattacharya, International Business, Excel Publications, New Delhi.

Online Learning Resources:

- https://www.slideshare.net/ShompaDhali/business-environment-53111245
- https://www.slideshare.net/rbalsells/fiscal-policy-ppt
- https://www.slideshare.net/aguness/monetary-policy-presentationppt
- https://www.slideshare.net/DaudRizwan/monetary-policy-of-india-69561982
- https://www.slideshare.net/ShikhaGupta31/indias-trade-policyppt

- https://www.slideshare.net/viking2690/wto-ppt-60260883
- https://www.slideshare.net/prateeknepal3/ppt-mo

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23AME40: MECHANICAL VIBRATIONS
(Professional Elective IV)

Course Outcomes:

CO1: Define, Understand and Solve problems related to undamped and damped free vibrations in Single Degree Freedom systems using classical and energy methods

CO2: Analyze forced vibrations in Single Degree Freedom systems under various excitation forces, apply and evaluate the concepts of transmissibility and isolation.

CO3: Derive the equations of motion, calculate natural frequencies, modes of vibration, and understand their application in dynamic vibration absorbers.

CO4: Formulate equations of motion, and perform modal analysis of free and forced vibrations. Apply vibration measurement tools to select appropriate exciters for vibration testing.

CO5: Explain and evaluate the damping characteristics in vibrating systems, including the effects of viscous damping, Coulomb damping, and damping in whirling of shafts.

UNIT I

Single Degree Freedom Systems

Single Degree Freedom Systems: Un-damped free vibration: Classical method, Energy method, equivalent systems, torsional systems. Damped free vibration- Viscous damping, under damping, critical damping, over damping. Coulomb damping, equivalent damping coefficient. Simple problems.

Whirling of shafts: Transverse vibrations: Dunkerley's lower bound approximation, Critical speed of shafts.

UNIT II

Forced vibrations of Single Degree Freedom Systems

Steady state forced vibration, sources of excitation, impressed harmonic force, resonance impressed force due to unbalance, motion excitation, transmissibility and isolation, performance of different type of isolators, power absorbed by viscous damping.

UNIT III

Two Degree Freedom Systems:

Formulation of Equation of motion, Natural frequencies and modes of vibration by classical method, coupled pendulum, forced vibration, dynamic vibration absorber.

UNIT IV

Multi Degree Freedom Systems:

Lagrangian method for formulation of equation of motion Influence co- efficient method, Lumped mass and distributed mass systems, Stodola method, Holzer's method, model analysis of free and forced vibrations.

UNIT V

Vibration measurement and Applications

Transducers: variable resistance transducers, Piezoelectric transducers, electro dynamic transducers and linear variable differential transformer transducer; Vibration pickups: vibrometer, accelerometer, velometer and phase distortion; Frequency-measuring instruments; Vibration exciters- Mechanical exciters and electro dynamic shaker.

Text Books:

1. Singiresu S. Rao, Mechanical Vibrations, 6/e, Pearson Education, 2018.
2. G.K. Groover, Mechanical Vibrations, Nemchand& Bro, 8/e, 2009.

Reference Books:

1. L. Meirovich, Elements of Vibrations Analysis, Tata McGraw Hill, 1986.
2.S. Graham Kelly, Mechanical Vibrations, Tata McGraw Hill, 1996
3. William Thomson, Theory of Vibrations with Applications, 5/e, Pearson, 2008

4. William Weaver, Timeoshenko, and Young, Vibration Problems in Engineering, 5/e, John Wiley, 2013.
5. C. Nataraj, Vibration of Mechanical Systems, 1/e, Cenage Learning, 2012.

Online Learning Resources:

- https://nptel.ac.in/courses/112107212
- https://nptel.ac.in/courses/112103111
- https://nptel.ac.in/courses/112103112
- https://nptel.ac.in/courses/101105081
- https://www.iare.ac.in/sites/default/files/PPT/MVSD%20PPT.pdf
- https://www.iare.ac.in/sites/default/files/lecture_notes/MV_LECTURE_NOTES.pdf

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23AME41: FINITE ELEMENT METHODS FOR MECHANICAL ENGINEERING
(Professional Elective IV)

Course Outcomes:

CO1: Understand the concepts behind formulation methods in FEA

CO2: Explain the concepts of Nodes and elements used in the analysis of beams and solve the simple problems

CO3: Understand the 2D stress analyses of the FEM method and solve the strain triangles.

CO4: Apply Suitable boundary conditions to a global structural equation, and reduce it to a solvable form.

CO5: Identify how the finite element method expands beyond the structural domain, for problems involving dynamics, heat transfer and fluid flow.

UNIT I

Introduction to finite element methods

Introduction to finite element methods for solving field problems, applications, Stress and equilibrium, Boundary conditions, Strain-Displacement relations, Stress- strain relations for 2D and 3D Elastic problems. Potential energy and equilibrium, Rayleigh-Ritz method, Formulation of Finite Element Equations.

One dimensional Problems: Finite element modelling of ID bar elements coordinates and shape functions. Requirements for Convergence and Interpolation functions, Pascal's Triangle, Assembly of global stiffness matrix and load vector. Finite element equations, Treatment of boundary conditions, Quadratic shape functions.

UNIT II

1D Analysis of Trusses and Beams

Analysis of trusses: Stiffness Matrix for 1D truss element, Stress Calculations and Problems with maximum of three elements.

Analysis of beams: Element Stiffness Matrix and Load vector for 1 D beam element, Hermite shape functions and simple problems.

UNIT III

2D Analysis

Finite element modeling of two-dimensional stress analysis with constant strain triangles and treatment of boundary conditions. Estimation of load Vector, Stresses.

Finite element modeling of Axi-symmetric solids subjected to axi-symmetric loading with triangular elements.

UNIT IV

Quadrilateral Elements & Thermal Analysis

Quadrilateral Elements: Isoparametric, Sub parametric and Super parametric elements, Modelling of 4 noded and 8 noded quadrilateral elements and simple problems. Numerical Integration.

Steady state heat transfer analysis: One dimensional analysis of composite slab and fin.

UNITV

Dynamic analysis

Analysis of a 1D uniform shaft subjected to torsion – Simple problems.

Dynamic analysis: Formulation of finite element model, element – mass matrices, evaluation of Eigen values and Eigen vectors for a bar and shaft.

Text books:

1. T. Chandraputla, Ashok Belegundu, Introduction to Finite Element in Engineering, Pearson Publication 2011.
2. S.S. Rao, The Finite Element Methods in Engineering, Elsevier Butterworth -Heinemann, 2/e, 2011.
3. J N Reddy, An introduction to the Finite Element Method, McGraw – Hill, New York, 1993.

Reference Books:

1. R D Cook, D S Malkus and M E Plesha, Concepts and Applications of Finite Element Analysis, 3/e, John Wiley, New York, 1989.
2. K J Bathe, Finite Element Procedures in Engineering Analysis, Prentice-Hall, Englewood Cliffs, 1982.
3. G. Lakshmi Narasaiah, Finite Element Analysis, 1/e, B.S. Publications, 2008.
4. O C Zienkiewicz and R L Taylor, the Finite Element Method, 3/e. McGraw-Hill, 1989.

Online Learning Resources:

- https://nptel.ac.in/courses/112/104/112104193/
- https://nptel.ac.in/courses/112/104/112104205/
- https://nptel.ac.in/courses/105/105/105105041/
- https://nptel.ac.in/courses/112/106/112106130/
- https://nptel.ac.in/courses/112/103/112103295/

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23AME42: REFRIGERATION & AIR CONDITIONING

(Professional Elective IV)

Course Outcomes:

CO1: Define and explain the principles of refrigeration and analyze the performance of air refrigeration systems including aircraft applications.

CO2: Apply thermodynamic principles to analyze and solve problems related to vapour compression refrigeration cycles using P-h and T-S diagrams.

CO3: Describe the operation of various refrigeration systems, calculate theoretical COP and create the effective refrigeration system.

CO4: Knowledge on psychometric chat and evaluate air conditioning processes using psychometric charts and analyze various cooling systems for different climates.

CO5: Identify and select appropriate air conditioning equipment based on comfort requirements and system needs. Build an effective air conditioning system.

UNIT I

Introduction to Refrigeration

Necessity and Applications, Carnot Refrigerator, First and Second Law Applied to Refrigerating Machines, Unit of Refrigeration, COP, EER, Different Refrigeration Methods.

Air Refrigeration: Bell-Coleman Cycle, Ideal and Actual Cycles, Open and Dense Air Systems - Numerical Problems - Refrigeration Needs of Air Crafts.

UNIT II

Vapour Compression Refrigeration (VCR) System

Vapour Compression Refrigeration (VCR) System - Basic Cycle - Working Principle and Essential Components of the Plant - COP - Representation of Cycle On T-S and P-h Charts - Expander Vs. Throttling, Effect of Sub Cooling and Super Heating - Cycle Analysis - Actual Cycle- Influence of Various Parameters on System Performance - Construction and Use of P-h Charts - Numerical Problems. Refrigerants - Desirable Properties - Classification of Refrigerants Used - Nomenclature- Secondary Refrigerants- Lubricants - Ozone Depletion - Global Warming- Newer Refrigerants.

UNIT III

Vapor Absorption Refrigeration (VAR) System

Vapor Absorption Refrigeration (VAR) System-Description and Working of NH3 - Water System and Li Br -Water (Two Shell & Four Shell) System -Calculation of Max COP, Principle of Operation of Three Fluid Absorption System

STEAM JET REFRIGERATION SYSTEM: Working Principle and Basic Components-Estimation of Motive Steam Required Principle and Operation of: (I) Thermo-Electric Refrigerator (ii) Vortex Tube or Hilsch Tube.

UNIT IV

Introduction to Air Conditioning:

Psychrometric Properties & Processes - Characterization of Sensible and Latent Heat Loads - Need for Ventilation, Consideration of Infiltrated Air - Heat Load Concepts. Air Cooler (Evaporative Cooling), Window, Split, Summer, Winter, Year Round, Central Air Conditioning Systems.

UNIT V

Air Conditioning Equipment

Air Conditioning Equipment - Humidifiers - Dehumidifiers - Air Filters, Fans and Blowers.

Human Comfort: Requirements of Temperature, Humidity And Concept of Effective Temperature, Comfort Chart. Heat Pump - Heat Sources - Different Heat Pump Circuits. Energy efficient AC system Star Rating.

Text Books:

1. Refrigeration and Air Conditioning, C P Arora, TMH, 15/e, 2013.
2. S. C Arora & Domkundwar, A Course in Refrigeration and Air conditioning, Dhanpat rai & Co, 2018.

Reference Books:

1. Refrigeration and Air Conditioning / Manohar Prasad / New Age, 2/e, 2013
2. Principles of Refrigeration - Dossat / Pearson Education, 4/e, 2007
3. Refrigeration and Air Conditioning-P.L. Ballaney, 2/e, 2012.
4. Basic Refrigeration and Air-Conditioning - P.N. Ananthanarayanan / TMH, 4/e, 2013.

NOTE: Tables/Codes: Thermal Engineering Data Book containing refrigerant and Psychrometric property Tables and charts are permitted in Exam.

Online Learning Resources:

- https://www.iare.ac.in/sites/default/files/lecture_notes/IARE_RAC_Lecture_Notes.pdf
- https://www.studocu.com/en-us/document/saint-louis-university/fluid-dynamics-laboratory/refrigeration-lecture-notes-1/3020577
- http://home.iitk.ac.in/~samkhan/ME340A.htm
- https://nptel.ac.in/courses/112105129
- http://dte.karnataka.gov.in/Institutes/gptkampli/GenericDocHandler/68-fc177b7d-f5d1-4580-b577-b1118df994f4.pdf

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23AEC52: MECHATRONICS & MEMS
(Professional Elective IV)

Course Outcomes:

CO1: Define and explain the fundamental concepts and applications of mechatronics in industrial systems.

CO2: Identify and analyze various types of sensors and their performance characteristics for specific applications.

CO3: Design and evaluate actuator systems including hydraulic and pneumatic circuits for automation tasks.

CO4: Understand and develop PLC ladder logic programs for industrial automation using sequencing, timers, counters, and analog I/O.

CO5: Describe MEMS fabrication methods, apply and analyze the effect of scaling in micro electromechanical systems.

UNIT I

Introduction

Definition of Mechatronics, Need for Mechatronics in Industry, Objectives of mechatronics, mechatronics design process, Mechatronics key elements, mechatronics applications – Computer numerical control (CNC) machines, Tool monitoring systems, Flexible manufacturing system (FMS), Industrial Robots, Automatic packaging systems, Automatic inspection systems.

UNIT II

Sensors

Static and dynamic characteristics of sensors, Displacement, Position and Proximity sensors, Force and torque sensors, Pressure sensors, Flow sensors, Temperature sensors, Acceleration sensors, Level sensors, Light sensors, Smart material sensors, Micro and Nano sensors, Selection criteria for sensors.

UNIT III

Actuators

Mechanical, Electrical, Hydraulic and Pneumatic Actuation systems, Characteristics and their limitations, Design of Hydraulic and Pneumatic circuits, Piezoelectric actuators, Shape memory alloys, Selection criteria for actuators.

UNIT IV

Microprocessors, Microcontrollers and Programmable Logic Controllers

Architecture of Microprocessor, Microcontroller and Programmable Logic Controller, PLC Programming using ladder diagrams, logics, latching, sequencing, timers relays and counters, data handling, Analog input/output, selection of controllers.

UNIT V

Micro Electro Mechanical Systems (MEMS)

History, Effect of scaling, Fabrication Techniques: Oxidation, Physical Vapor disposition, Chemical Vapor Deposition, Lithography, Etching, Wafer bonding, LIGA, DRIE, Applications: Lab on chip.

Text Books:

1. Bolton, Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering, 3/e, Pearson Education Press, 2005.
2. Devadas Shetty and Richard A Kolk, Mechatronic System Design, 2/e, Cengage learning, 2010.
3. N. Mahalik, MEMS, McGraw Hill Educations, 2017.

Reference Books:

1. Clarence W. de Silva, Mechatronics an Integrated Approach, CRC Press, 2004.
2. James J Allen, Micro Electro Mechanical Systems Design, CRC Press Taylor & Francis group, 2005.

3. Ganesh S Hedge, Mechatronics, Jones & Bartlett Learning, 2010.
4. Mohammed Gad, MEMS; Design and Fabrication, CRC Press, 2010.

Online Learning Resources:

- https://onlinecourses.nptel.ac.in/noc22_me54/preview
- https://nptel.ac.in/courses/112108092
- https://nptel.ac.in/courses/112101304
- https://onlinecourses.nptel.ac.in/noc20_ee56/preview
- https://www.cet.edu.in/noticefiles/259_Lecturer%20Note%20on%20Mechatronics-ilovepdf-compressed.pdf,
- https://lecturenotes.in/subject/1176/mechatronics-and-mems

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23AME43: POWER PLANT ENGINEERING
(Professional Elective IV)

Course Outcomes:

CO1: Outline sources of energy, power plant economics, and environmental aspects.
CO2: Describe working components of a steam power plant.
CO3: Illustrate the working mechanism of diesel and gas turbine power plants.
CO4: Summarize types of renewable energy sources and their working principle.
CO5: Demonstrate the working principle of nuclear power plants.

UNIT I

Introduction to the Sources Of Energy - Resources and Development of Power in India. Convectional and non-conventional energy sources, Power Plant Economics and Environmental Considerations: Capital Cost, Investment of Fixed Charges, Operating Costs, General Arrangement of Power Distribution, Load Curves, Load Duration Curve. Definitions of Connected Load, Maximum Demand, Demand Factor, Average Load, Load Factor, Diversity Factor - Tariff - Related Exercises. Effluents from Power Plants and Impact on Environment - Pollutants and Pollution Standards - Methods of Pollution Control. Inspection And Safety Regulations.

UNIT II

Steam Power Plant: Introduction to Boilers- Modern High Pressure and Supercritical Boilers - Analysis of Power Plant Cycles - Modern Trends in Cycle Improvement - Waste Heat Recovery, Fluidized Bed Boilers., Fuel and Handling Equipments, Types of Coals, Coal Handling, Choice of Handling Equipment, Coal Storage, Ash Handling Systems.

Steam Power Plant: Combustion Process: Properties of Coal - Overfeed and Under Feed Fuel Beds, Travelling Grate Stokers, Spreader Stokers, Retort Stokers, Pulverized Fuel Burning System and Its Components, Combustion Needs and Draught System, Cyclone Furnace, Design and Construction, Dust Collectors, Cooling Towers and Heat Rejection. Analysis of Pollution from Thermal Power Plants - Pollution Controls.CO_2 Recorders

UNIT III

Diesel Power Plant: Diesel Power Plant, Construction, Plant lay out with auxiliaries, fuel storage.

GAS TURBINE PLANT: Introduction - Classification - Construction - Layout with Auxiliaries - Principles of Working Closed and Open Cycle Gas Turbines. Advantages And Disadvantages Combined Cycle Power Plants.

UNIT IV

Hydro Electric Power Plant: Water Power - Hydrological Cycle / Flow Measurement - Drainage Area Characteristics - Hydrographs - Storage and Pondage - Classification of Dams and Spill Ways.

Hydro Projects Plant: Types - Typical Layouts - Plant Auxiliaries - Plant Operation Pumped Storage Plants.

UNIT V

Power from Non-Conventional Sources: Utilization of Solar Collectors- Working Principle, Wind Energy - Types of Turbines - HAWT & VAWT-Tidal Energy. MHD power Generation.

Nuclear Power Station: Nuclear Fuel - Nuclear Fission, Chain Reaction, Breeding and Fertile Materials - Nuclear Reactor -Reactor Operation.

Types of Reactors: Pressurized Water Reactor, Boiling Water Reactor, Sodium-Graphite Reactor, Fast breeder Reactor, Homogeneous Reactor, Gas Cooled Reactor, Radiation Hazards and Shielding - Radioactive Waste Disposal.

Text Books:

1. P.K. Nag, ―Power Plant Engineering‖, 3rd edition, TMH, 2013.
2. Wakil, ―Power plant technology‖, M.M. EI TMH Publications.

Reference Books:

1. Rajput, ―A Text Book of Power Plant Engineering, 4th edition, Laxmi Publications, 2012.

2. Ramalingam, ―Power plant Engineering‖, Scietech Publishers, 2013
3. P.C. Sharma, ―Power Plant Engineering‖, S.K. Kataria Publications, 2012.
4. Arora and S. Domakundwar, ―A course in Power Plant Engineering‖, Dhanpat Rai & Co (p) Ltd, 2014.

Online Learning Resources:

- https://nptel.ac.in/courses/112107291
- https://youtube.com/playlist?list=PLLy_2iUCG87BT8H9uMufjrcPF5e6Qd2bz&si=RQhZwEibgqXK2dRL
- https://youtube.com/playlist?list=PLLy_2iUCG87BT8H9uMufjrcPF5e6Qd2bz&si=LjgzdabT7tIsCwJC
- https://youtu.be/IdPTuwKEfmA?si=PyF04z9beiVGkXAS

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L	T	P	C
3	0	0	3

23AME44: NON-CONVENTIONAL ENERGY SOURCES
(Professional Elective V)

Course Outcomes:

CO1: Define and explain the fundamentals of solar radiation and analyze data using appropriate instruments and models

CO2: Compare different types of solar collectors and evaluate their thermal performance for various applications.

CO3: Describe and apply renewable energy technologies such as solar heating, wind turbines, and biomass digesters to evaluate the renewable energy.

CO4: Illustrate the principles and potential of ocean, geothermal, and mini-hydel energy to apply and create sustainable energy models.

CO5: Analyze the principles and performance of direct energy conversion systems including fuel cells and MHD generators.

UNIT – I

PRINCIPLES OF SOLAR RADIATION: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extra-terrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

UNIT-II

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT-III

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, photovoltaic energy conversion.

WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria

UNIT-IV

BIO-MASS: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C. Engine operation and economic aspects.

GEOTHERMAL ENERGY: Resources, types of wells, methods of harnessing the energy, potential in India.

UNIT-V

OCEAN ENERGY: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

DIRECT ENERGY CONVERSION: Need for DEC, Carnot cycle, limitations, and principles of DEC. Thermo-electric generators, Seebeck, Peltier and Joule Thomson effects, Figure of merit, materials, applications,
MHD generators, principles, dissociation and ionization, hall effect, magnetic flux, MHD accelerator, MHD Engine, power generation systems, electron gas dynamic conversion, economic aspects. Fuel cells, principles, faraday's law's, thermodynamic aspects, selection of fuels and operating conditions.

Text Books:

1. Non-Conventional Energy Sources /G.D. Rai Khanna Publisher.
2. Energy Resources Utilization and Technologies, Anjaneyulu Yerramilli, Francis Tuluri, BS Publications, 2012

Reference Books:

1. Renewable Energy Sources/ Twidell & Weir 3rd edition Routledge publisher (2015)
2. Non-Conventional Energy Resources, B.H. Khan, McGrawHill, 2015

3. Solar Power Engineering/B.S.Magal Frank Kreith & J.F. Kreith.
4. Principles of Solar Energy/ Frank Krieth & John F Kreider.
5. Non-Conventional Energy/ Ashok V Desai/ Wiley Eastern

Online Learning Resources:

- https://youtube.com/playlist?list=PL3QMEfkolRFbGhXveCE7RFDBgY0_gRxkh&si=ZYwAnUNtmIwsIq
- https://youtube.com/playlist?list=PLfxYQ3zfSrafm79OhjA7hvdCgm29EKrcq&si=wBQZsw0JtePVc2f-
- https://youtube.com/playlist?list=PLcWcvGXrBFeRV7f9oyuuX9RabYUuanGrK&si=TVHlSydk9cPw5MsV

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23AME39: AUTOMATION & ROBOTICS
(Professional Elective V)

Course Outcomes:

CO1: Explain the need, types, and elements of automation systems and analyze different levels of automation strategies in industry.

CO2: Demonstrate the operation of automated flow lines and apply methods for assembly line balancing and optimization.

CO3: Identify robotic components and describe their configuration, degrees of freedom, and industrial applications in various processes.

CO4: Apply transformation techniques and D-H notation to solve problems in robot kinematics and evaluate actuator and sensor selection.

CO5: Analyze robot dynamics using Jacobians and Euler formulations and develop suitable trajectories for obstacle-free motion.

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 /4thEdition, Pearson education (2016)
2. Industrial Robotics - M.P. Groover, TMH (1996)

Reference Books:
1. Robotics, Fu K S, McGraw Hill, 4th edition, 2010.
2. An Introduction to Robot Technology, P. Coiffet and M. Chaironze, Kogam Page Ltd. 1983 London.
3. Robotic Engineering, Richard D. Klafter, Prentice Hall
4. Robotics, Fundamental Concepts and analysis – Ashitave Ghosal, Oxford Press, 1/e, 2006
5. Robotics and Control, Mittal R K &Nagrath I J , TMH.

Online Learning Resources:
- http://www.cadcamfunda.com/cam_computer_aided_manufacturing
- http://wings.buffalo.edu/eng/mae/courses/460-564/Course-Notes/cnc- classnotes.pdf
- http://nptel.iitm.ac.in/courses.php?branch=Mechanical
- http://academicearth.org/courses/introduction-to-robotics

Video references: -
- http://nptel.iitm.ac.in/video.php?courseId=1052

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IV B. Tech - I Semester (ME)

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23AME45: NON-DESTRUCTIVE TESTING (NDT)
(Professional Elective V)

Course Outcomes:

CO1: Demonstrate the working principles, equipment, and safety considerations in radiographic and ultrasonic NDT methods and apply and analyze the different methods.

CO2: Apply appropriate NDT techniques such as liquid penetrant, eddy current, and magnetic particle testing to analyze defect detection to solve the problems.

CO3: Analyze the effectiveness and limitations of various NDT methods in real-world testing scenarios and create the solutions.

CO4: Evaluate and create thermal and infrared NDT methods for different materials and structural applications, especially in aerospace and electronics.

CO5: Illustrate the application of NDT techniques in diverse industrial domains and recommend suitable testing methods for specific components.

UNIT - I

Introduction to non-destructive testing: Radiographic test, Sources of X and Gamma Rays and their interaction with Matter, Radiographic equipment, Radiographic Techniques, Safety Aspects of Industrial Radiography.

UNIT - II

Ultrasonic test: Principle of Wave Propagation, Reflection, Refraction, Diffraction, Mode Conversion and Attenuation, Sound Field, Piezo-electric Effect, Ultrasonic Transducers and their Characteristics, Ultrasonic Equipment and Variables Affecting Ultrasonic Test, Ultrasonic Testing, Interpretations and Guidelines for Acceptance, Rejection - Effectiveness and Limitations of Ultrasonic Testing.

UNIT – III

Liquid penetrant, Eddy Current & Magnetic Particle Test

Liquid Penetrant Test: Liquid Penetrant Test, Basic Concepts, Liquid Penetrant System, Test Procedure, Effectiveness and Limitations of Liquid Penetrant Testing.

Eddy Current Test: Principle of Eddy Current, Eddy Current Test System, Applications of Eddy Current-Testing Effectiveness of Eddy Current Testing.

Magnetic Particle Test: Magnetic Materials, Magnetization of Materials, Demagnetization of Materials, Principle of Magnetic Particle Test, Magnetic Particle Test Equipment, Magnetic Particle Test Procedure, Standardization and Calibration, Interpretation and Evaluation, Effective Applications and Limitations of the Magnetic Particle Test.

UNIT - IV

Infrared & Thermal Testing

Infrared And Thermal Testing: Introduction and fundamentals to infrared and thermal testing–Heat transfer –Active and passive techniques –Lock in and pulse thermography– Contact and non-contact thermal inspection methods– Heat sensitive paints –Heat sensitive papers –-thermally quenched phosphors liquid crystals –techniques for applying liquid crystals –other temperature sensitive coatings –Inspection methods –Infrared radiation and infrared detectors–thermo mechanical behavior of materials–IR imaging in aerospace applications, electronic components, Honey comb and sandwich structures–Case studies.

UNIT - V

Industrial Applications of NDE

Industrial Applications of NDE: Span of NDE Activities Railways, Nuclear, Non-nuclear and Chemical Industries, Aircraft and Aerospace Industries, Automotive Industries, Offshore Gas and Petroleum Projects, Coal Mining Industry, NDE of pressure vessels, castings, welded constructions.

Text Books:

1. J Prasad, GCK Nair, Nondestructive test and evaluation of Materials, Tata McGraw - Hill Education Publishers, 2008.
2. Josef Krautkrämer, Herbert Krautkrämer, Ultrasonic testing of materials, 3/e, Springer-Verlag, 1983.
3. X.P.V. Maldague, Nondestructive evaluation of materials by infrared thermography, 1/e, Springer-Verlag, 1993.

Reference Books:

1. Gary L. Workman, Patrick O. Moore, Doron Kishoni, Non-destructive, Hand Book, Ultrasonic Testing, 3/e, Amer Society for Nondestructive, 2007.
2. ASTM Standards, Vol 3.01, Metals and alloys.

Online Learning Resources:

- http://www.twivirtualacademy.com/online-courses/ndt/
- https://www.classcentral.com/course/swayam-theory-and-practice-of-non-destructive- testing-9872
- https://onlinecourses.nptel.ac.in/noc20_mm07/preview
- https://www.youtube.com/watch?v=dyMR58TZMbo
- https://www.youtube.com/watch?v=Wam-Ewcn3aQ
- https://www.iare.ac.in/sites/default/files/lecture_notes/IARE_NDT_LECTURE_NOTES.pdf
- https://lecturenotes.in/subject/390/non-destructive-testing

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IV B. Tech - I Semester (ME)

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23AME46: TOTAL QUALITY MANAGEMENT
(Professional Elective V)

Course Outcomes:

CO1: Define and explain the basic concepts of quality, quality costs, and the scope of Total Quality Management.

CO2: Summarize the philosophies and contributions of TQM pioneers and evaluate barriers and enablers for TQM implementation.

CO3: Apply TQM principles such as employee empowerment, customer satisfaction, and supplier partnerships to real-world business scenarios.

CO4: Analyze the application of tools like QFD, FMEA, Six Sigma, and Benchmarking in improving product and process quality.

CO5: Evaluate and formulate quality systems like ISO 9000 and ISO 14000, and design documentation and auditing processes.

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: 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 Edition, CRC Press, 2017.

Reference Books:

1. Narayana V and Sreenivasan N.S, Quality Management – Concepts and Tasks, New Age International, 1996.
2. Robert L. Flood, Beyond TQM, First Edition, John Wiley & Sons Ltd, 1993.
3. Richard S. Leavenworth & Eugene Lodewick Grant, Statistical Quality Control, Seventh Edition, Tata McGraw Hill, 2015

4. Samuel Ho, TQM – An Integrated Approach, Kogan Page Ltd, USA, 1995.

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/

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23AME47: SMART MANUFACTURING
(Professional Elective V)

Course Outcomes:

CO1: Define and explain the evolution of Smart Manufacturing, Industry 4.0 and IoT in Manufacturing.
CO2: Concepts of Data Analytics and Artificial Intelligence in Manufacturing.
CO3: Apply knowledge of Smart Sensors, RFID, and Block chain in Manufacturing.
CO4: Summarise the techniques of Digital Twin & Simulation in Manufacturing.
CO5: Importance of Sustainable and Green Manufacturing.

Unit – I

Introduction to Smart Manufacturing

Definition, Evolution, and Importance of Smart Manufacturing, Industry 4.0 and Its Impact on Manufacturing, Traditional vs. Smart Manufacturing, Key Technologies in Smart Manufacturing

Cyber-Physical Systems & Industrial IoT (IIoT)

Basics of Cyber-Physical Systems (CPS), Internet of Things (IoT) in Manufacturing, Smart Sensors and Actuators Communication Protocols (MQTT, OPC-UA, Modbus),

Unit – II

Data Analytics and Artificial Intelligence in Manufacturing

Role of Big Data in Manufacturing, Machine Learning & Deep Learning for Smart Manufacturing, Predictive Maintenance and Anomaly Detection, Digital Twin Technology

Automation & Robotics in Smart Manufacturing

Industrial Automation: PLCs, SCADA, and DCS, Autonomous Robots and Cobots (Collaborative Robots), Additive Manufacturing (3D Printing), Case Studies of Smart Factories.

Unit – III

Cloud Computing and Edge Computing in Manufacturing

Introduction to Cloud Computing for Manufacturing, Edge and Fog Computing in Real-time Manufacturing Systems, Cloud-based Manufacturing Execution Systems (MES)

Smart Sensors, RFID, and Block chain in Manufacturing

Role of Smart Sensors and RFID in Inventory Management, Blockchain for Secure Supply Chains Smart Contracts and Decentralized Manufacturing Systems

Unit- IV

Digital Twin & Simulation in Manufacturing

Digital Twin Technology and Virtual Prototyping, Simulation Software for Smart Manufacturing, Augmented Reality (AR) and Virtual Reality (VR) in Industry 4.0

Cybersecurity in Smart Manufacturing

Threats and Risks in Smart Manufacturing, Cybersecurity Frameworks for Industrial Systems, Best Practices for Securing IoT and IIoT Devices

Unit – V

Sustainable and Green Manufacturing

Energy Efficiency in Smart Manufacturing, Sustainable Supply Chain Management, Role of AI in Green Manufacturing

Case Studies and Future Trends

Case Studies of Leading Smart Manufacturing Companies, Emerging Technologies in Smart Manufacturing, Future of Industry 5.0 and Beyond

Text Books:

1. Green Manufacturing Processes and Systems - J. Paulo Davim/Springer 2013
2. Smart Manufacturing by Kamalakar Mutalik The Right order (2023).

Reference Books:
1. Introduction To Smart Manufacturing and Automation Dr. Rajkumar. E Namya Press (29 March 2024); 213, Vardan House 7/28 Ansari Road Daryganj Delhi 110002.
2. Smart Manufacturing by Michael Deng (Author), Colin Koh Kindle Edition (2023).

Online Learning Resources:

- https://www.youtube.com/watch?v=sdgI072DJNM&pp=ygUUU01BUlQgTUFOVUZBQ1RVUklORyA%3D(2023)

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23ACE55: BUILDING MATERIALS AND SERVICES
(Open Elective III)

Course Outcomes:

CO1: Understand the properties, classifications, and applications of building materials like stones, bricks, tiles, wood, aluminum, glass, paints, and plastics.
CO2: Analyze the composition, manufacturing process, and properties of cement and admixtures.
CO3: Apply knowledge of building components such as lintels, arches, walls, stairs, floors, roofs, foundations, and joinery.
CO4: Evaluate masonry, mortars, finishing techniques, and formwork systems.
CO5: Assess various building services including plumbing, ventilation, air conditioning, acoustics, and fire protection.

UNIT– I

Stones and Bricks, Tiles: Building Stones – Classifications and Quarrying – Properties – Structural Requirements – Dressing. Bricks – Composition of Brick Earth – Manufacture and Structural Requirements, Fly Ash, Ceramics. Timber, Aluminum, Glass, Paints and Plastics: Wood - Structure – Types and Properties – Seasoning – Defects; Alternate Materials for Timber – GI / Fibre – Reinforced Glass Bricks, Steel & Aluminum, Plastics.

UNIT– II

Cement &Admixtures: 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, Masonry and Finishing‘s Mortars: Lime and Cement Mortars Brick Masonry– Types – Bonds; Stone Masonry – Types; Composite Masonry – Brick-Stone Composite; Concrete, Reinforced Brick. Finishers: Plastering, Pointing, Painting, Claddings – Types – Tiles – ACP. form Work: Types: Requirements – Standards – Scaffolding – Design; Shoring, Underpinning.

UNIT– V

Building Services: Plumbing Services: Water Distribution, Sanitary – Lines &Fittings; Ventilations: Functional Requirements Systems of Ventilations. Air-Conditioning-Essentials and Types; Acoustics – Characteristic – Absorption – Acoustic Design; Fire Protection – Fire Hazards – Classification of Fire Resistant Materials and Constructions.

Text Books:

1. Building Materials and Construction–Arora & Bindra, Dhanpat Roy Publications.
2. Building Materials and Construction by GCSahu, Joygopal Jena Mc Graw hill Pvt Ltd 2015.

Refrence Books:

1. Building Construction by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi.
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, LongmanPublishingGroup,1973.
5. S.K. Duggal, Building Materials, Oxford & IBH Publishing Co.Ltd., NewDelhi, 2019

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23ACE26: ENVIRONMENTAL IMPACT ASSESSMENT
(Open Elective III)

Course Outcomes:

CO1: Apply various methodologies for conducting Environmental Impact Assessments.
CO2: Analyze the impact of land-use changes on soil, water, and air quality.
CO3: Evaluate the environmental impact on vegetation, wildlife, and conduct risk assessments.
CO4: Develop environmental audit reports and assess compliance with environmental policies.
CO5: Interpret and apply environmental acts and regulations related to EIA.

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 BaseMap, Classification of Environmental Parameters –Criteria for the Selection of EIA Methodology, EIA 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 A in 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, Wild life 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, Concept of ISO and ISO 14000.

Text Books:

1. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B. S. Publication, Hyderabad 2nd edition 2011.
2. Environmental Impact Assessment, by Canter Larry W., McGraw-Hill education Edi (1996)

Refrence Books:

1. Environmental Engineering, by Peavy, H. S, Rowe, D. R, Tchobanoglous, McGraw-Hill International Editions, New York 1985.
2. Environmental Science and Engineering, by Suresh K. Dhaneja, S.K., Katania & Sons Publication, New Delhi.
3. Environmental Science and Engineering, by J.Glynn and Gary W.Hein Ke, Prentice Hall Publishers.
4. Environmental Pollution and Control, by H.S.Bhatia, Galgotia Publication (P)Ltd, Delhi.

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23AEE42: SMART GRID TECHNOLOGIES
(Open Elective III)

Course Outcomes:

CO1: Understanding the Concept and Evolution of Smart Grids.
CO2: Analyzing Wide Area Monitoring System and Synchrophasor Technology.
CO3: Applying Smart Metering and Advanced Metering Infrastructure (AMI) Concepts.
CO4: Evaluating Information and Communication Technology (ICT) Systems in Smart Grids.
CO5: Designing Smart Grid Applications and Cyber security Measures.

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 Fiber 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.

Reference Books:

1. Power Grid Corporation of India Limited, "Smart Grid Primer", 1st Edition, Power Grid Corporation of India Limited, Bangalore, India, 2013.
2. Fereidoon.P.Sioshansi, "Smart Grid – Integrating Renewable, Distributed and Efficient Energy", 1st Edition, Academic Press, USA, 2011.
3. Stuart Borlase, "Smart Grids: Infrastructure, Technology and Solutions", 1st Edition, CRC Press Publication, England, 2013.

4. Phadke A G, Thorp J S, "Synchronized Phasor Measurements and Their Applications", 1st Edition, Springer, Newyork, 2012.

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23AEC14: MICROPROCESSORS & MICROCONTROLLERS
(Open Elective III)

Course Outcomes:

CO1: Distinguish between microprocessors & microcontrollers.
CO2: Demonstrate programming skills in assembly language for processors and Controllers.
CO3: Analyze various interfacing techniques.
CO4: Apply the techniques for the design of processor / Controller based systems.

UNIT I

Introduction: Basic Microprocessor architecture, Harvard and Von Neumann architectures with examples, Microprocessor Unit versus Microcontroller Unit, CISC and RISC architectures. 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

Intel 8051 MICROCONTROLLER

Architecture, Hardware concepts, Input/output ports and circuits, external memory, counters/timers, serial data input/output, interrupts. Assembly language programming: Instructions, addressing modes, simple programs.

Interfacing to 8051: A/D and D/A Convertors, Stepper motor interface, keyboard, LCD Interfacing, Traffic light control.

UNIT V

ARM Architectures and Processors: ARM Architecture, ARM Processors Families, ARM Cortex-M Series Family, ARM Cortex-M3 Processor Functional Description, functions and Interfaces Programmers Model – Modes of operation and execution, Instruction set summary, System address map, write buffer, bit-banding, processor core register summary, exceptions. ARM Cortext-M3 programming – Software delay, Programming techniques, Loops, Stack and Stack pointer, subroutines and parameter passing, parallel I/O, Nested Vectored Interrupt Controller – functional description and NVIC programmers' mode.

Text Books:

1. Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3 rd Edition,1994.
2. The 8051 Microcontrollers and Embedded systems Using Assembly and C. Muhammad Ali Mazidi

and Janice Gillespie Mazidi and Rollin D. McKinlay; Pearson 2-Edition, 2011.

3. The Definitive Guide to ARM Cortex-M3 and Cortex-M4 Processors by Joseph You.

Reference Books:

1. Embedded Systems Fundamentals with Arm Cortex-M based Microcontrollers: A Practical Approach in English, by Dr. Alexander G. Dean, Published by Arm Education Media, 2017.
2. Cortex -M3 Technical Reference Manual.

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23ACS12: DATABASE MANAGEMENT SYSTEMS
(Open Elective III)

Course Outcomes:

CO1: Understand the basic concepts of database management systems.
CO2: Analyze a given database application scenario to use ER model for conceptual design of the database.
CO3: Utilize SQL proficiently to address diverse query challenges.
CO4: Employ normalization methods to enhance database structure.
CO5: Assess and implement transaction processing, concurrency control and database recovery protocols in databases

UNIT I:

Introduction: Database system, Characteristics (Database Vs File System), Database Users, Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.
Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.

Unit II:

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

UNIT III:

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

UNIT IV:

Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency Loss less 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:

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, MH (For Chapter 1 and Chapter 5)

Reference Books:

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

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

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23ACC10: CYBER SECURITY
(Open Elective III)

Course Outcomes:

CO1: Understand the fundamentals of cybercrime and information security, and explain the legal and global perspectives, especially with reference to Indian IT Act 2000.
CO2: Analyze how cybercriminals plan and execute cyber offenses using techniques like social engineering, cyber stalking, and botnets, including threats posed by cloud computing.
CO3: Evaluate the security challenges of mobile and wireless devices and formulate measures to secure mobile environments within an organization.
CO4: Identify and explain various cyber attack tools and methods such as phishing, keyloggers, Trojans, and SQL injection used in committing cybercrimes.
CO5: Assess the organizational implications of cybercrimes, including IPR issues, social media risks, and formulate strategies to mitigate security and privacy challenges.

UNIT I Introduction to Cybercrime

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

UNIT II Cyber Offenses: How Criminals Plan Them

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

UNIT III Cybercrime: Mobile and Wireless Devices

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

UNIT IV Tools and Methods Used in Cybercrime

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

UNIT V Cyber Security: Organizational Implications

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

Text Books:

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

Reference Books:

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

Online Learning Resources:

1. http://nptel.ac.in/courses/106105031/40

2. http://nptel.ac.in/courses/106105031/39
3. http://nptel.ac.in/courses/106105031/38

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23AHS41: WAVELET TRANSFORMS AND ITS APPLICATIONS
(Open Elective III)

Course Outcomes:

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 Multi resolution Formulation of Wavelet Systems
Signal Spaces -The Scaling Function -Multi resolution 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
Multi resolution versus Time-Frequency Analysis- Periodic versus Non periodic 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 Bi orthogonal Bases -Matrix Examples - Fourier Series Example - Sine Expansion Example - Frames and Tight Frames - Matrix Examples -Sine Expansion as a Tight Frame Example.

Text Books:

1. C. Sidney Burrus, Ramesh A. Gopinath, ―Introduction to Wavelets and Wavelets Transforms‖, Prentice Hall, (1997).
2. James S. Walker, ―A Primer on Wavelets and their Scientific Applications‖, CRC Press, (1999)..

Reference Books:

1. Raghuveer Rao, ―Wavelet Transforms‖, Pearson Education, Asia
2. C. S. Burrus, Ramose and A. Gopinath, Introduction to Wavelets and Wavelet Transform, Prentice Hall

Inc.

Web Resources:

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

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
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IV B. Tech - I Semester (ME)

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23AHS42: SMART MATERIALS AND DEVICES
(Open Elective III)

Course Outcomes:

CO1: Identify key discoveries that led to modern applications of shape memory materials, describe the two phases in shape memory alloys.
CO2: Describe how different external stimuli (light, electricity, heat, stress, and magnetism) influence smart material properties.
CO3: Summarize various types of synthesis of smart materials.
CO4: Analyze various characterization techniques used for smart materials.
CO5: Interpret the importance of smart materials in various devices.

UNIT- I
Introduction to Smart Materials
Historical account of the discovery and development of smart materials, Shape memory materials, chromoactive materials, magnetorheological materials, photoactive materials, Polymers and polymer composites (Basics).

UNIT-II
Properties of Smart Materials
Optical, Electrical, Dielectric, Piezoelectric, Ferroelectric, Pyroelectric and Magnetic properties of smart materials.

UNIT-III
Synthesis of Smart Materials
Chemical route: Chemical vapour deposition, Sol-gel technique, Hydrothermal 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.

TEXT BOOKS:

1. Yaser Dahman, Nano technology 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. Mahmood Alio fkhazraei, Hand book of functional nano materials, Vol (1&2), Nova Publishers ,2014.
3. Hand book of Smart Materials, Technologies, and Devices: Applications of Industry,4.0, Chaudhery Mustansar Hussain, Paolo DiSia, 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

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23AHS43: INTRODUCTON TO QUANTUM MECHANICS
(Open Elective III)

Course Outcomes:

CO1: Explain the key principles of quantum mechanics and wave-particle duality.
CO2: Apply Schrödinger equations to solve one-dimensional quantum problems.
CO3: Solve quantum mechanical problems using operator and matrix methods.
CO4: Evaluate quantum states using Dirac notation and expectation values.
CO5: Analyze angular momentum and spin systems using Pauli matrices and operators.

UNIT- I
PRINCIPLES OF QUANTUM MECHANICS

Introduction: Limitations of classical Mechanics, Difficulties with classical theories of black body radiation and origin of quantum theory of radiation. Wave-particle duality: de Broglie wavelength, Heisenberg uncertainty principle. Schrödinger time independent and time dependent wave equation, Solution of the time dependent Schrödinger equation, Concept of stationary states, Physical significance of wave function (ψ), Orthogonal, Normalized and Orthonormal functions

UNIT- II
ONE DIMENSIONAL PROBLEMS AND SOLUTIONS

Potential step – Reflection and Transmission at the interface. Potential well: Square well potential with rigid walls, Square well potential with finite walls. Potential barrier: Penetration of a potential barrier (tunneling effect). Periodic potential and Harmonic oscillator, Energy eigen functions and eigen values.

UNIT- III
OPERATOR FORMALISM

Operators, Operator Algebra, Eigen values and Eigen vectors, Postulates of quantum mechanics, Matrix representation of wave functions and linear operators.

UNIT- IV
MATHEMATICAL TOOLS FOR QUANTUM MECHANICS

The concept of row and column matrices, Matrix algebra, Hermitian operators – definition. Dirac's bra and ket notation, Expectation values, Heisenberg (operator) representation of harmonic oscillator, Ladder operators and their significance.

UNIT- V
ANGULAR MOMENTUM AND SPIN

Angular momentum operators: Definition. Eigen functions and Eigen values of AM operators. Matrix representation of angular momentum operators, System with spin half (1/2), Spin angular momentum, Pauli's spin matrices. Clebsch - Gordon coefficients. Rigid Rotator: Eigen functions and Eigen values**.**

Text Books:

1. Quantum Mechanics Vol.1, A. Messaia Noth - 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 Prakash Nath& 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.

VLab: CUBIT

NPTEL courses link :

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**

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23AHS44: GREEN CHEMISTRYAND CATALYSIS FOR SUSTAINABLE ENVIRONMENT
(Open Elective III)

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 uneconomic 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 Super critical carbon dioxide, Explain Supercritical water, recycling of green solvents.

CO4: Describe importance of Biomass and Solar Power, Illustrate So no chemistry, Apply Green Chemistry for Sustainable Development, discuss the importance of Renewable resources, mechano chemical synthesis.

CO5: Discuss Alternative green methods like Photo redox catalysis, single electron transfer reactions (SET), Photochemical Reactions, Microwave-assisted Reactions, and Sono chemical reactions , examples and applications.

Unit- I: Principles and Concepts of Green Chemistry

Introduction, Green chemistry Principles, sustainable development and green chemistry, E factor, atom economy, atom economic reactions: Rearrangement and addition reactions, and atom uneconomic reactions: Substitution, elimination and Wittig reactions, Reducing Toxicity. Waste - problems and Prevention: Design for degradation, Polymer recycling

Unit - II: Catalysis and Green Chemistry

Introduction, Types of catalysis, Heterogeneous catalysis: Basics of Heterogeneous Catalysis, Zeolite and the Bulk Chemical Industry, Heterogeneous Catalysis in the Fine Chemical and Pharmaceutical Industries, Catalytic Converters, Homogeneous catalysis: Transition Metal Catalysts with Phosphine Ligands, Greener Lewis Acids, and Phase transfer catalysis, Bio- catalysis and Photo-catalysis with examples.

Unit - III: Green Solvents in Chemical Synthesis

Green Solvents: Concept, Tools and techniques for solvent selection, supercritical fluids: Supercritical carbon dioxide, supercritical water, Polyethylene glycol (PEG), Ionic liquids, Recycling of green solvents.

Unit - IV: Emerging Greener Technologies

Biomass as renewable resource, Energy: Energy from Biomass, Solar Power, Chemicals from Renewable Feedstocks, Chemicals from Fatty Acids, Polymers from Renewable Resources, Alternative Economies: The Syngas Economy, The Biorefinery, Design for energy efficiency, Mechanochemical synthesis.

Unit - V: Alternative Greener Methods

Photochemical Reactions - Examples, Advantages and Challenges, Photoredox catalysis, single electron transfer reactions (SET), Examples of Photochemical Reactions , Microwave-assisted Reactions and So no chemical reactions, examples and applications.

Text Books:

1. M. Lancaster, Green Chemistry an introductory text, Royal Society of Chemistry, 2002.
2. Paul T. Anastas and John C. Warner, Green Chemistry Theory and Practice, 4th Edition, Oxford University

Press, USA

References Books:

1. Green Chemistry for Environmental Sustainability, First Edition, Sanjay K.Sharma and Ackmez Mudhoo, CRC Press, 2010.
2. Edited by Alvise Perosa and Maurizio Selva, Handbook of Green Chemistry Volume 8: Green Nanoscience, Wiley-VCH, 2013

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23AHS45: EMPLOYABILITY SKILLS
(Open Elective III)

Course Outcomes:

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.

UNIT- I Goal Setting and Time Management

Definition, importance, types of Goal Setting – SMART Goal Setting – Advantages-Motivation – Intrinsic and Extrinsic Motivation –- Self-Management - Knowing about self – SWOC Analysis – Emotional Intelligence.

UNIT -II Writing Skills

Definition, significance, types of writing skills – Resume writing Vs CV Writing - E-Mail writing, Cover Letters - E-Mail Etiquette -SoP (Statement of Purpose).

UNIT –III Technical Presentation Skills

Nature, meaning & significance of Presentation Skills – Planning, Preparation, Presentation, Stage Dynamics –Anxiety in Public speaking (Glossophobia)- PPT & Poster Presentation.

UNIT -IV Group Presentation Skills

Body Language – Group Behaviour - Team Dynamics – Leadership Skills – Personality Manifestation-Group Discussion-Debate –Corporate Etiquette.

UNIT- V Job Cracking Skills

Nature, characteristics, importance & types of Interviews – Job Interviews – Skills for success – Job searching skills - STAR method - FAQs- Answering Strategies – Mock Interviews

Text Books:

1. Sabina Pillai, Agna Fernandez. Soft Skills & Employability Skills, 2014.Cambridge Publisher. Alka Wadkar. Life Skills for Success, Sage Publications, 2016.
2. Clear, James. Atomic Habits: An Easy & Proven Way to Build Good Habits & Break Bad Ones. Penguin Publishing Group, 2018.

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:

- https://youtu.be/gkLsn4ddmTs
- https://youtu.be/2bf9K2rRWwo
- https://youtu.be/FchfE3c2jzc
- https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ
- https://www.youtube.com/c/skillopedia/videos
- https://onlinecourses.nptel.ac.in/noc25_hs96/preview

- https://onlinecourses.nptel.ac.in/noc21_hs76/preview
- https://archive.nptel.ac.in/courses/109/107/109107172/#
- https://archive.nptel.ac.in/courses/109/104/109104107/

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23ACE56: GEO-SPATIAL TECHNOLOGIES
(Open Elective IV)

Course Outcomes:

CO1: Understand raster-based spatial analysis techniques, including query, overlay, and cost-distance analysis.
CO2: Analyze vector-based spatial analysis techniques such as topology, overlay, and proximity analysis.
CO3: Apply network analysis techniques for geocoding, shortest path analysis, and location-allocation problems.
CO4: Evaluate surface and geostatistical analysis methods, including terrain modeling, watershed analysis, and spatial interpolation.
CO5: Assess GIS customization, Web GIS, and mobile mapping techniques for real-world applications.

UNIT– I
RASTER ANALYSIS

Raster Data Exploration: Query Analysis - Local Operations: Map Algebra, Reclassification, Logical and Arithmetic Overlay Operations—Neighborhood - Operations: Aggregation, Filtering – Extended Neighborhood-Operations- Zonal Operations - Statistical Analysis – Cost-Distance Analysis-Least Cost Path.

UNIT– II
VECTOR ANALYSIS

Non-Topological Analysis: Attribute Database Query, Structured Query Language, Co- Ordinate Transformation, Summary Statistics, Calculation of Area, Perimeter and Distance – topological Analysis: Reclassification, Aggregation, Overlay Analysis: Point-In-Polygon, Line-In-Polygon, Polygon-On-Polygon: Clip, Erase, Identity, Union, Intersection –Proximity Analysis: Buffering.

UNIT– III
NETWORK ANALYSIS

Network – Introduction - Network Data Model – Elements of Network – Building A Network Database - Geocoding – Address Matching - Shortest Path in A Network – Time and Distance Based Shortest Path Analysis – Driving Directions – Closest Facility Analysis – Catchment / Service Area Analysis-Location-Allocation Analysis

UNIT– IV
SURFACE and GEOSTATISTICAL ANALYSIS

Surface Data – Sources of X, Y, Z Data – DEM, TIN – Terrain Analysis – Slope, Aspect, Viewshed, Watershed Analysis: Watershed Boundary, Flow Direction, Flow Accumulation, Drainage Network, Spatial Interpolation: IDW, Spline, Kriging, Variogram.

UNIT– V
CUSTOMISATION, WEBGIS, 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. and Yeung, Albert K.W., Concepts and Techniques of Geographic Information Systems Prentice Hall, 2002.

Refrence Books:

1. MichaelN. 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.

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23ACE57: SOLID WASTE MANAGEMENT
(Open Elective IV)

Course Outcomes:

CO1: Understand the types, sources, and characteristics of solid waste, along with regulatory frameworks.
CO2: Analyze engineering systems for solid waste collection, storage, and transportation.
CO3: Apply resource and energy recovery techniques for sustainable solid waste management.
CO4: Evaluate landfill design, construction, and environmental impact mitigation strategies.
CO5: Assess hazardous waste management techniques, including biomedical and e-waste.

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 Systems for Solid Waste Management: Solid Waste Generation; On-Site Handling, Storage and Processing; Collection of Solid Wastes; Stationary Container System and Hauled Container Systems – Route Planning - Transfer and Transport; Processing Techniques;

UNIT– III

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 Hand Vigil SA_Integrated Solid Waste Management, Engineering Principles and Management Issues' McGraw-Hill, 1993.
2. Vesilind PA, Worrell Wand 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, Mc Graw Hill Inc., New York, 1985.
2. Qian X, Koerner R M and Gray D H, Geotechnical Aspects of Land fill Design and Construction, Prentice Hall, 2002.

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23AEE43: ELECTRIC VEHICLES
(Open Elective IV)

Course Outcomes:

CO1: Understand and differentiate between Conventional Vehicle and Electric Vehicles, electro mobility and environmental issues of EVs.
CO2: Understand Various dynamics of Electric Vehicles.
CO3: Remember and understand various configurations in parameters of EV system and dynamic aspects of EV.
CO4: Analyze fuel cell technologies in EV and HEV systems.
CO5: Analyze the battery charging and controls required of EVs.

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.

Text Books:

1. C.C Chan, K.T Chau: Modern Electric Vehicle Technology, Oxford University Press Inc., New York 2001,1st Edition.
2. Ali Emadi, ―Advanced Electric Drive Vehicles‖, CRC Press, 2017,1st Edition

Reference Books:

1. Electric and Hybrid Vehicles Design Fundamentals, Iqbal Husain, CRC Press 2021, 3rd Edition.
2. Francisco Díaz-González, Andreas Sumper, Oriol Gomis-Bellmunt,‖ Energy Storage in Power Systems‖ Wiley Publication, ISBN: 978-1-118-97130-7, Mar 2016,1st Edition
3. A.G.Ter-Gazarian, ―Energy Storage for Power Systems‖, the Institution of Engineering and Technology (IET) Publication, UK, (ISBN – 978-1-84919-219-4), Second Edition, 2011.
4. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, ―Modern 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

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23AEC53: TRANSDUCERS AND SENSORS
(Open Elective IV)

Course Outcomes:

CO1: Understand characteristics of Instrumentation System and the operating principle of motion transducers.
CO2: Explore working principles, and applications of different temperature transducers and Piezo-electric sensors.
CO3: Gain knowledge on flow transducers and their applications.
CO4: Learn the working principles of pressure transducers.
CO5: Understand the working principle and applications of force and sound transducers.

UNIT I

Introduction: General Configuration and Functional Description of measuring instruments, Static and Dynamic Characteristics of Instrumentation System, Errors in Instrumentation System, Active and Passive Transducers and their Classification.
Motion Transducers: Resistive strain gauge, LVDT, RVDT, Capacitive transducers, Piezo-electric transducers, seismic displacement pick-ups, vibrometers and accelerometers.

UNIT II

Temperature Transducers: Standards and calibration, fluid expansion and metal expansion type transducers - bimetallic strip, Thermometer, Thermistor, RTD, Thermocouple and their characteristics. Hall effect transducers, Digital transducers, Proximity devices, Bio-sensors, Smart sensors, Piezo-electric sensors.

UNIT III

Flow Transducers: Bernoulli's principle and continuity, Orifice plate, Nozzle plate, Venture tube, Rotameter, Anemometers, Electromagnetic flow meter, Impeller meter and Turbid flow meter.

UNIT IV

Pressure Transducers: Standards and calibration, different types of manometers, elastic transducers, diaphragm bellows, bourdon tube, capacitive and resistive pressure transducers, high- and low-pressure measurement.

UNIT V

Force and Sound Transducers: Proving ring, hydraulic and pneumatic load cell, dynamometer and gyroscopes. Sound level meter, sound characteristics, Microphone.

Text Books:

1. A.K. Sawhney, "A course in Electrical and Electronics Measurements and Instrumentation", Dhanpat Rai& Co. 3rd edition Delhi, 2010.
2. Rangan C.S, Sarma G.R and Mani V S V, "Instrumentation Devices and Systems", TATA McGraw Hill publications, 2007.

Reference Books:

1. Doebelin. E.O, "Measurement Systems Application and Design", McGraw Hill International, New York, 2004.
2. Nakra B.C and Chaudhary K.K, "Instrumentation Measurement and Analysis", Second Edition, Tata McGraw-Hill Publication Ltd.2006.

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23ACS16: COMPUTER NETWORKS
(Open Elective IV)

Course Outcomes:

CO1: Identify the software and hardware components of a computer network.
CO2: Design software for a computer network.
CO3: Develop new routing, and congestion control algorithms.
CO4: Assess critically the existing routing protocols.
CO5: Explain the functionality of each layer of a computer network.
CO6: Choose the appropriate transport protocol based on the application requirements.

UNIT I

Introduction: Types of Computer Networks, Broadband Access Networks, Mobile and Wireless Access Networks, Content Provider Networks, Transit networks, Enterprise Networks, Network technology from local to global, Personal Area Networks, Local Area Networks, Home Networks, Metropolitan Area Networks, Wide Area Networks, Internetworks, Network Protocols, Design Goals, Protocol Layering, Connections and Reliability, Service Primitives, The Relationship of Services to Protocols ,Reference Models, The OSI Reference Model, The TCP/IP Reference Model, A Critique of the OSI Model and Protocols, A Critique of the TCP/IP Reference Model and Protocols.

UNIT II

The Data Link Layer: Guided Transmission Media, Persistent Storage, Twisted Pairs, Coaxial Cable, Power Lines, Fiber Optics, Data Link Layer Design Issues, Services Provided To The Network Layer, Framing Error Control, Flow Control, Error Detection And Correction, Error-Correcting Codes, Error-Detecting Codes, Elementary Data Link Protocols, Initial Simplifying Assumptions Basic Transmission And Receipt, Simplex Link-Layer Protocols, Improving Efficiency, Bidirectional Transmission, Multiple Frames In Flight, Examples Of Full-Duplex, Sliding Window Protocols, The Channel Allocation Problem, Static Channel Allocation, Assumptions For Dynamic Channel Allocation, Multiple Access Protocols, Aloha, Carrier Sense Multiple Access Protocols, Collision-Free Protocols, Limited-Contention Protocols, Wireless LAN Protocols, Ethernet, Classic Ethernet Physical Layer, Classic Ethernet Mac Sublayer Protocol, Ethernet Performance, Switched Ethernet, Fast Ethernet, Gigabit Ethernet, 10-Gigabit Ethernet,40- And 100-Gigabit Ethernet, Retrospective On Ethernet.

UNIT III

The Network Layer: Network Layer Design Issues, Store-And-Forward Packet Switching, Services Provided To The Transport Layer, Implementation Of Connectionless Service, Implementation Of Connection-Oriented Service, Comparison Of Virtual-Circuit And Datagram Networks, Routing Algorithms In A Single Network, The Optimality Principle, Shortest Path Algorithm, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing Within a Network, Broadcast Routing, Multicast Routing, Anycast Routing, Traffic Management at The Network Layer, The Need for Traffic Management: Congestion, Approaches To Traffic Management, Internetworking, Internetworks: An Overview, How Networks differ, Connecting Heterogeneous Networks, Connecting Endpoints Across Heterogeneous Networks, Internetwork Routing: Routing Across Multiple Networks Supporting Different Packet Sizes: Packet Fragmentation, The Network Layer In The Internet, The IP Version 4 Protocol, IP Addresses, IP Version 6, Internet Control Protocols, Label Switching and MPLS, OSPF—An Interior Gateway Routing Protocol, BGP—The Exterior Gateway Routing Protocol, Internet Multicasting.

UNIT IV

The Transport Layer: The Transport Service, Services Provided To The Upper Layers, Transport Service Primitives, Berkeley Sockets, An Example Of Socket Programming: An Internet File Server, Elements Of Transport Protocols, Addressing, Connection Establishment, Connection Release, Error Control And Flow Control, Multiplexing, Crash Recovery, Congestion Control, Desirable Bandwidth Allocation, Regulating The Sending Rate, Wireless Issues, The Internet Transport Protocols: UDP, Introduction To UDP, Remote

Procedure Call, Real-Time Transport Protocols, The Internet Transport Protocols: TCP, Introduction To TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release.

UNIT V

The Application Layer: Electronic Mail, Architecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery, The World Wide Web, Architectural Overview, Static Web Objects, Dynamic Web Pages and Web Applications, HTTP and HTTPS, Web Privacy, Content Delivery, Content and Internet Traffic, Server Farms and Web Proxies, Content Delivery Networks, Peer-To-Peer Networks, Evolution of The Internet.

Textbooks:

1. Andrew Tanenbaum, David Wetherall, Computer Networks, 6th Edition, PEARSON.

Reference Books:

1. Forouzan, Data communications and Networking, 5th Edition, McGraw Hill Publication.
2. Youlou Zheng, Shakil Akthar, ―Networks for Computer Scientists and Engineers‖, Oxford Publishers, 2016.
3. James F. Kurose, Keith W. Ross, ―Computer Networking: A Top-Down Approach‖, 6th edition, Pearson, 2019

Online Learning Resources:

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

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23ACO01: INTERNET OF THINGS
(Open Elective IV)

Course Outcomes:

CO1: Understand general concepts of Internet of Things.
CO2: Apply design concept to IoT solutions.
CO3: AnalyzevariousM2MandIoTarchitectures.
CO4: Evaluated e sign issues in IoT applications.
CO5: Create IoT solutions using sensors, actuators and Devices.

UNIT I

Introduction to IoT: Definition and Characteristics of IoT, physical design of IoT, IoT protocols, IoT communication a. Ceaser cipher b. Substitution cipher c. Hill Cipher cation models, IoT Communication APIs, Communication protocols, Embedded Systems, IoT Levels and Templates.

UNIT II

Prototyping IoT Objects using Microprocessor / Microcontroller: Working principles of sensors and actuators, setting up the board – Programming for IoT, Reading from Sensors, Communication: communication through Bluetooth, Wi-Fi.

UNIT III

IoT Architecture and Protocols: Architecture Reference Model Introduction, Reference Model and architecture, IoT reference Model, Protocols- 6LowPAN, RPL, CoAP, MQTT, IoT frameworks Thing Speak.

UNIT IV

Device Discovery and Cloud Services for IoT: Device discovery capabilities – Registering a device, Deregister a device, Introduction to Cloud Storage models and communication APIs Web-Server, Web server for IoT.

UNIT V

UAV IoT: Introduction to Unmanned Aerial Vehicles/Drones, Drone Types, Applications: Defense, Civil, Environmental Monitoring; UAV elements and sensors- Arms, motors, Electronic Speed Controller (ESC), GPS, IMU, Ultra sonic sensors; UAV Software –Arudpilot, Mission Planner, Internet of Drones (IoD)- Case study FlytBase.

Text Books:

1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)",1st Edition, VPT, 2014.
2. Handbook of unmanned aerial vehicles, K Valavanis; George J Vachtsevanos, New York, Springer, Boston, Massachusetts: Credo Reference, 2014. 2016.

Reference Books:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Aves and, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
2. Arshdeep Bahga, Vijay Madisetti -Internet of Things: A Hands-On Approach, Universities Press,2014.
3. The Internet of Things, Enabling technologies and use cases – Pethuru Raj, Anupama C. Raman, CRC Press.
4. Francis da Costa, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013.

5. Cuno Pfister, Getting Started with the Internet of Things, O'Reilly Media, 2011, ISBN: 978- 1-4493-9357-1.

6. DGCA RPAS Guidance Manual, Revision 3 – 2020.
7. Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs, John Baichtal.

Online Learning Resources:

1. https://www.arduino.cc/
2. https://www.raspberrypi.org/
3. https://nptel.ac.in/courses/106105166/5
4. https://nptel.ac.in/courses/108108098/4

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

IV B. Tech - I Semester (ME)

L	T	P	C
3	0	0	3

23ACS35: QUANTUM COMPUTING
(Open Elective IV)

Course Outcomes:

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.

UNIT I: Fundamentals of Quantum Mechanics and Linear Algebra
Classical vs Quantum Computation, Complex Numbers, Vectors, and Matrices, Hilbert Spaces and Dirac Notation, Quantum States and Qubits, Superposition and Measurement, Tensor Products and Multi-Qubit Systems.

UNIT II: Quantum Gates and Circuits
Quantum Logic Gates: Pauli, Hadamard, Phase, Controlled Gates and CNOT, Unitary Operations and Reversibility, Quantum Circuit Representation, Quantum Teleportation, Simulation of Quantum Circuits.

UNIT III: Quantum Algorithms and Complexity
Quantum Parallelism and Interference, Deutsch and Deutsch-Jozsa Algorithms, Grover's Search Algorithm, Shor's Factoring Algorithm, Quantum Fourier Transform, Complexity Classes: BQP, P, NP, and QMA.

UNIT IV: Quantum Programming and Simulation Platforms
Introduction to Qiskit and IBM Quantum Experience, Writing Quantum Circuits in Qiskit, Measuring Qubits and Results, Classical-Quantum Hybrid Programs, Noisy Intermediate-Scale Quantum (NISQ) Systems, Limitations and Current State of Quantum Hardware.

UNIT V: Applications and Future of Quantum Computing
Quantum Machine Learning: Basics and Models, Quantum Cryptography and Quantum Key Distribution, Quantum Algorithms in AI and Optimization, Quantum Advantage and Supremacy, Ethical and Societal Impact of Quantum Technologies, Future Trends and Research Directions.

Text Books:

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

Reference Books:

1. David McMahon, Quantum Computing Explained, Wiley, 2008.
2. Phillip Kaye, Raymond Laflamme, Michele Mosca, An Introduction to Quantum Computing, Oxford University Press, 2007.
3. Scott Aaronson, Quantum Computing Since Democritus, Cambridge University Press, 2013.

Online Learning Resources:

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

5. Qiskit Textbook – IBM Quantum

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IV B. Tech - I Semester (ME)

L	T	P	C
3	0	0	3

23AMB22: FINANCIAL MATHEMATICS
(Open Elective IV)

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.

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 Lookbacks. Monte Carlo methods for derivative pricing, Black-Scholes-Merton model: Derivation and applications.

Text Books:

1. Ales Cerny, Mathematical Techniques in Finance: Tools for Incomplete Markets, Princeton University Press.
2. S.R. Pliska, Introduction to Mathematical Finance: Discrete-Time Models, Cambridge University Press.

Reference Books:

1. Ioannis Karatzas& Steven E. Shreve, Methods of Mathematical Finance, Springer, New York.
2. John C. Hull, Options, Futures, and Other Derivatives, Pearson.

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IV B. Tech - I Semester (ME)

L	T	P	C
3	0	0	3

23AHS46: SENSORS AND ACTUATORS FOR ENGINEERING APPLICATIONS
(Open Elective IV)

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.

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
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: Tactile sensors, Pressure sensors: Piezo resistive.

Unit-III: Optical and Acoustic Sensors

Optical Sensors: Basic principle and working of: Photodiodes, Phototransistors and Photo resistors-based sensors, Photomultipliers, 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, Magneto strictive 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.

Text Books:

1. Sensors and Actuators – Clarence W.de Silva, CRC Press, 2nd Edition, 2015.
2. Sensors and Actuators, D.A. Hall and C.E. Millar, CRC Press, 1999.

Reference Books:

1. Sensors and Transducers, D. 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. Hand book of modern sensors, Springer, Stefan Johann Rupitsch.

NPTEL course link: https://onlinecourses.nptel.ac.in/noc21_ee32/preview.

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IV B. Tech - I Semester (ME)

L	T	P	C
3	0	0	3

23AHS47: CHEMISTRY OF NANO MATERIALS AND APPLICATIONS
(Open Elective IV)

Course Outcomes:

CO1: Classify the nano structure materials; describe scope of nano science 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 high-energy ball milling.
CO3: Discuss different technique for characterization of nano material, Explain electron microscopy techniques for characterization of nano material, Describe BET method for surface area analysis.
CO4: Explainsynthesisandpropertiesandapplicationsofnanomaterials.Discussabout fullerenes and carbon nano tubes, differentiate nano magnetic 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.

Unit -I: Basics and Characterization of Nano materials

Introduction**,** Scope of nano science and nano technology, nano science in nature, classification of nano structured materials, importance of nano materials

Unit - II: Synthesis of Nano materials

Top-Down approach**,** Inert gas condensation, arc discharge method, aerosol synthesis, plasma arc technique, ion sputtering, laser ablation, laser pyrolys is, and chemical vapour deposition method, electro deposition method, high energy ball milling method.

Synthetic Methods**:** Bottom-Up approach**,** Sol-gel synthesis, micro emulsions or reverse micelles, co-precipitation method, solvo thermal synthesis, hydrothermal synthesis, microwave heating synthesis and sono chemical synthesis.

Unit - III: Techniques for Characterization

Diffraction technique, spectroscopy techniques, electron microscopy techniques for the characterization of nano materials, 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 nano materials -fullerenes, carbon nano tubes, 2D-nano material (Graphene), core-shell, magnetic nano particles, thermo electric materials, non-linear optical materials.

Unit - V: Advanced Engineering Applications of Nano materials

Applications of nano particles, 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, Ma Graw-Hill, 2007.
2. Textbook of Nano science and nano technolog y: B S Murty, P Shankar, Baldev Rai, B B Rath and James Murday, Univ. Press, 2012.

References Books:

1. Concepts of Nano chemistry; Ludo vico Cademrtiri and Geoffrey A. Ozin & Geoffrey A. Ozin,

Wiley-VCH, 2011.
2. Nanostructures & Nano materials; Synthesis, Properties & Applications: Guozhong Cao, Imperial College Press, 2007.

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IV B. Tech - I Semester (ME)

L	T	P	C
3	0	0	3

23AHS48: LITERARY VIBES
(Open Elective IV)

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.

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
2. Plot & sub-plot and Historical background of the play
3. Themes and Criticism
4. Style and literary elements
5. Characters and characterization

UNIT III: Short Story

1. The Luncheon - Somerset Maugham
2. The Happy Prince-Oscar Wild
3. Three Questions – Leo Tolstoy
4. Swami and Friends – R. K. Narayan

UNIT IV: Prose: Essay and Autobiography

1. My struggle for an Education-Booker T Washington
2. The Essentials of Education-Richard Livingston
3. Ignited Minds – A. P. J. Abdul Kalam
4. The story of My Life-Helen Keller

UNIT V: Novel: *Hard Times*- Charles Dickens

1. Charles Dickens-Life and works
2. Plot and Historical background of the novel
3. Themes and criticism
4. Style and literary elements
5. Characters and characterization

Text Books:

1. Charles Dickens**.** *Hard Times.*(Sangam Abridged Texts) Vantage Press, 1983
2. DENT JC.*William Shakespeare. Twelfth Night***.** Oxford University Press,2016.

Reference Books:

1. WJ Long.*History of English Literature***,** Rupa Publications India; First Edition (4 October 2015)
2. RK Kaushik And SC Bhatia. *Essays, Short Stories and One Act Plays*, Oxford University Press .2018.
3. Narayan, R.K. *Swami and Friends*. Indian Thought Publications, 2015.
4. Kalam, Abdul. *Ignited Minds*. Penguin Books India, 2014.
5. *New Horizon*, Pearson publications, New Delhi 2014.
6. Vimala Ramarao, *Explorations Volume*-II, Prasaranga Bangalore University,2014**.**

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_vignette
4. https://sirjitutorials.com/where-the-mind-is-without-fear-poem-notes- explanation/
5. https://www.litcharts.com/lit/twelfth-night/themes
6. https://smartenglishnotes.com/2021/11/28/the-luncheon-summary-characters-themes- and-irony/

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(AUTONOMOUS)

IV B. Tech - I Semester (ME)

L	T	P	C
0	1	2	2

23AME48: INTRODUCTION TO DRONE TECHNOLOGIES
(Skill Enhancement Course)

Course Outcomes:

CO1: Know about a various type of drone technology, drone fabrication and programming.
CO2: Execute the suitable operating procedures for functioning a drone
CO3: Select appropriate sensors and actuators for Drones
CO4: Develop a drone mechanism for specific applications
CO5: Create the programs for various drones.

UNIT I: INTRODUCTION TO DRONE TECHNOLOGY

Drone Concept - Vocabulary Terminology- History of drone - Types of current generation of drones based on their method of propulsion- Drone technology impact on the businesses- Drone business through entrepreneurship- Opportunities/applications for entrepreneurship and employability

UNIT II: DRONE DESIGN, FABRICATION AND PROGRAMMING

Classifications of the UAV -Overview of the main drone parts- Technical characteristics of the parts - Function of the component parts -Assembling a drone- The energy sources- Level of autonomy- Drones configurations -The methods of programming drone- Download program -Install program on computer- Running Programs- Multi rotor stabilization- Flight modes -Wi-Fi connection

UNIT III: DRONE FLYING AND OPERATION

Concept of operation for drone -Flight modes- Operate a small drone in a controlled environment- Drone controls Flight operations –management tool –Sensors-Onboard storage capacity -Removable storage devices- Linked mobile devices and applications

UNIT IV: DRONE COMMERCIAL APPLICATIONS

Choosing a drone based on the application -Drones in the insurance sector- Drones in delivering mail, parcels and other cargo- Drones in agriculture- Drones in inspection of transmission lines and power distribution -Drones in filming and panoramic picturing

UNIT V: FUTURE DRONES AND SAFETY

The safety risks- Guidelines to fly safely -Specific aviation regulation and standardization- Drone license- Miniaturization of drones- Increasing autonomy of drones -The use of drones in swarms

Text Books

1. Daniel Tal and John Altschuld, “Drone Technology in Architecture, Engineering and Construction: A Strategic Guide to Unmanned Aerial Vehicle Operation and Implementation”, 2021 John Wiley & Sons, Inc.
2. Terry Kilby and Belinda Kilby, “Make: Getting Started with Drones”, Maker Media, Inc,

REFERENCE Books

1. John Baichtal, “Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs”, Que Publishing, 2016
2. Zavrsnik, “Drones and Unmanned Aerial Systems: Legal and Social Implications for Security and Surveillance”, Springer, 2018.

Online Learning resources

1. https://nptel.ac.in/courses/101108661
2. https://www.youtube.com/watch?v=iJnuTtUFiWM

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IV B. Tech - I Semester (ME)

L	T	P	C
2	0	0	0

23AME49: GENDER SENSITIZATION
(Audit Course)

Course Outcomes:

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: Analyze the 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.

Unit – I UNDERSTANDING GENDER

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood. Growing up Male. First lessons in Caste.

Unit – II GENDER ROLES AND RELATIONS

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles- Gender Roles and Relationships Matrix-Missing Women-Sex Selection and its Consequences- Declining Sex Ratio-Demographic Consequences-Gender Spectrum -

Unit – III GENDER AND LABOUR

Division and Valuation of Labour-Housework: The Invisible Labor- ―My Mother doesn‘t Work.―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 – IV GENDER-BASED VIOLENCE

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment - Domestic Violence - Different forms of violence against women - Causes of violence, impact of violence against women - Consequences of gender-based violence

Unit – V GENDER AND CULTURE

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature-Gender Development Issues-Gender Issues-Gender Sensitive Language- Just Relationships

Prescribed Books

1. A.Suneetha, Uma Bhrugubanda, et al. Towards a World of Equals: A Bilingual Textbook on Gender‖, Telugu Akademi, Telangana, 2015.
2. Butler, Judith. Gender Trouble: Feminism and the Subversion of Identity. UK Paperback Edn. March 1990

Reference Books

1. Wtatt, Robin and Massood, Nazia, Broken Mirrors: The dowry Problems in India,London : Sage Publications, 2011
2. Datt, R. and Kornberg, J.(eds), Women in Developing Countries, Assessing Strategies for Empowerment, London: Lynne Rienner Publishers, 2002
3. Brush, Lisa D., Gender and Governance, New Delhi, Rawat Publication, 2007
4. Singh, Direeti, Women and Politics World Wide, New Delhi, Axis Publications, 2010

5. Raj Pal Singh, Anupama Sihag, Gender Sensitization: Issues and Challenges (English, Hardcover), Raj Publications, 2019
6. A.Revathy& Murali, Nandini, A Life in Trans Activism(Lakshmi Narayan Tripathi). The University of Chicago Press, 2016

Online Resources:

1. Understanding Gender chrome-extension://kdpelmjpfafjppnhbloffcjpeomlnpah/https://www.arvindguptatoys.com/arvindgupta/kamla-gender1.pdf
https://onlinecourses.swayam2.ac.in/nou24_hs53/preview
2. Gender Roles and Relations
https://www.plannedparenthood.org/learn/gender-identity/sex-gender-identity/what-are-gender-roles-and-stereotypes
https://www.verywellmind.com/understanding-gender-roles-and-their-effect-on-our-relationships-7499408
https://onlinecourses.swayam2.ac.in/cec23_hs29/preview
3. Gender and Labour
https://www.economicsobservatory.com/what-explains-the-gender-division-of-labour-and-how-can-it-be-redressed
https://onlinecourses.nptel.ac.in/noc23_mg67/preview
4. Gender-Based Violence
https://eige.europa.eu/gender-based-violence/what-is-gender-based-violence?language_content_entity=en
https://www.worldbank.org/en/topic/socialsustainability/brief/violence-against-women-and-girls
https://onlinecourses.swayam2.ac.in/nou25_ge38/preview
5. Gender and Culture
https://gender.study/psychology-of-gender/culture-impact-gender-roles-identities/
https://sociology.iresearchnet.com/sociology-of-culture/gender-and-culture/
https://archive.nptel.ac.in/courses/109/106/109106136/

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
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IV B. Tech - I Semester (ME)

L	T	P	C
0	0	0	2

23AME49: EVALUATION OF INDUSTRY INTERNSHIP

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

IV B. Tech - II Semester (ME)

L	T	P	C
0	0	24	4

23AME53: INTERNSHIP

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
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IV B. Tech - II Semester (ME)

L	T	P	C
0	0	0	8

23AME54: PROJECT

HONORS

IN

MECHANICAL ENGINEERING

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

Honors in Mechanical Engineering (R23)

L	T	P	C
3	0	0	3

23AME55: AUTOMOTIVE THERMAL SYSTEM

Course Outcomes:

CO1: Explain fundamental heat transfer concepts and apply them to design and optimize thermal systems.
CO2: Analyze engine thermal management using thermodynamic principles and modern control strategies.
CO3: Evaluate automotive climate control systems using psychrometrics and thermal interaction principles.
CO4: Select and design appropriate heat exchangers for efficient automotive thermal management.
CO5: Assess thermal management techniques in electric vehicles focusing on batteries and power electronics.

Unit – I

Fundamentals and Systematic Approach to Heat Transfer Concepts: Energy, Heat & Work, First Law of Thermodynamics, Heat Engines, Refrigerators, and Heat Pumps, Second Law of Thermodynamics, Carnot Cycle, Conduction, Convection-Parallel flow on a Isothermal Plate, A cylinder in cross flow, Flow in Ducts, Free Convection, Radiation. Formulation of Thermal System Design- Requirement and Specifications, Design Variables, Constraints. Designing a workable system, Optimization methods -overview and significance.

Unit – II

Automotive Engine Thermal Management: Fundamentals of First & Second Law of Thermodynamics to the engine performance (Volumetric efficiency and Thermal Efficiency), heat balance equation, Fundamentals of Exergy, Energy analysis, Thermal Models and Operating Strategy- smart valve, variable speed pump, variable speed fan. Applications of Thermoelectric generators and Thermoelectric coolers, Applications of heat pipes and heat sink.

UNIT-III

Fundamentals of Automotive Climate Control: Psychrometric properties, Use of psychrometric chart, coefficient of performance, Refrigerants – Types of refrigerants, Properties and Selection of refrigerants, Factors affecting the air flow, Types of fans, Axial and Centrifugal fans, Load calculations, Winter air-conditioning, Two-phase flow effects in the Evaporator and Condenser, air side heat transfer on the Evaporator and Condenser, System mass effects, Simplified cabin thermal model. Convective thermal interaction-cabin air and atmosphere.

UNIT-IV

Fundamentals- Heat Exchangers: Functions of radiator, compressor, Functions of condenser, evaporator, expansion valve, Classification of heat exchangers – According to transfer process, Number of fluids, surface compactness, Construction features, flow arrangements, heat transfer mechanisms, Selection and design of heat exchangers based on – Types, heat transfer rate, cost, pumping power, size and materials. Coolant- function, types, and required properties. Advanced cooling system with smart valve, variable speed pump, variable speed fan, engine block, radiator, and sensors (temperature, mass flow rate and power).

UNIT-V

Thermal management in EV systems: Temperature sensitivity and heat generation of batteries- electro-thermal, Internal heat generation, Rate of Discharge, Battery ageing, Thermal runaway, battery heat transfer medium. Role of thermal management in power electronics and controllers, heat sink design and configuration, Application of microfluidics and nano fluids.

Text Books:

1. Yunus A Cengel, Afshin J Ghajar, “Heat and Mass Transfer”., Tat McGraw Hill Education Private

Limited, New Delhi,2018.
2. W. F. Stoecker Design of Thermal Systems Third Edition, McGraw – Hill, Newyork, 1989.
3. Ho Sung Lee "Thermal Design: Heat Sinks, Thermoelectrics, Heat Pipes, Compact Heat Exchangers, and Solar Cells" 2011 John Wiley & Sons, Inc

Reference Books:

1. Concepts of Nano chemistry; Ludovico Cademrtiri and Geoffrey A. Ozin & Geoffrey A. Ozin, Wiley-VCH, 2011.
2. Concepts of Nano chemistry; Ludovico Cademrtiri and Geoffrey A. Ozin & Geoffrey A. Ozin, Wiley-VCH, 2011.
3. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2012.
4. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003 8. "Bosch' Automotive Handbook", 8thEdition

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

Honors in Mechanical Engineering (R23)

L	T	P	C
3	0	0	3

23AME56: SIMULATION AND MODELLING OF MANUFACTURING SYSTEMS

Course Outcomes:

CO1: Understand system modeling concepts and statistical foundations for simulation, including estimation and hypothesis testing.
CO2: Develop, validate, and verify simulation models using stochastic input elements and statistical techniques.
CO3: Generate random variates using standard methods and evaluate simulation languages and tools for effective modeling.
CO4: Perform output data analysis and apply methods to achieve steady-state performance in simulation studies.
CO5: Apply simulation techniques to real-world systems like queues, inventory models, and production systems.

Unit – I

System – ways to analyze the system – Model – types of models – Simulation – Definition – Types of simulation models – steps involved in simulation – Advantages & Disadvantages. Parameter estimation – estimator – properties – estimate – point estimate – confidence interval estimates – independent – dependent – hypothesis – types of hypotheses- steps – types 1& 2 errors – Framing – strong law of large numbers.

Unit – II

Building of Simulation model – validation – verification – credibility – their timing – principles of valid simulation Modeling – Techniques for verification – statistical procedures for developing credible model. Modeling of stochastic input elements – importance – various procedures – theoretical distribution – continuous – discrete – their suitability in modeling.

UNIT-III

Generation of random variates – factors for selection – methods – inverse transform – composition – convolution – acceptance – rejection – generation of random variables – exponential – uniform – Weibull – normal Bernoulli – Binomial – uniform – poisson. Simulation languages – comparison of simulation languages with general purpose languages – Simulation languages vs Simulators – software features – statistical capabilities – G P S S – SIMAN- SIMSCRIPT –Simulation of M/M/1 queue – comparison of simulation languages.

UNIT-IV

Output data analysis – Types of Simulation w.r.t output data analysis – warmup period- Welch algorithm – Approaches for Steady – State Analysis – replication – Batch means methods – comparisons.

UNIT-V

Applications of Simulation – flow shop system – job shop system – M/M/1 queues with infinite and finite capacities – Simple fixed period inventory system – Newboy paper problem.

TEXT BOOKS:

1. Law, A.M. & Kelton, "Simulation Modelling and Analysis", McGraw Hill, 2nd Edition, New York, 1991.
2. Narahari and M. Vishwanathan, Prentice Hall England wood Cliffs, "Performance modelling of automated manufacturing systems". NJ USA 1992.

REFERENCE BOOKS:

1. Carrie A. / Wiley, NY, "Simulation of Manufacturing Systems", 1990.
2. Ross, S.M., McMillan, NY, "A Course in Simulation", 1990. Simulation Modelling and SIMNET / Taha H.A / PH, Englewood Cliffs, NJ, 1987

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

Honors in Mechanical Engineering (R23)

L	T	P	C
3	0	0	3

23AME57: SUPPLY CHAIN MANAGEMENT

Course Outcomes:

CO1: Understand the fundamentals of supply chain management, its drivers, strategies, and key components.

CO2: Design efficient distribution and network systems considering transportation modes and influencing factors.

CO3: Analyze sourcing strategies, procurement processes, and pricing methods in various supply chain scenario.

CO4: Evaluate logistics systems using analytical techniques and understand the role of demand management and customer service.

CO5: Explore emerging trends and technologies in supply chain management, including e-commerce and green practices.

UNIT – I

Introduction to Supply Chain Management: Supply chain - objectives - importance - decision phases - process view -competitive and supply chain strategies - achieving strategic fit – supply chain drivers - obstacles – framework - facilities -inventory-transportation-information-sourcing-pricing.

UNIT – II

Designing the distribution network: Role of distribution - factors influencing distribution - design options - e-business and its impact – distribution networks in practice –network design in the supply chain - role of network -factors affecting the network design decisions modeling for supply chain. Role of transportation - modes and their performance – transportation infrastructure and policies - design options and their trade-offs tailored transportation.

UNIT-III

Supply Chain Analysis: Sourcing - In-house or Outsource - 3rd and 4th PLs - supplier scoring and assessment, selection - design collaboration - Procurement process - Sourcing planning and analysis. Pricing and revenue management for multiple customers, perishable products, seasonal demand, bulk and spot contracts.

UNIT-IV

Dimensions of Logistics: A macro and micro dimension - logistics interfaces with other areas - approach to analyzing logistics systems - logistics and systems analysis - techniques of logistics system analysis - factors affecting the cost and importance of logistics. Demand Management and Customer Service Outbound to customer logistics systems - Demand Management –Traditional Forecasting - CPFRP - customer service - expected cost of stock outs - channels of distribution.

UNIT-V

Recent Trends in Supply Chain Management: Introduction, New Developments in Supply Chain Management, Outsourcing Supply Chain Operations, Co-Maker ship, The Role of E-Commerce in Supply Chain Management, Green Supply Chain Management, Distribution Resource Planning, World Class Supply Chain Management.

TEXT BOOKS:

1. Sunil Chopra and Peter Meindl, Supply Chain Management – "Strategy, Planning and Operation", 3rd Edition, Pearson/PHI, 2007.
2. Supply Chain Management by Janat Shah Pearson Publication 2008.

REFERENCE BOOKS:

1. A Logistic approach to Supply Chain Management – Coyle, Bardi, Longley, Cengage Learning, 1/e.
2. Donald J Bowersox, Dand J Closs, M Bixby Coluper, "Supply Chain Logistics Management", 2nd edition,

TMH, 2008

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

Honors in Mechanical Engineering (R23)

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23AME58: ADVANCED MECHANISM DESIGN

Course Outcomes:

CO1: Understand and analyze the position and velocity of planar mechanisms using vector and complex algebra methods.
CO2: Perform kinematic analysis of planar complex mechanisms using analytical and graphical methods for velocity and acceleration.
CO3: Apply principles of synthesis to design mechanisms for specific motion tasks using analytical and graphical approaches.
CO4: Analyze static and dynamic forces in planar mechanisms with and without friction using principles of equilibrium and virtual work.
CO5: Perform kinematic analysis of spatial mechanisms and robotic manipulators using Denavit-Hartenberg parameters and kinematic equations.

UNIT – I

Introduction – review of fundamentals of kinematics - analysis and synthesis – terminology, definitions and assumptions – planar, spherical and spatial mechanisms‟ mobility – classification of mechanisms – kinematic Inversion – Grashoff`s law Position and displacement – complex algebra solutions of planar vector equations – coupler curve generation velocity – analytical methods - vector method – complex algebra methods – Freudenstein‟s theorem.

UNIT – II

Planar complex mechanisms - kinematic analysis - low degree complexity and high degree complexity, Hall and Ault`s auxiliary point method – Goodman‟s indirect method for low degree of complexity mechanisms Acceleration – analytical methods – Chase solution - Instant centre of acceleration. Euler-Savory equation - Bobillier construction.

UNIT-III

Synthesis of mechanisms: Type, number and dimensional synthesis – function generation – two position synthesis of slider crank and crankrocker mechanisms with optimum transmission angle – three position synthesis – structural error – Chebychev spacing - Cognate linkages – Robert-Chebychev theorem – Block‟s method of synthesis, Freudenstein‟s equation.

UNIT-IV

Static force analysis of planar mechanism – static force analysis of planar mechanism with friction – method of virtual work Dynamic force analysis of planar mechanisms - Combined static and inertia force analysis.

UNIT-V

Kinematic analysis of spatial revolute-Spherical-Spherical-Revolute mechanism – Denavit-Hartenberg parameters – forward and inverse kinematics of robotic manipulators.

TEXT BOOKS:

1. Amitabh Ghosh and Ashok Kumar Mallik, “Theory of Mechanisms and Machines,”,3e, EWP, 1999.
2. Arthur G. Erdman and G.N. Sandor, “Advanced Mechanism Design: Analysis and Synthesis”, Vol. II, PHI, 1984.

REFERENCE BOOKS:

1. Shighley Joseph Edwards and Uicker John Joseph, “Theory of Machines and Mechanism”, 2e, McGraw Hill,1985.
2. Arthur G. Erdman and G.N. Sandor, “Advanced Mechanism Design: Analysis and Synthesis”, Vol. I, PHI, 1984

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

Honors in Mechanical Engineering (R23)

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23AME59: BIO MECHANICS

Course Outcomes:

CO1: Understand the fundamentals of statics, dynamics, and biomechanical terminology applied to the human body.
CO2: Analyze kinematics and forces in upper limb joints using free-body diagrams and biomechanical principles.
CO3: Model and analyze upper limb motion using mechanical system concepts, forward kinematics, and fingertip force analysis.
CO4: Evaluate biomechanics of lower body joints, gait, and mechanical behavior of hard tissues such as bones.
CO5: Understand the mechanical behavior of soft tissues, viscoelastic modeling, and basic biofluid mechanics of blood flow.

Unit – I

Introductory Mechanics – Statics and Dynamics – Basic Principles. The human body as a biomechanical system – basic terminologies.

Unit – II

Kinematics of muscles and joints - free-body diagrams and equilibrium, forces and stresses in joints.
Biomechanical analysis of joints of upper limb - Shoulder, Elbow, wrist, hand and fingers.

UNIT-III

Upper limb as a mechanical system – analysis of reaching as movement of a multi-link serial chain – forward kinematics, analysis of fingertip forces as a parallel manipulator.

UNIT-IV

Biomechanical analysis of joints – Spine, Hip, Knee, Ankle. Introduction to Postural stability and Gait analysis. Gait analysis in health and disease - basics. Mechanics of Hard Tissues - Definition of Stress and Strain, Deformation Mechanics, structure and mechanical properties of bone - cortical and cancellous bones, Wolff's law of bone remodeling.

UNIT-V

Soft Tissues - Structure, functions, material properties – tendon function, elasticity in a tendon, models of non-linear elasticity in a tendon – physiological and non-physiological regimes, Davis' law of soft tissue remodeling. Visco-elastic properties of soft tissues, Models of visco-elasticity: Maxwell & Voight models. Basic Biofluid mechanics - Flow properties of blood in the intact human cardiovascular system.

TEXT BOOKS:

1. David A. Winter, Biomechanics and Motor Control of Human Movement.
2. Margareta Nordin and Victor H. Frankel, Basic Biomechanics of the Musculoskeletal System.

REFERENCE BOOKS:

1. Francisco Valero-Cuevas, Fundamentals of Neuro mechanics.
2. Susan Hall, Basic Bio mechanics.

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Honors in Mechanical Engineering (R23)

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23AME60: APPLIED PROJECT WORK

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

III Year B.Tech. CE–I Semester	**L**	**T**	**P**	**C**
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(23ACE67) CONSTRUCTION MATERIALS

Course Objectives:

1. To Understand the Types, Physical Characteristics, Testing, and Deterioration of Natural and Artificial Stones Used In Construction.(L2)
2. To Explain and Classify Various Structural Clay Products Such As Bricks, Tiles, Terracotta, Porcelain, and their Manufacturing Processes and Applications.(L2)
3. To Analyze and Apply the Knowledge of Cement, Aggregates, and Admixtures To Evaluate the Properties of Fresh and Hardened Concrete, Including Mix Design. (L3)
4. To Evaluate and Apply the Knowledge of Wood and Timber—Its Properties, Preservation, Defects, Testing, and Uses In Building Construction. (L3)
5. To Understand and Interpret the Composition, Application Techniques, and Properties of Paints, Varnishes, Enamels, and Surface Finishes.(L2)

Course Outcomes :

Upon Successful Completion of the Course, the Student Will Be Able To:

1. Identify the Characteristics, Types, Deterioration, and Applications of Building Stones. (L2)
2. Classify and Evaluate the Quality and Suitability of Bricks, Tiles, and Other Structural Clay Products. (L3)
3. Analyze the Properties and Mix Design of Cement, Aggregates, and Concrete For Construction Use. (L4)
4. Assess Timber Based On Its Properties, Preservation Methods, and Applications In Building Works. (L3)
5. Explain the Properties, Preparation, and Application of Paints, Varnishes, and Polishes For Surface Protection. (L2)

UNIT–I

Introduction-Rock-Forming Minerals-Classification of Rocks-Quarrying of Stones-Seasoning of Stone-Dressing of Stone –Uses of Stones –Characteristics of Good Building Stones-Testing of Stones-

Deterioration of Stones - Durability of Stones - Preservation of Stones - Selection of Stones - Common Building Stones - Artificial Stones -Applications of Stones.

UNIT–II

STRUCTURAL CLAY PRODUCTS

Introduction - Physical Properties of Clays - Classification of Bricks - Ingredients of Good Brick Earth - Characteristics of Good Brick –Manufacturing of Bricks -Different Forms of Bricks –Testing of Bricks – Defects of Bricks-Clay Tiles-Fire-Clay Bricks or Refractory Bricks–Terracotta–Porcelain–Stoneware–Earthenware–Glazing–Majolica-ApplicationofClayProducts.

UNIT–III

CEMENT & CONCRETE

Introduction- Portland Cement- Chemical Composition- Hydration of Cement-Manufacture of Cement -Testing of Cement-Types of Cement–Aggregates-Classification of Aggregates-Fine Aggregate & Coarse Aggregate-Testing of Aggregates-Quality of Mixing&CuringWater–

Admixtures For Concrete – Principles of Mix Design-Fresh and Hardened Properties.

UNIT–IV

WOOD

Introduction-Classification of Trees - Growth of Trees - Classification of Timber (IS: 399) - Structure of Timber - Characteristics of Good Timber - Seasoning of Timber - Defects In Timber - Diseases of Timber- Decay of Timber - Preservation of Timber (IS: 401) - Fire Resistance of Timber - Testing of Timber(IS:1708)-Suitability of Timber For Specific Uses- Properties of Wood-Wood Products-

Applications of Wood and Wood- Products

UNIT–V

PAINTS, ENAMELS AND VARNISHES

Introduction - Composition of Oil Paint - Characteristics of An Ideal Paint - Preparation of Paint - Covering Power of Paints - Pigment Volume Concentration (P.V.C.) - Painting Plastered Surfaces – Painting Wood Surfaces-PaintingMetalSurfaces-Defects-Enamel-Distemper-WaterWashand

Colour Wash -Varnish-French Polish-Wax Polish –Miscellaneous Paints

Text Books

1. S.K. Duggal, *Building Materials*, New Age International Pvt. Ltd., 3rd Revised Edition, 2008.
2. P.C. Varghese, *Building Materials*, PHI Learning Pvt. Ltd., 2nd Edition, 2015.

Reference Books

1. M.L. Gambhir, *Building Materials*, Tata McGraw Hill Publishing Co. Ltd., 4th Edition, 2013.
2. S.S. Bhavikatti, *Building Materials*, Vikas Publishing House Pvt. Ltd., 3rd Edition, 2015.
3. B.C. Punmia, *Building Materials*, Laxmi Publications Pvt. Ltd., 2010.
4. Jagadish, Venkatarama Reddy, *Alternate Building Materials and Technology*, New Age International Publishers, 2010.
5. Surendra Singh, *Engineering Materials*, Vikas Publishing House Pvt. Ltd., 2014.
6. P.D. Kulkarni et al., *Civil Engineering Materials*, Tata McGraw Hill Publishing Co. Ltd., 2008.

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III Year B.Tech. CE–I Semester	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(23ACE68) CONSTRUCTION METHODS

Course Objectives:

1. To understand the importance, types, and selection of foundations for various site conditions. (L2)
2. To identify and apply construction techniques of different types of masonry and structural components. (L3)
3. To describe and evaluate different types and techniques of plastering used in construction. (L2)
4. To examine the properties, applications, and construction methods of various flooring types. (L4)
5. To analyze and design basic components of industrial structures with emphasis on modern techniques and materials. (L4)

Course Outcomes:

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

1. Understand various types of foundations, their functions, and methods to improve soil bearing capacity. (L2)
2. Apply knowledge of masonry types, bonds, and composite construction methods in practical construction. (L3)
3. Identify types of plastering, defects, and special techniques used in surface finishing. (L2)
4. Analyze different flooring materials, laying techniques, and repair methods. (L4)
5. Design and assess components of industrial structures such as PEBs, trusses, and roofing systems. (L6)

UNIT–I

FOUNDATIONS

Introduction To Foundations - Importance of Foundations In Construction - Functions of A Foundation - Factors Affecting the Choice of Foundations - Types of Foundations - Shallow Foundations: Strip Footing, Isolated Footing, Combined Footing, Raft Foundation - Deep Foundations :Pile Foundations, Well Foundations-Site Investigation For Foundations-Soil

Testing Methods, Bearing Capacity of Soils, Methods of Improving Bearing Capacity.

UNIT–II

MASONRY

Introduction To Masonry Construction - Definition and Importance of Masonry - Comparison of Different Types of Masonry - Types of Masonry Construction - Brick Masonry: Stretcher, Header, English, Flemish Bonds - Stone Masonry: Random Rubble Masonry, Coursed Rubble Masonry,AshlarMasonry-ConcreteBlockMasonry:HollowBlocks,SolidBlocks,Interlocking Blocks-CompositeMasonry:Brick-StoneCompositeMasonry-Lintels,Arches,andCopings-

Construction Techniques and Materials Used

UNIT–III
PLASTERING

Introduction To Plastering - Purpose and Importance of Plastering - Materials Used In Plastering (Cement, Lime, Gypsum) - Types of Plastering - Lime Plaster, Cement Plaster, Gypsum Plaster, Stucco Plaster - Methods of Plastering -Single Coat, Double Coat, and Three-Coat Plastering - Defects In Plastering and Remedies - Cracking, Peeling, Efflorescence, Blistering - Special Plastering Techniques -Waterproof Plastering, Decorative Plastering

UNIT–IV
FLOORING

Introduction To Flooring - Importance and Requirements of Good Flooring - Types of Flooring- Hard Flooring: Stone (Marble, Granite, Kota), Concrete Flooring , Ceramic and Vitrified Tiles - Resilient Flooring: PVC, Linoleum, Rubber Flooring - Wooden Flooring: Solid Wood, Laminated Wood, Parquet Flooring - Special Flooring: Epoxy Flooring, Mosaic Flooring, Terrazzo Flooring - Construction Methods of Flooring - Laying of Different Floor Materials - Sub-BasePreparationandFinishing-DefectsInFlooringandRepairTechniques-Cracking,

Dampness, Un even Settlement

UNIT–V
INDUSTRIAL STRUCTURES

Introduction To Industrial Structures - Requirements of Industrial Buildings - Structural Components - Types of Industrial Structures - Steel Structures: Components of Steel Buildings (Trusses, Columns, Girders) - Pre-Engineered Buildings (PEB): Concept, Advantages, and Applications - Portal Frames and Space Frames: Design and Construction Considerations – Roofing Systems In Industrial Buildings - Trusses, Shell Roofs, Domes, Vaults - Construction of Warehouses and Sheds : Material Selection, Structural Stability Considerations - Factories and Large-SpanStructures,ConstructionTechniquesForLong-SpanStructures,FireResistanceand

Safety Measures - Special Considerations For Industrial Buildings - Ventilation and Lighting Requirements, Vibration Control and Noise Reduction Techniques

Textbooks:

1. B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, *Building Construction*, Laxmi Publications (P) Ltd., New Delhi, 2008.
2. P.C. Varghese, *Building Construction*, PHI Learning Pvt. Ltd., 2nd Edition, 2017.

Reference Books:

1. Sushil Kumar, *Building Construction*, Standard Publishers Distributors, New Delhi, 2013.
2. S.S. Bhavikatti, *Building Construction*, Vikas Publishing House Pvt. Ltd., 2nd Edition, 2016.
3. Dr. S.C. Rangwala, *Building Construction*, Charotar Publishing House, 26th Edition, 2014.
4. R.L. Peurifoy, *Construction Planning, Equipment and Methods*, McGraw Hill Education, 8th Edition, 2010.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

III Year B.Tech. CE–II Semester	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(23ACE69) FUNDAMENTALS OF BUILDING PLANNING AND DRAWING

Course Objectives:

1. To Understand the Principles of Building Planning and Regulatory Requirements For Residential and Public Structures. (L2)
2. To Apply Functional Planning Skills For Residential, Public, and Commercial Buildings Including Vastu and Barrier-Free Concepts. (L3)
3. To Analyze and Prepare Building Plans and Elevations For Industrial and Special-Purpose Structures. (L4)
4. To Utilize Computer-Aided Drafting Tools To Develop Architectural and Working Drawings. (L3)
5. To Evaluate Planning Strategies In Compliance With National Codes and Sustainability Standards. (L5)

Course Outcomes:
Upon Completion of This Course, the Student Will Be Able To:

1. Understand the Objectives and Principles of Building Planning, and Interpret National and Local Building Regulations. (L2)

2. Apply Functional Planning Techniques For Various Residential Building Layouts and Integrate Vastu Principles. (L3)

3. Design and Draw Public, Commercial, and Industrial Buildings as Per Functional and Universal Design Standards. (L6)

4. Develop Detailed Plans, Elevations, and Sections Using CAD Software For Residential and Non-Residential Buildings. (L3)

5. Evaluate and Prepare Service Drawings, Submission Drawings, and Working Drawings In Compliance With Municipal Regulations. (L5)

UNIT – I

BUILDING PLANNING PRINCIPLES & REGULATIONS

Introduction To Building Planning - Objectives of Planning - Principles of Planning - Orientation of Buildings - Building Bye-Laws and Regulations - Necessity of Building Bye-Laws - National Building Code (NBC) Provisions - Local Municipal and Development Authority Regulations - Setbacks and Open Space Requirements - Floor Area Ratio (FAR) and Floor Space Index (FSI) , Height Regulations and Ground Coverage - Lighting, Ventilation, and Fire Safety Regulations - Natural Lighting and Ventilation Standards - Fire-Resistant Construction and Safety Measures - Concepts of Green Building and Sustainable Planning - Energy-Efficient Building Design - Passive Solar Architecture

UNIT – II

RESIDENTIAL BUILDINGS

Classification of Residential Buildings - Individual Houses, Duplex Houses, Apartments, Row Houses, Villas - Functional Requirements of A Residential Building - Zoning and Space Requirements For Different Rooms - Circulation and Connectivity - Types of Residential Plans - Single-Bedroom, Double-Bedroom, and Multi-Storey Residential Plans - Preparation of Building Plans - Plan, Elevation, and Section of A Simple Residential Building - Vastu Considerations In Residential Planning - Orientation of Rooms as Per Traditional Indian Architectural Practices.

UNIT – III

PUBLIC and COMMERCIAL BUILDINGS

Classification of Public Buildings - Educational Buildings (Schools, Colleges, Universities) - Institutional Buildings (Hospitals, offices, Banks) - Recreational Buildings (Theatres, Auditoriums, Stadiums) - Functional Requirements and Planning of Public Buildings - Planning of Commercial Buildings - Shopping Malls, Hotels, office Buildings - Preparation of Drawings For Public Buildings - Plan, Elevation, and Section of A Public/Commercial Building - Universal Design and Barrier-Free Planning - Provision For Differently-Abled Individuals - Ramps, Lifts, Tactile Paving, and Accessible Washrooms

UNIT – IV

INDUSTRIAL and SPECIAL STRUCTURES

Introduction To Industrial Buildings - Functional Planning of Industries - Layout of Factory Buildings - Types of Industrial Structures - Warehouses, Godowns, Cold Storage Facilities - Special Purpose Buildings - Parking Structures, Bus Terminals, Railway Stations, Airports - Planning of Multi-Storied Buildings - Structural Aspects and Service Provisions - Vertical Circulation (Lifts, Escalators, Staircases) - Preparation of Drawings For Industrial Buildings – Plan, Elevation, and Section of An Industrial Shed Or Warehouse

UNIT – V

COMPUTER-AIDED DRAWING (CAD) and WORKING DRAWINGS

Introduction To CAD In Building Drawing - Importance of CAD In Modern Construction - Software Used (Autocad, Revit, Sketchup) - Preparation of Working Drawings - Detailed Plans, Elevations, and Sections – Site Plan, Key Plan, and Service Plans - Structural Drawings and Detailing - Footing Details, Column Layouts, Slab Reinforcement - Preparation of Submission Drawings - Sanction Drawings as Per Municipal Regulations - Approval Process and Documentation - Service Drawings - Electrical, Plumbing, and HVAC (Heating, Ventilation, and Air Conditioning) Drawings.

Text Books:

1. M. G. Shah, C. M. Kale, *Building Drawing*, Tata McGraw Hill Publishing Co. Ltd., 2nd Edition, 2012.
2. Gurucharan Singh, *Building Drawing*, Standard Publishers Distributors, 9th Edition, 2015.

Reference Books:

1. K. R. Karnan, *Building Planning and Drawing*, Scitech Publications (India) Pvt. Ltd., 2016.
2. S. P. Bindra, *Building Drawing and Detailing*, Dhanpat Rai Publishing Co., 2014.
3. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, *Building Planning and Drawing*, Laxmi Publications Pvt. Ltd., 2011.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

III Year B.Tech. CE–II Semester

L	T	P	C
3	0	0	3

(23ACE70) BASIC SURVEYING

Course Objectives :-

The Objectives of This Course Are To Enable the Students To:

1. Understand the Principles, Classifications, and Fundamental Techniques of Surveying Including Chain, Compass, Levelling, and Plane Table Surveys. **(L2)**
2. Apply Basic Surveying Instruments and Techniques For Measurement of Distances, Angles, Levels, Areas, and Volumes. **(L3)**
3. Analyze and Compute Traverse Data, Horizontal and Vertical Angles Using theodolites and Trigonometric Levelling Methods. **(L4)**
4. Evaluate the Use of Modern Surveying Instruments Like Total Stations, GPS, and Remote Sensing Tools For Spatial Data Acquisition. **(L5)**
5. Interpret Photogrammetric Data For Topographic Mapping, Aerial Triangulation, and Preparation of Maps Using Stereoscopy. **(L5)**

Course Outcomes :-

After Successful Completion of the Course, the Student Will Be Able To:

1. To Understand the Basic Principles, Classifications, and Techniques of Surveying Using Chain, Compass, Levelling, and Plane Table Methods. **(L2)**
2. To Apply Appropriate Methods For Levelling, Contouring, and Calculating Areas and Volumes For Civil Engineering Projects. **(L3)**
3. To Analyze and Compute Angular Measurements, Traverses, and Heights Using theodolites and Trigonometric Levelling. **(L4)**
4. To Utilize Modern Surveying Tools Such as EDM, Total Station, GPS, Drones, and Lidar For Advanced Spatial Data Collection. **(L3)**
5. To Evaluate and Interpret Photogrammetric Data For Map Preparation, Stereoscopy, Aerial Triangulation, and Mosaics. **(L5)**

UNIT–I

Introduction and Basic Concepts: Introduction, Objectives, Classification and Principles of Surveying, Surveying Accessories. Introduction To Compass, Leveling and Plane Table Surveying.
Linear Distances- Approximate Methods, Direct Methods- Chains- Tapes, Ranging, Tape Corrections.
Prismatic Compass- Bearings, Included Angles, Local Attraction, Magnetic Declination, and Dip –Systems and W.C.B and Q.B Systems of Locating Bearings

UNIT-II

Leveling- Types of Levels, Methods of Levelling, and Determination of Levels, Effect of Curvature of Earth and Refraction.
Contouring- Characteristics and Uses of Contours, Methods of Contour Surveying.
Areas - Determination of Areas Consisting of Irregular Boundary and Regular Boundary.
Volumes -Determination of Volume of Earth Work In Cutting and Embankments For Level Section, Capacity of Reservoirs.

UNIT – III

Theodolite Surveying: Types of theodolites, Temporary Adjustments, Measurement of Horizontal Angle By Repetition Method and Reiteration Method, Measurement of Vertical Angle, Trigonometrical Leveling When Base Is Accessible and Inaccessible.
Traversing: Methods of Traversing, Traverse Computations and Adjustments, Introduction To Omitted Measurements.

UNIT – IV

Curves: Types of Curves and their Necessity, Elements of Simple, Compound, Reverse Curves. Introduction To Tacheometric Surveying.
Modern Surveying Methods: Principle and Types of E.D.M. Instruments, Total Station- Advantages and Applications. Introduction To Global Positioning System. Introduction To Drone Survey and Lidar survey (Light Detection and Ranging).

UNIT – V

Photogrammetry Surveying:
Introduction, Basic Concepts, Perspective Geometry of Aerial Photograph, Relief and Tilt Displacements, Terrestrial Photogrammetry, Flight Planning; Stereoscopy, Ground Control Extension For Photographic Mapping- Aerial Triangulation, Radial Triangulation, Methods; Photographic Mapping- Mapping Using Paper Prints, Mapping Using Stereo-Plotting Instruments, Mosaics, Map Substitutes.

Text Books:

1. S. K. Duggal, *Surveying* (Vol. 1 & 2), Tata McGraw Hill Publishing Co. Ltd., New Delhi, 5th Edition, 2019.
2. C. Venkatramaiah, *Textbook of Surveying*, Universities Press, 1st Edition, 2011.

Reference Books:

1. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, *Surveying* (Vol. 1), Laxmi Publications (P) Ltd., New Delhi, 18th Edition, 2024.
2. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, *Surveying* (Vol. 2), Laxmi Publications (P) Ltd., New Delhi, 17th Edition, 2022.
3. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, *Surveying* (Vol. 3), Laxmi Publications (P) Ltd., New Delhi, 16th Edition, 2023.
4. A. M. Chandra, *Plane Surveying and Higher Surveying*, New Age International Pvt. Ltd., New Delhi, 3rd Edition, 2015.
5. N. Basak, *Surveying and Levelling*, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 4th Edition, 2014.
6. K. R. Arora, *Surveying* (Vol. 1, 2 & 3), Standard Book House, Delhi, 12th Edition, 2015.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
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IV Year B.Tech. CE– I Semester

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3	0	0	3

(23ACE72) ESSENTIALS OF CONCRETE TECHNOLOGY

Course Objectives :-

The Objectives of This Course Are To Enable the Student To:

1. Understand the Composition, Properties, Specifications, and Testing Methods For Concrete Materials. [L1]
2. Learn the Methods of Concrete Production Including Mixing, Transportation, Placing, Compaction, and Curing. [L2]
3. Acquire Knowledge On the Behavior of Fresh and Hardened Concrete and Factors Influencing Performance. [L3]
4. Develop the Ability To Design Concrete Mixes Using Standard Methods For Normal and High Strength Concrete. [L4]
5. Explore Special Concretes, Quality Control Measures, and Durability Aspects. [L4]

Course Outcomes :-

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

1. **CO1:** Explain the chemical and physical properties of cement, aggregates, water, and admixtures as per IS standards. [L2]
2. **CO2:** Describe the manufacturing process of concrete, including equipment, methods, and curing techniques. [L2]
3. **CO3:** Analyze the fresh and hardened properties of concrete including workability, strength, and microstructure. [L4]
4. **CO4:** Design concrete mix proportions using ACI and IS methods for normal and high-strength concrete. [L4]
5. **CO5:** Evaluate the behavior and performance of concrete under various conditions, including shrinkage, creep, corrosion, thermal effects, and special concrete types. [L5]

UNIT – I

Materials For Making Concrete: Cement - Chemical Composition, Physical Properties; Tests, I.S. Specifications; Different Types – Aggregates - Classification, Mechanical Properties, and Tests, Grading Requirements, Sampling of Aggregate; Water - Quality of Water, Permissible Impurities As Per I.S; – Mineral Admixtures: Fly Ash, GGBS, Silica Fume, Metakaolin, Rice Husk Ash, Etc. Chemical Admixtures - Accelerators, Retarders, Water Reducing Agents, Super Plasticizers, Air Entrainers, Water Proofers.

UNIT – II

Concrete: Manufacture of Concrete, Measurement of Materials, Storage and Handling, Batching Plant and Equipment Mixing - Types of Mixers, Transportation of Concrete, Pumping of Concrete, Placing

of Concrete, Under Water Concreting, Compaction of Concrete, Curing of Concrete, Ready Mixed Concrete. Mix Design - Nominal Mixes and Design Mixes, Factors Influencing Mix Design; ACI Method and I.S Method, Design For High Strength Mixes.

UNIT – III

Fresh, Hardened Properties of Concrete: Fresh Concrete - Workability, Tests For Workability, Cohesion, Segregation, and Bleeding; Hardened Concrete- Factors Affecting Strength of Concrete, Strength of Concrete In Compression, Tension, and Flexure; Stress- Strain Characteristics and Elastic Properties; Introduction To Microstructural Properties of Concrete

UNIT – IV

Mix Design - Factors Influencing Mix Proportion - Mix Design By ACI Method and I.S. Code Method - Design of High Strength Concrete. Strength of Concrete - Shrinkage and Temperature Effects - Creep of Concrete - Permeability of Concrete - Durability of Concrete - Corrosion - Causes and Effects - Remedial Measures- thermal Properties of Concrete - Micro Cracking of Concrete.

UNIT – V

Special Concrete - Lightweight Concrete - Fibre Reinforced Concrete - Polymer-Polymer Modified Concrete - Ferrocement - Mass Concrete - Ready Mix Concrete- Self Compacting Concrete- Quality Control - Sampling and Testing-Acceptance Criteria.

Text Books:

1. Properties of Concrete, AM Nevelli, Prentice Hall Publishers, 2012, 5th Edition.
2. Concrete Technology: theory and Practice, M.L. Gambhir, Tata Mc Graw Hill Publishers, 2017, 5th Edition.

Reference Books:

1. P. Kumar Mehta , Paulo J.M. Monteiro, Concrete: Microstructure, Properties, and Materials, Mcgraw Hill Education,2014
2. Concrete Technology: theory and Practice, M. S. Shetty and A. K. Jain, S Chand Co., Publishers, 2018.
3. Concrete Technology, J.J. Brooks and A. M. Neville, Pearson, 2019, 2nd Edition.
4. Santakumar A.R., Concrete Technology, Oxford University Press, New Delhi, 2007.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

III Year B.Tech. CE–II Semester

L	T	P	C
0	0	3	1.5

(23ACE71) BASIC SURVEYING LAB

Course Objectives :-

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

1. Understand and perform different types of surveying techniques including chain, compass, plane table, and Theodolite surveying. [L2]
2. Apply methods of leveling and contouring for field measurements and building layouts. [L3]
3. Interpret and plot survey data accurately to prepare maps and plans. [L3]
4. Use modern surveying instruments like Total Station for precise measurements. [L3]
5. Develop skills to set out curves and perform traversing for practical civil engineering projects. [L3]

Course Outcomes :

1. After completing this course, the student will be able to:
   CO1: Conduct chain, compass, and plane table surveys, and accurately plot survey details. [L3]
2. CO2: Perform leveling operations including fly leveling, profile leveling, and contouring for terrain mapping. [L3]
3. CO3: Use theodolite for precise measurement of horizontal angles and set out simple curves. [L4]
4. CO4: Operate Total Station equipment for accurate data collection and site layout. [L4]
5. CO5: Prepare field survey maps and layouts for building and civil engineering projects based on survey data. [L4]

1. Chain Survey - Traversing and Plotting of Details
2. Compass Survey - Traversing With Compass and Plotting
3. Plane Table Survey - Method of Radiation and Intersection
4. Levelling - Fly Leveling - Plane of Collimation Method
5. Levelling - Fly Leveling - Rise and Fall Method
6. Levelling - Longitudinal and Cross Sectioning
7. Levelling - Contour Surveying 8. Layout of Buildings
8. Profile Levelling and Cross Sectioning.
9. Grid Contouring
10. Theodolite Surveying - Measurement of Horizontal Angle By Method of Repetition and Reiteration
11. Setting Out of Simple Curves - Linear Methods
12. Description of Total Station

Text Books :

Surveying and Levelling By N.N.Basak, TMH Publication 2. Surveying By B.C. Punamia, A.K. Jain and A.K. Jain, Vol. 1, Laxmi Publications (P) Ltd., New Delhi

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(AUTONOMOUS)

IV Year B.Tech. CE–I Semester

L	T	P	C
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(23ACE73) BASIC CONCRETE TECHNOLOGY LAB

Course Objectives :-
The Objectives of This Course Are To:

1. Understand the Physical Properties and Behavior of Cement and Aggregates. [L1]
2. Gain Hands-On Experience In Determining the Fresh and Hardened Properties of Concrete. [L2]
3. Conduct Standard Laboratory Procedures For Assessing the Quality of Concrete Materials. [L3]
4. Familiarize With Concrete Mix Design Using IS Method. [L4]
5. Interpret Experimental Data For Evaluating the Performance of Concrete. [L5]

Course Outcomes :-

1. After Completing This Course, the Student Will Be Able To:
2. **CO1**: Determine the Physical Properties of Cement Through Standard Tests Such As Fineness, Consistency, Setting Time, Soundness, and Compressive Strength. [L3]
3. **CO2**: Assess the Properties of Fine and Coarse Aggregates and Evaluate the Workability of Fresh Concrete Using Standard Test Methods. [L3]
4. **CO3**: Prepare, Cure, and Test Concrete Specimens To Determine Compressive and Tensile Strength, and Analyze Stress-Strain Behavior. [L4]
5. **CO4**: Apply the IS Method For Concrete Mix Design and Verify the Mix Through Testing. [L4]
   CO5: Demonstrate the Use of Non-Destructive Testing Equipment To Assess the Quality of Hardened Concrete. [L3]

1. Determination of Fineness and Specific Gravity of Cement.
2. Determination of Consistency of Standard Cement Paste.
3. Determination of Initial and Final Setting Times of Cement.
4. Determination of Compressive Strength of Cement.
5. Determination of Soundness of Cement By La-Chatalier's Apparatus.
6. Determination of Fineness Modulus of Coarse and Fine Aggregates.
7. Determination of Percentage of Voids, Bulk Density, Specific Gravity of Course and Fine Aggregates.
8. Workability Tests: Slump Cone Test, Compaction Factor Test, Vee-Bee Consistometer, Flow Test.
9. Preparing and Curing Concrete Specimens For Tests & Determination of Compressive Strength of Concrete Cubes.
10. Study of Stress - Strain Characteristics of Concrete and Tests For Tensile Strength of Concrete.
11. Experiments To Demonstrate the Use of Non-Destructive Test Equipment.
12. Mix Design: IS Code Method.

Text/ Reference Books :

1. Concrete Technology: theory and Practice, M.L. Gambhir, Tata Mc Graw Hill Publishers, 2017, 5th Edition.

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23AEE58 FUTURISTIC POWER SYSTEMS

COURSE OUTCOMES:

After the completion of the course students will be able to

CO1. To solicit the importance of large scale renewable energy integration with existing grid infrastructure.L1

CO2. To understand the importance and utility of Energy storage systems in futuristic power systems. L2

CO3. To explore large scale micro-grid deployment with RES and ESS integration. L3

CO4. To understand the role of communication and IT Infrastructure in power system and related challenges. L2

CO5. To explore the potential of Microgrids and its importance in Indian context. L3

UNIT I

Introduction:

Present status of worldwide scenario of electricity generation, transmission and distribution; Energy infrastructure-Resilience and Security; Social, Technical and economic challenges; Major trends driving power system evolution; State of the art technologies in power system.

UNIT II

Renewable Energy Integration:

Review of renewable energy (RE) resources and systems: Solar- PV, Solar Thermal, Wind, Biomass, Micro- hydro and Fuel Cell, comparison of various RE resources; Renewable Energy Policies and present status of integration with existing grid; Large scale integration of renewable energy-Technical challenges, enabling technologies, International requirements; Renewable energy forecasting.

UNIT III

Energy Storage Systems (ESS):

Review of energy storage components: Battery, VRB, Ultra-capacitor, Fuel Cells, Pumped Hydro-Storage and flywheels, comparison of ESS technologies; Importance of ESS in

futuristic power systems; Aggregated ESS, Distributed ESS; Applications of ESS: Energy Management (Load Leveling and Peak Shifting), Fluctuation Suppression (Intermittency Mitigation), Uninterruptible Power System Low-Voltage Ride Through; Placement of the ESS to Improve Power Quality, Voltage Regulation Using ESS, ESS as Spinning Reserve.

UNIT IV

Micro-grid and Smart-grid:

Micro-grid evolution: Micro-grid concept, importance in futuristic power system, basic architectures and control, objectives and state of the art technologies; Microgrid as a building block of Smart-grid; Smart-grid concept, Smart Grid versus conventional electrical networks, Smart-grid infrastructure, Smart Grid communication system and its cyber security, International standard IEC 61850 and its application to Smart-grid;

Microgrids /smart grid and Electric Vehicles integration. Technical, Economic, Environmental and Social Benefits of Microgrid Operation. Microgrids for Rural Electrification, Review of Microgrid Best Practices through Case Studies: Strategic Planning, Operations: Commercial and Financial Considerations; Technical and Social Context.

UNIT V

Communication and IT infrastructure:

Requirements of Communication and IT infrastructure in futuristic power systems: various communication protocols, comparison of performance; IEEE standard: IEEE 802.11 Mesh Networking, IEEE 802.15.4-Wireless Sensor Networks; Communications Technologies for Smart metering; Cyber security issues and mitigation techniques.

TEXTBOOKS:

1. Microgrids Architectures and Control Edited by Nikos Hatziargyriou, IEEE and Wiley, 2014.
2. Energy Storage for Sustainable Microgrid by David Wenzhong Gao, Elsevier, 2015.
3. Introduction to the Smart Grid- Concepts, Technologies and Evolution by Salman K. Salman, IET, 2017.
4. Energy Storage Systems and Components by Alfred Rufer, CRC Press, 2018

REFERENCE BOOKS:

1. Energy Efficiency and Renewable Energy Handbook Edited by D. Yogi Goswami and Frank Kreith, 2nd Edition- 2016, CRC.
2. Clean Energy Microgrids, Edited by Shin'ya Obara and Jorge Morel IET, 2017.
3. Hybrid-Renewable Energy Systems in Microgrids- Integration, Developments and Control edited by Hina Fathimaby et al., Elsevier WoodHead Publishing, 2018.

4. Smart Microgrids: Lessons from Campus Microgrid Design and Implementation edited by Hassan Farhangi, CRC Press 2017.

WEBSITE REFERENCE / VIDEO COURSES:

1. NPTEL Web Course on: DC Microgrid And Control System Prof. Avik Bhattacharya, IIT Roorkee.
2. NPTEL Web Course on Electronics and Distributed Generation Dr. Vinod John Department of Electrical Engineering IISc Bangalore.
3. NPTEL Web Course on Introduction to Smart Grid, PROF. N.P. PADHY Department of Electrical Engineering IIT Roorkee PROF. PREMALATA JENA Department of Electrical Engineering.
4. NPTEL Web Course on Electric vehicles and Renewable energy, Prof. Ashok Jhunjhunwala, Prof. Prabhjot Kaur, Prof. Kaushal Kumar Jha and Prof. L Kannan, IIT Madras.

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23AEE59 POWER ELECTRONIC CONVERTERS for ENERGY SOURCES

COURSE OUTCOMES:

After the completion of the course students will be able to

CO1. Select and size various passive and active components for power converters L3

CO2. Design power converters used with DC energy resources with their control implementation L5

CO3. Design power converters used with AC energy resources with their control implementation L5

CO4. Understand the design considerations of power conditioning unit for ESS, SPV and Wind applications. L2

CO5. Understand the design and selection aspects of various auxiliary systems and components used in PCUs L2

UNIT I

Selection of components for Power Electronics Converters (PEC):

Selection and Sizing of capacitors and magnetic components for PECs, design of Magnetic Components; Selection and sizing of Power Devices, Commonly used software tools for selection and sizing; Heat sink- selection and sizing.

UNIT II

Design and Control of DC-DC Converters:

Design of Buck and Boost converters, Design examples; Design of Bidirectional Converters. Design of gate driver circuits; Review of DC-DC converter modelling; Closed loop PI controller design for buck and boost converters; Current control mode and voltage control mode.

UNIT III

Design and Control of DC-AC converters:

Design of Inverter for standalone applications; Design of grid connected Inverter with different grid synchronization strategies- ZCD, PLL; Strategies for Control of voltage, current and power output.

UNIT IV

Design of PCU for SPV and Wind Application:

Various topologies of Power Converter Unit (PCU) for SPV and Wind energy systems. Design considerations of PCU for SPV and Wind energy Systems and Design Examples.

UNIT V

Design of PCU for ESS Applications and Design of Auxiliary System and Interfaces:

Design consideration for BDC converter based PCU for batteries and Ultra-capacitors. Design of current and voltage sensor interfaces; Design considerations for auxiliary power supplies; Design of protection and snubber components: Introduction to Digital Signal Processors (DSP) and microcontroller interfaces

TEXTBOOKS:

1. Power Electronic Converters for Microgrids by Suleiman M. Sharkh, Mohammad A. Abusara, Georgios I. Orfanoudakis Babar Hussain, IEEE and Wiley, 2014.
2. Control Circuits In Power Electronics Practical Issues In Design And Implementation Edited by Miguel Castilla, IET, 2016.
3. Control and Dynamics in Power Systems and Microgrids by Lingling Fan, CRC Press, 2017.
4. Integrated Power Electronic Converters and Digital Control, by Ali Emadi, Alireza Khaligh, Zhong Nie, and Young Joo, Lee 2009, CRC Press.

REFERENCE BOOKS:

1. Cooperative Synchronization in Distributed Microgrid Control by Ali Bidram, Vahidreza Nasirian Ali Davoudi, and Frank L. Lewis, Springer, 2017.
2. Hybrid-Renewable Energy Systems in Microgrids- Integration, Developments and Control edited by Hina Fathimaby et al., Elseiver WoodHead Publishing, 2018.
3. Smart Microgrids- Lessons from Campus Microgrid Design and Implementation edited by Hassan Farhangi, CRC Press 2017.
4. Energy Storage Systems and Components by Alfred Rufer, CRC Press, 2018.
5. Microgrids Design and Implementation edited by Antonio Carlos Zambroni de Souza and Miguel Castilla, Springer, 2019

6. Microgrids Architectures and Control Edited by Nikos Hatziargyriou, IEEE and Wiley, 2014.
7. Energy Storage for Sustainable Microgrid by David Wenzhong Gao, Elsevier, 2015.

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23AEE60 MICROGRID POWER AND CONTROL ARCHITECTURE

COURSE OUTCOMES:

After the completion of the course students will be able to

CO1. Understand various types Microgrids based on applications, power and control architecture. L2

CO2. Illustrate various power control strategies adopted in DC, AC and Hybrid Microgrids L3

CO3. Compare and contrast various control architectures used DC, AC and Hybrid Microgrids also various aspects related to stability in Microgrids L4

CO4. Illustrate the various operational challenges in Microgrids L3

CO5. Comprehend the various aspects related to the stability in Microgrids L4

UNIT I

Microgrid Power Architecture:

Types of Microgrid system, AC and DC and Hybrids Microgrids, Application based Suitability of Microgrid type; Review of power architecture of various Microgrids deployed world-wide. Comparison of various Microgrid power architectures.

UNIT II

AC Microgrid and Control Architecture:

Black-start operation, Grid Synchronization- various Grid synchronization methods, Grid forming and grid following operations; Power Control- Real and reactive power control in AC Microgrid, simple droop control and other variants of droop control, Unit Power Flow Control, Feeder power flow control and Mixed mode control, source optimization; Centralized, decentralized, distributed and hierarchical control architecture, Local and system / supervisory level control strategies, Multi Agent System (MAS) Based Control; Control approaches used in AC Microgrids deployed worldwide. Microgrid standards IEEE 1547 series. Communication in AC Microgrids.

UNIT III

DC Microgrid and Control Architecture:

Power sharing in DC Microgrids, source optimization; Control approaches: Centralized, decentralized, distributed and hierarchical control architecture. Control approaches used in hybrid Microgrids. Communication in DC/Hybrid Microgrids.

UNIT IV

Operational Control in Microgrids:

Energy management in Microgrids, coordinated control, load management, grid synchronization and islanding, Anti-islanding schemes; Various Architectural and Operational Challenges in Microgrid, Optimal operation of Microgrids.

UNIT V

Microgrid Stability & Protection:

Steady-state and dynamic stability in AC and DC Microgrids, Methods to improve the stability in Microgrids; introduction to small signal and large signal stability analysis in Microgrids. Fault scenarios in DC and AC Microgrids, Protection in DC and AC Microgrids, adaptive protection, Fault current source (FCS) based protection; Protection challenges in islanded and autonomous modes of operation and ways to mitigate.

TEXTBOOKS:

1. Microgrids Design and Implementation edited by Antonio Carlos Zambroni de Souza and Miguel Castilla, Springer, 2019
2. Microgrids Architectures and Control Edited by Nikos Hatziargyriou, IEEE and Wiley, 2014
3. Cooperative Synchronization in Distributed Microgrid Control by Ali Bidram, Vahidreza Nasirian Ali Davoudi, and Frank L. Lewis, Springer, 2017.
4. Control Circuits In Power Electronics Practical Issues In Design And Implementation Edited by Miguel Castilla, IET, 2016

REFERENCE BOOKS:

1. Control and Dynamics in Power Systems and Microgrids by Lingling Fan, CRC Press, 2017
2. Hybrid-Renewable Energy Systems in Microgrids- Integration, Developments and Control edited by Hina Fathimaby et al., Elseiver WoodHead Publishing, 2018.
3. Urban DC Microgrid Intelligent Control and Power Flow Optimization by Manuela Sechilariu and Fabrice Locment, 2016 Elsevier

4. Integrated Power Electronic Converters and Digital Control, by Ali Emadi, Alireza Khaligh, Zhong Nie, and Young Joo, Lee 2009, CRC Press.
5. Island Power Systems by Lukas Sigrist, Enrique Lobato, Francisco M. Echavarren Ignacio Egido, and Luis Rouco, CRC Press, 2016.

WEBSITE REFERENCE / VIDEO COURSES:

1. NPTEL Web Course on: DC Microgrid and Control System Prof. Avik Bhattacharya, IIT Roorkee.
2. NPTEL Web Course on Electronics and Distributed Generation Dr. Vinod John Department of Electrical Engineering IISc Bangalore.
3. NPTEL Web Course on Introduction to Smart Grid, PROF. N.P. PADHY Department of Electrical Engineering IIT Roorkee PROF. PREMALATA JENA Department of Electrical Engineering.
4. NPTEL Web Course on Electric vehicles and Renewable energy, Prof. Ashok Jhunjhunwala, Prof. Prabhjot Kaur, Prof. Kaushal Kumar Jha and Prof. L Kannan, IIT Madras.

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23AEE61 MICROGRID SYSTEM DESIGN

COURSE OUTCOMES:

After the completion of the course students will be able to

CO1. Select and size various Microgrid energy resources L3

CO2. Select the power and control architecture of the Microgrid L3

CO3. Select and design the Microgrid‘s communication architecture. L3

CO4. Illustrate the design aspects DC and AC Microgrids with their control strategies. L4

CO5. Illustrate the implementation of the Microgrid islanding detection and anti-islanding scheme/ black start operation L4

UNIT I

Selection/ Sizing of Microgrid Energy Resources

Factors affecting the selection and sizing of energy resources for Microgrid applications, dependency on type of loads connected, Selection/ Sizing: Renewable energy resources, Energy Storage components. Hybrid combination of RES and ESS.

UNIT II

Selection of Power and Control Architecture:

Factors affecting the selection of Microgrid power and control architecture; Design Consideration for control implementation; Sensors: Selection of sensors and design of sensor Interfaces, design of control Interfaces. Design considerations for DSP/ Microcontroller interfaces.

UNIT III

Selection and Design of Communication Architecture:

Design considerations for selection of communication network for Microgrid applications; Design and implementation of communication links/ interfaces. Microcontroller programming for Data transfer on communication network. Practical design considerations for Communication networks**.**

UNIT IV

Design of DC and AC Microgrid:

Design DC Power Conditioning Units for RES and ESS, Unidirectional and Bidirectional Converter design, implementation of Control loop with DSP; Programming for Power sharing and Energy Management algorithms; Design of Protection system for DC Microgrid Design AC Power Conditioning Units for RES and ESS, Unidirectional and Bidirectional Converter design, implementation of Control loop with DSP; Grid Synchronization. Programming for Power sharing and Energy Management algorithms; Design of Protection system for AC Microgrid.

UNIT V

Islanding in Microgrids:

Selection and implementation of Islanding detection and anti-islanding scheme; Black- start and Autonomous operations in Microgrids.

TEXTBOOKS:

1. Microgrids Design and Implementation edited by Antonio Carlos Zambroni de Souza and Miguel Castilla, Springer, 2019
2. Microgrids Architectures and Control Edited by Nikos Hatziargyriou, IEEE and Wiley, 2014
3. Power Electronic Converters For Microgrids by Suleiman M. Sharkh, Mohammad A. Abusara, Georgios I. Orfanoudakis Babar Hussain, IEEE and Wiley, 2014

REFERENCE BOOKS:

1. Energy Storage for Sustainable Microgrid by David Wenzhong Gao, Elsevier, 2015
2. Cooperative Synchronization in Distributed Microgrid Control by Ali Bidram, Vahidreza Nasirian Ali Davoudi, and Frank L. Lewis, Springer, 2017.
3. Energy Efficiency and Renewable Energy Handbook Edited by D. Yogi Goswami and Frank Kreith, 2nd Edition- 2016, CRC
4. Control Circuits In Power Electronics Practical Issues In Design And Implementation Edited by Miguel Castilla, IET, 2016.
5. Hybrid-Renewable Energy Systems in Microgrids- Integration, Developments and Control edited by Hina Fathimaby et al., Elseiver WoodHead Publishing, 2018.
6. Urban DC Microgrid Intelligent Control and Power Flow Optimization by Manuela Sechilariu and Fabrice Locment, 2016 Elsevier.
7. Integrated Power Electronic Converters and Digital Control, by Ali Emadi, Alireza Khaligh, Zhong Nie, and Young Joo, Lee 2009, CRC Press.

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23AEE62 ANALYSIS OF SMART GRID SYSTEMS

COURSE OUTCOMES:

After the completion of the course students will be able to

CO1. Understand the analysis and planning of smart grids L2

CO2. Evaluate the tools for modeling and analysis of smart grid L3

CO3. Analyze and synthesize the smart grid operation L4

CO4. Assess the influence of distributed generation in smart grid on power systems L4

UNIT I

Introduction:

Conventional power systems and Smart grid, definition of smart grid, need for smart grid, Smart grid architecture, smart grid domains, enablers of smart grid, Communication architecture and protocols for smart grid, smart grid priority standards and regulation, smart-grid activities in India**.**

UNIT II

Systems of non linear equations:

Fixed point iteration, Newton Raphson Iteration, Continuation methods, Power system application: power flow, regulating transformer, Fast decoupled load flow, PV curves and continuation power flow, three phase power flow.

UNIT III

Smart Grid Security analysis:

Concept of security, Security analysis and monitoring, factors affecting power system security, detection of network problems, an overview of security analysis. Contingency analysis for generator and line outages by Interactive Linear Power Flow (ILPF) method, Fast decoupled inverse Lemma based approach, network sensitivity factors, Contingency selection, concentric relaxation and bounding.

UNIT IV

Smart Grid Operation and Planning: Economic Dispatch, Optimal Power Flow, Load forecasting, Operation of smart grid system, Load Dispatch Centre functions, preventive, Emergency and Restorative, control objectives of a smart distribution system, Operational bottlenecks in smart grid. Planning Aspects of smart grid, Planning and operation Standards.

UNIT V

Distributed Generation in Smart Grid:

Renewable-based Distributed generations, Energy Storage Technologies, Modeling, Control of energy storage system, Short- mid -long term application of energy storage system in smart grids.

TEXTBOOKS:

1. Muhammad Kamran, Fundamentals of Smart Grid Systems, Academic Press, 2022
2. Mariesa L Crow, Computetional methods for Electric Power Systems, CRC Press, NW, 2016, 3rd Edition.
3. Francisco D´ıaz-Gonz´alez, Andreas Sumper and Oriol Gomis-Bellmunt, Energy Storage in Power Systems, John Wiley & Sons Ltd, 2016

REFERENCE BOOKS:

1. Prabha Kundur, Power System Stability and Control, McGraw Hill Education, 2006, 1st Edition.
2. Math H. J. Bollen, Fainan Hassan, Integration of Distributed Generation in the Power System, Wiley, 2011
3. A. Mahaboob Subahani, G. R. Kanagachidambaresan, M. Kathiresh, Integration of Renewable Energy Sources with Smart Grid, Willey, 2021
4. J. Ekanayake, N. Jenkins, K. Liyanage, J. Wu, A. Yokoyama, Smart Grid: Technology and Applications, John Wiley & Sons, 2015, 1st Edition.
5. Ali Keyhani, Design of smart power grid renewable energy systems, Wiley, 2019, 3rd Edition. Other.

WEBSITE REFERENCE / VIDEO COURSES:

1. https://nptel.ac.in/courses/108/104/108104052/.

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23AEE63 PROJECT IN MICRO GRID TECHNOLOGY

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23AEE52 ENERGY AUDIT AND MANAGEMENT

COURSE OUTCOMES:

After the completion of the course students will be able to

CO1. Understanding the Fundamentals of Energy Auditing and Conservation. -L2

CO2. Analyzing Energy Audit Concepts and Techniques -L3

CO3. Designing and Implementing Energy Management Programs -L5

CO4. Managing Thermal Energy and Implementing Energy Conservation Techniques L4

CO5. Implementing Electrical Energy Management and Conservation -L4

UNIT I

Introduction:

Basic elements and measurements - Mass and energy balances – Scope of energy auditing industries - Evaluation of energy conserving opportunities.

UNIT II

Energy Audit Concepts:

Need of Energy audit - Types of energy audit – Energy management (audit) approach - understanding energy costs - Bench marking – Energy performance - Matching energy use to requirement - Maximizing system efficiencies - Optimizing the input energy requirements - Duties and responsibilities of energy auditors- Energy audit instruments - Procedures and Techniques.

UNIT III

Principles and Objectives of Energy Management:

Design of Energy Management Programs - Development of energy management systems – Importance - Indian need of Energy Management - Duties of Energy Manager - Preparation and presentation of energy audit reports - Some case study and potential energy savings.

UNIT IV

Thermal Energy Management:

Energy conservation in boilers - steam turbines and industrial heating systems - Application of FBC - Cogeneration and waste heat recovery - Thermal insulation - Heat exchangers and heat pumps - Building Energy Management.

UNIT V

Electrical Energy Management:

Supply side Methods to minimize supply-demand gap- Renovation and modernization of power plants - Reactive power management – HVDC - FACTS - Demand side - Conservation in motors - Pumps and fan systems – Energy efficient motors. Demand side management.

TEXTBOOKS:

1. Hamies, Energy Auditing and Conservation; Methods Measurements, Management and Case study, Hemisphere, Washington, 1980.
2. Energy Management: W.R.Murphy, G.Mckay.

REFERENCE BOOKS:

1. Energy Management Principles: C.B.Smith.
2. Efficient Use of Energy : I.G.C.Dryden.
3. Energy Economics A.V.Desai.
4. Guide book for National Certification Examination for Energy Managers and Energy Auditors (Could be downloaded from www.energymanagertraining.com).

RESOURCES:

1. https://nptel.ac.in/courses/108106022

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23AEE53 ENERGY MANAGEMENT IN BUILDING

COURSE OUTCOMES:

After the completion of the course students will be able to

CO1. Understanding the Fundamentals of Energy Use in Buildings Apply the Energy management concepts for building designs -L2

CO2. Analyzing Indoor Environmental Requirements and Their Impact on Energy Use -L3

CO3. Examining the Role of Climate and Environmental Factors in Building Energy Use - L3

CO4. Evaluating Energy Utilization and Heat Transfer in Building Envelopes L4

CO5. Implementing Energy Management Strategies for Buildings -L5

UNIT I

Overview of the Significance of Energy use and Energy Processes in Building:

Indoor activities and environmental control - Internal and external factors on energy use and the attributes of the factors - Characteristics of energy use and its management - Macro aspect of energy use in dwellings and its implications – Concepts of energy efficient building.

UNIT II

Indoor Environmental Requirement and Management:

Thermal comfort – Ventilation and air quality - Air-conditioning requirement - Visual perception – Illumination requirement - Auditory requirement – Concept of sick building syndrome – Significance in energy management in buildings.

UNIT III

Climate:

Solar radiation and their influences - The sun-earth relationship and the energy balance on the earth‘s surface – Climate – Wind - Solar radiation - Temperature – Sun shading and solar radiation on surfaces - Energy impact on the shape and orientation of buildings.

UNIT IV

END-USE:

Energy utilization and requirements – Lighting and day lighting – End-use energy requirements – Status of energy use in buildings – Estimation of energy use in a building - Heat gain and thermal performance of building envelope – Steady and non steady heat transfer through the glazed window and the wall – Standards for thermal performance of building envelope – Evaluation of the overall thermal transfer – Concepts of window management.

UNIT V

Energy Management Options:

Energy audit and energy targeting – Technological options for energy management – Modifications for energy efficient buildings for Indian conditions. Energy Management for large tower buildings.

TEXTBOOKS:

1. Heating and Cooling of Buildings – Design for Efficiency, J. Krieder and A. rabl, McGraw Hill, 1994.
2. Mechanical and Electrical Equipment for Buildings, S. M. Guinnes and Reynolds, Wiley, 1989.

REFERENCE BOOKS:

1. Energy Design for Architects, Shaw, Aee Energy Books, 1991.
2. Energy Conservation in Buildings – Royal Institute of Architecture, Canada.
3. Publication of CBRI, Roorkee – Energy Management in Buildings.

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY,

CHITTOOR

(AUTONOMOUS)

L	T	P	C
3	0	0	3

23AEE54 ENERGY STORAGE TECHNOLOGIES

COURSE OUTCOMES:

After the completion of the course students will be able to

CO1. Understanding the Basics of Batteries and Their Performance Characteristics -L2

CO2. Analyzing Primary Battery Types and Their Applications -L3

CO3. Exploring Advanced Battery Technologies and Their Applications -L4

CO4. Assessing Energy Storage for Renewable Energy Systems -L4

CO5. Understanding and Applying Super capacitors in Energy Storage -L4

UNIT I

Batteries:

Types-battery characteristics - voltage, current, capacity, volumetric energy density, specific energy density, charge rate, cycle life, internal resistance, energy efficiency, shelf life, battery management system, SoC, SoH estimation techniques. Testing of batteries, battery charging method, Factors affecting the battery performance.

UNIT II

Primary Batteries:

Fabrication, performance aspects, packing and rating of alkaline manganese, silver oxide cells. Lithium primary batteries-Lithium/Manganese Dioxide, Lithium/Carbon Monofluoride, Lithium/Thionyl chloride, Lithium/Sulfur Dioxide, Lithium/Iodine, Lithium-Aluminum/Iron Disulfide**.**

UNIT III

Advanced Batteries:

Advanced Lead Acid Battery -design, performance aspects, Pb-Acid batteries for transportation, nickel-metal hydride batteries, zinc- alkaline batteries, ZEBRA Battery (Na/NiCl2) -NaS Battery-Lithium-Ion Battery-Lithium- Polymer Battery, Li-air batteries, Li-S batteries, Sodium - ion batteries.

UNIT IV

Storage for Renewable Energy Systems:

Solar energy, Wind energy, pumped hydro energy, Energy storage in Micro-grid and Smart grid, Energy Management with storage systems, Battery SCADA, Increase of energy conversion efficiencies by introducing energy storage. Superconducting Magnetic Energy Storage (SMES), charging methodologies, Photo galvanic cells, semiconductor solar batteries (SC-SB), thermo-ionic converter s, dye-sensitized solar cells (DSSC).

UNIT V

Super capacitors and Fuel Cells:

Fundamentals of electrochemical Super capacitors, electrode and electrolyte interfaces and their capacitances, charge-discharge characteristics, energy/power density, design, fabrication, operation and evaluation, thermal management. Super capacitors for transportation applications - aqueous and organic based super capacitors, Pseudo and asymmetric super capacitors. Advance battery-super capacitors hybrids for auto, space and marine applications. Fuel Cells working Principle and Construction.

TEXTBOOKS:

1. Dell, Ronald M. Rand and David A. J., ―Understanding Batteries, Royal Society of Chemistry, 2001.
2. Vladimir S. Bagotsky, Alexander M. Skundin, Yurij VM. Volfkovich., ―Electrochemical power sources : Batteries, fuel cells, and supercapacitors‖, John Wiley & Sons, Inc.,2015.

REFERENCE BOOKS:

1. Lindon David, ―Handbook of Batteries‖, McGraw Hill, 2002.
2. Kiehne H. A., ―Battery Technology Handbook‖, Expert Verlag, Renningen Malsheim, 2003.
3. AuliceScibioh M. and Viswanathan B., ―Fuel Cells – Principles and Applications‖, University Press, 2006.
4. A.G.Ter-Gazarian, ―Energy Storage for Power Systems‖, The Institution of Engineering and Technology (IET) Publication, UK, 2011.

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23AEE55 ENERGY SCENARIO AND ENERGY POLICY

COURSE OUTCOMES:

After the completion of the course students will be able to

CO1. Understanding the Global Energy Scenario and Its Impact on Economic Development-L2

CO2. Analyzing International Energy Policies and Treaties -L3

CO3. Understanding the Indian Energy Scenario and Policy Framework -L2

CO4. Evaluating Global Energy Issues and Energy Security -L3

CO5. Exploring Energy Conservation and Sustainable Development- L4

UNIT I

Global Energy Scenario:

Role of energy in economic development and social transformation - Energy and GDP - GNP and its dynamics - Energy sources and overall Energy demand and availability - Energy consumption in various sectors and its changing pattern - Depletion of energy sources and impact exponential rise in energy consumption on economies of countries.

UNIT II

Energy Polices:

International Energy Polices of G-8 Countries - G-20 Countries - OPEC Countries - EU Countries - International Energy Treaties (Rio, Montreal, Kyoto) - INDO-US Nuclear Deal.

UNIT III

Indian Energy Scenario:

Energy resources and Sector wise energy Consumption pattern Impact of energy on economy and development - National and State Level Energy polices and Issues - Status of Nuclear and Renewable Energy and Power Sector reforms. Energy policy 2030

UNIT IV

Energy Policy:

Global Energy Issues - Energy Security - Energy Vision Energy Pricing and Impact of Global Variations Energy Productivity (National and Sector wise productivity).

UNIT V

Energy Conservation:

Act – 2001 and its features - Electricity Act – 2003 and its features - Energy Crisis - Future energy options - Need for use of new and renewable energy sources - Energy for Sustainable development.

TEXTBOOKS:

1. Energy for a sustainable World: Jose Golden berg, Thomas Johan son, AKN. Reddy, Robert Williams (Wiley Eastern).
2. Energy Policy, B.V. Desai (Wiley Eastern)

REFERENCE BOOKS:

1. Modeling approach to long term demand and energy implication, J.K.Parikh
2. Energy Policy and Planning, B.Bukhootsow.
3. TEDDY Year Book Published by Tata Energy Research Institute(TERI) World Energy Resources, Charles E. Brown, _International Energy Outlook‘ - EIA annual Publication.
4. *BEE Reference book: no. 1/2/3/4*.

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3	0	0	3

23AEE56 WASTE ENERGY MANAGEMENT

COURSE OUTCOMES:

After the completion of the course students will be able to

CO1. Understanding and Characterizing Different Types of Waste -L2

CO2. Analyzing Thermo-Chemical Waste Conversion Methods and Their Environmental Impacts -L3

CO3. Exploring Bio-Chemical Conversion Technologies for Waste to Energy-L4

CO4. Evaluating Energy Production from Waste Plastics and Waste Heat Recovery-L4

CO5. Analyzing Environmental and Health Impacts of Waste-to-Energy Conversion and Case Studies-L3

UNIT I

Characterization of Wastes:

Agricultural residues and wastes including animal wastes; industrial wastes; municipal solid wastes. Waste processing types and composition of various types of wastes; Characterization of Municipal Solid Waste, Industrial waste and Biomedical Waste, waste collection and transportation; waste processing-size reduction, separation; waste management hierarchy, waste minimization and recycling of Municipal solid waste.

UNIT II

Thermo Chemical Conversion:

Incineration, pyrolysis, gasification of waste using gasifiers, environmental and health impacts of incineration; strategies for reducing environmental impacts. Energy production from wastes through incineration, energy production through gasification of wastes, Energy production through pyrolysis and gasification of wastes, syngas utilization.

UNIT III

Bio-Chemical Conversion:

Anaerobic digestion of sewage and municipal wastes, direct combustion of MSW-refuse derived solid fuel, industrial waste, agro residues, anaerobic digestion biogas production, and present status of technologies for conversion of waste into energy, design of waste to energy plants for cities, small townships and villages. Energy production from wastes through fermentation and trans esterification. Cultivation of algal biomass from waste water and energy production from algae, Energy production from organic wastes through anaerobic digestion and fermentation.

UNIT IV

Energy Production from Waste Plastics, Gas Cleanup Waste, Heat Recovery:

Concept of conversion efficiency, energy waste, waste heat recovery classification, advantages and applications, commercially viable waste heat recovery devices.

UNIT V

Environmental and Health Impacts-Case Studies: Environmental and health impacts of waste to energy conversion, Industrial waste management – Hazardous waste management – E-waste management. EV Batteries – Mobile Chargers - case studies of commercial waste to energy plants, waste to energy- potentials and constraints in India, eco- technological alternatives for waste to energy conversions.

TEXTBOOKS:

1. Parker, Colin and Roberts, ―Energy from Waste – An Evaluation of Conversion Technologies‖, Elsevier Applied Science, 1985.
2. Khandelwal, K. C. and Mahdi, S. S., ―Biogas Technology - A Practical Hand Book, Vol. I & amp; II, Tata McGraw Hill Publishing Co. Ltd., 1983

REFERENCE BOOKS:

1. Robert C. Brown, ―Thermo-chemical Processing of Biomass: Conversion into Fuels, Chemicals and Power‖, John Wiley and Sons, USA, 2019.
2. Sergio Capareda, ―Introduction to Biomass Energy Conversions‖, CRC Press, USA, 2013.
3. Krzysztof J Ptasinski, ―Efficiency of Biomass Energy: An Exergy Approach to Biofuels, Power, and Biorefineries, John Wiley & Sons, USA, 2013.
4. Vesilind, P.A., and Worrell W. A, ―Solid Waste Engineering, 2nd Ed‖, Cengage India, 2016.

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L	T	P	C
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23AEE57 PROJECT IN ENERGY SYSTEMS

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

Course Code: 23AEC63

EMBEDDED SYSTEMS TECHNOLOGY
(Minor in Embedded Systems and IOT)

L	T	P	C
3	0	0	3

Course Outcomes:

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

CO1: Understand the basics of embedded systems, including their history, classification, and processor selection.

CO2: Analyze different embedded processor architectures, including ARM, RISC, and application-specific processors.

CO3: Evaluate various communication interfaces and protocols, such as UART, USB, SPI, I2C, and Zigbee.

CO4: Implement rapid prototyping techniques using Arduino, sensors, and wearable system modules.

CO5: Develop and interface embedded GUI systems, including LCDs, touchscreens, and VGA cameras, for real-world applications.

UNIT-I:

Introduction to Embedded system: Introduction to Embedded Systems, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Embedded Processor Requirements, Features, Types, RISC Processors, Harvard Architecture, Super Harvard Architecture, Selection of Processors &Microcontrollers.

UNIT-II:

Architecture of Embedded System Processor: Embedded processor models, ARM core processor, Application specific processor like network processors, multimedia processors, industrial processors, superscalar processor, Advanced RISC processors.Architecture of Embedded OS, Categories of Embedded OS, Application Software, Communication Software, Development and Testing Tools

UNIT-III:

Communication Interfaces: Need for Communication Interfaces, OSI Reference Model, Basic of Networks, Network Topology, RS232/UART, RS422/RS485, USB, Infrared,

Ethernet, IEEE 802.11,Bluetooth, SPI, I2C, CAN, Wifi, FlexRay, LIN Bus, Zigbee.

UNIT-IV:

Rapid prototyping: Arduino platform, hardware and software, Sensor's modules, Robo Control modules, 3D printing module, ADC module, wearable systems. etc.

UNIT-V:

Embedded GUI interfacing: Arduino based graphic LCD, Touch screen, joy stick, VGA camera interfacing and programming in Python. Creative applications of Arduino

Design Examples & Case Studies of Embedded System: Digital Thermometer, Navigation Systems, Smart Card, RF Tag.

Text Books :

1. David Simon, "An embedded Software Primer" PearsonPublication,2021.
2. Frank Vahid, "Embedded system — A unified Hardware Software Introduction" John Wiley and Sons,2005.

Reference Books :

1. Tammy Noergaard," Embedded System Architecture", Elsevier publication, 2014.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

Course Code: 23AEC64

REAL TIME EMBEDDED SYSTEMS DESIGN AND ANALYSIS
(Minor in Embedded Systems and IOT)

L	T	P	C
3	0	0	3

Course Outcomes:

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

CO1: Explain the architecture of RTOS, task scheduling, and synchronization mechanisms such as semaphores, mutexes, and message queues.

CO2: Demonstrate proficiency in real-time embedded software development using Linux, RT Linux, and various RTOS platforms.

CO3: Apply real-time scheduling algorithms to optimize task execution and system performance.

CO4: Analyze real-time embedded hardware architectures and software stacks for efficient system integration.

CO5: Implement real-time communication protocols and perform validation and verification of embedded systems using case studies.

UNIT-I:

Introduction to RTOS: Overview Of RTOS, Architecture of Kernel, Task & Task Scheduler, ISR, Semaphore, Mutex, Mailbox, Message Queues, Event Registers, Pipes, Signals, Timers, Memory Management, Priority Inversion Problem.

UNIT-II:

Real Time Embedded Software: Linux, RT Linux, multiprocessor software developments, data flow graph, Study and programming of RTOS like RTX51, Free RTOS etc. timing diagram analysis for fixed and dynamic priority software services.

UNIT-III:

Real time Scheduling: Scheduling Real-Time Tasks: Types of Schedulers Table-driven scheduling Cyclic schedulers EDF RMA, Priority Pre-emptive Scheduler State Machine for Linux and VxWorks, Comparison of Cyclic Executive, Introduction to Worst Case Analysis, Example of scheduling, Real-Time Scheduling and Rate Monotonic Least Upper Bound.

UNIT-IV:

Overview of Real-time Hardware Architectures and Software Stacks: Embedded Linux on the Raspberry Pi ARM A-Series System-on-Chip processors, Tracing Linux kernel and

network stack events. Best Practices for RTES Programming, System Integration Testing (Hardware, Firmware, and Software).

UNIT-V:

Real Time Communication: RT Services Communication and Synchronization, Performance of two Real-Time communication Protocols, Real time communication over network, Real Time database.

Verification and Validation of RTES project: Using Point-to-point Serial and TCP/IP for Embedded Systems, Case Study of Coding for Sending Application Layer Byte Streams on A TCP/IP Network Using RTOS. Building a simple Linux multi-service system using POSIX real-time extensions on Raspberry Pi 3b using sequencing and methods to log and verify agreement between theory and practice.

Text Books :

1. “Embedded Real time systems” ,Prasad Dream tech Wiley Publication,2003.
2. "Real-Time Systems: Theory and Practice, "Raji b Mall Pearson,2008.

Reference Books :

1. “Real-Time Systems Design and Analysis” ,Philip Laplante,2nd Edition,PrenticeHall, 2013.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

Course Code: 23AEC65

PRINCIPLES OF IOT
(Minor in Embedded Systems and IOT)

L	T	P	C
3	0	0	3

Course Outcomes:

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

CO1: Understand the fundamentals of IoT, including its architecture, characteristics, and challenges.

CO2: Analyze IoT communication protocols and networking techniques used in wireless sensor networks and M2M communication.

CO3: Design and manage IoT platforms, including device integration, service models, and application development.

CO4: Implement IoT networking and computing techniques, including cloud storage, APIs, and Python-based IoT programming.

CO5: Develop and evaluate IoT applications in real-world domains such as smart cities, connected vehicles, and industrial automation.

UNIT-I:

Introduction & Basic of IoT : Definition, Characteristics, Physical and Logical Designs, challenges, Technological trends in IOT, IoT Examples, M2M.

UNIT-II:

IoT: Components, Communication and Networking: Introduction to Sensing and Networking: Sensing & actuation, Wireless Senor network, Senor nodes, Communication Protocols,M2M Communication, Networking Hardware, Networking Protocols.

UNIT-III:

IoT System Management: Network Operator Requirements, IoT Platform Design Specification – Requirements, Process, Domain Model, Service, IoT Level, Function, Operational view, Device and Component Integration, Application development.

UNIT-IV:

Networking and Computing: File Handling, Python Packages for IoT, IoT Physical Servers – Cloud Storage Models, Communication APIs.

UNIT-V:

IoT Clouds and Data Analytics: REST ful Web API, Amazon Web Services for IoT,

Apache Hadoop, Batch Data Analysis, Chef, Chef Case Studies, Puppet, NETCONF-YANG

IoT Applications: Case studies: smart cities, smart home, connected vehicles, Industrial IOT.

Text Books :

1. Kamal, R., ”Internet of Things – Architecture and Design Principles,” 1st Edition, Mcgraw Hill,2017.
2. Simone Cirani,”Internet of Things-Architectures, Protocols and Standards”, WILEY,2018.

Reference Books :

1. Alessandro Bassi,” Enabling Things to Talk- Designing IoT solutions with the IoT Architectural Reference Model”, Springer,2013.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

Course Code: 23AEC48

WIRELESS NETWORKS
(Minor in Embedded Systems and IOT)

L	T	P	C
3	0	0	3

Course Outcomes:

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

CO1: Learn the fundamental concepts and architecture of wireless sensor networks.

CO2: Explore various network architectures, optimization techniques, and design principles for wireless sensor networks.

CO3: Gain knowledge of MAC protocols, routing techniques, and addressing mechanisms for efficient sensor network communication.

CO4: Understand the infrastructure establishment of sensor networks, including topology control and synchronization.

CO5: Grasp the knowledge on sensor network platforms, programming challenges, and simulation tools.

UNIT- I:

Overview of Wireless Sensor Networks: Single-Node Architecture - Hardware Components- Network Characteristics- unique constraints and challenges, Enabling Technologies for Wireless Sensor Networks- Types of wireless sensor networks.

UNIT- II:

Architectures: Network Architecture- Sensor Networks-Scenarios- Design Principle, Physical Layer and Transceiver Design Considerations, Optimization Goals and Figures of Merit, Gateway Concepts.

UNIT –III:

Networking Sensors: MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols and Wakeup Concepts - SMAC, - B-MAC Protocol, IEEE 802.15.4 standard and ZigBee, the Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols Energy-Efficient Routing, Geographic Routing.

UNIT- IV:

Infrastructure Establishment: Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

UNIT- V:

Sensor Network Platforms and Tools: Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node level Simulators, State-centric programming

Text books:

1. Holger Karl & Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley, 2005.
2. Feng Zhao & Leonidas J.Guibas, "Wireless Sensor Networks-An Information Processing Approach", Elsevier, 2007

Reference Books:

1. WaltenegusDargie , Christian Poellabauer, "Fundamentals Of Wireless Sensor Networks Theory And Practice", By John Wiley & Sons Publications, 2011
2. KazemSohraby, Daniel Minoli, &TaiebZnati, "Wireless Sensor Networks-Technology, Protocols, and Applications", John Wiley, 2007.
3. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003

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SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

Course Code: 23AEC66

PRINCIPLES OF IOT LAB
(Minor in Embedded Systems and IOT)

L	T	P	C
0	0	3	1.5

Course Outcomes:

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

CO1: Demonstrate the ability to control and monitor sensors and actuators using microcontrollers and IoT platforms.

CO2: Implement IoT-based applications using cloud services like ThingSpeak and mobile applications like Blynk.

CO3: Develop web-based IoT applications using HTTP and MQTT protocols for remote device management.

CO4: Apply IoT principles in real-world applications such as home automation, security systems, and industrial monitoring.

CO5: Integrate UAV/Drone technologies with IoT for automated navigation and data acquisition.

List of Experiments: (Any 10 Experiments are to be conducted)

1. **Serial Monitor, LED, Servo Motor - Controlling**
   - Controlling actuators through Serial Monitor. Creating different led patterns and controlling them using push button switches. Controlling servo motor with the help of joystick.

2. **Distance Measurement of an object**
   - Calculate the distance to an object with the help of an ultrasonic sensor and display it on an LCD.

3. **LDR Sensor, Alarm and temperature, humidity measurement**
   - Controlling relay state based on ambient light levels using LDR sensor.
   - Basic Burglar alarm security system with the help of PIR sensor and buzzer.
   - Displaying humidity and temperature values on LCD

4. Experiments using Raspberry Pi

- Controlling relay state based on input from IR sensors
- Interfacing stepper motor with R-Pi
- Advanced burglar alarm security system with the help of PIR sensor, buzzer and keypad. (Alarm gets disabled if correct keypad password is entered)
- Automated LED light control based on input from PIR (to detect if people are present) and LDR(ambient light level)

5. IOT Framework

- Upload humidity & temperature data to Thing Speak, periodically logging ambient light level to Thing Speak.

6.Controlling LEDs, relay & buzzer using Blynk app

7. HTTP Based

- Introduction to HTTP. Hosting a basic server from the ESP32 to control various digital based actuators (led, buzzer, relay) from a simple web page.

8. Displaying various sensor readings on a simple web page hosted on the ESP32.

9. MQTT Based

- Controlling LEDs/Motors from an Android/Web app, Controlling AC Appliances from an android/web app with the help of relay.

10. Displaying humidity and temperature data on a web-based application

11. UAV/Drone:

- Demonstration of UAV elements, Flight Controller
- Mission Planner flight planning design

12. Python program to read GPS coordinates from Flight Controller

Reference:

1. Adrian McEwen, Hakim Cassimally - Designing the Internet of Things, Wiley Publications, 2012.
2. Alexander Osterwalder, and Yves Pigneur – Business Model Generation – Wiley, 2011
3. Arshdeep Bahga, Vijay Madisetti - Internet of Things: A Hands-On Approach, Universities Press, 2014.
4. The Internet of Things, Enabling technologies and use cases – Pethuru Raj, Anupama C. Raman, CRC Press.

Online Learning Resources/Virtual Labs:

https://www.arduino.cc/

https://www.raspberrypi.org/

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

Course Code: 23AEC35

EMBEDDED SYSTEMS & IOT APPLICATIONS
(Minor in Embedded Systems and IOT)

L	T	P	C
3	0	0	3

Course Outcomes:

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

CO1: Understand the Architecture, Development & Design of Embedded Systems and IoT.

CO2: Learn the architecture and programming of ARM Microcontroller.

CO3: Work with Raspberry Pi using Python Programming.

CO4: Know about the loT standards, communication technologies and protocols for IoT devices.

CO5: Implement case studies and applications using the tools and techniques of IoT Platform

UNIT –I:

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

UNIT -II:

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

UNIT –III:

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

UNIT –IV:

IoT Technologies, Standards, Tools & M2M Network: Fundamental characteristics and high-level requirements of IoT, IoT Reference models; Introduction to Communication Technologies & Protocols of IoT: BLE, Wi-Fi, LoRA, 3G/4G Technologies and HTTP, MQTT, CoAP protocols; Relevant Practicals on above technologies, M2M Network, SDN

(Software Defined Networking) & NFV (Network Function Virtualization) for IoT.

UNIT –V:

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

Text Books:

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

References:

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

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

Course Code: 23AEC67

INDUSTRIAL INTERNET OF THINGS LAB
(Minor in Embedded Systems and IOT)

L	T	P	C
0	0	3	1.5

Course Outcomes:

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

CO1: Explain the architecture, challenges, and fundamental concepts of IIoT and differentiate it from IoT.

CO2: Demonstrate the interfacing of sensors and actuators with microcontrollers like Raspberry Pi and Node MCU for industrial automation.

CO3: Implement communication protocols such as MQTT, ZigBee, and Bluetooth to enable seamless IIoT connectivity.

CO4: Develop web-based dashboards for real-time visualization and control of IIoT devices.

CO5: Retrieve, analyze, and transmit industrial data using web-based interactions and M2M communication.

CO6: Implement PLC-based automation, Boolean logic programming, and process control using SCADA for industrial applications.

(All the modules need to be conducted and minimum one project to be done)

MODULE 1: Introduction & Architecture

What is IIoT and connected world? The difference between IoT and IIoT, Architecture of IIoT, IOT node, Challenges of IIOT. Practice

1. Introduction to Arduino, Introduction to raspberry Pi.

https://www.youtube.com/watch?v=AQdLQV6vhbk

MODULE 2: IIOT Components

Fundamentals of Control System, introductions, components, closed loop & open loop system.Introduction to Sensors (Description and Working principle): What is sensor? Types of sensors, working principle of basic Sensors -Ultrasonic Sensor, IR sensor, MQ2, Temperature and Humidity Sensors (DHT-11).Digital switch, Electro Mechanical switches.

Practice

1. Measurement of temperature & pressure values of the process using raspberry pi/node mcu.

2. Modules and Sensors Interfacing (IR sensor, Ultrasonic sensors, Soil moisture sensor) using Raspberry pi/node mcu.
3. Modules and Actuators Interfacing (Relay, Motor, Buzzer) using Raspberry pi/node mcu.

MODULE 3: Communication Technologies of IIoT

Communication Protocols: IEEE 802.15.4, Zig Bee, Bluetooth, BLE, NFC, RFID Industry standards communication technology (MQTT), wireless network communication.

Practice

1. Demonstration of MQTT communication.

MODULE 4: Visualization and Data Types of IIoT

Connecting an Arduino/Raspberry pi to the Web: Introduction, setting up the Arduino/Raspberry pi development environment, Options for Internet connectivity with Arduino, Configuring your Arduino/Raspberry pi board for the IoT.

Practice

1. Visualization of diverse sensor data using dashboard (part of IoT's 'control panel')
2. Sending alert message to the user. ways to control and interact with your environment)

MODULE 5: Retrieving Data

Extraction from Web: Grabbing the content from a web page, Sending data on the web, Troubleshooting basic Arduino issues, Types of IoT interaction, Machine to Machine interaction (M2M).

Practice

1. Device control using mobile Apps or through Web pages.
2. Machine to Machine communication.

MODULE 6: Control & Supervisory Level of Automation

Programmable logic controller (PLC), Real-time control system, Supervisory Control & Data Acquisition (SCADA).

Practice

1. Digital logic gates programming using ladder diagram.
2. Implementation of Boolean expression using ladder diagram.
3. Simulation of PLC to understand the process control concept.

Projects:

IIoT based smart energy meter

Smart Agriculture system

Automation using controller via Bluetooth

Temperature controlled Fan/cooler using controller

Automatic streetlight

Smart Baggage Tracker

Textbooks

1. The Internet of Things in the Industrial Sector, Mahmood, Zaigham (Ed.) (Springer Publication)
2. Industrial Internet of Things: Cyber manufacturing System, Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat (Springer Publication).
3. Industrial IoT Challenges, Design Principles, Applications, and Security by Ismail Butun (editor)

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

Course Code: 23AEC10

ANALOG AND DIGITAL COMMUNICATIONS

L	T	P	C
3	0	0	3

Course Outcomes:

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

CO1: Recognize the basic terminology used in analog and digital communication technique for transmission of information/data. (L1)

CO2: Explain the basic operation of different analog and digital communication systems at baseband and pass band level. (L2)

CO3: Compute various parameters of baseband and pass band transmission schemes by applying basic engineering knowledge. (L3)

CO4: Analyze the performance of different modulation & demodulation techniques to solve complex problems in the presence of noise. (L4)

CO5: Evaluate the performance of all analog and digital modulation techniques to know the merits and demerits of each one of them in terms of bandwidth and power efficiency. (L5)

UNIT- I:

Amplitude Modulation: Need for modulation, Amplitude Modulation - Time and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves - Switching modulator, Detection of AM Waves - Envelope detector, DSBSC modulation - time and frequency domain description, Generation of DSBSC Waves - Balanced Modulators, Coherent detection of DSB-SC Modulated waves, COSTAS Loop, SSB modulation - time and frequency domain description, frequency discrimination and Phase discrimination methods for generating SSB, Demodulation of SSB Waves, principle of Vestigial side band modulation.

UNIT- II:

Angle Modulation: Basic concepts of Phase Modulation, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave using Bessel functions, Narrow band FM, Wide band FM, Constant Average Power, Transmission

bandwidth of FM Wave - Generation of FM Signal- Armstrong Method, Detection of FM Signal: Balanced slope detector, Phase locked loop, Comparison of FM and AM., Concept of Pre-emphasis and de-emphasis

UNIT- III:

Transmitters: Classification of Transmitters, AM Transmitters, FM Transmitters

Receivers: Radio Receiver - Receiver Types - Tuned radio frequency receiver, Super heterodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, Image frequency, AGC, Amplitude limiting, FM Receiver, Comparison of AM and FM Receivers.

UNIT -IV:

Introduction to Noise: Types of Noise, Receiver Model, Noise in AM, DSB, SSB, and FM Receivers.

Pulse Modulation: Types of Pulse modulation- PAM, PWM and PPM. Comparison of FDM and TDM. Pulse Code Modulation: PCM Generation and Reconstruction, Quantization Noise, Non-Uniform Quantization and Companding, Delta Modulation, DPCM, Noise in PCM and DM.

UNIT -V:

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

Baseband Transmission and Optimal Reception of Digital Signal: A Baseband Signal Receiver, Probability of Error, Optimum Receiver, Coherent Reception, ISI, Eye Diagrams.

Textbooks:

1. Simon Haykin, "Communication Systems", JohnWiley& Sons, 4th Edition, 2004.
2. Wayne Tomasi - Electronics Communication Systems-Fundamentals through Advanced, 5thEd., PHI, 2009
3. B. P. Lathi, Zhi Ding " Modern Digital and Analog Communication Systems", Oxford press, 2011.

References:

1. Sam Shanmugam, "Digital and Analog Communication Systems", John Wiley & Sons, 1999.
2. Bernard Sklar, F. J. harris "Digial Communications: Fundamentals and Applications", Pearson Publications, 2020.
3. Taub and Schilling, "Principles of Communication Systems", Tata McGraw Hill, 2007.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

Course Code: 23AEC69

ELECTRONIC INSTRUMENTATION
(Minor in Electronic Systems)

L	T	P	C
3	0	0	3

Course Outcomes:

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

CO1: Know the working principle, operation, and applications of analog and digital measuring instruments.

CO2: Get familiar with the working principles, construction, and applications of oscilloscopes in signal analysis.

CO3: Learn about the bridge circuits for measurement of resistance, inductance, and capacitance.

CO4: Understand the principles and operation of various signal generators used in electronic applications.

CO5: Gain knowledge about the operation and applications of transducers in measurement systems

UNIT- I:

Measuring Instruments: Introduction, Errors in Measurement, Accuracy, Precision, Resolution and Significant figures. Basic PMMC Meter- construction and working, DC and AC Voltmeters- Multirange, Range extension, DC Ammeter, Multimeter for Voltage, Current and resistance measurements.

Digital Instruments: Digital Voltmeters – Introduction, DVM's based on V–T, V–F and Successive approximation principles, Resolution and sensitivity, General specifications, Digital Multimeters, Digital frequency meters, Digital measurement of time.

UNIT- II:

Oscilloscopes: Introduction, Block diagram of CRO, Basic principle of CRT, CRT Construction and features, vertical amplifiers, horizontal deflection system- sweep, trigger pulse, delay line, sync selector circuits. Dual beam and dual trace CROs, Sampling and Digital storage oscilloscopes.

UNIT- III:

Bridges: DC Bridges for Measurement of resistance - Wheat stone bridge, Kelvin's Bridge,

AC Bridges for Measurement of inductance- Maxwell's bridge, Hay's Bridge, Anderson bridge, Measurement of capacitance - Schearing Bridge, Wien Bridge, Errors and precautions in using bridges.

UNIT- IV:

Signal Generators: Introduction, Fixed and variable AF oscillator, Standard signal generator, Laboratory type signal generator, AF sine and Square wave generator, Function generator, Square and Pulse generator, Sweep frequency generator.

UNIT- V:

Transducers: Introduction, Types of Transducers, Electrical transducers, Selecting a transducer, Resistive transducer, Strain gauges, Piezoelectric transducer, Photoelectric transducer, Photovoltaic transducer, Temperature transducers-RTD, LVDT.

Text Books:

1. H.S.Kalsi, "Electronic Instrumentation", Third edition, Tata McGraw Hill, 2010.
2. A.D. Helfrick and W.D. Cooper, "Modern Electronic Instrumentation and Measurement Techniques", PHI, 6th Edition, 2010.

Reference Books:

1. A.K. Sawhney, Dhanpat Rai & Co., "A course in Electrical and Electronic Measurements and Instrumentation", 9^{th} Edition, 2010.
2. David A. Bell, "Electronic Instrumentation & Measurements", PHI, 2nd Edition, 2006.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

Course Code: 23AEC16

ANALOG AND DIGITAL IC APPLICATIONS

L	T	P	C
3	0	0	3

Course Outcomes:

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

CO1: Understand the classification of Integrated Circuits, internal blocks and characteristics of Op- Amp.

CO2: Analyse linear and non-linear applications of Op-Amp.

CO3: Gain knowledge on active filters, timers and phased locked loops.

CO4: Understand the working of Voltage Regulators and Converters.

CO5: Know about different types of Digital ICs and their applications.

UNIT-I: ICs and OP- AMPS

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

UNIT-II: Applications of OP- AMP

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

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

UNIT-III: Active Filters and other ICs

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

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

UNIT-IV: Voltage Regulators and Converters

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

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

UNIT-V: Digital ICs

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

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

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

Textbooks:

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

References:

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

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

Course Code: 23AEC68

PRINCIPLES OF COMMUNICATION ENGINEERING
(Minor in Electronic Systems)

L	T	P	C
3	0	0	3

Course Outcomes:

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

CO1: Understand the fundamentals of communication systems and amplitude modulation techniques.

CO2: Learn about the angle modulation techniques and bandwidth considerations in communication systems.

CO3: Gain knowledge on pulse analog modulation and multiple access techniques used in digital communication systems.

CO4: Get familiar with pulse modulation and digital modulation techniques used in modern communication systems.

CO5: Know about wireless communication systems, cellular networks, and GSM technology.

UNIT- I:

Analog communication-I: Elements of communication systems, need for Modulation, Modulation Methods, Baseband and carrier communication Amplitude Modulation(AM),Generation of AM signals, Rectifier detector, Envelope detector, sideband and carrier power of AM, Double side band suppressed carrier(DSB-SC) modulation & its demodulation, Switching modulators, Ring modulator, Balanced modulator, Single sideband(SSB) transmission, VSB Modulation.

UNIT- II:

Analog communication-II : Angle Modulation & Demodulation: Concept of instantaneous frequency Generalized concept of angle modulation, Bandwidth of angle modulated waves-Narrow band frequency modulation (NBFM); and Wide band FM (WBFM),Phase modulation, Pre-emphasis & De-emphasis, Illustrative Problems.

UNIT-III:

Digital communications-I (Qualitative Approach only): Pulse Analog Modulation Techniques: Pulse analog modulation techniques, Generation and detection of Pulse amplitude modulation, Pulse width modulation, Pulse position modulation

Multiple Access Techniques: Introduction to multiple access techniques, FDMA, TDMA, CDMA, SDMA: Advantages and applications.

UNIT-IV:

Digital communications-II (Qualitative Approach only): Pulse Code Modulation, DPCM, Delta modulation, Adaptive delta modulation, Overview of ASK, PSK, QPSK, BPSK and M-PSK techniques.

UNIT-V:

Wireless communications (Qualitative Approach only): Introduction to wireless communication systems, Examples of wireless communication systems, comparison of 2G and 3G cellular networks, Introduction to wireless networks, Differences between wireless and fixed telephone networks, Introduction to Global system for mobile(GSM),GSM services and features

Text Books:

1. H Taub, D. Schilling and GautamSahe, "Principles of Communication Systems", TMH, 2007, 3rd Edition.
2. George Kennedy and Bernard Davis, "Electronics & Communication System", 4th Edition, TMH 2009.
3. Wayne Tomasi, "Electronic Communication System: Fundamentals Through Advanced",2nd edition,PHI,2001.

Reference Books:

1. Simon Haykin, "Principles of Communication Systems", John Wiley, 2nd Edition.
2. Sham Shanmugam, "Digital and Analog communication Systems",Wiley-India edition,2006.
3. Theodore. S.Rapport, "Wireless Communications", Pearson Education,2nd Edition,2002.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

Course Code: 23AEC22

ANALOG & DIGITAL IC APPLICATIONS LAB

L	T	P	C
0	0	3	1.5

Course Outcomes:

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

CO1: Design an Inverting and Non-inverting Amplifier using an Op Amp.

CO2: Demonstrate the Linear and Non-Linear Applications using IC 741.

CO3: Design Astable and Monostable Multivibrator using timer ICs.

CO4: Analyse the DAC and ADC converter.

CO5: Design Counters and Registers using digital ICs.

List of Experiments: (**At least 8 Linear and 4 Digital IC experiments shall be performed**).

1. Design an Inverting and Non-inverting Amplifier using Op Amp and calculate gain.
2. Design Adder and Subtractor using Op Amp and verify addition and subtraction process.
3. Design a Comparator using Op Amp and draw the comparison results of A=B, A>B, A<B
4. Design a Integrator and Differentiator Circuits using IC741 and derive the required condition practically.
5. Design a Active LPF, HPF cutoff frequency of 2 KHZ and find the roll off of it.
6. Design a Circuit using IC741 to generate sine/square/triangular wave with period of 1KHZ and draw the output waveform.
7. Construct Mono-stable Multivibrator using IC555 and draw its output waveform.
8. Construct AstableMultivibrator using IC555 and draw its output waveform and also find its duty cycle.
9. Design a Schmitt Trigger Circuit and find its LTP and UTP.
10. Design Voltage Regulator usingIC723, IC 7805/7809/7912 and find its load regulation factor.
11. Design R-2R ladder DAC and find its resolution and write a truth table with respective voltages.
12. Design Parallel comparator type/ counter type/ successive approximation ADC and find its efficiency.
13. Design a 8x1 multiplexer using digital ICs.
14. Design a 4-bit Adder/Subtractor using digital ICs
15. Design a Decade counter and verify its truth table and draw respective waveforms.
16. Design a Up/down counter usingIC74163 and draw read/write waveforms.
17. Design a Universal shift register using IC 74194/195 and verify its shifting operation.
18. Design a 8x3 encoder/3x8 decoder and verify its truth table.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

Course Code: 23AEC33

VLSI DESIGN

L	T	P	C
3	0	0	3

Course Outcomes:

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

CO1: Understand the steps involved in fabrication of ICs using MOS transistor technology.

CO2: Learn about the VLSI design processes, Stick diagrams and Layouts.

CO3: Gain knowledge on the Gate Level Design concepts.

CO4: Learn the design of various subsystems with different VLSI Design styles.

CO5: Familiar with CMOS testing techniques.

UNIT- I:

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

UNIT- II:

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

UNIT –III:

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

UNIT –IV:

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

UNIT- V:

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

Textbooks:

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

References:

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

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

Course Code: 23AEC40

VLSI DESIGN LAB

L	T	P	C
0	0	3	1.5

Course Outcomes:

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

CO1: Design a logic circuit using CMOS transistorusing 180 nm technology in terms of schematic, symbol, test bench, DC and AC analysis.

CO2: Evaluate different schematics &output responses for AOI logic by using different software tools.

CO3: Design CMOS circuits using Full & Semi custom IC designsfor analyzation.

CO4: Design different layouts using different software tools for analog circuits.

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

1. **Design and analysis of CMOS Inverter**
   a) Implement CMOS inverter schematic using 180 nm technology and design its symbol.
   b) Implement test bench for CMOS Inverter and check its output response.
   c) Perform DC and AC analysis for CMOS inverter.
   d) Check the performance of CMOS inverter using parametric sweep.
2. **Design and analysis of NAND and NOR Logic gates**
   a) Implement NAND/NOR schematic using 180 nm technology and design its symbol.
   b) Implement test bench for NAND/NOR and check its output response.
   c) Perform DC and AC analysis for NAND/NOR.
   d) Check the performance of NAND/NOR using parametric sweep.
3. **Design and analysis of XOR and XNOR Logic gates**
   a) Implement XOR/XNOR schematic using 180 nm technology and design its symbol.
   b) Implement test bench for XOR/XNOR and check its output response.
   c) Perform DC and AC analysis for XOR/XNOR.
   d) Check the performance of XOR/XNOR using parametric sweep.
4. **Design of AOI logic**
   a) Design Schematic for AB+C‘D and check its output response.
   b) Design Schematic for AB‘+C‘D and check its output response.
   c) Design Schematic for (A+B‘)(C+D) and check its output response.
   d) Design Schematic for (A+B‘)(C‘+D) and check its output response.

5. **Design and analysis of Full adder**
   a) Design full adder using Full custom IC design.
   b) Design full adder using Semi custom IC design.
6. **Analysis of NMOS and PMOS characteristics**
   a) Implement test bench for NMOS/PMOS transistor.
   b) Perform DC and AC analysis for NMOS/PMOS transistor
   c) Check the performance of NMOS/PMOS transistor using parametric sweep.
7. **Design and analysis of Common source amplifier**
   a) Implement CS amplifier schematic using 180 nm technology and design its symbol.
   b) Implement test bench for CS amplifier and check its output response.
   c) Perform DC and AC analysis for CS amplifier.
   d) Check the performance of CS amplifier using parametric sweep.
8. **Design and analysis of Common drain amplifier**
   a) Implement CD amplifier schematic using 180 nm technology and design its symbol.
   b) Implement test bench for CD amplifier and check its output response.
   c) Perform DC and AC analysis for CD amplifier.
   d) Check the performance of CD amplifier using parametric sweep.
9. **Design of MOS differential amplifier**
   a) Design differential amplifier schematic using 180 nm technology and its symbol.
   b) Implement test bench for differential amplifier and check its output response.
   c) Perform DC and AC analysis for differential amplifier.
   d) Check the performance of differential amplifier using parametric sweep.
10. **Design of differential amplifier using FET/BJT**
    a) Design differential amplifier using FET/BJT schematic using 180 nm technology and its symbol.
    b) Implement test bench for two stage differential amplifier and check its output response.
    c) Perform DC and AC analysis for differential amplifier.
    d) Check the performance of differential amplifier using parametric sweep.
11. **Design of Inverter Layout**
    a) Design and implement inverter schematic.
    b) Design the layout for inverter using 180 nm tech file.
    c) Perform LVS for schematic and layout
    d) Check and remove all DRC violations.
    e) Extract parasitic R and C in layout.

12. Design of NAND/NOR Layout

a) Design and implement NAND/NOR schematic.

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

c) Perform LVS for schematic and layout

d) Check and remove all DRC violations.

e) Extract parasitic R and C in layout

The students are required to design the schematic diagrams using CMOS logic and to draw the layout diagrams to perform the experiments with the Industry standard EDA Tools.

Software Required: i. Mentor Graphics/ Synopsis/ Cadence / Equivalent Industry Standard Software. ii. Personal computer system with necessary software to run the programs and to implement.

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)

III B. Tech II Semester
Course Code: 23ABM09

NANO BIOTECHNOLOGY

L	T	P	C
3	0	0	3

Course Outcome:

After completion of this course students will be able to

CO1: Understand the basics of bio-nanotechnology and bio-machines.

CO2: Demonstrate a comprehensive understanding of state-of-the-art methods for fabrication, characterization and handling of nano-materials.

CO3: Explain the functional principles of nanotechnology and the interaction between biomolecules and nanoparticle surface.

CO4: Apply the knowledge on nanotechology in the field of Biomedical Engineering

UNIT- 1:

Bio-Nano machines and Their Basics: Negligible gravity and inertia, atomic granularity, thermal motion, water environment and their importance in bionanomachines. The role of proteins- amino acids- nucleic acids- lipids and polysaccharides in modern biomaterials. Overview of natural Bionanomachines: Thymidylate Synthetase, ATP synthetase, Actin and myosin, Opsin, Antibodies and Collagen.

UNIT- 2:

Synthesis of Bio molecules and Interphase Systems: Recombinant Technology, Site-directed mutagenesis, Fusion Proteins. Quantum Dot structures and their integration with biological structures. Molecular modeling tools: Graphic visualization, structure and functional prediction, Protein folding prediction and the homology modeling, Docking simulation and Computer assisted molecular design. Interphase systems of devices for medical implants –Microfluidic systems –Microelectronic silicon substrates –Nano-biometrics Introduction –Lipids as nano-bricks and mortar: self-assembled nanolayers.

UNIT- 3:

Functional Principles of Nano biotechnology: Information driven nanoassembly, Energetic, Role of enzymes in chemical transformation, allosteric motion and covalent modification in protein activity regulation, Structure and functional properties of

Biomaterials, Bimolecular motors: ATP Synthetase and flagellar motors, Traffic across membranes: Potassium channels, ABC Transporters and Bactreriorhodapsin, Bimolecular sensing, Self-replication, Machine-Phase Bionanotechnology Protein folding; Self assembly, Self-organization, Molecular recognition and Flexibility of biomaterials.

UNIT- 4:

Protein and DNA based Nanostructures : Protein based nanostructures building blocks and templates – Proteins as transducers and amplifiers of biomolecular recognition events – Nanobioelectronic devices and polymer nanocontainers – Microbial production of inorganic nanoparticles – Magnetosomes, DNA based nanostructures – Topographic and Electrostatic properties of DNA and proteins – Hybrid conjugates of gold nanoparticles – DNA oligomers – Use of DNA molecules in nanomechanics and Computing.

UNIT- 5:

Applications of Nano biotechnology: Semiconductor (metal) nanoparticles and nucleic acid and protein-based recognition groups –Application in optical detection methods – Nanoparticles as carrier for genetic material –Nanotechnology in agriculture – Fertilizer and pesticides. Designer proteins, Peptide nucleic acids, Nanomedicine, Drug delivery, DNA computing, Molecular design using biological selection, Harnessing molecular motors, Artificial life, Hybrid materials, Biosensors, Future of Bionanotechnology.

TEXT / REFERENCE BOOKS:

1. C. M. Niemeyer, C. A. Mirkin, ―Nanobiotechnology: Concepts, Applications and Perspectives‖, Wiley – VCH, (2004).

2. David S Goodsell, "Bionanotechnology‖, John Wiley & Sons, (2004).

Reference Books:

3. T. Pradeep, ―Nano: The Essentials, McGraw – Hill education, (2007).

4. Challa, S.S.R. Kumar, Josef Hormes, Carola Leuschaer, Nanofabrication Towards Biomedical Applications, Techniques, Tools, Applications and Impact,
Wiley – VCH, (2005).

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)

III B. Tech II Semester
Course Code: 23ABM10

TISSUE ENGINEERING

L	T	P	C
3	0	0	3

Course Outcome:

After completion of the course, students will be able to

CO1: Understand the biological requirement for tissue engineering systems and also specify the different types of biodegradable biomaterials that can be used in tissue engineering applications.

CO2: Discuss the complex interactions between biomaterials, cells and signals in biological systems using stem cells, proteomics and bioreactors.

CO3: Design and fabricate scaffolds using advanced manufacturing technologies including 3D printing for growing biological materials.

CO4: Develop engineered tissue like cardiovascular tissues and also evaluate the patterning of bio-mimetic substances.

UNIT- 1:

Introduction to Tissue Engineering : Introduction – definitions - basic principles - structure-function relationships –Biomaterials: metals, ceramics, polymers (synthetic and natural) – Biodegradable materials - native matrix -Tissue Engineering and Cell-Based Therapies –Tissue Morphogenesis and Dynamics- Stem Cells and Lineages - Cell-Cell Communication.

UNIT- 2:

Tissue Culture Basics: Primary cells vs. cell lines - sterile techniques – plastics – enzymes - reactors and cryopreservation - Synthetic Biomaterial Scaffolds- Graft Rejection – Immune Responses-Cell Migration-Controlled Drug Delivery- Micro technology Tools.

UNIT- 3:

Scaffold Formation: Oxygen transport - Diffusion - Michalies-Menten kinetics - oxygen uptake rates -limits of diffusion - Principals of self-assembly - Cell migration - 3D organization and angiogenesis - Skin tissue engineering –Introduction - scar vs. regeneration - split skin graft -apligraft. Engineered Disease Models- Tissue Organization- Cell Isolation and Culture - ECM and Natural Scaffold Materials- Scaffold Fabrication and Tailoring, Hernia.

UNIT- 4:

Cardiovascular Tissue Engineering: Blood vessels structure – vascular grafts – Liver tissue engineering – Bioartificial liver assist device – shear forces – oxygen transport – plasma effects – Liver tissue engineering – Self assembled organoids – decelluarized whole livers – Stem cells – basic principle – embryonic stem cells – Induced pluripotent stem cells - Material Biocompatibility – Cell Mechanics – Vascularization- Stem Cell Therapies.

UNIT - 5:

Patterning of Biomimetic Substrates: Patterning of biomimetic substrates with AFM lithography primarily focusing on DPN Nanotemplating polymer melts - Nanotechnology-based approaches in the treatment of injuries to tendons and ligaments - Progress in the use of electrospinning processing techniques for fabricating nanofiber scaffolds for neural applications -Nanotopography techniques for tissue engineered scaffolds

TEXT / REFERENCE BOOKS:

1. KetulPopat"Nanotechnology in Tissue Engineering and Regenerative Medicine" CRC Press Taylor and Francis 2011.

2. Cato T. Laurencin, Lakshmi S "Nanotechnology and Tissue Engineering: The Scaffold "CRC Press Taylor and Francis 2008.

3. Kun Zhou, David Nisbet, George Thouas, Claude Bernard and John Forsythe "Bio nanotechnology Approaches to Neural Tissue Engineering", NC-SA 2010.

4. Nair "Biologically Responsive Biomaterials for Tissue Engineering", Springer Series in Biomaterials Science and Engineering, Vol. 1 Antoniac, Iulian (Ed.) 2012.

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

II B. Tech II Semester

Course Code: 23ABM02

BIOMATERIALS

L	T	P	C
3	0	0	3

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

CO1: Identify different types of biomaterials used for various biomedical applications. (L2)

CO2: Recognize various synthetic polymers, used as biomaterials for organ replacement.(L3)

CO3: Understand different types of ceramics and composite used as biomaterials. (L4)

CO4: Acquire knowledge about hard tissue replacement and soft tissue replacement for various fixations. (L4)

CO5: Apply knowledge about how to rectify eye defect using various biomaterials.

CO6: Implement various methods to test Biocompatibility and Hemocompatibility test of biomaterials (L5)

UNIT I

METALLIC BIOMATERIALS: Biomaterials - Overview, Classification of biomaterials, Biocompatibility and Hemocompatibility, Metals and alloys -Stainless steel, Titanium and its alloys, Cobalt chromium alloy, Metallic corrosion, Dental implants - Impression Materials, Fillings and Restoration Materials, Materials for Deep Cavities, Material for oral and Maxillofacial Implants.

UNIT II:

SYNTHETIC POLYMERS AND APPLICATIONS: Synthetic Polymers, Polymers in biomedical use, Polyethylene, Per fluorinated Polymers, Acrylic Polymers, Hydrogels, Polyurethanes, biodegradable synthetic polymers, silicone rubber, microorganisms in polymeric implants, Polymer Sterilization.

UNIT III:

BIOCERAMICS AND COMPOSITES: Bio ceramics, types- Carbon, Alumina, Zirconia - bioactive resorbable and non – resorbable bioceramics, bioceramic coatings on metallic implants and bone bonding reactions on implantation, Hydroxyapatite-properties and applications. Composites-Types and Applications, Bioglass.

UNIT IV:

HARD AND SOFT TISSUE REPLACEMENT: Bioelectric effect, Wolff's Law, Temporary orthopaedic fixation devices-pins, screws and plates, Intra Medullary and spinal nails, hard tissue replacements - total hip and knee joint replacements. Soft Tissue Replacements-Sutures-Tapes, Staples, Adhesives, Wound Dressings, Biomaterials in urological practice.

UNIT V:

BIOMATERIALS IN OPTHALMOLOGY AND BIOLOGICAL TESTS: Ophthalmology-Introduction, Optical implants, Contact lenses, Eye shields, Viscoelastic solutions, Vitreous implants, Acrylate adhesives, Scleral buckling materials for retinal detachment, artificial tears, Biological Tests.

Textbooks:

1. Sujata V.Bhat, Biomaterials, Narosa Publishing House, New Delhi, India, 2012.

2. William Wagner, Shelly Sakiyama-Elbert, Guigen Zhang, Michael Yaszemski, Biomaterials Science: An Introduction to Materials in Medicine, ELSEVIER, 4th Edition -, 2020

3. Park, Biomaterials an Introduction, Third Edition, Springer, 2007.

4. Joseph D Bronzino, the Biomedical Engineering Hand Book, Fourth Edition, CRC Press, 2015.

References:

1. Buddy D. Ratner, Allan S. Hoffman, Biomaterial Sciences – Int. to Materials in Medicine

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)

IV B. Tech I Semester
Course Code: 23ABM14

BIOMEMS & BIOMICROFLUIDICS

L	T	P	C
3	0	0	3

Course outcome:

After completion of this course, students will be able to

CO1: Build a foundation in micro-systems engineering including basic biological/ biochemical concepts and techniques emphasizing biomedical devices.

CO2: Understand material properties important for MEMS system performance; analyze dynamics of resonant micromechanical structures.

CO3: Design and Development of models using microfabrication technique and simulate electrostatic and electromagnetic sensors and actuators.

CO4: Design and evaluation of MEMs and microfluidics based analytical platform as per the requirement.

UNIT- 1:

Introduction to BioMEMS and microfluidics, Introduction to Bio nano technology, Biosensors, fluidics. Introduction to device fabrication (Silicon and Polymers) Introduction to device fabrication (Silicon and Polymers). Sensors, Transduction and Performance factors. Sensors, Transduction and Performance factors continued.

UNIT- 2:

Important materials for fabrication of BioMEMS platforms Introduction to silicon device fabrication Some Fabrication Methods for soft materials Transduction Methods. About cell potential and SHEs Cell reaction, Nernst equation, Construction of Ion selective electrodes Measurement and calibration of electrodes, ion-solvent interaction.

UNIT- 3:

Introduction to Cell biology, Basic structure of DNA DNA hybridization, DNA polymerization,PCR Thermal cycle , Real Time PCR.PCR design Electrophoresis, Gel and Capillary electrophoresis,Agarose DNA microarrays (concepts, and utility). Affymetrix and Nanogen approaches in realization of micro-arrays. DNA sequencing (Sanger’s reaction). DNA nano-pores. DNA detection using Mechanical antilevers.Basics of Protein structure.

UNIT- 4:

Protein charging at different pH range, Amino acids, protein polymerization, Transcription, Translation Antibody, Microencapsulation, Cyclic voltametry Microfluidics, Similarity of Streamlines, Pathlines, Sreaklines and Timelines for a steady flow Stress tensor.

UNIT-5

Viscosity, Newtonian, non-Newtonian fluids, Pseudoplastic, Dilatant, Bingham Plastic materials, Thixotropic fluids. Flow over infinite plates, laminar and turbulent flow, Compressible and Incompressible flows Flow over an infinite plate. Types of flows. Types of Fluids. Kinematics of fluids

Text/ Reference Books:

1. Introduction to BioMEMS, Albert Folch, CRC Press; 1st ed.

2. Essential Cell Biology, Bruce Albert, et al. Garland Science, 2nd ed.

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

II B. Tech II Semester

Course Code: 23ABM03

BIOMATERIALS LAB

L	T	P	C
0	0	3	1.5

Course Outcome:

After completion of the course, students will be able to

CO1: Characterize the mechanical properties of biomaterials using destructive and non-destructive testing.

CO2: Measure the Surface roughness of biomaterials as per the ASTM standards.

CO3: Perform *invitro* hemocompatibility study for implantable biomaterials.

CO4: Conduct the test to measure the pH, viscosity and Conductivity of the body fluid.

List of Experiments:

1. Mechanical Characterization of Biomaterials
2. Hardness Testing of Metallic Biomaterials
3. Hardness Testing of Polymeric Biomaterials
4. Surface Roughness measurement
5. *Invitro* hemocompatibility study of biomaterials
6. pH measurement of Body Fluid
7. Conductivity Measurement of Body Fluid
8. Viscosity Measurement of Body Fluid
9. Non-Destructive Testing of Biomaterials
10. Innovative Experiment

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)

III B. Tech I Semester
Course Code: 23ABM04

BIOSENSORS & TRANSDUCERS

L	T	P	C
3	0	0	3

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

CO1: Explain the introduction and characteristics of transducers

CO2: Illustrate the types of transducers

CO3: Examine the basic characteristics of bio potential recorders

CO4: Explain the structure of biosensors in detail

CO5: Explain the working and applications of Biosensors

UNIT-I:

INTRODUCTION: General measurement system - purpose, structure and elements- Transducers - Definition, Classification. Resistance type- strain gauges, thermometers, potentiometers. Capacitive type, Inductive type- variable reluctance and LVDT. Biomedical Applications.

UNIT-II:

TRANSDUCERS: Temperature transducers, Piezoelectric transducers, Piezo resistive transducers, Photoelectric transducers, Pressure transducers, Magnetostrictive transducers Biomedical applications.

UNIT-III:

BIO POTENTIAL ELECTRODES: Half cell potential (or) Electrode potential, Types of Electrodes - Micro electrodes, Depth and needle electrodes, Surface electrodes, and Chemical electrodes. Catheter type electrodes, stimulation electrodes, electrode paste, electrode material.

UNIT-IV:

BIOSENSORS: Introduction, biological elements, immobilization of biological components. Micro machined biosensor – cantilever based chemical sensors - Biosensors for diabetes mellitus, FAB. Biochip - introduction, gene chip.

UNIT-V:

APPLICATIONS OF BIOSENSORS:ISFET for glucose and urea. IMFET, MOSFET biosensors, affinity biosensor (catalytic biosensor), Enzyme electrodes, Ion exchange membrane electrodes.

TEXT / REFERENCE BOOKS:

1. H.S. Kalsi, Electronic Instrumentation & Measurement, Tata McGraw HILL, 1995.

2. Brain R Eggins, Biosensors: An Introduction‖, John Wiley Publication.1996.

3. A. K.Sawhney, A course in Electronic Measurements and Instruments, Dhapat Rai & sons, 1991

4. John G Webster, Medical Instrumentation: Application and design, John Wiley Publications.2007.

5. John P Bentley, Principles of Measurement Systems, 3rd Edition, Pearson Education Asia, (2000 Indian reprint)

6. Geddes and Baker, Principles of Applied Biomedical Instrumentation, John Wiley Publications. 1975.

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)

III B. Tech I Semester

Course Code: 23ABM05

BIOSENSORS & TRANSDUCERS LAB

L	T	P	C
0	0	3	1.5

Course Outcomes:

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

CO1: Analyze about various theory, practical characteristics and conversions of the various transducers

CO2: Evaluate the measurement of the vital physiological signals such as heart rate, spo2 etc

CO3: Analyze various types of transducers

CO4: Test compatibility for any clinical measurement

CO5: Apply the biosensors in different measurement techniques

LIST OF EXPERIMENTS

1. Characteristics of pressure transducer
2. Measurement of displacement capacitive transducer, LVDT and Inductive transducer
3. Characteristics of optical transducer for SpO2 measurement
4. Measurement of skin temperature by both contact and non-contact method
5. Study of the characteristics of capacitor level sensor for saline level measurement in a I-V set.
6. Data acquisition of physiological signals
7. Study of hot-wire anemometry
8. Study of ampere metric sensor for blood glucose measurement
9. Electronic weighing machine for the measurement of chemical compounds
10. Non-invasive gas analyzer as an electronic nose.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

III B.Tech-I Semester CE, E,EEE,ECE(MINOR)

L	T	P	C
3	0	0	3

23ACS24: CLOUD COMPUTING

Course Outcomes:

At the end of the course, the student will be able to
CO1: Ability to create cloud computing environment
CO2: Ability to design applications for Cloud environment
CO3: Design & develop back up strategies for cloud data based on features.
CO4: Use and Examine different cloud computing services.
CO5: Apply different cloud programming model as perneed.

UNIT I: Basics of Cloud computing **Lecture 8Hrs**

Introduction to cloud computing: Introduction, Character is tics of cloud computing, Cloud Models, Cloud Services Examples, Cloud Based services and applications

Cloud concepts and Technologies: Virtualization, Load balancing, Scalability and Elasticity, Deployment, Replication, Monitoring, Software defined, Network function virtualization, Map Reduce, Identity and Access Management, services level Agreements, Billing.

Cloud Services and Plat forms: Compute Services, Storage Services, Data, base Services, Application services, Content delivery services Analytics Services, Deployment and Management Services, Identity and Access Management services, Open Source Private Cloud software.

UNIT II: Hadoop and Python **Lecture 9Hrs**

Hadoop Map Reduce: Apache Hadoop, Hadoop Map Reduce Job Execution, Hadoop Schedulers, Hadoop Clusterset up. Cloud Application Design: Reference Architecture for Cloud Applications, Cloud Application Design Methodologies, Data Storage Approaches.

Python Basics: Introduction, Installing Python, Python data Types & Data Structures, Controlflow, Function, Modules, Packages, Filehandling, Date/TimeOperations, Classes.

UNIT III: Python for Cloud computing **Lecture 8Hrs**

Python for Cloud: Python for Amazon web services, Python for Google Cloud Platform, Python for windows Azure, Python for Map Reduce, Python packages of Interest, Python web Application Frame work, Designing a REST ful web API.

Cloud Application Development in Python: Design Approaches, Image Processing APP, Document Storage App, Map Reduce App, Social Media Analytics App.

UNIT IV: Big data, multimedia and Tuning **Lecture 8Hrs**

Big Data Analytics: Introduction, Clustering Big Data, Classification of Big data Recommendation of Systems.

Multimedia Cloud: Introduction, Case Study: Live video Streaming App, Streaming Protocols, case Study: Video Trans coding App.

Cloud Application Bench marking and Tuning: Introduction, Work load Character is tics, Application Performance Metrics, Design Considerations for a Bench marking Methodology, Bench marking Tools, Deployment Prototyping, Load Testing & Bottleneck Detection case Study, Hadoop bench marking case Study.

UNIT V: Applications and Issues in Cloud **Lecture 9Hrs**

Cloud Security: Introduction, CSA Cloud Security Architecture, Authentication, Authorization, Identity Access Management, Data Security, Key Management, Auditing.

Cloud for Industry, Health care & Education: Cloud Computing for Health care, Cloud computing for Energy Systems, Cloud Computing for Transportation Systems, Cloud Computing for Manufacturing

Industry, Cloud computing for Education.

Migrating in to a Cloud: Introduction, Broad Approaches to migrating into the cloud, the seven– step model of migration in to a cloud.

Organizational readiness and Change Management in The Cloud Age: Introduction, Basic concepts of Organizational Readiness, Drivers for changes: A frame work to comprehend the competitive environment, common change management models, change management maturity models, Organizational readiness self–assessment.

Legal Issues in Cloud Computing: Introduction, Data Privacy and security Issues, cloud contracting models, Jurisdictional issues raised by virtualization and at a location, commercial and business considerations, Special Topics.

Text books:

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

Reference Books:

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

Online Learning Resources:

Cloud computing – Course (nptel.ac.in)

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

II B.Tech II Semester (Common to CSE, CSD, CSM, CSC, CAI,CSO,IT,CSBS))

III B.Tech I Semester CE.ME,EEE,ECE(Minor)

L	T	P	C
3	0	0	3

23AIT02: SOFTWARE ENGINEERING

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

CO1: Perform various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance (L3)

CO2: Analyse various software engineering models and apply methods for design and development of software projects. (L4)

CO3: Develop system designs using appropriate techniques. (L3)

CO4: Understand various testing techniques for a software project. (L2)

CO5: Apply standards, CASE tools and techniques for engineering software projects (L3)

UNIT I:

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

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

UNIT II:

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

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

UNIT III:

Software Design: Overview of the design process, How to characterize a good software design? Layered arrangement of modules, Cohesion and Coupling. approaches to software design.

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

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

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

UNIT IV:

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

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

UNIT V:

Computer-Aided Software Engineering (Case): CASE and its scope, CASE environment, CASE support in the software life cycle, other characteristics of CASE tools, Towards second generation CASE Tool, and Architecture of a CASE Environment.

Software Maintenance: Characteristics of software maintenance, Software reverse engineering, Software maintenance process models and Estimation of maintenance cost.

Software Reuse: reuse- definition, introduction, reason behind no reuse so far, Basic issues in any reuse program, A reuse approach, and Reuse at organization level.

Text Books:

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

Reference Books:

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

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105182/
2) https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012605895063871 48827_shared/overview
3) https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013382690411003 904735_shared/overview

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

II B.Tech I Semester (Common to CSE,CSD,CSM,CSC,CAI,CSO,IT,CSBS))
III B.Tech II Semester CE,ME,EEE,ECE(Minor)

L	T	P	C
3	0	0	3

23ACS05: ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS

Course Outcomes: After completion of the course, students will be able to
CO1: Illustrate the working of the advanced tree data structures and their applications (L2)
CO2: Understand the Graph data structure, traversals and apply them in various contexts. (L2)
CO3: Use various data structures in the design of algorithms (L3)
CO4: Recommend appropriate data structures based on the problem being solved (L5)
CO5: Analyze algorithms with respect to space and time complexities (L4)
CO6: Design new algorithms (L6)

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.

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
5. Algorithms + Data Structures &Programs:,N.Wirth, PHI
6. Fundamentals of Data Structures in C++: Horowitz Sahni& Mehta, Galgottia Pub.
7. Data structures in Java:, Thomas Standish, Pearson Education Asia

Online Learning Resources:

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

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

III B.Tech II Semester CE.ME,EEE,ECE(Minor)

L	T	P	C
3	0	0	3

23ACS43: COMPUTER ORGANIZATION

Course Outcomes:

After completion of the course, students will be able to

CO1: Understand computer architecture concepts related to the design of modern processors, memories and I/Os

CO2: Identify the hardware requirements for cache memory and virtual memory

CO3: Design algorithms to exploit pipelining and multiprocessors

CO4: Understand the importance and trade-offs of different types of memories.

CO5: Identify pipeline hazards and possible solutions to those hazards

UNIT - I

Basic Structure of Computer: Computer Types, Functional Units, Basic operational Concepts, Bus Structure, Software, Performance, Multiprocessors and Multicomputer.

Machine Instructions and Programs: Numbers, Arithmetic Operations and Programs, Instructions and Instruction Sequencing, Addressing Modes, Basic Input/output Operations, Stacks and Queues, Subroutines, Additional Instructions.

UNIT - II

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.

Basic Processing Unit: Fundamental Concepts, Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control, and Multi programmed Control.

UNIT - III

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

UNIT - IV

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

UNIT - V

Pipelining: Basic Concepts, Data Hazards, Instruction Hazards, Influence on Instruction Sets.

Large Computer Systems: Forms of Parallel Processing, Array Processors, The Structure of General-Purpose multiprocessors, Interconnection Networks.

Textbooks:

1. Carl Hamacher, ZvonkoVranesic, SafwatZaky, “Computer Organization”, 5th Edition, McGraw Hill Education, 2013.

Reference Books:

1. M.Morris Mano, “Computer System Architecture”, 3rd Edition, Pearson Education.
2. Themes and Variations, Alan Clements, “Computer Organization and Architecture”, CENGAGE Learning.
3. SmrutiRanjanSarangi, “Computer Organization and Architecture”, McGraw Hill Education.
4. John P.Hayes, “Computer Architecture and Organization”, McGraw Hill Education

Online Learning Resources:

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

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(AUTONOMOUS)

III B.Tech II Semester CE.ME,EEE,ECE(Minor)

L	T	P	C
3	0	0	3

23ACS44: WEB TECHNOLOGIES

Course Outcomes:

CO1: Understand the Web essentials.
CO2: Develop web pages using XHTML
CO3: Apply style to web pages using CSS
CO4: Write scripts for client side
CO5: Develop and transform XML documents.

UNIT I

Web Essentials: Clients, Servers, and Communication, The Internet, Basic Internet protocols, WWW, HTTP request message, HTTP response message, Web clients, Web Servers, Case study.

UNIT II

Markup Languages: XHTML 1.0,An introduction to HTML, Basic XHTML syntax and semantics, fundamental HTML elements, Relative URLs, Lists, Tables, Frames, Forms, Defining XHTML's abstract syntax, Creating HTML documents.

UNIT III

Cascading Style Sheets: Introduction, features, core syntax, style sheets and HTML, style rule cascading and inheritance, text properties, Box model, normal flow box layout, beyond the normal flow, lists, tables, cursor styles.

UNIT IV

Client-side programming - JavaScript: Basic syntax, variables and data types, statements, operators, literals, functions, objects, Arrays, built-in objects, JavaScript debuggers.

UNIT V

Representing Web Data-XML: Documents and vocabularies, Versions and declaration, Namespaces, Ajax, DOM and SAX parsers, transforming XML documents, XPath, XSLT, Displaying XML documents in Web browsers.

Textbooks:

1. J.C. Jackson, Web technologies: A computer science perspective, Pearson.

Reference Books:

1. Sebesta, Programming world wide web, Pearson.
2. Dietel and Nieto , Internet and World Wide Web –How to program, Pearson Education
3. Chris Bates , Web Programming, building internet applications, 2nd edition, WILEY, Dreamtech.

Online Learning Resources:

1. http://getbootstrap.com/
2. https://www.w3schools.com/whatis/
3. https://nptel.ac.in/courses/106105084

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
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II B.Tech I Semester (Common to CSE,CSM,CSC,CAI,CSO,IT,CSBS))
III B.Tech II Semester CE,ME,EEE,ECE(Minor)

L	T	P	C
0	0	3	1.5

23ACS07: ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS LAB

Course Outcomes: After completion of the course, students will be able to
CO1: Design and develop programs to solve real world problems with the popular algorithm design methods. (L5)
CO2: Demonstrate an understanding of Non-Linear data structures by developing implementing the operations on AVL Trees, B-Trees, Heaps and Graphs. (L2)
CO3: Critically assess the design choices and implementation strategies of algorithms and data structures in complex applications. (L5)
CO4: Utilize appropriate data structures and algorithms to optimize solutions for specific computational problems. (L3)
CO5: Compare the performance of different of algorithm design strategies (L4)
CO6: Design algorithms to new real world problems (L6)

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.

Reference Books:

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

Online Learning Resources:

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

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)

IV B.Tech I Semester CE,ME,EEE,ECE(Minor)

L	T	P	C
0	0	3	1.5

23ACS45: WEB TECHNOLOGIES LAB

Course Outcomes (CO):

After completion of the course, students will be able to

- Construct web sites with valid HTML, CSS, JavaScript
- Create responsive Web designs that work on phones, tablets, or traditional laptops and widescreen monitors.
- Develop websites using jQuery to provide interactivity and engaging user experiences
- Embed Google chart tools in a website for better visualization of data.
- Design and develop web applications using Content Management Systems like WordPress

Sample Programs:

1. Create a Basic HTML document
2. Create your Profile Page
3. Create a Class Timetable (to merge rows/columns, use rowspan/colspan)
4. Create a Student Hostel Application Form
5. Make the Hostel Application Form designed in Module -4 beautiful using CSS (add colors,backgrounds, change font properties, borders, etc.)
6. Style the Hostel Application Form designed in Module-5still more beautiful using Bootstrap
7. Analyse various HTTP requests (initiators, timing diagrams, responses) and identify problems if any.
8. Design a simple calculator using JavaScript to perform sum, product, difference, and quotient operations:
9. Design& develop a Shopping Cart Application with features including Add Products, Update Quantity, Display Price(Sub-Total & Total), Remove items/products from the cart.
10. Validate all Fields and Submit the Hostel Application Form designed in Module-6 using JQuery
11. Develop an HTML document to illustrate each chart with real-time examples.
12. Develop an E-learning website using any CMS(for example WordPress)

References:

1. Deitel and Deitel and Nieto, ―Internet and World Wide Web - How to Program‖, PrenticeHall, 5th Edition, 2011.
2. Web Technologies, Uttam K. Roy, Oxford Higher Education., 1st edition, 10th impression, 2015.
3. Stephen Wynkoop and John Burke ―Running a Perfect Website‖, QUE, 2nd Edition,1999.
4. Jeffrey C and Jackson, ―Web Technologies A Computer Science Perspective Pearson Education, 2011.
5. Gopalan N.P. and Akilandeswari J., ―Web Technology, Prentice Hall of India, 2011.

Online Learning Resources/Virtual Labs:

1. HTML: https://html.spec.whatwg.org/multipage/
2. HTML: https://developer.mozilla.org/en-US/docs/Glossary/HTML5
3. CSS: https://www.w3.org/Style/CSS/
4. Bootstrap - CSS Framework: https://getbootstrap.com/
5. BrowserDeveloperTools:https://developer.mozilla.org/enUS/docs/Learn/Common_questions/What_are_browser_developer_tools
6. Javascript: https://developer.mozilla.org/en-US/docs/Web/JavaScript
7. JQuery: https://jquery.com
8. Google Charts: https://developers.google.com/chart
9. Wordpress: https://wordpress.com

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

III B. Tech - II Semester -CSE(CS)

III B. Tech - I Semester CSC MINORS

L	T	P	C
3	0	0	3

23ACC05: CYBER CRIMES & DIGITAL FORENSICS

Course Outcomes:

At the end of the course students will be able to

CO1: Understand the fundamentals of cybercrime.

CO2: Understand the various cybercrime issues.

CO3: Understand different investigation tools for cybercrime.

CO4: Understand basics of Forensic Technology and Practices.

CO5: Analyze different laws, ethics and evidence handling procedures.

UNIT-I: Introduction 9 Hrs

Introduction and Overview of Cyber Crime, Nature and Scope of Cyber Crime, Types of Cyber Crime: Social Engineering, Categories of Cyber Crime, Property Cyber Crime.

UNIT-II: Cyber Crime Issues 9 Hrs

Unauthorized Access to Computers, Computer Intrusions, White collar Crimes, Viruses and Malicious Code, Internet Hacking and Cracking, Virus Attacks, Pornography, Software Piracy, Intellectual Property, Mail Bombs, Exploitation, Stalking and Obscenity in Internet, Digital laws and legislation, Law Enforcement Roles and Responses.

UNIT-III: Investigation 9 Hrs

Introduction to Cyber Crime Investigation, Investigation Tools, rediscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E- Mail Recovery, Hands on Case Studies. Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.

UNIT-IV: Digital Forensics 9Hrs

Introduction to Digital Forensics, Forensic Software and Hardware, Analysis and Advanced Tools, Forensic Technology and Practices, Forensic Ballistics and Photography, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Network Forensics.

UNIT-V: Laws and Acts **9 Hrs**

Laws and Ethics, Digital Evidence Controls, Evidence Handling Procedures, Basics of Indian Evidence ACT IPC and Corps, Electronic Communication Privacy ACT, Legal Policies

TEXT BOOKS:

1. Nelson Phillips and Engineer Stuart, —Computer Forensics and Investigations‖, CEng age Learning, New Delhi, 2009.
2. Kevin Media, Chris Promise, Matt Pipe, —Incident Response and Computer Forensics —, Tata McGraw -Hill, New Delhi, 2006.

REFERENCE BOOKS:

1. Robert M Slade, Software Forensics‖, Tata McGraw - Hill, New Delhi, 2005.
2. Bernadette H Schell, Clemens Martin, —Cybercrime‖, ABC – CLIO Inc, California, 2004
3. Understanding Forensics in IT —, NIIT Ltd, 2005.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

IV B. Tech - I Semester -CSE(CS)

III B. Tech - I Semester -CSC MINORS

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23ACC16: CYBER LAWS AND SECURITY POLICIES

(Professional Elective-V)

Course Outcomes

At the end of the course students will be able to

CO1: Learn evolution and key aspects of Indian cyber law, including recent amendments.

CO2: Gain knowledge about the legalities of digital signatures and the role of e-governance in the IT Act.

CO3: Develop an understanding of the legalities involved in electronic contracts and international conventions.

CO4: Adapt in understanding and analyzing cybercrime, electronic evidence, and intellectual property rights in the context of IT.

UNIT - I

Introduction: History of Internet and World Wide Web, Need for cyber law, Cybercrime on the rise, Important terms related to cyber law.

Cyber law in India: Need for cyber law in India, History of cyber law in India.

Information Technology Act, 2000: Overview of other laws amended by the IT Act, 2000, National Policy on Information Technology 2012.

UNIT - II

Overview of the Information Technology Act, 2000: Applicability of the Act, Important provisions of the Act: Digital signature and Electronic signature, Digital Signature under the IT Act, 2000, E-Governance Attribution, Acknowledgement and Dispatch of Electronic Records, Certifying Authorities, Electronic Signature Certificates, Duties of Subscribers, Penalties and Offences, Intermediaries.

UNIT - III

Overview of rules issued under The IT Act, 2000, Electronic Commerce, Electronic Contracts, Cyber Crimes, Cyber Frauds.

UNIT - IV

Regulatory Authorities: Department of Electronics and Information Technology, Controller of Certifying Authorities (CCA), Cyber Appellate Tribunal, Indian Computer Emergency Response Team (ICERT), Cloud Computing, Case Laws.

UNIT - V

Introduction to Cybercrime and procedure to report Cyber crime: procedure to report cybercrime, some basic rules for safe operations of the computer and internet, the criminal law (amendment) act, 2013: legislative remedies for online harassment and cyber stalking in India.

TEXT BOOKS:

1. Text book on ―Cyber Law‖,**2 Ed Rap 2023**, Pagan Dug gal, Universal Law Publishing.
2. Text book on ―Indian Cyber law on Cybercrimes‖, Pagan Dug gal,

REFERENCE BOOKS:

1. Debby Russell and Sr. G.T Gingili, "Computer Security Basics (Paperback), 2nd Edition, O'Reilly Media, 2006.
2. Thomas R. Pettier, ―Information Security policies and procedures: Practitioner's Reference‖, 2nd Edition Prentice Hall, 2004.
3. Kenneth J. Knapp, ―Cyber Security and Global Information Assurance: Threat Analysis and Response Solutions‖, IGI Global, 2009.
4. Thomas R Pettier, Justin Pettier and John Blackley, Information Security Fundamentals‖, 2nd Edition, Prentice Hall, 1996.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

III B. Tech - I Semester -CSE(CS)

III B. Tech - II Semester -CSC MINORS

L	T	P	C
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23ACC01: INTRODUCTION TO CYBER SECURITY

Course Outcomes:

At the end of the course students will be able to

CO1: Demonstrate knowledge on Automata Theory, Regular Expression and Analyze and Design of finite automata, and prove equivalence of various finite automata.

CO2: Demonstrate knowledge on context free grammar, Analyze and design of PDA and TM.

CO3: Understand the basic concept of compiler design, and its different phases which will be helpful to construct new tools like LEX, YACC, etc.

CO4: Ability to implement semantic rules into a parser that performs attribution while parsing and apply error detection and correction methods.

CO5: Apply the code optimization techniques to improve the space and time complexity of programs while programming and Ability to design a compiler.

UNIT-I: Cyber security Essentials and Cube **9 Hrs**

The Cyber security World, Cyber Criminals versus Cyber security Specialists, Common Threats, Spreading Cyber security Threats, The Three Dimensions of the Cyber security Cube, CIA Triad, States of Data, Cyber security Countermeasures, IT Security Management Framework.

UNIT-II: Cyber security Threats, Vulnerabilities, Attacks and Protecting Secrets 9Hrs

Introduction, Governance, Managing Cloud Security Risk, Compliance, Legal Issues in Cloud, Audit, CSA Tools.

UNIT-III: Data Integrity **9 Hrs**

Types of Data Integrity Controls, Digital Signatures, Certificates, Database Integrity Enforcement.

UNIT-IV: Data Availability and Recovery **9 Hrs**

High Availability, Measures to Improve Availability, Incident Response, Disaster Recovery.

UNIT-V: Protecting a Cyber security Domain **9 Hrs**

Defending Systems and Devices, Server Hardening, Network Hardening, Physical and Environmental Security, Cyber security Domains, Ethics of Working in Cyber security.

Text books:

1. CISSP (ISC)2 Certified Information Systems Security Professional Official Study Guide, Mike Chappell, James Michael Stewart and Darrel Gibson, 9th Edition
2. Cyber security: The Beginner's Guide, Dr. Erdal Ozkaya, Packt Publishing Limited, 2019.

Reference Books:

1. Cyber security Essentials, Charles J. Brooks, Christopher Grow, Philip Craig and Donald Short, 1st edition, Say box.
2. Network Security Essentials, William Stallings, 6th edition, Pearson Education, 2018.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

IV B. Tech - I Semester -CSE(CS)

III B. Tech -II Semester -CSC MINORS

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3	0	0	3

23ACC11: BLOCK CHAIN TECHNOLOGY

Course Outcomes (CO):

At the end of the course students will be able to

CO1: Demonstrate the foundation of the Block chain technology and understand the processes in payment and funding.

CO2: Identify the risks involved in building Block chain applications.

CO3: Review of legal implications using smart contracts.

CO4: Choose the present landscape of Block chain implementations and Understand Crypto currency markets Examine how to profit from trading crypto currencies

UNIT - I Introduction **Lecture 8Hrs**

Introduction, Scenarios, Challenges Articulated, Block chain, Block chain Characteristics, Opportunities Using Block chain, History of Block chain. Evolution of Block chain: Evolution of Computer Applications, Centralized Applications, Decentralized Applications, Stages in Block chain Evolution, Consortia, Forks, Public Blockchain Environments, Type of Players in Block chain Ecosystem, Players in Market.

UNIT - II Block chain Concepts **Lecture 9Hrs**

Block chain Concepts: Introduction, Changing of Blocks, Hashing, Markel-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on block chain, data storage on block chain, wallets, coding on block chain: smart contracts, peer-to-peer network, types of block chain nodes, risk associated with block chain solutions, life cycle of block chain transaction.

UNIT - III Architecting Block chain solutions **Lecture 9Hrs**

Architecting Block chain solutions: Introduction, Obstacles for Use of Block chain, Block chain Relevance Evaluation Framework, Block chain Solutions Reference Architecture, Types of Block chain Applications. Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Block chain Solutions, Architecture Considerations, Architecture with Block chain Platforms, Approach for Designing Block chain Applications.

UNIT - IV Ethereal Block chain Implementation **Lecture 8Hrs Ethereal**

Block chain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereal Ecosystem, Ethereal Development, Ethereal Tool Stack, Ethereal Virtual Machine, Smart Contract Programming,

Integrated Development Environment, Truffle Framework, Gouache, Unit Testing, Ethereal Accounts, My Ether Wallet, Ethereal Networks/Environments, Inure, Ether scan, Ethereal Clients, Decentralized Application, Metalmark, Tuna Fish Use Case Implementation, Open Zeppelin in Contracts

UNIT - V Hyper ledger Block chain Implementation **Lecture 8Hrs**

Hyper ledger Block chain Implementation: Introduction, Use Case – Car Ownership Tracking, Hyper ledger Fabric, Hyper ledger Fabric Transaction Flow, Facer Use Case Implementation, Invoking Chain code Functions Using Client Application.

Advanced Concepts in Block chain: Introduction, Inter Planetary File System (IPFS), Zero Knowledge Proofs, Oracles, Self-Sovereign Identity, Block chain with IoT and AI/ML Quantum Computing and Block chain, Initial Coin Offering, Block chain Cloud Offerings, Block chain and its Future Potential.

Textbooks:

1. Armadas, Arched Surfers A riff, Sham ―Block chain for Enterprise Application Developers‖, Wiley, 2020
2. Andreas M. Antonopoulos, ―Mastering Bit coin: Programming the Open Block chain‖, O'Reilly, 2017

Reference Books:

1. Block chain: A Practical Guide to Developing Business, Law, and Technology Solutions, Joseph Barbara, Paul R. Allen, Mc Grow Hill.
2. Block chain: Blueprint for a New Economy, Melanie Swan, O'Reilly

Online Learning Resources:

https://github.com/blockchainedindia/resources

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

III B. Tech - II Semester -CSE(CS)

IV B. Tech - I Semester -CSC MINORS

L	T	P	C
3	0	0	3

23ACC04: CRYPTOGRAPHY & NETWORK SECURITY

Course outcomes:

At the end of the course students will be able to

CO1: Identify information security goals, classical encryption technique and acquire fundamental knowledge on the concepts off in tie fields and number theory.

CO2: Compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication.

CO3: Apply the knowledge of cryptographic checksum and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes.

CO4: Apply different digital signature algorithms to achieve authentication and create secure applications.

CO5: Apply network security basics, analyze different attack son networks and evaluate the performance of fire walls and security protocols like TLS, IPSec, and PGP.

CO6: Apply the knowledge of cryptographic utilities and authentication mechanisms to design secure applications.

UNIT-I: **Lecture 9Hrs**

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

UNIT-II: **Lecture 9Hrs**

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

UNIT-III: **Lecture 9Hrs**

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

UNIT-IV: **Lecture 9Hrs**

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

UNIT-V: **Lecture 8Hrs**

Transport Level Security: Web Security Requirements, Transport Layer Security (TLS), HTTPS, Secures hell (SSH) Firewalls: Fire wall Characteristics and Access Policy, Types of Fire walls, Fire wall ovation and Configurations.

Textbooks:

1) Cryptography and Network Security-William Stallings, Pearson Education,8th Edition.
2) Cryptography, network Security and Cyber Laws–Bernard Menaces, Engage Learning, 2010 edition.

Reference Books:

1) Cryptography and Network Security- Beerhouse Frozen, Debden Mukhopadhyaya, Mc –Grow Hill, 3rd Edition, 2015.
2) Network Security Illustrated, Jason Albanese and Wes Scone Reich, MGH Publishers, 2003.

Online Learning Resources:

1) https://nptel.ac.in/courses/106/105/106105031/lecture
2) https://nptel.ac.in/courses/106/105/106105162/lecturebyDr.SouravMukhopadhyay IITKharagpur[VideoLecture]
3) https://www.mitel.com/articles/web-communication-cryptography-and-network-security web articles by Mitel Power Connections.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

III B. Tech - I Semester -CSE(CS)

III B. Tech - II Semester -CSC MINORS

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23ACC02: CYBER SECURITY LAB

Course Outcomes:

At the end of the course students will be able to

CO1: Get the skill to identify cyber threats/attacks.

CO2: Get the knowledge to solve security issues in day-to-day life.

CO3: Able to use Autopsy tools

CO4: Perform Memory capture and analysis

CO5: Demonstrate Network analysis using Network miner tools

List of Experiments

1. Perform an Experiment for port scanning with neap
2. Set Up a honey pot and monitor the honey pot on the network
3. Install Jscript/Cryptal tool (or any other equivalent) and demonstrate Asymmetric, symmetric crypto algorithm, Hash and Digital/PKI signatures.
4. Generate minimum 10 passwords of length 12 characters using open SSL command
5. Perform practical approach to implement Foot printing-Gathering target information using Dmitry-D magic, U Attester
6. Working with sniffers for monitoring network communication (Wire shark).
7. Using Snort, perform real time traffic analysis and packet logging.
8. Perform email analysis using the Autopsy tool.
9. Perform Registry analysis and get boot time logging using process monitor tool
10. Perform File type detection using Autopsy tool
11. Perform Memory capture and analysis using FTK imager tool
12. Perform Network analysis using the Network Miner tool

TEXT BOOKS:

1. Real Digital Forensics for Handheld Devices, E. P. Dorothy, Auer back Publications, 2013.
2. The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics, J. Sammons, Singles Publishing, 2012.

REFERENCE BOOKS:

1. Handbook of Digital Forensics and Investigation, E. Casey, Academic Press, 2010.
2. Malware Forensics Field Guide for Windows Systems: Digital Forensics Field Guides, C. H. Malian, E. Casey and J. M. Aquiline, Signers, 2012.
3. The Best Damn Cybercrime and Digital Forensics Book.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

III B. Tech - II Semester -CSE(CS)

IV B. Tech - I Semester -CSC MINORS

L	T	P	C
0	0	3	1.5

23ACC08: CRYPTOGRAPHY AND NETWORK SECURITY LAB

List of Experiments:

1. Write a C program that contains a string (char pointer) with a value _Hello world'. The program should XOR each character in this string with 0 and displays the result.
2. Write a C program that contains a string (char pointer) with a value _Hello world'. The program should AND or and XOR each character in this string with 127 and display the result.
3. Write a Java program to perform encryption and decryption using the following algorithms

a. Cease cipher b. Substitution cipher c. Hill Cipher

4. Write a C/JAVA program to implement the DES algorithm logic.
5. Write a C/JAVA program to implement the Blowfish algorithm logic.
6. Write a C/JAVA program to implement the Randal algorithm logic.
7. Write the RC4 logic in Java Using Java cryptography; encrypt the text ―Hello world‖ using Blowfish. Create your own key using Java key tool.
8. Write a Java program to implement RSA algorithm.
9. Implement the Daffy-Hellman Key Exchange mechanism using HTML and JavaScript.
10. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.
11. Calculate the message digest of a text using the MD5 algorithm in JAVA.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

Minors in CSE (IoT) (R23)

23ACO01: Internet of Things

L	T	P	C
3	0	0	3

Course Objectives:

1. Understand the basics of Internet of Things and protocols.
2. Discuss the requirement of IoT technology
3. Introduce some of the application areas where IoT can be applied.
4. Understand the vision of IoT from a global perspective, understand its applications, determine its market perspective using gateways, devices, and data management.

Course Outcomes (COs):

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

CO1: Understand general concepts of Internet of Things
CO2: Apply design concept to IoT solutions
CO3: AnalyzevariousM2MandIoTarchitectures
CO4: Evaluated e sign issues in IoT applications
CO5: Create IoT solutions using sensors, actuators and Devices

UNIT I

Introduction to IoT: Definition and Characteristics of IoT, physical design of IoT, IoT protocols, IoT communication a. Ceaser cipher b. Substitution cipher c. Hill Cipher cation models, IoT Communication APIs, Communication protocols, Embedded Systems, IoT Levels and Templates

UNIT II

Prototyping IoT Objects using Microprocessor / Microcontroller: Working principles of sensors and actuators, setting up the board – Programming for IoT, Reading from Sensors, Communication: communication through Bluetooth, Wi-Fi.

UNIT III

IoT Architecture and Protocols: Architecture Reference Model Introduction, Reference Model and architecture, IoT reference Model, Protocols- 6LowPAN, RPL, CoAP, MQTT, IoT frameworks Thing Speak.

UNIT IV

Device Discovery and Cloud Services for IoT: Device discovery capabilities – Registering a device, Deregister a device, Introduction to Cloud Storage models and communication APIs Web-Server, Web server for IoT.

UNIT V

UAV IoT: Introduction to Unmanned Aerial Vehicles/Drones, Drone Types, Applications: Defense, Civil, Environmental Monitoring; UAV elements and sensors- Arms, motors, Electronic Speed Controller (ESC), GPS, IMU, Ultra sonic sensors; UAV Software –Arudpilot, Mission Planner, Internet of Drones(IoD)- Case study FlytBase.

Textbooks:

1.Vijay Madisetti and Arshdeep Bahga,"Internet of Things (A Hands-on-Approach)",1st Edition, VPT, 2014.

2.Handbook of unmanned aerial vehicles, K Valavanis; George JVachtsevanos, NewYork, Springer, Boston, Massachusetts: Credo Reference, 2014. 2016..

Reference Books:

1.Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Aves and, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things :Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.

2.Arshdeep Bahga, Vijay Madisetti-Internet of Things: A Hands-On Approach, Universities Press,2014.

3.The Internet of Things, Enabling technologies and use cases – Pethuru Raj, Anupama C. Raman, CRC Press.

4.Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013

5.Cuno Pfister, Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 978- 1-4493-9357-1

6.DGCA RPAS Guidance Manual, Revision 3 – 2020

7.Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs, John Baichtal

Online Courses & Resources

1. https://www.arduino.cc/
2. https://www.raspberrypi.org/
3. https://nptel.ac.in/courses/106105166/5
4. https://nptel.ac.in/courses/108108098/4

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

Minors in CSE(IoT) (R23)

23ACS25: Wireless Sensor Networks

L	T	P	C
3	0	0	3

Course Objectives:

1. To acquire the knowledge about various architectures and applications of Sensor Networks
2. To understand issues, challenges and emerging technologies for wireless sensor networks
3. To learn about various routing protocols and MAC Protocols
4. To understand various data gathering and data dissemination methods
5. To Study about design principals, node architectures, hardware and software required for implementation of wireless sensor networks.

Course Outcomes (COs):

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

CO1: Analyze and compare various architectures of Wireless Sensor Networks
CO2: Understand Design issues and challenges in wireless sensor networks
CO3: Analyze and compare various data gathering and data dissemination methods.
CO4: Design, Simulate and Compare the performance of various routing and MAC protocol

Unit I

Characteristics Of WSN: Characteristic requirements for WSN - Challenges for WSNs – WSN vs Adhoc Networks -Sensor node architecture – Commercially available sensor nodes –Imote, IRIS, MicaMote, EYES nodes, BTnodes, TelosB, Sunspot -Physical layer and transceiver design considerations in WSNs, Energy usage profile, Choice of modulation scheme, Dynamic modulation scaling, Antenna considerations.

Unit II

Medium Access Control Protocols: Fundamentals of MAC protocols - Low duty cycle protocols and wakeup concepts - Contention- based protocols-Schedule-based protocols-SMAC -BMAC -Traffic-adaptive medium access protocol (TRAMA) - The IEEE 802.15.4 MAC protocol.

Unit III

Routing And Data Gathering Protocols Routing Challenges and Design Issues in Wireless Sensor Networks, Flooding and gossiping – Data centric Routing – SPIN – Directed Diffusion – Energy aware routing - Gradient-based routing - Rumor Routing – COUGAR – ACQUIRE – Hierarchical Routing - LEACH, PEGASIS – Location Based Routing – GF, GAF, GEAR, GPSR – Real Time routing Protocols – TEEN, APTEEN, SPEED, RAP - Data aggregation - data aggregation operations - Aggregate Queries in Sensor Networks - Aggregation Techniques – TAG, Tiny DB.

Unit IV

Embedded Operating Systems: Operating Systems for Wireless Sensor Networks – Introduction - Operating System Design Issues - Examples of Operating Systems – TinyOS – Mate – MagnetOS – MANTIS- OSPM - EYES OS – SenOS – EMERALDS – PicOS – Introduction to Tiny OS – NesC – Interfaces and Modules- Configurations and Wiring - Generic Components -Programming in Tiny OS using NesC, Emulator TOSSIM.

Unit V

Applications Of WSN: WSN Applications - Home Control - Building Automation - Industrial Automation - Medical Applications - Reconfigurable Sensor Networks - Highway Monitoring - Military Applications - Civil and Environmental Engineering Applications-WildfireInstrumentation-HabitatMonitoring-NanoscopicSensorApplications –Case Study: IEEE802.15.4 LR-WPANs Standard - Target detection and tracking - Contour/edge detection - Field sampling.

TEXT BOOKS

1. Kazem Sohraby, Daniel Minoli and Taieb Znati, “Wireless Sensor Networks Technology, Protocols, and Applications”, John Wiley & Sons,2007.
2. Holger Karl and Andreas Willig, “Protocols and Architectures for Wireless Sensor Networks”, John Wiley & Sons, Ltd, 2005.

REFERENCE BOOKS

1. K.Akkaya and M.Younis, “A survey of routing protocols in wireless sensor networks”, Elsevier Ad Hoc Network Journal, Vol. 3, no. 3, pp. 325—349.
2. Philip Levis,“Tiny OS Programming”.
3. Anna Ha´c, “Wireless Sensor Network Designs”, John Wiley & Sons Ltd.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

Minors in CSE(IoT) (R23)

23ACO16: Communication Protocols for IoT

L	T	P	C
3	0	0	3

Course Objectives:

In this course, learners will be going to learn about various protocols designed for the implementation of the Internet of Things (IoT) applications.

Course Outcomes (COs):

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

CO1: Understand fundamentals of IoT architecture outline and standards.
CO2: Understand and analyze different architectural views.
CO3: Understand the importance of IoT Data Link Layer & Network Layer Protocols.
CO4: Understand the importance of Iot Transport & Session Layer Protocols.

UNIT - I

Introduction: IoT architecture outline, standards - IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service (XaaS), M2M and IoT Analytics.

Unit - II

Iot Reference Architecture: Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant Architectural views. Real-World Design Constraints- Introduction, Technical Design constraints.

UNIT - III

IoT Data Link Layer: PHY/MAC Layer (3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART, ZWave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7

UNIT - IV

Network Layer Protocols: Network Layer-IPv4,IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP.

UNIT - V

IOT Transport & Session Layer Protocols: Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS) – Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT.

TEXT BOOKS:

1. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications ,2016
2. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence",1st Edition, Academic Press, 2015.

REFERENCE BOOKS:

1. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-64219156-5 e-ISBN 978-3-642-19157-2, Springer, 2016.
2. N. Ida, Sensors, Actuators and Their Interfaces, Scitech Publishers, 2014.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

Minors in CSE(IoT) (R23)

23ACO19: Industrial IoT

L	T	P	C
3	0	0	3

Course Objectives:

1. Acquire theoretical knowledge on Industrial Internet of Things.
2. Apply suitable machine learning techniques for data handling and to gain knowledge from it.
3. Evaluate the performance of algorithms for sensors and data transmission.

Course Outcomes (COs):

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

CO1: Understand the characteristics of Internet of Things and its industry strategies.
CO2: Apply various Internet of Things models to appropriate problems.
CO3: Identify and integrate more than one technology to enhance the performance.
CO4: Understand the sensors and data transmission used in Internet of Things.
CO5: Analyse the co-occurrence of data to find interesting frequent patterns.
CO6: Pre-process the data before applying to any real-world problem and can evaluate its performance.

UNIT I

Overview of Internet of Things: Introduction, IOT Architecture, Application –based IOT protocols, Cloud Computing, Fog Computing, Sensor Cloud, Big Data.
Overview of Industry 4.0 and Industrial Internet of Things: IIoT- Prerequisites of IIOT, Basics of CPS, CPS and IIOT, Applications of IIoT.

UNIT II

Industrial Internet of Things: Introduction, Industrial Internet Systems, Industrial sensing, Industrial sensing, Industrial Processes.
Business Models and Reference Architecture of IIoT: Definition of a business model, Business models of IOT, Business models of IIOT.

UNIT III

Key and On-site Technologies: Key Technologies:Off-site Technologies- Introduction, Cloud Computing- Necessity, Cloud Computing and IIot, Industrial Cloud Platform Providers, SLA, Requirements of Industry 4.0, Fog Computing.
On-site Technologies- Introduction, Augmented Reality- History, Categorization, Applications, Virtual Reality- History, Categorization, Applications.

UNIT IV

Sensors and Data Transmission Sensors: Introduction to Sensors, Characteristics-Sensor calibration, Sensor profile, Operating voltage, Sensor Categories. Actuators:Introduction, Thermal Actuators, Hydraulic Actuators, Pneumatic Actuators, Electromechanical Actuators.
Industrial Data Transmission: Foundation fieldbus, Profibus, HART, Interbus, Bitbus.

UNIT V

Machine Learning and Data Science in Industries: Introduction, Machine Learning, Categorization on ML, Applications and Data Science of ML in industries, Deep Learning, Applications of Deep Learning in industries.

Applications of Healthcare in Industries: Smart Devices, Advanced Technologies using in Healthcare, Open Research Issues to be Addressed.

Textbooks:

1. S. Misra, C. Roy, and A. Mukherjee, 2020. Introduction to Industrial Internet of Things and Industry 4.0. CRC Press.

Reference Books:

1. Industrial IoT. Available online: https://medium.com/iotforall/whatproduct-managers-need-to-know-about-industrial-iot-8c92eec1d9d2

2. IIoT Cloud Platforms. Available online: https://fr.farnell.com/willthere-be-a-dominant-iiot-cloud-platform.

3. Kajima, T. and Kawamura, Y., 1995. Development of a high-speed solenoid valve: Investigation of solenoids. IEEE Transactions on industrial electronics, 42(1), pp.1-8.

Online Learning Resources:

1. https://www.coursera.org/learn/industrial-internet-of-things
2. https://www.coursera.org/specializations/developing-industrial-iot

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

Minors in CSE(IoT) (R23)

23ACS24: Cloud Computing

L	T	P	C
3	0	0	3

Course Objectives:

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

Course Outcomes (COs):

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

CO1: Ability to create cloud computing environment
CO2: Ability to design applications for Cloud environment
CO3: Design & amp; develop backup strategies for cloud data base don features.
CO4: Use and examine different cloud computing services.
CO5: Apply different cloud programming model as per need.

UNIT-I

Introduction to cloud computing: Introduction, Characteristics of cloud computing, Cloud Models, Cloud Services Examples, Cloud Based services and applications

Cloud concepts and Technologies: Virtualization, Load balancing, Scalability and Elasticity, Deployment, Replication, Monitoring, Software defined, Network function virtualization, Map Reduce, Identity and Access Management, services level Agreements, Billing.

Cloud Services and Platforms: Compute Services, Storage Services, Database Services, Application services, Content delivery services, Analytics Services, Deployment and Management Services, Identity and Access Management services, Open Source Private Cloud software.

UNIT-II

Hadoop MapReduce: Apache Hadoop, Hadoop Map Reduce Job Execution, Hadoop Schedulers, Hadoop Cluster setup.

Cloud Application Design: Reference Architecture for Cloud Applications, Cloud Application Design Methodologies, Data Storage Approaches.

Python Basics: Introduction, Installing Python, Python data Types & Data Structures, Control flow, Function, Modules, Packages, File handling, Date/Time Operations, Classes.

UNIT-III

Python for Cloud: Python for Amazon web services, Python for Google Cloud Platform, Python for windows Azure, Python for MapReduce, Python packages of Interest, Python web Application Frame work, Designing a RESTful web API.

Cloud Application Development in Python :Design Approaches, Image Processing APP, Document Storage App, MapReduce App, Social Media Analytics App.

UNIT-IV

Big Data Analytics: Introduction, Clustering Big Data, Classification of Bigdata Recommendation of Systems. Multimedia Cloud: Introduction, Case Study: Live video Streaming App, Streaming Protocols, case Study: Video Transcoding App.

Cloud Application Benchmarking and Tuning: Introduction, Workload Characteristics, Application

Performance Metrics, Design Considerations for a Benchmarking Methodology,
Benchmarking Tools, Deployment Prototyping, Load Testing & Bottleneck Detection case Study, Hadoop benchmarking case Study.

UNIT-V

Cloud Security: Introduction, CSA Cloud Security Architecture, Authentication, Authorization, Identity Access Management, Data Security, Key Management, Auditing.

Cloud for Industry, Healthcare & Education: Cloud Computing for Health care, Cloud computing for Energy Systems, Cloud Computing for Transportation Systems, Cloud Computing for Manufacturing Industry, Cloud computing for Education.

Migrating into a Cloud: Introduction, Broad Approaches to migrating into the cloud, the seven– step model of migration into a cloud.

Organizational readiness and Change Management in The Cloud Age: Introduction, Basic concepts of Organizational Readiness, Drivers for changes: A frame work to comprehend the competitive environment, common change management models, change management maturity models, Organizational readiness self – assessment.

Legal Issues in Cloud Computing: Introduction, Data Privacy and security Issues, cloud contracting models, Jurisdiction a issues raised by virtualization and data location, commercial and
Business considerations, Special Topics.

Textbooks:

1.Cloud computing A hands-on Approach‖ By ArshdeepBahga, Vijay Madisetti, Universities Press, 2016

2.Cloud Computing Principles and Paradigms: By Raj Kumar Buyya, James Broberg, Andrzej, Goscinski, Wiley, 2016.

Reference Books:

1. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S ThamaraiSelvi, TMH

2. Cloud computing A Hands-On Approach by ArshdeepBahga and Vijay Madisetti.

3. Cloud Computing: A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, Tata McGraw Hill, rp2011.

4. Enterprise Cloud Computing, Gautam Shroff, Cambridge University Press, 2010.

5. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, George Reese, O ‘Reilly, SPD, rp2011.

6. Essentials of Cloud Computing by K. Chandrasekaran. CRC Press.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

Minors in CSE(IoT) (R23)

23ACO02: Internet of Things Lab

L	T	P	C
0	0	3	1.5

Course Objectives:

1. To introduce components such as WiFi, Bluetooth, Temperature, Moisture sensors
2. To know the Micro controller such as Arduino
3. To know the System on Chip (SOC) / Single Board Computer such as Raspberry Pi
4. To understand HTTP IoT protocols and perform Experiments for data transmission
5. To understand UAV/Drones and Internet of Drones Experiments.

Course Outcomes (COs):

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

CO1: Know the various IoT sensors and understand the functionality
CO2: Design and analyzeIoT experiments and transfer the data to IoT Clouds
CO3: Design the IoT systems for real time applications
CO4: Understand Drones and Perform Internet of Drones Experiments

List of Experiments:

Experiments using ESP32

1. Serial Monitor, LED, Servo Motor - Controlling

Experiment1: Controlling actuators through Serial Monitor. Creating different ledpatterns and controlling them using push button switches. Controlling servo motor with the help of joystick.

2. Distance Measurement of an object

Experiment 2: Calculatethe distance to an object with the help of an ultrasonic sensor and display it on an LCD.

3, LDR Sensor, Alarm and temperature, humidity measurement

Experiment 3:

- Controlling relay state based on ambient light levels using LDR sensor.
- Basic Burglar alarm security system with the help of PIR sensor and buzzer.
- Displaying humidity and temperature values on LCD

4. Experiments using Raspberry Pi

Experiment 4:

- Controlling relay state based on input from IR sensors
- Interfacing stepper motor with R-Pi
- Advanced burglar alarm security system with the help of PIR sensor, buzzer and keypad. (Alarm gets disabled if correct keypad password is entered)
- Automated LED light control based on input from PIR (to detect if people are present) and LDR(ambient light level)

5. IOT Framework

Experiment 5: Upload humidity & temperature data to ThingSpeak, periodically logging ambient light level to ThingSpeak

Experiment 6: Controlling LEDs, relay & buzzer using Blynk app

6. HTTP Based

Experiment 7: Introduction to HTTP. Hosting a basic server from the ESP32 to control various digital based actuators (led, buzzer, relay) from a simple web page.

Experiment 8:Displaying various sensor readings on a simple web page hosted on the ESP32.

7. MQTT Based

Experiment 9:Controlling LEDs/Motors from an Android/Web app, Controlling AC Appliances from an android/web app with the help of relay.

Experiment 10:

Displaying humidity and temperature data on a web-based application

8. UAV/Drone:

Experiment 11:

- Demonstration of UAV elements, Flight Controller
- Mission Planner flight planning design

Experiment 12:

- Python program to read GPS coordinates from Flight Controller

Reference:

1. Adrian McEwen, Hakim Cassimally - Designing the Internet of Things, Wiley Publications, 2012.
2. Alexander Osterwalder, and Yves Pigneur – Business Model Generation – Wiley, 2011
3. ArshdeepBahga, Vijay Madisetti - Internet of Things: A Hands-On Approach, Universities Press, 2014.
4. The Internet of Things, Enabling technologies and use cases – Pethuru Raj, Anupama C. Raman, CRC Press.

Online Learning Resources/Virtual Labs:

https://www.arduino.cc/

https://www.raspberrypi.org/

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

Minors in CSE(IoT) (R23)

23ACS26: Cloud Computing Lab

L	T	P	C
0	0	3	1.5

Course Objectives:

1. Demonstrate application development using Cloud
2. Explain features of Hadoop

Course Outcomes (CO):

On completion of this course, the students will be able to:

CO1: Configure various virtualization tools such as Virtual Box, VMware workstation.
CO2: Design and deploy a web application in a PaaS environment.
CO3: Learn how to simulate a cloud environment to implement new schedulers.
CO4: Install and use a generic cloud environment that can be used as a private cloud.
CO5: Manipulate large data sets in a parallel environment.

List of Experiments:

1. Install VirtualBox/VMware Workstation with different flavours of Linux or windows OS on top of windows operating systems.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Install Google App Engine. Create hello world app and other simple web applications using python/java.
4. Use GAE launcher to launch the web applications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
7. Find a procedure to launch virtual machine using try stack (Online Open stack Demo Version)
8. Install Hadoop single node cluster and run simple applications like wordcount
9. Establish an AWS account. Use the AWS Management Console to launch an EC2 instance and connect to it.
10. Develop a Guestbook Application using Google App Engine
11. Develop a Serverless Web App using AWS
12. Design a Content Recommendation system using AWS
13. Design a Cloud based smart traffic management system
14. Design Cloud based attendance management system
15. Design E-learning cloud-based system
16. Using Amazon Lex build a Chatbot

References:

- https://www.vmware.com/products/workstation-pro/workstation-pro evaluation.html.
- http://code.google.com/appengine/downloads.html
- http://code.google.com/appengine/downloads.html

Online Learning Resources/Virtual Labs:

- Google Cloud Computing Foundations Cour

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

III B. Tech. - I Semester

23ACD36	DATA SCIENCE FOR ENGINEERS	L	T	P	C
		3	0	0	3

Course Objectives:

- Provide a foundational understanding of data science processes and applications.
- Introduce key tools and techniques such as Python, statistics, data cleaning, visualization, and machine learning.
- Develop practical skills in data analysis, interpretation, and data storytelling.
- Enable students to work on real-world datasets using data science techniques.
- Prepare students for advanced studies or industry roles in data science and analytics.

Course Outcomes:

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

CO1:	Explain the data science lifecycle and its importance in business and research.	Understand(L2)
CO2:	Use Python and libraries like Pandas, NumPy, and Matplotlib for data handling.	Apply(L3)
CO3:	Perform data cleaning, transformation, and visualization effectively.	Apply(L3)
CO4:	Apply basic machine learning models for classification and regression.	Apply(L3)
CO5:	Interpret data analysis results and communicate findings clearly.	Analyze(L4)

Unit I: Introduction to Data Science: What is Data Science?,Role of Data Scientist, Data Science Process (Problem definition, data collection, preprocessing, modeling, evaluation), Applications of Data Science in different domains, Tools: Jupyter, Anaconda, Python/R Overview

Unit II: Data Handling and Preprocessing: Introduction to NumPy and Pandas, Reading data from CSV, Excel, SQL, Data Wrangling: Missing values, duplicates, outliers, Data transformation: Scaling, encoding, Feature engineering basics

Unit III: Data Visualization: Importance of visualization, Visualization libraries (Matplotlib, Seaborn), Histograms, Boxplots, Pairplots, Heatmaps, Dashboards and Storytelling with Data, Real-time data dashboards (Optional)

Unit IV: Statistical Foundations for Data Science: Descriptive Statistics, Probability and Probability Distributions, Inferential Statistics: Hypothesis Testing, Confidence Intervals, Correlation and Causation, Use of Scipy/Statsmodels for statistical analysis

Unit V: Introduction to Machine Learning: Supervised vs Unsupervised Learning, Classification and Regression problems, Basic ML Algorithms: Linear Regression, Logistic Regression, KNN, Decision Trees, Model Evaluation Metrics: Accuracy, Precision, Recall, F1-Score, Overfitting and Underfitting

Textbooks:

1. **Joel Grus –** Data Science from Scratch: First Principles with Python, O'Reilly.
2. **Cathy O'Neil and Rachel Schutt –** Doing Data Science, O'Reilly.
3. **Wes McKinney –** Python for Data Analysis, O'Reilly.

Reference Books:

1. **Jake VanderPlas –** Python Data Science Handbook, O'Reilly.
2. **Andreas Müller & Sarah Guido –** Introduction to Machine Learning with Python.
3. **Han, Kamber, & Pei –** Data Mining: Concepts and Techniques, Morgan Kaufmann.

Online Courses:

NPTEL / SWAYAM:

- NPTEL: Introduction to Data Science
  Instructor: Prof. Raghunathan Rengasamy, IIT Madras

Coursera:

- **IBM Data Science Professional Certificate**
  Link: coursera.org
- **Introduction to Data Science in Python (University of Michigan)**
  Link: coursera.org

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

III B. Tech. - I Semester

23ACD37	STATISTICAL LEARNING FOR DATA SCIENCE	L	T	P	C
		3	0	0	3

Course Objectives:

- Introduce fundamental concepts of statistical learning and its importance in data science.
- Develop understanding of regression, classification, and resampling methods.
- Build skills in model assessment, selection, and regularization techniques.
- Apply statistical learning methods to real-world datasets.
- Interpret, communicate, and evaluate data-driven models.

Course Outcomes:

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

CO1:	Understand the basics of statistical learning and data representation.	Understand(L2)
CO2:	Apply linear regression, logistic regression, and classification techniques.	Apply(L3)
CO3:	Evaluate models using resampling methods and cross-validation.	Evaluate(L5)
CO4:	Analyze regularization methods like Ridge and Lasso to avoid overfitting.	Analyze(L4)
CO5:	Create and interpret statistical learning models in practical scenarios.	Create(L6)

U**nit I: Introduction to Statistical Learning:** What is Statistical Learning?, Supervised vs Unsupervised Learning, Model Accuracy vs Interpretability, Bias-Variance Trade-off, Curse of Dimensionality, Applications of Statistical Learning

Unit II: Linear and Polynomial Regression: Simple Linear Regression. Multiple Linear Regression, Polynomial Regression, Assumptions of Linear Models, Model Diagnostics and Performance Metrics (R^2, RMSE), Variable Selection Techniques

Unit III: Classification Methods: Logistic Regression, Discriminant Analysis (LDA, QDA), Naïve Bayes Classifier, K-Nearest Neighbors, Confusion Matrix, Precision, Recall, F1-Score

Unit IV: Resampling and Model Assessment: Train-Test Split, Cross Validation (k-Fold, LOOCV), Bootstrap Methods, Model Selection and Hyperparameter Tuning.

Unit V: Regularization & Advanced Topics: Ridge Regression, Lasso Regression, Shrinkage Methods, Principal Component Regression (PCR), Partial Least Squares (PLS), Introduction to Support Vector Machines.

Textbooks:

1. **Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani** An Introduction to Statistical Learning with Applications in R – Springer (Free PDF: https://www.statlearning.com/)
2. **Trevor Hastie, Robert Tibshirani, Jerome Friedman** The Elements of Statistical Learning – Springer

Reference Books:

1. **Norman Matloff –** Statistical Regression and Classification: from R to Data Science
2. **Chris Bishop –** Pattern Recognition and Machine Learning
3. **T. Ryan –** Modern Regression Methods

Online Courses (Free + Paid)

NPTEL / SWAYAM:

- NPTEL: Introduction to Statistical Learning
  Instructor: Prof. Balaraman Ravindran (IIT Madras)

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

III B. Tech. - II Semester

23ACD38	INTRODUCTION TO DATA ENGINEERING	L	T	P	C
		3	0	0	3

Course Objectives:

- Understand the data engineering lifecycle, tools, and platforms.
- Gain proficiency in building scalable data pipelines using batch and streaming systems.
- Explore data storage formats, data lakes, and warehouses.
- Learn about workflow orchestration, scheduling, and data quality.
- Apply data engineering techniques in real-time and big data environments.

Course Outcomes:

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

CO1:	Understand the foundations of data engineering tools, platforms, and data lifecycle.	Understand(L2)
CO2:	Design and implement batch and streaming data pipelines.	Apply(L3)
CO3:	Analyze data storage and querying using file formats, data lakes, and warehouses.	Analyze(L4)
CO4:	Evaluate orchestration and workflow management tools.	Evaluate(L5)
CO5:	Build end-to-end data engineering workflows and troubleshoot data quality issues.	Create(L6)

Unit I: Introduction to Data Engineering: What is Data Engineering? Data Engineering vs Data Science, Data Lifecycle and Architectures, Roles and Responsibilities of a Data Engineer, Tools Overview: Hadoop, Spark, Kafka, Airflow, Hive.

Unit II: Data Storage and Formats: Structured, Semi-structured, and Unstructured Data, File Formats: CSV, JSON, Parquet, Avro, ORC, Data Warehousing Concepts (Star/Snowflake Schema), Data Lakes vs Data Warehouses, Cloud Storage Solutions (S3, Azure Blob, GCS)

Unit III: Batch and Stream Processing: ETL vs ELT, Batch Processing with Apache Spark, Stream Processing with Apache Kafka and Spark Streaming, Windowing, Late Events, and Watermarks, Lambda and Kappa Architectures.

Unit IV: Workflow Orchestration & Data Quality: Introduction to Apache Airflow, DAGs, Operators, Scheduling, Data Lineage and Observability, Data Profiling, Cleaning, Validation, Ensuring Data Quality with Great Expectations.

Unit V: End-to-End Pipeline and Case Studies: Designing a Data Pipeline: Source to Sink, Real-time Analytics with Kafka + Spark + Cassandra, Monitoring and Logging, CI/CD in Data Engineering (using GitHub Actions or Jenkins), Case Studies: Fraud Detection, Log Analysis, and Recommendation Engine.

Textbooks:

1. **Andreas François Vermeulen**, The Data Engineering Cookbook – Packt
2. **Joe Reis and Matt Housley**, Fundamentals of Data Engineering – O'Reilly, 2022
3. **Anurag Bhardwaj**, Data Engineering with Apache Spark, Delta Lake, and Lakehouse – Packt

Reference Books:

1. Designing Data-Intensive Applications – Martin Kleppmann (O'Reilly)
2. Streaming Systems: The What, Where, When, and How of Large-Scale Data Processing – Tyler Akidau

Online Courses:

NPTEL / SWAYAM

- NPTEL: Big Data Computing
- NPTEL: Cloud Computing and Distributed Systems

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

III B. Tech. - II Semester

23ACM34	MACHINE LEARNING FUNDAMENTALS	L	T	P	C
		3	0	0	3

Course Objectives:

- Understand core concepts of supervised, unsupervised, and reinforcement learning.
- Learn foundational algorithms for classification, regression, and clustering.
- Analyze model performance using evaluation metrics and tuning methods.
- Gain practical knowledge in implementing ML models using datasets.
- Understand the mathematical and probabilistic foundations of ML algorithms.

Course Outcomes:

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

CO1:	Understand the concepts and assumptions behind key ML algorithms.	Understand(L2)
CO2:	Apply various supervised and unsupervised learning techniques.	Apply(L3)
CO3:	Analyze the strengths and limitations of different machine learning models.	Analyze(L4)
CO4:	Evaluate model performance using metrics and validation techniques.	Evaluate(L5)
CO5:	Design and implement complete ML solutions for real-world problems.	Create(L6)

Unit I: Introduction to Machine Learning:

Definition and Scope of ML, Types of Learning: Supervised, Unsupervised, Reinforcement, Basic Terminology: Instance, Feature, Label, Training and Testing Sets, Applications and Challenges, Python Libraries: scikit-learn, pandas, numpy

Unit II: Supervised Learning – Regression & Classification

Linear Regression, Polynomial Regression, Logistic Regression, k-Nearest Neighbors (k-NN), Decision Trees and Random Forests, Naïve Bayes Classifier

Unit III: Unsupervised Learning & Dimensionality Reduction,

k-Means Clustering, Hierarchical Clustering, Principal Component Analysis (PCA), t-SNE, Autoencoders (Intro Only). Association Rule Mining,

Unit IV: Model Evaluation and Tuning

Confusion Matrix, Precision, Recall, F1-Score, ROC-AUC, Bias-Variance Tradeoff, Cross-Validation, Hyperparameter Tuning: Grid Search & Random Search, Overfitting & Underfitting

Unit V: Advanced Topics & Real-time Applications

Introduction to Neural Networks (Perceptron), Introduction to SVMs, Feature Engineering & Selection, Real-world Use Cases: Spam Detection, Credit Scoring, Medical Diagnosis, Ethical AI and Model Explainability (XAI – Intro Only).

Textbooks:

1.Tom M. Mitchell, Machine Learning, McGraw-Hill, 1997

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

IV B. Tech. - I Semester

23ACD39	DATA SCIENCE APPLICATIONS	L	T	P	C
		3	0	0	3

Course Objectives:

- Understand key domains where data science plays a transformative role.
- Learn how data is collected, preprocessed, and analyzed in different domains.
- Explore application-driven problem-solving using real-world datasets.
- Evaluate models and interpret data science outputs effectively.
- Gain hands-on exposure to tools and techniques used in data science applications.

Course Outcomes:

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

CO1:	Explain the role and impact of data science across various application areas.	Understand(L2)
CO2:	Apply suitable data science methods to domain-specific datasets.	Apply(L3)
CO3:	Analyze domain-specific problems using exploratory and predictive techniques.	Analyze(L4)
CO4:	Evaluate model effectiveness and insights in practical use cases.	Evaluate(L5)
CO5:	Design data-driven solutions for real-world problems.	Create(L6)

Unit I: Introduction to Data Science & Domains

Definition and Workflow of Data Science. Lifecycle of a Data Science Project, Overview of Applications: Healthcare, Finance, Retail, Manufacturing, Agriculture, Education, and Smart Cities, Ethical Considerations in Data Science.

Unit II: Data Science in Healthcare and Finance

Use cases: Disease prediction, EHR data, medical imaging, outbreak modelling, Predictive modeling for diagnosis (e.g., Diabetes prediction), Applications in FinTech: Fraud detection, Risk scoring, Credit analytics, Time series analysis in financial markets.

Unit III: Data Science in Retail, Marketing & Customer Analytics

Market basket analysis, Recommendation Systems, Customer Segmentation using Clustering, Churn Prediction Models, Sentiment Analysis for Customer Feedback.

Unit IV: Data Science in Smart Cities, Agriculture & Education

Traffic prediction, Waste management using ML, IoT-enabled Smart Farming and Yield prediction, Adaptive Learning and Student Performance Prediction, Case studies with real-world datasets.

Unit V: Tools, Case Studies, and Deployment

Case Studies on End-to-End Projects, Tools: Python, Jupyter, Power BI, Tableau, Deploying Models: APIs, Streamlit, Flask, Interpreting Results and Storytelling, Recent Advances and Future Directions

Textbooks:

1. Joel Grus, Data Science from Scratch, O'Reilly, 2nd Edition.
2. Cathy O'Neil & Rachel Schutt, Doing Data Science, O'Reilly Media.
3. V. K. Jain, Data Science and Big Data Analytics, Khanna Publishing.

Reference Books:

1. Wes McKinney, Python for Data Analysis, O'Reilly.
2. Sebastian Raschka, Machine Learning with Python Cookbook, Packt.
3. Bill Franks, Taming the Big Data Tidal Wave, Wiley.

Online Courses:

NPTEL / SWAYAM

- NPTEL – Data Science for Engineers
- SWAYAM – Data Science Applications

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

III B. Tech. - II Semester

23ACD40	DATA SCIENCE PRACTICE LAB (R/Python)	L	T	P	C
		0	0	3	1.5

Course Objectives:

- To introduce basic data analysis using R/Python.
- To understand data wrangling, visualization, and preprocessing.
- To develop skills in exploratory data analysis and simple ML models

Course Outcomes:

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

- Apply Python/R for real-time data handling.
- Perform data visualization and preprocessing.
- Build basic machine learning models.

Experiments:

1. Introduction to Python/R and IDE setup
2. Data Types, Variables, and Operators
3. Reading and writing CSV/Excel data
4. Data Cleaning and Wrangling (nulls, types, etc.)
5. Exploratory Data Analysis with Matplotlib/ggplot2
6. Correlation and Covariance Calculation
7. Linear Regression implementation
8. Classification using KNN
9. Clustering using K-Means
10. Data Visualization using Seaborn
11. Building simple ML pipeline using scikit-learn
12. Data analysis on real-world dataset

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)

IV B. Tech. - I Semester

23ACD41	STATISTICAL LEARNING & ML LAB	L	T	P	C
		0	0	3	1.5

Course Objectives

- To explore statistical methods for data science.
- To apply statistical learning to predictive modelling.

Course Outcomes:

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

- Utilize statistical models in data science tasks.
- Implement regression and classification algorithms.

Experiments:

1. Introduction to probability distributions
2. Descriptive statistics on datasets
3. Hypothesis testing
4. Linear Regression and visualization
5. Logistic Regression for classification
6. Decision Trees
7. Random Forests
8. Confusion Matrix and Accuracy metrics
9. Cross-validation techniques
10. Feature scaling and encoding
11. Principal Component Analysis
12. Regression or Classification on dataset

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

III B. Tech - I Semester

23ACM33- ESSENTIALS OF ARTIFICIAL INTELLIGENCE	**L**	**T**	**P**	**C**
	3	0	0	3

Course Objectives

- Understand the fundamental concepts and historical evolution of Artificial Intelligence.
- Learn various problem-solving approaches using AI algorithms.
- Gain insights into knowledge representation, reasoning, and planning techniques.
- Explore basic machine learning and neural network models.
- Familiarize with real-world AI applications and ethical implications.

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

CO1 Explain the foundational principles and history of AI.	Understand (L2)
CO2 Apply AI techniques for problem-solving and decision-making.	Apply (L3)
CO3 Analyze search strategies and knowledge representation models.	Analyze (L4)
CO4 Evaluate the effectiveness of learning algorithms and intelligent agents.	Evaluate (L5)
CO5 Design simple AI-based systems or prototypes using AI concepts.	Create (L6)

Unit I: Introduction to Artificial Intelligence

Definition and applications of AI, History and evolution of AI, Intelligent agents – types and environments, AI techniques: Symbolic AI, Sub-symbolic AI

Unit II: Problem Solving and Search Strategies

Problem formulation, Uninformed search: BFS, DFS, Uniform Cost, Informed search: Greedy, A* search, Local search: Hill climbing, Simulated annealing, Constraint satisfaction problems

Unit III: Knowledge Representation and Reasoning

Propositional and First-Order Logic, Forward and backward chaining, Rule-based systems and ontologies, Semantic networks, frames, Uncertainty: Bayesian reasoning, fuzzy logic

Unit IV: Machine Learning Basics

Overview of supervised, unsupervised, reinforcement learning, Decision Trees, k-NN, Naïve Bayes, Basic concepts of neural networks and perceptron, Training and testing

Unit V: Applications of AI and Ethical Issues

AI in Robotics, NLP, Vision, Healthcare, Finance, Chatbots and virtual assistants, AI biases, fairness, explainability, Social and legal implications of AI, Future trends: AGI, ethical AI datasets, Evaluation metrics: Accuracy, precision, recall, F1-score

Textbooks

1. **Stuart Russell & Peter Norvig**, *Artificial Intelligence: A Modern Approach*, 4th Edition, Pearson
2. **Elaine Rich, Kevin Knight**, *Artificial Intelligence*, 3rd Edition, McGraw-Hill
3. **Dan W. Patterson**, *Introduction to Artificial Intelligence and Expert Systems*, PHI

Reference Books

1. **Kevin Murphy**, *Machine Learning: A Probabilistic Perspective*, MIT Press
2. **Nils J. Nilsson**, *The Quest for Artificial Intelligence*, Cambridge
3. **Tom Mitchell**, *Machine Learning*, McGraw-Hill

Online Courses

1. CourseraAI For Everyone – Andrew Ng

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

III B. Tech - I Semester

23ACM34 - MACHINE LEARNING FUNDAMENTALS

L	T	P	C
3	0	0	3

Course Objectives

- Understand core concepts of supervised, unsupervised, and reinforcement learning.
- Learn foundational algorithms for classification, regression, and clustering.
- Analyze model performance using evaluation metrics and tuning methods.
- Gain practical knowledge in implementing ML models using datasets.
- Understand the mathematical and probabilistic foundations of ML algorithms.

Course Outcomes

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

CO1	Understand the concepts and assumptions behind key ML algorithms.	Understand (L2)
CO2	Apply various supervised and unsupervised learning techniques.	Apply (L3)
CO3	Analyze the strengths and limitations of different machine learning models.	Analyze (L4)
CO4	Evaluate model performance using metrics and validation techniques.	Evaluate (L5)
CO5	Design and implement complete ML solutions for real-world problems.	Create (L6)

Unit I: Introduction to Machine Learning:
Definition and Scope of ML, Types of Learning: Supervised, Unsupervised, Reinforcement, Basic Terminology: Instance, Feature, Label, Training and Testing Sets, Applications and Challenges, Python Libraries: scikit-learn, pandas, numpy

Unit II: Supervised Learning – Regression & Classification

Linear Regression, Polynomial Regression, Logistic Regression, k-Nearest Neighbors (k-NN), Decision Trees and Random Forests, Naïve Bayes Classifier

Unit III: Unsupervised Learning & Dimensionality Reduction,

k-Means Clustering, Hierarchical Clustering, Principal Component Analysis (PCA), t-SNE, Autoencoders (Intro Only). Association Rule Mining,

Unit IV: Model Evaluation and Tuning

Confusion Matrix, Precision, Recall, F1-Score, ROC-AUC, Bias-Variance Tradeoff, Cross- Validation, Hyperparameter Tuning: Grid Search & Random Search, Overfitting & Underfitting.

Unit V: Advanced Topics & Real-time Applications

Introduction to Neural Networks (Perceptron), Introduction to SVMs, Feature Engineering & Selection, Real-world Use Cases: Spam Detection, Credit Scoring, Medical Diagnosis, Ethical AI and Model Explainability (XAI – Intro Only)

Textbooks

Tom M. Mitchell, *Machine Learning*, McGraw-Hill, 1997.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

III B. Tech - II Semester

23ACM35- DEEP LEARNING & NEURAL NETWORKS	**L**	**T**	**P**	**C**
	3	0	0	3

Course Objectives

- Understand the fundamentals of deep learning and neural networks.
- Analyze and implement feedforward, convolutional, and recurrent neural networks.
- Learn key optimization techniques and regularization methods.
- Explore architectures like CNN, RNN, LSTM for various applications.
- Apply deep learning models to real-world problems in vision, NLP, and speech.

Course Outcomes (COs)
After successful completion of the course, the student will be able to:
CO1 Explain the structure and working of deep neural networks. Understand (L2)
CO2 Analyze the learning process and optimization strategies in deep learning. Analyze (L4)
CO3 Apply CNNs and RNNs to practical problems like image and sequence processing. Apply (L3)
CO4 Evaluate the performance of models using loss functions and regularization. Evaluate (L5)
CO5 Design and implement deep learning models using modern frameworks. Create (L6)

Unit I: Introduction to Deep Learning

Basics of machine learning and need for deep learning, Biological and artificial neurons, Activation functions: Sigmoid, Tanh, ReLU, Leaky ReLU, Perceptron and Multi-Layer Perceptron (MLP), Backpropagation algorithm

Unit II: Optimization and Regularization

Cost functions: Cross-entropy, MSE, Gradient descent, SGD, Momentum, RMSProp, Adam, Overfitting and underfitting, Regularization: L1, L2, Dropout, Batch Normalization, Weight initialization techniques

Unit III: Convolutional Neural Networks (CNN)

Convolution operation, filters, feature maps, Pooling layers, padding, stride, CNN architectures: LeNet, AlexNet, VGGNet, ResNet, Applications in image classification and object detection.

Unit IV: Recurrent Neural Networks (RNNs) and LSTMs
Sequence modeling basics, RNN architecture and backpropagation through time, Vanishing/exploding gradient problems, Long Short-Term Memory (LSTM) and GRU, Applications: Text generation, machine translation, time-series

Unit V: Generative Models and Applications

Autoencoders and Variational Autoencoders (VAE), Generative Adversarial Networks (GANs), Transfer learning and pre-trained models, Deep learning applications in vision, NLP, healthcare, Deployment considerations (TensorFlowLite, ONNX, etc.)

Textbooks

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville – *Deep Learning*, MIT Press
2. François Chollet – *Deep Learning with Python*, Manning Publications
3. Josh Patterson & Adam Gibson – *Deep Learning: A Practitioner's Approach*, O'Reilly

Reference Books

1. Michael Nielsen – *Neural Networks and Deep Learning* (online free book)
2. Nikhil Buduma – *Fundamentals of Deep Learning*, O'Reilly
3. Simon Haykin – *Neural Networks and Learning Machines*, Pearson

Online Courses

Coursera Deep Learning Specialization – Andrew Ng

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

III B. Tech - II Semester

23ACM36- INTRODUCTION TO NATURAL LANGUAGE PROCESSING (NLP)	**L**	**T**	**P**	**C**
	3	0	0	3

Course Objectives

- Understand the foundational concepts of NLP and linguistics.
- Explore text preprocessing and linguistic analysis techniques.
- Apply NLP techniques for syntactic and semantic analysis.
- Utilize NLP tools for information retrieval, summarization, and sentiment analysis.
- Design and build machine learning and deep learning models for NLP applications.

Course Outcomes (COs)
After successful completion of the course, the student will be able to:

CO1	Understand language structure and basic NLP pipeline.	Understand (L2)
CO2	Apply text processing and feature extraction techniques.	Apply (L3)
CO3	Analyze syntactic and semantic structures using NLP tools.	Analyze (L4)
CO4	Evaluate NLP models and select suitable algorithms for various tasks.	Evaluate (L5)
CO5	Design NLP-based solutions using ML/DL models for real-world applications.	Create (L6)

Unit I: Introduction to NLP & Linguistics

NLP tasks and applications. Components of NLP: Morphology, syntax, semantics, pragmatics, Linguistic essentials: POS tagging, Lemmatization, Stemming, Languagemodeling: N-grams, Smoothing techniques, Perplexity

Unit II: Text Processing & Feature Engineering

Text preprocessing: Tokenization, normalization, stopword removal, Feature extraction: Bag of Words, TF-IDF, Word embeddings (Word2Vec, GloVe), Dimensionality reduction: PCA, LSA

Unit III: Syntax & Parsing Techniques

POS tagging algorithms: Rule-based, HMM, CRF, Syntax trees and dependency parsing, Context- Free Grammars (CFG), CYK algorithm

Unit IV: Semantics & Discourse Processing

Named Entity Recognition (NER).Word Sense Disambiguation (WSD). Semantic similarity and clustering. Sentiment analysis and emotion detection

Unit V: NLP with Machine Learning & Deep Learning

Text classification using Naïve Bayes, SVM, RNN, LSTM, GRU for sequence modelling, Transformer-based models (BERT, GPT), Applications: Chatbots, Summarization, Translation

Textbooks

1. **Daniel Jurafsky and James H. Martin –** *Speech and Language Processing*, Pearson
2. **Steven Bird, Ewan Klein, Edward Loper –** *Natural Language Processing with Python*, O'Reilly
3. **Yoav Goldberg –** *Neural Network Methods in NLP*, Morgan & Claypool

Reference Books

1. **Jacob Eisenstein –** *Introduction to Natural Language Processing*, MIT Press
2. **Chris Manning –** Stanford NLP resources (online)
3. **Allen & Unwin –** *Foundations of Statistical Natural Language Processing*

Online Courses

1. Coursera-Natural Language Processing Specialization – DeepLearning.AI

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

IV B. Tech - I Semester

23ACM37 - INTRODUCTION TO COMPUTER VISION

L	T	P	C
3	0	0	3

Course Objectives

- Understand the fundamentals of image formation, representation, and basic processing.
- Explore key concepts of feature detection, segmentation, and motion tracking.
- Apply machine learning and deep learning techniques in visual recognition tasks.
- Analyze real-time applications of computer vision in various domains.
- Implement and evaluate computer vision algorithms using Python/OpenCV frameworks.

Course Outcomes (COs)
After successful completion of the course, the student will be able to:

CO1 Understand the principles of digital image formation and transformation. Understand (L2)
CO2 Apply computer vision algorithms for image enhancement and feature extraction. Apply (L3)
CO3 Analyze object recognition, detection, and classification techniques. Analyze (L4)
CO4 Evaluate deep learning models for vision tasks like segmentation and tracking. Evaluate (L5)
CO5 Design and implement real-world computer vision applications. Create (L6)

Unit I: Fundamentals of Computer Vision
Introduction to computer vision and image formation, Camera models: pinhole, orthographic, perspective, Digital images: pixels, intensity, channels, color spaces (RGB, HSV, YCbCr), Basic image operations: filtering, edge detection (Sobel, Canny)

Unit II: Image Processing and Feature Detection
Histograms, thresholding, contrast adjustment, Convolution, Gaussian smoothing, Laplacian, Feature detection: corners (Harris, FAST), blobs (LoG, DoG), edges, SIFT, SURF, ORB for local features

Unit III: Image Segmentation and Object Recognition
Region-based segmentation: region growing, split and merge, Clustering: K-means, Mean-shift, Morphological operations, Object detection: Haar cascades, HOG+ SVM, Viola-Jones.

Unit IV: Motion Analysis and 3D Vision
Optical flow: Horn-Schunck, Lucas-Kanade, Background subtraction, moving object detection, Structure from Motion(SfM), Stereo vision, depth estimation.

Unit V: Deep Learning in Computer Vision
Introduction to CNNs (Convolutional Neural Networks), Architectures: LeNet, AlexNet, VGG, ResNet, Object detection using YOLO, SSD, Faster R-CNN, Image segmentation using U-Net, Mask R-CNN, Applications: face recognition, self-driving cars, surveillance.

Textbooks

1. **Richard Szeliski** – *Computer Vision: Algorithms and Applications*, Springer
2. **Gonzalez & Woods** – *Digital Image Processing*, Pearson
3. **Simon Prince** – *Computer Vision: Models, Learning, and Inference*, Cambridge University Press

Reference Books

1. **Gary Bradski& Adrian Kaehler** – *Learning OpenCV*, O'Reilly
2. **David Forsyth & Jean Ponce** – *Computer Vision: A Modern Approach*, Pearson
3. **Ian Goodfellow et al.** – *Deep Learning*, MIT Press (for Unit V)

Online Courses

1. Coursera- Computer Vision Specialization – University of Michigan

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

III B. Tech - II Semester

	L	T	P	C
23ACM38-ESSENTIALS OF AI & ML LAB	0	0	3	1.5

Course Objectives:

- To understand core AI and ML techniques.
- To implement models using Python libraries.

Course Outcomes (COs)
After successful completion of the course, the student will be able to:

- Develop supervised and unsupervised ML models.
- Evaluate model performance using metrics.

Experiments:

1. Introduction to AI/ML libraries: NumPy, Pandas
2. Supervised vs Unsupervised Learning demo
3. Linear Regression implementation
4. Decision Tree Classifier
5. Naive Bayes Classifier
6. K-Means Clustering
7. SVM classifier
8. Hyperparameter tuning
9. Model evaluation techniques
10. Deployment with Flask API (demo)
11. Model saving and loading using pickle

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

IV B. Tech - I Semester

	L	T	P	C
23ACM39- NLP & COMPUTER VISION LAB	0	0	3	1.5

Course Objectives:

- To implement basic NLP and CV pipelines.
- To work with image and text datasets.

Course Outcomes (COs)
After successful completion of the course, the student will be able to:

- Build NLP pipelines (tokenization to classification).
- Perform image preprocessing and recognition.

Experiments:

1. Text preprocessing (tokenization, stemming, etc.)
2. Bag of Words and TF-IDF models
3. Text classification using Logistic Regression
4. Named Entity Recognition (NER)
5. Sentiment Analysis
6. Image reading and manipulation using OpenCV
7. Image filtering and transformations
8. Face detection using Haar cascades
9. CNN model using TensorFlow/Keras
10. Image classification with pre-trained models
11. Text-to-Image and Image Captioning (intro)

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

III B. Tech. - I Semester

23ACD42	INTRODUCTION TO DATA ANALYTICS	L	T	P	C
		3	0	0	3

Course Objectives:

- To introduce the fundamental concepts of data analytics.
- To understand the process of collecting, cleaning, analyzing, and interpreting data.
- To gain insights into exploratory data analysis (EDA) and visualization techniques.
- To apply statistical and machine learning techniques to draw inferences from data.
- To use analytical tools (like Python/R) to solve real-world data problems.

Course Outcomes:

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

CO1:	Understand the core concepts and applications of data analytics.	Understand(L2)
CO2:	Prepare and preprocess data for analysis using appropriate techniques.	Apply(L3)
CO3:	Analyze data using descriptive and inferential statistical methods.	Analyze(L4)
CO4	Visualize data insights through various graphical representations.	Evaluate(L5)
CO5:	Apply data analytics tools for solving domain-specific problems.	Create(L6)

Unit I: Introduction to Data Analytics

Data, Information, and Knowledge, Types of data: Structured, Unstructured, Semi-Structured, Phases of the Data Analytics Lifecycle, Introduction to Business Analytics, Tools for data analytics: Excel, Python, R, SQL.

Unit II: Data Collection and Preprocessing

Sources of data: Databases, APIs, Web Scraping, Handling missing data and outliers, Data cleaning, transformation, normalization, Feature engineering and selection, Data partitioning and sampling techniques.

Unit III: Descriptive and Inferential Statistics

Central tendency and dispersion: Mean, Median, Mode, Standard Deviation, Correlation and covariance, Probability distributions: Normal, Binomial, Poisson, Hypothesis testing, t-test, Chi-square test, Confidence intervals and p-values.

Unit IV: Exploratory Data Analysis (EDA) and Visualization

Univariate, Bivariate, Multivariate Analysis, Histograms, Boxplots, Scatter plots, Pair plots, Heatmaps and correlation matrices, Data dashboards and storytelling using visualizations, Tools: Matplotlib, Seaborn, Plotly, Tableau basics.

Unit V: Data-Driven Decision Making

Predictive analytics vs descriptive analytics, Introduction to regression and classification, Clustering and segmentation basics, Model evaluation metrics: Accuracy, Precision, Recall, F1-score, Case studies in marketing, healthcare, finance, operations

Textbooks:

1. **V. Uday Shankar –** Data Analytics, Cengage Learning
2. **P. N. Murthy –** Introduction to Data Analytics, Himalaya Publishing
3. **Anil Maheshwari –** Data Analytics Made Accessible, Amazon Independent

Reference Books:

1. **Foster Provost & Tom Fawcett –** Data Science for Business, O'Reilly
2. **Joel Grus –** Data Science from Scratch, O'Reilly
3. **Wes McKinney –** Python for Data Analysis, O'Reilly
4. **Allen Downey –** Think Stats, Green Tea Press

Online Courses:

Platform	Course Title & Link
Coursera	Introduction to Data Analytics – IBM

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

III B. Tech. - I Semester

23ACD43	DATA ENGINEERING ESSENTIALS	L	T	P	C
		3	0	0	3

Course Objectives:

- To introduce the architecture, components, and workflow of modern data engineering systems.
- To provide knowledge on ingestion, storage, and processing of large-scale data.
- To apply tools and techniques like ETL, data pipelines, and distributed processing frameworks.
- To explore data modeling, warehousing, and real-time data processing.
- To build scalable and maintainable data systems with cloud and open-source technologies

Course Outcomes:

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

CO1	Understand core concepts of data engineering and data pipelines.	Understand(L2)
CO2	Apply data ingestion, transformation, and storage techniques.	Apply(L3)
CO3	Analyze big data processing frameworks and streaming systems.	Analyze(L4)
CO4	Evaluate data warehousing models and real-time processing strategies.	Evaluate(L5)
CO5	Design and implement scalable data engineering workflows.	Create(L6)

Unit I: Introduction to Data Engineering

What is Data Engineering? Role of Data Engineer in the data ecosystem, Types of data: Structured, Semi-structured, Unstructured, Data Lifecycle: Collection to Consumption, Introduction to ETL and ELT processes.

Unit II: Data Ingestion and Storage

Batch vs Streaming data, Data ingestion tools: Sqoop, Flume, Kafka, Logstash, Structured storage: Relational DBs, Data Lakes, File formats: CSV, JSON, Avro, Parquet, ORC, NoSQL overview: HBase, MongoDB, Cassandra.

Unit III: Distributed Data Processing

Hadoop ecosystem: HDFS, MapReduce, YARN, Apache Spark: RDD, DataFrame, and SQL APIs, Data cleaning and transformation techniques, Resource allocation and job scheduling in Spark, Introduction to cloud-based data processing (AWS/GCP).

Unit IV: Data Warehousing & Modeling

Concepts of OLTP vs OLAP, Star and Snowflake Schemas, Fact and Dimension tables, Data Warehousing tools: Amazon Redshift, Google BigQuery, Snowflake, Data modeling tools: dbt (data build tool), ER diagrams.

Unit V: Real-Time Data Engineering and Pipelines

Streaming with Apache Kafka and Spark Streaming, Message Queues and Pub/Sub systems, Lambda and Kappa architectures, Monitoring and logging tools: Prometheus, Grafana, Case study: End-to-end data pipeline implementation.

Textbooks:

1. Andreas François Vermeulen – Data Engineering with Python, Packt Publishing
2. V. Uday Shankar – Big Data Analytics & Data Engineering, Cengage Learning
3. Sam Newman – Building Microservices, O'Reilly (for data infrastructure components)

Reference Books:

1. Bill Inmon – Building the Data Warehouse, Wiley
2. Tom White – Hadoop: The Definitive Guide, O'Reilly
3. Jules S. Damji et al. – Learning Spark: Lightning-Fast Big Data Analysis, O'Reilly
4. Noel Markham – Learning Apache Kafka, Packt Publishing

Online Courses:

Platform	Course Title & Link
Coursera	Data Engineering on Google Cloud – Google

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

III B. Tech. - II Semester

23ACD44	PREDICTIVE ANALYTICS FUNDAMENTALS	L	T	P	C
		3	0	0	3

Course Objectives:

- To understand the fundamentals of predictive analytics and modeling.
- To learn statistical, machine learning, and probabilistic techniques used for prediction.
- To build and evaluate predictive models for various types of data.
- To apply data preprocessing, feature engineering, and model tuning techniques.
- To explore real-world use cases of predictive analytics in business, health, and industry.

Course Outcomes:

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

CO1	Understand key concepts, tools, and algorithms used in predictive analytics.	Understand(L2)
CO2	Apply classification and regression techniques for prediction problems.	Apply(L3)
CO3	Analyze model performance using error metrics and validation techniques.	Analyze(L4)
CO4	Evaluate predictive models in real-world applications and domains.	Evaluate(L5)
CO5	Design complete predictive analytics pipelines with preprocessing to prediction.	Create(L6)

Unit I: Introduction to Predictive Analytics

Basics of predictive analytics, Types of predictive models: Classification vs Regression, Predictive modeling workflow, Applications in finance, healthcare, marketing, etc., Introduction to supervised learning.

Unit II: Data Preparation and Feature Engineering

Data cleaning and preprocessing, Handling missing values, outliers, Categorical encoding, normalization, scaling, Feature selection and dimensionality reduction (PCA, LDA), Feature importance.

Unit III: Regression and Classification Models

Linear Regression, Ridge & Lasso Regression, Logistic Regression, K-Nearest Neighbors (KNN), Decision Trees, Random Forests, Model diagnostics: R^2, MAE, RMSE, Confusion Matrix, AUC

Unit IV: Advanced Predictive Modeling

Support Vector Machines (SVM), Ensemble Models: Bagging, Boosting, XGBoost, Model selection and hyperparameter tuning, Cross-validation, Grid Search, Avoiding overfitting/underfitting.

Unit V: Real-Time Predictive Analytics and Deployment

Case studies: Predictive maintenance, customer churn, disease prediction, Tools: Python (scikit-learn, pandas), R, AutoML, Model interpretability: SHAP, LIME, Model deployment using Flask, FastAPI, or cloud (AWS/GCP), Ethics in predictive analytics.

Textbooks:

1. Dean Abbott – Applied Predictive Analytics: Principles and Techniques, Wiley
2. GalitShmueli et al. – Data Mining for Business Analytics: Concepts, Techniques, and Applications, Wiley
3. John D. Kelleher et al. – Fundamentals of Machine Learning for Predictive Data Analytics, MIT Press

Reference Books:

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman – The Elements of Statistical Learning
2. Ian H. Witten, Eibe Frank, Mark A. Hall – Data Mining: Practical Machine Learning Tools and Techniques
3. Tom Fawcett – Data Science for Business, O'Reilly

Online Courses:

Platform	**Course Title & Link**
Coursera	Advanced Predictive Modeling – University of Washington

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

III B. Tech. - II Semester

23ACD45	BIG DATA ANALYTICS (Hadoop, Spark)	L	T	P	C
		3	0	0	3

Course Objectives:

- To understand the need and concepts of Big Data and its ecosystem.
- To study architectures and tools such as Hadoop and Spark for large-scale data processing.
- To explore Hadoop Distributed File System (HDFS) and MapReduce programming.
- To learn in-memory computation using Apache Spark.
- To implement big data solutions using real-time tools for analytics and decision-making.

Course Outcomes:

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

CO1	Explain the concepts, characteristics, and challenges of Big Data.	Understand(L2)
CO2	Apply HDFS and MapReduce programming for large-scale data processing.	Apply(L3)
CO3	Analyze and optimize data pipelines using Spark RDDs and DataFrames.	Analyze(L4)
CO4	Evaluate Big Data tools and frameworks for distributed processing.	Evaluate(L5)
CO5	Design end-to-end Big Data workflows for analytics use cases.	Create(L6)

UNIT I: Introduction to Big Data

Characteristics of Big Data: Volume, Velocity, Variety, Veracity, and Value, Challenges of Big Data, Traditional vs. Big Data systems, Big Data architecture: Storage, processing, analytics, Introduction to Hadoop Ecosystem

UNIT II: Hadoop Distributed File System (HDFS) and MapReduce

HDFS Architecture, Blocks, NameNode&DataNode, File Read/Write operations, MapReduce Architecture, Developing MapReduce programs (Word Count Example), Combiners, Partitioner, and Counters

UNIT III: Apache Spark and RDDs

Need for Apache Spark over Hadoop, Spark architecture and components, Spark RDDs and transformations/actions, DataFrames and Spark SQL, Working with Spark MLlib for basic ML tasks

UNIT IV: Big Data Tools and Streaming

YARN architecture, Sqoop: Import/export between RDBMS and Hadoop, Flume: Ingesting streaming data, Kafka for distributed messaging, Spark Streaming: DStreams, windowing, real-time analytics

UNIT V: Big Data Applications and Case Studies

Social media analytics, IoT data pipelines, Retail analytics (recommendation engines, customer sentiment), Fraud detection, End-to-End Mini Project: Data ingestion, processing, and visualization

Textbooks:

1. Tom White, Hadoop: The Definitive Guide, O'Reilly Media
2. Jules S. Damji et al., Learning Spark: Lightning-Fast Big Data Analysis, O'Reilly
3. VenkatAnkam, Big Data Analytics Using Spark, Wiley

Reference Books:

1. Chuck Lam, Hadoop in Action, Manning
2. Alex Holmes, Hadoop in Practice, Manning Publications
3. P. J. Sadalage& M. Fowler, NoSQL Distilled, Addison-Wesley
4. Sridhar Alla, Big Data Analytics with Hadoop 3, Packt Publishing

Online Courses:

Platform	Course Title & Link
Coursera	Big Data Specialization – UC San Diego

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

IV B. Tech. - I Semester

23ACD46	DATA ANALYTICS WITH POWER BI / TABLEAU / MATPLOTLIB	L	T	P	C
		3	0	0	3

Course Objectives:

- To understand the fundamentals of data visualization and storytelling using analytics tools.
- To learn practical implementation of visual analytics using Power BI, Tableau, and Matplotlib.
- To develop dashboards, custom reports, and interactive charts.
- To explore real-world datasets and generate insights.
- To design end-to-end data pipelines and reporting workflows.

Course Outcomes:

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

CO1:	Understand data analytics lifecycle and fundamentals of visualization tools.	Understand(L2)
CO2:	Apply Power BI, Tableau, and Matplotlib to visualize structured data.	Apply(L3)
CO3:	Analyze visual trends and compare different types of charting techniques.	Analyze(L4)
CO4:	Evaluate dashboards and performance metrics for decision-making.	Evaluate(L5)
CO5:	Design interactive data dashboards and business visual reports.	Create(L6)

UNIT I: Introduction to Data Visualization & BI

What is data analytics and visualization?, Importance of business intelligence, Types of charts and graphs, Visualization best practices and perception, Introduction to tools: Power BI, Tableau, and Python/Matplotlib

UNIT II: Power BI for Data Analytics

Power BI interface and data sources, Data transformations using Power Query, DAX (Data Analysis Expressions) basics, Visualizations: Bar, Line, Area, Pie, Tree Maps, Report publishing and dashboard sharing

UNIT III: Tableau for Data Analytics

Tableau workspace and connecting to datasets, Dimensions vs. Measures, Filters, Parameters, and Calculated Fields, Visualizations: Heatmaps, Maps, Scatter Plots, Building Interactive Dashboards

UNIT IV: Matplotlib & Seaborn (Python Visualization)

Introduction to Matplotlib architecture, Basic plots: line, bar, pie, histogram, Subplots, customization (color, label, grid), Seaborn: heatmaps, boxplots, pairplots, Exporting and saving visuals

UNIT V: Real-time Case Studies and BI Projects

Designing end-to-end dashboards for:Sales analytics, Healthcare data, IoT or Sensor data dashboards, Social media analytics, Performance monitoring and KPI analysis, BI deployment best practices

Textbooks:

1. Alberto Ferrari & Marco Russo, Introducing Microsoft Power BI, Microsoft Press.
2. Joshua N. Milligan, Learning Tableau, Packt Publishing.
3. AdrienChauveau, Data Visualization with Python and Matplotlib, Packt Publishing.

Reference Books:

1. Ben Jones, Storytelling with Data in Tableau, O'Reilly.
2. Jake VanderPlas, Python Data Science Handbook, O'Reilly.
3. Cole NussbaumerKnaflic, Storytelling with Data, Wiley.

Online Courses:

Platform	Course Title & Link
Coursera	Data Visualization with Tableau – UC Davis

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

III B. Tech. - II Semester

23ACD47	DATA ANALYTICS TOOLS LAB	L	T	P	C
		0	0	3	1.5

Course Objectives:

- To visualize and interpret data using modern tools.
- To create dashboards and analytical views.

Course Outcomes:

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

- Use BI tools for analytical visualizations.
- Interpret datasets using graphical methods.

Experiments:

1. Introduction to Power BI / Tableau interface
2. Loading data and transforming in BI tools
3. Creating bar, pie, and line charts
4. Cross filters and slicers
5. Using DAX in Power BI
6. Map visualization
7. Dashboards creation
8. Connecting to real-time data
9. Storytelling with data
10. Introduction to Matplotlib for comparison
11. Using Seaborn and Plotly

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

III B. Tech. - I Semester

23ACD49	DATA SCIENCE FOR ENGINEERS	L	T	P	C
		3	0	0	3

Course Objectives:

- Provide a foundational understanding of data science processes and applications.
- Introduce key tools and techniques such as Python, statistics, data cleaning, visualization, and machine learning.
- Develop practical skills in data analysis, interpretation, and data storytelling.
- Enable students to work on real-world datasets using data science techniques.
- Prepare students for advanced studies or industry roles in data science and analytics.

Course Outcomes:

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

CO1:	Explain the data science lifecycle and its importance in business and research.	Understand(L2)
CO2:	Use Python and libraries like Pandas, NumPy, and Matplotlib for data handling.	Apply(L3)
CO3:	Perform data cleaning, transformation, and visualization effectively.	Apply(L3)
CO4:	Apply basic machine learning models for classification and regression.	Apply(L3)
CO5:	Interpret data analysis results and communicate findings clearly.	Analyze(L4)

Unit I: Introduction to Data Science: What is Data Science? Role of Data Scientist, Data Science Process (Problem definition, data collection, preprocessing, modeling, evaluation), Applications of Data Science in different domains, Tools: Jupyter, Anaconda, Python/R Overview

Unit II: Data Handling and Preprocessing: Introduction to NumPy and Pandas, Reading data from CSV, Excel, SQL, Data Wrangling: Missing values, duplicates, outliers, Data transformation: Scaling, encoding, Feature engineering basics

Unit III: Data Visualization: Importance of visualization, Visualization libraries (Matplotlib, Seaborn), Histograms, Boxplots, Pairplots, Heatmaps, Dashboards and Storytelling with Data, Real-time data dashboards (Optional)

Unit IV: Statistical Foundations for Data Science: Descriptive Statistics, Probability and Probability Distributions, Inferential Statistics: Hypothesis Testing, Confidence Intervals, Correlation and Causation, Use of Scipy/Statsmodels for statistical analysis

Unit V: Introduction to Machine Learning: Supervised vs Unsupervised Learning, Classification and Regression problems, Basic ML Algorithms: Linear Regression, Logistic Regression, KNN, Decision Trees, Model Evaluation Metrics: Accuracy, Precision, Recall, F1-Score, Overfitting and Underfitting

Textbooks:

1. **Joel Grus –** Data Science from Scratch: First Principles with Python, O'Reilly.
2. **Cathy O'Neil and Rachel Schutt –** Doing Data Science, O'Reilly.
3. **Wes McKinney –** Python for Data Analysis, O'Reilly.

Reference Books:

1. **Jake VanderPlas –** Python Data Science Handbook, O'Reilly.
2. **Andreas Müller & Sarah Guido –** Introduction to Machine Learning with Python.
3. **Han, Kamber, & Pei –** Data Mining: Concepts and Techniques, Morgan Kaufmann.

Online Courses:

NPTEL / SWAYAM:

- NPTEL: Introduction to Data Science
  Instructor: Prof. Raghunathan Rengasamy, IIT Madras

Coursera:

- **IBM Data Science Professional Certificate**
  Link: coursera.org
- **Introduction to Data Science in Python (University of Michigan)**
  Link: coursera.org

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

III B. Tech. - I Semester

23ACD50	STATISTICAL LEARNING FOR DATA SCIENCE	L	T	P	C
		3	0	0	3

Course Objectives:

- Introduce fundamental concepts of statistical learning and its importance in data science.
- Develop understanding of regression, classification, and resampling methods.
- Build skills in model assessment, selection, and regularization techniques.
- Apply statistical learning methods to real-world datasets.
- Interpret, communicate, and evaluate data-driven models.

Course Outcomes:

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

CO1:	Understand the basics of statistical learning and data representation.	Understand(L2)
CO2:	Apply linear regression, logistic regression, and classification techniques.	Apply(L3)
CO3:	Evaluate models using resampling methods and cross-validation.	Evaluate(L5)
CO4:	Analyze regularization methods like Ridge and Lasso to avoid overfitting.	Analyze(L4)
CO5:	Create and interpret statistical learning models in practical scenarios.	Create(L6)

U**nit I: Introduction to Statistical Learning:** What is Statistical Learning?, Supervised vs Unsupervised Learning, Model Accuracy vs Interpretability, Bias-Variance Trade-off, Curse of Dimensionality, Applications of Statistical Learning

Unit II: Linear and Polynomial Regression: Simple Linear Regression. Multiple Linear Regression, Polynomial Regression, Assumptions of Linear Models, Model Diagnostics and Performance Metrics (R^2, RMSE), Variable Selection Techniques

Unit III: Classification Methods: Logistic Regression, Discriminant Analysis (LDA, QDA), Naïve Bayes Classifier, K-Nearest Neighbors, Confusion Matrix, Precision, Recall, F1-Score

Unit IV: Resampling and Model Assessment: Train-Test Split, Cross Validation (k-Fold, LOOCV), Bootstrap Methods, Model Selection and Hyperparameter Tuning.

Unit V: Regularization & Advanced Topics: Ridge Regression, Lasso Regression, Shrinkage Methods, Principal Component Regression (PCR), Partial Least Squares (PLS), Introduction to Support Vector Machines.

Textbooks

1. **Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani**
   An Introduction to Statistical Learning with Applications in R – Springer
   (Free PDF: https://www.statlearning.com/)
2. **Trevor Hastie, Robert Tibshirani, Jerome Friedman**
   The Elements of Statistical Learning – Springer

Reference Books:

1. **Norman Matloff –** Statistical Regression and Classification: from R to Data Science
2. **Chris Bishop –** Pattern Recognition and Machine Learning
3. **T. Ryan –** Modern Regression Methods

Online Courses (Free + Paid)

NPTEL / SWAYAM:

- NPTEL: Introduction to Statistical Learning
  Instructor: Prof. Balaraman Ravindran (IIT Madras)

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

III B. Tech. - II Semester

23ACD51	DATA VISUALIZATION & EXPLORATORY DATA ANALYSIS	L	T	P	C
		3	0	0	3

Course Objectives:

- To understand the role of data visualization and EDA in the data science lifecycle.
- To explore data types, distributions, missing values, and outliers using statistical and visual methods.
- To gain expertise in using tools such as Python (Matplotlib, Seaborn, Plotly) or R for EDA.
- To develop meaningful, interactive visualizations for both univariate and multivariate data.
- To interpret trends and communicate data-driven insights effectively through dashboards and storytelling.

Course Outcomes:

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

CO1:	Understand the significance of data exploration and visualization in the data analysis process.	Understand(L2)
CO2:	Identify and preprocess anomalies, missing data, and data types through exploratory methods.	Analyze(L4)
CO3:	Apply visual and statistical techniques to univariate, bivariate, and multivariate data.	Apply(L3)
CO4:	Evaluate different chart types and visualization libraries/tools for effective communication.	Evaluate(L5)
CO5:	Create storytelling dashboards and dynamic visual reports for real-world datasets.	Create(L6)

Unit I: Introduction to EDA and Data Types

What is Exploratory Data Analysis?,Types of Data (Categorical, Numerical, Ordinal), Central tendency & dispersion: Mean, Median, Mode, Variance, StdDev, Importance of visualization in EDA

Unit II: Data Cleaning &Preprocessing

Handling missing values and imputation. Detecting and handling outliers, Feature engineering basics, Data transformations (scaling, normalization, encoding)

Unit III: Data Visualization Tools & Techniques

Univariate visualizations: Histogram, Boxplot, Violin plot, Pie chart, Bivariate and Multivariate visualizations: Scatter plot, Heatmaps, Pairplot, Time series plots, Density plots, Introduction to Matplotlib, Seaborn, Plotly, and Tableau

Unit IV: Advanced Data Visualization Concepts

Interactive visualizations: Hover, Zoom, Filters, Geospatial visualization using Folium or Mapbox, Visual perception principles (Gestalt, color theory), Visual storytelling and design best practices

Unit V: Dashboards & Real-World Case Studies

Creating dashboards using Power BI/Tableau/Plotly Dash, Building EDA pipelines with Python/R, Case studies: Finance, Healthcare, Social media, IoT, Interpreting visualizations for decision-making

Textbooks:

1. **Alberto Cairo**, The Truthful Art: Data, Charts, and Maps for Communication, New Riders.
2. **Nathan Yau**, Visualize This: The FlowingData Guide to Design, Visualization, and Statistics, Wiley.
3. **Hadley Wickham**, R for Data Science, O'Reilly (for R users).

Reference Books:

1. **Ben Fry**, Visualizing Data: Exploring and Explaining Data with the Processing Environment, O'Reilly.
2. **Claus O. Wilke**, Fundamentals of Data Visualization, O'Reilly.
3. **Scott Murray**, Interactive Data Visualization for the Web, O'Reilly.

Online Courses:

Platform	**Course Title & Link**
Coursera	Data Visualization with Python – IBM

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

III B. Tech. - II Semester

23ACD52	BIG DATA ANALYTICS FUNDAMENTALS	L	T	P	C
		3	0	0	3

Course Objectives:

- Understand the fundamentals of Big Data, its characteristics, and challenges.
- Learn key tools and technologies for storing, processing, and analyzing Big Data (Hadoop, Spark, etc.).
- Explore advanced analytical techniques including MapReduce, machine learning on Big Data, and real-time analytics.
- Develop skills to design and implement Big Data solutions for real-world problems.
- Gain hands-on experience with Big Data frameworks and platforms.

Course Outcomes:

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

CO1:	Understand the core concepts and architecture of Big Data and related technologies.	Understand(L2)
CO2:	Analyze Big Data processing frameworks like Hadoop and Spark for scalability and efficiency.	Analyze(L4)
CO3:	Apply MapReduce programming model to solve Big Data problems.	Apply(L3)
CO4:	Evaluate different storage options (HDFS, NoSQL) and processing techniques for Big Data.	Evaluate(L5)
CO5:	Create end-to-end Big Data analytics pipelines using relevant tools and platforms.	Create(L6)

Unit I: Introduction to Big Data

Definition and Characteristics (Volume, Velocity, Variety, Veracity, Value), Challenges of Big Data, Traditional Data Processing vs Big Data Analytics, Overview of Big Data applications.

Unit II: Big Data Technologies and Ecosystem

Hadoop Framework: HDFS, YARN, MapReduce, Apache Spark: Architecture and Components, NoSQL Databases (HBase, Cassandra, MongoDB), Data ingestion tools (Sqoop, Flume)

Unit III: MapReduce Programming Model

MapReduce fundamentals, Writing Map and Reduce functions, Job configuration and execution, Hands-on example: Word count, log analysis.

Unit IV: Advanced Big Data Analytics

Machine Learning on Big Data using MLlib (Spark), Real-time analytics and streaming data (Spark Streaming, Kafka), Graph processing (GraphX), Data visualization of Big Data

Unit V: Big Data Project and Case Studies

Designing Big Data solutions for healthcare, finance, social media analytics, Performance optimization and security considerations, Cloud-based Big Data platforms (AWS EMR, Google BigQuery), Case studies and project presentations.

Textbooks:

1. **Viktor Mayer-Schönberger, Kenneth Cukier**, Big Data: A Revolution That Will Transform How We Live, Work, and Think, Houghton Mifflin Harcourt.
2. **Tom White**, Hadoop: The Definitive Guide, O'Reilly Media.
3. **Jules S. Damji, Brooke Wenig, Tathagata Das, Denny Lee**, Learning Spark: Lightning-Fast Big Data Analysis, O'Reilly Media.

Reference Books:

1. **Raj Kamal**, Big Data Analytics, McGraw-Hill Education.
2. **Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos,** Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, McGraw-Hill.
3. **Anand Rajaraman, Jeffrey David Ullman**, Mining of Massive Datasets, Cambridge University Press.

Online Courses:

Platform	Course Title & Link
Coursera	**Big Data Specialization by University of California San Diego**

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

IV B. Tech. - I Semester

23ACD53	INTRODUCTION TO RECOMMENDER SYSTEMS	L	T	P	C
		3	0	0	3

Course Objectives:

- Understand the fundamental concepts and techniques of recommender systems.
- Explore different types of recommendation approaches: content-based, collaborative filtering, and hybrid methods.
- Learn about evaluation metrics and methods to assess recommender system performance.
- Understand challenges such as scalability, sparsity, and cold-start problems.
- Gain hands-on experience implementing and tuning recommender algorithms using real-world datasets

Course Outcomes:

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

CO1:	Explain the basic principles and types of recommender systems.	Understand(L2)
CO2:	Analyze various recommendation algorithms, including collaborative and content-based filtering.	Analyze(L4)
CO3:	Apply different algorithms to build practical recommender system models.	Apply(L3)
CO4:	Evaluate the performance of recommender systems using appropriate metrics.	Evaluate(L5)
CO5:	Design hybrid recommender systems that address common challenges.	Create(L6)

Unit I: Introduction to Recommender Systems

Definition and applications (e-commerce, media, social networks), Types of recommender systems: content-based, collaborative filtering, hybrid, Overview of user-item interactions

Unit II: Content-Based Recommendation

Item profiles and user profiles, Similarity measures (cosine similarity, Pearson correlation), Building content-based recommenders, Advantages and limitations

Unit III: Collaborative Filtering Techniques

User-based collaborative filtering, Item-based collaborative filtering, Matrix factorization techniques (SVD, PCA), Addressing sparsity and scalability issues.

Unit IV: Evaluation of Recommender Systems

Metrics: Precision, Recall, F1-score, RMSE, MAE, Cross-validation and train-test split, Handling cold-start and diversity, Case studies on real-world evaluation.

Unit V: Advanced Topics and Hybrid Systems

Hybrid recommender systems (weighted, switching, feature combination), Context-aware recommendations, Deep learning in recommender systems, Privacy, ethics, and future trends

Textbooks:

1. **Charu C. Aggarwal**, Recommender Systems: The Textbook, Springer, 2016.
2. **Francesco Ricci, LiorRokach, BrachaShapira, Paul B. Kantor (Editors),** Recommender Systems Handbook, Springer, 2015.

Reference Books:

1. **Dietmar Jannach, Markus Zanker, Alexander Felfernig, Gerhard Friedrich,** Recommender Systems: An Introduction, Cambridge University Press, 2010.
2. **Joseph A. Konstan, John Riedl**, Collaborative Filtering Recommender Systems, Now Publishers, 2012.
3. **GuibingGuo, Jie Zhang, Neil Yorke-Smith**, Deep Learning Based Recommender System, Springer, 2020.

Online Courses:

Platform	Course Title & Link
Coursera	Recommender Systems Specialization by University of Minnesota

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

III B. Tech. - II Semester

23ACD54	DATA VISUALIZATION & EDA LAB	L	T	P	C
		0	0	3	1.5

Course Objectives:

- To explore and visualize datasets.
- To derive insights through analysis

Course Outcomes:

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

- Conduct EDA on datasets.
- Create meaningful visualizations

Experiments:

1. Importing data from different sources
2. Handling missing values and outliers
3. Univariate and bivariate analysis
4. Boxplots, Histograms, Heatmaps
5. Correlation matrix
6. Using pandas profiling
7. Data visualization using Plotly
8. Pairplots and violin plots
9. Feature engineering basics
10. Time series visualization
11. Dashboards with Streamlit

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

IV B. Tech. - I Semester

23ACD55	RECOMMENDER SYSTEM LAB	L	T	P	C
		0	0	3	1.5

Course Objectives:

- To understand collaborative and content filtering.
- To build and test recommender models.

Course Outcomes:

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

- Build simple recommender systems.
- Evaluate recommender performance

Experiments:

1. Introduction to recommender systems
2. User-item interaction matrix
3. Cosine similarity for recommendations
4. Collaborative filtering – user-based
5. Collaborative filtering – item-based
6. Content-based filtering
7. Surprise library intro
8. Building SVD model
9. Hybrid recommender
10. Evaluation metrics (RMSE, MAE)
11. Recommendation visualization

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

III B. Tech - I Semester

		L	T	P	C
23ACA40 FOR AI	**QUANTUM COMPUTING**	3	0	0	3

Course Objectives (COs)

- Understand foundational concepts of quantum computing and its significance in Artificial Intelligence (AI).
- Explore quantum algorithms relevant to AI applications.
- Analyze the advantages and challenges of applying quantum computing in AI.
- Develop skills to implement basic quantum algorithms for AI tasks.
- Investigate emerging trends and research in Quantum AI.

Course Outcomes:

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

CO1 Understand principles of quantum computing and their implications for AI. Understand (L2)

CO2 Explain key quantum algorithms used in AI applications. Understand (L2)

CO3 Apply quantum computing techniques to solve basic AI problems. Apply (L3)

CO4 Analyze the benefits and limitations of quantum computing in AI contexts. Analyze (L4)

CO5 Design and implement quantum algorithms for AI applications. Create (L6)

Unit 1: Introduction to Quantum Computing and AI

Classical Computing vs Quantum Computing, Qubits and Quantum States, Quantum Superposition and Entanglement, Quantum Gates and Circuits, Measurement in Quantum Systems, Basic Quantum Algorithms Overview, Introduction to Artificial Intelligence, Intersection of Quantum Computing and AI

Unit 2: Quantum Algorithms for AI

Quantum Search Algorithm (Grover's Algorithm), Quantum Fourier Transform, Quantum Amplitude Amplification, Quantum Phase Estimation, Variational Quantum Algorithms (VQA), Quantum Annealing and Optimization, Quantum Approximate Optimization Algorithm (QAOA), Quantum Machine Learning Overview

Unit 3: Quantum Machine Learning (QML) Fundamentals

Quantum Data Encoding and State Preparation, Quantum Support Vector Machines (QSVM), Quantum Neural Networks (QNN), Quantum Clustering Algorithms, Quantum Principal Component Analysis (QPCA), Hybrid Quantum-Classical Models, Quantum Kernel Methods, Challenges in QML

Unit 4: Quantum AI Applications and Implementations

Quantum Reinforcement Learning Basics, Quantum Natural Language Processing (QNLP), Quantum Image Processing, Quantum Optimization for AI Problems, Error Correction and Noise in Quantum AI Systems, Quantum Hardware for AI (Qubits technologies), Performance Evaluation of Quantum AI Algorithms, Case Studies of Quantum AI Applications.

Unit 5: Advanced Topics and Future Directions

Designing Quantum Circuits for AI Tasks, Quantum AI Programming Frameworks (Qiskit, Cirq, etc.), Scalability and Resource Management in Quantum AI, Ethical and Security Implications of Quantum AI, Quantum AI Research Trends, Integration of Quantum AI with Classical AI, Quantum AI for Big Data Analytics, Emerging Quantum Technologies and AI

Textbooks

1. Michael A. Nielsen and Isaac L. Chuang, *Quantum Computation and Quantum Information*, Cambridge University Press, 2010.
2. Maria Schuld and Francesco Petruccione, *Supervised Learning with Quantum Computers*, Springer, 2018.
3. Peter Wittek, *Quantum Machine Learning: What Quantum Computing Means to Data Mining*, Academic Press, 2014.

Reference Books

1. Seth Lloyd, *Quantum Machine Learning: An Applied Approach*, MIT Press, 2020.
2. VlatkoVedral, *Introduction to Quantum Information Science*, Oxford University Press, 2006.
3. Jacob Biamonte et al., "Quantum Machine Learning," *Nature*, 2017.
4. Research papers and IEEE articles on Quantum AI and Quantum Machine Learning.

Online Courses and Tutorials

Platform	Course Title & Link
IBM Qiskit	Introduction to Quantum Computing and Qiskit
Coursera	Quantum Machine Learning by University of Toronto

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

III B. Tech - I Semester

		L	T	P	C
23ACA41	**EDGE AI &IOT**	3	0	0	3

Course Objectives

- To introduce the concept of Edge Computing and its integration with AI and IoT.
- To explore AI model deployment on edge devices.
- To understand IoT protocols, architectures, and security issues.
- To apply Edge AI techniques for real-time decision-making.
- To analyze case studies of Edge AI applications in smart systems.

Course Outcomes:

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

CO1 Understand the fundamentals of Edge Computing and IoT systems. Understand (L2)
CO2 Explain the architecture and protocols used in IoT and Edge AI. Understand (L2)
CO3 Apply machine learning models to edge devices for real-time inference. Apply (L3)
CO4 Analyze the constraints and trade-offs in deploying AI models on edge devices. Analyze (L4)
CO5 Design and evaluate edge-based AI systems for real-world applications. Create (L6)

UNIT 1: Introduction to Edge Computing and IoT

Introduction to IoT: Definition, architecture, components, IoTvs Edge Computing, Edge, Fog, and Cloud Computing – Differences, Edge AI Overview – Concept and Applications, Characteristics and Benefits of Edge AI, Edge Devices: Microcontrollers, SBCs, Smart Cameras, Industry 4.0 and Smart Systems, Use Cases: Smart Home, Healthcare, Industry

UNIT 2: IoT and Edge AI Architectures & Communication Protocols

IoT Architectures: 3-Layer, 5-Layer, Middleware, Edge AI Pipeline Architecture, MQTT, CoAP, HTTP, and AMQP Protocols, Data Collection and Preprocessing at the Edge, Real-time Data Transmission and Synchronization, Sensor Networks and Wireless Protocols (BLE, Zigbee, LoRaWAN), Communication Challenges in IoT, Interoperability and Integration Frameworks

UNIT 3: AI and ML for Edge Devices

AI/ML Workflow Overview: Training vs Inference, Model Compression Techniques (Quantization, Pruning), Knowledge Distillation for Edge AI, TinyML and Lightweight Model Deployment, Edge ML Frameworks: TensorFlowLite, ONNX, PyTorch Mobile, Case Study: Deploying a CNN on Raspberry Pi, Energy and Latency Considerations, Model Evaluation Metrics for Edge AI

UNIT 4: Edge AI System Design and Optimization

Hardware Selection: MCU, MPU, FPGA, ASIC, Power Consumption and Thermal Constraints, Model Accuracy vs Performance Tradeoffs, Data Management and Storage on Edge Devices, Federated Learning at the Edge, Edge-to-Cloud Integration Patterns, Edge AI Application Lifecycle, Security and Privacy at the Edge

UNIT 5: Applications and Case Studies of Edge AI &IoT

Smart City Applications: Traffic, Waste, Lighting, Healthcare Monitoring Systems using Edge AI, Industrial Automation with Edge-enabled Sensors, Agriculture: Soil Health, Irrigation, Crop Monitoring, Surveillance & Real-time Video Analytics, Edge AI for Predictive Maintenance, AI on Drones and Autonomous Vehicles, Building Scalable Edge AI Solutions

Textbooks

1. **"Edge AI: Convergence of Edge Computing and Artificial Intelligence" –** Xiaofei Wang, Springer, 2020.
2. **"Internet of Things: Principles and Paradigms" –** RajkumarBuyya, Amir VahidDastjerdi, Elsevier, 2016.
3. **"TinyML: Machine Learning with TensorFlowLite on Arduino and Ultra-Low-Power Microcontrollers" –** Pete Warden, Daniel Situnayake, O'Reilly Media, 2019.

Reference Books

1. **"Architecting the Internet of Things" –** Dieter Uckelmann, Springer.
2. **"Hands-On Edge Analytics with Azure IoT" –** ArvindRavulavaru, Packt Publishing.
3. Research papers from **IEEE IoT Journal**, **ACM Transactions on IoT**, **Nature Electronics (Edge AI)**.

Online Courses

Platform	**Course Title & Link**
Coursera	AI for Edge Computing – IBM

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

III B. Tech - II Semester

		L	T	P	C
23ACA38	**PYTHON FOR AI & DATA SCIENCE**	3	0	0	3

Course Objectives (COs)

- Understand the fundamentals of Python programming relevant to AI and Data Science.
- Learn to handle, process, and visualize data using Python libraries.
- Apply Python-based techniques to build AI and machine learning models.
- Explore advanced AI concepts and implement them using Python.
- Develop skills to work with real-world datasets and AI applications using Python.

Course Outcomes:

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

CO1 Understand Python programming basics and syntax for AI and Data Science applications.	Understand (L2)
CO2 Apply Python libraries for data manipulation and visualization.	Apply (L3)
CO3 Analyze data sets and extract meaningful insights using Python tools.	Analyze (L4)
CO4 Evaluate machine learning models implemented with Python.	Evaluate (L5)
CO5 Design and implement AI solutions using Python programming.	Create (L6)

Unit 1: Python Programming Fundamentals for AI & Data Science

Introduction to Python: Features and Setup, Data Types and Variables, Control Structures: Conditional Statements and Loops, Functions and Modules, Exception Handling, File Handling in Python, Introduction to Object-Oriented Programming, Introduction to Python IDEs and Notebooks

Unit 2: Data Handling and Preprocessing Using Python Libraries

Introduction to NumPy: Arrays and Operations, Pandas for Data Manipulation: Series and DataFrames, Handling Missing Data, Data Cleaning and Transformation, Data Aggregation and Grouping, Working with Dates and Time in Pandas, Data Input/Output: CSV, Excel, JSON, Introduction to Data Preprocessing Techniques

Unit 3: Data Visualization Techniques in Python

Introduction to Matplotlib: Basic Plotting, Customizing Plots and Graphs, Seaborn for Statistical Visualizations, Plotting Categorical Data, Plotting Time Series Data, Pairplots, Heatmaps, and Correlation Plots, Interactive Visualizations with Plotly, Visualizing Distributions and Outliers

Unit 4: Machine Learning Basics with Python

Introduction to Scikit-learn, Supervised Learning Algorithms: Linear Regression, Logistic Regression, Unsupervised Learning: K-Means Clustering, Model Evaluation Metrics: Accuracy, Precision, Recall, F1- score, Cross-validation and Hyperparameter Tuning, Feature Selection and Engineering, Overfitting and Underfitting Concepts, Introduction to Pipeline and Model Persistence

Unit 5: Advanced AI Applications with Python

Introduction to Neural Networks with Keras and TensorFlow, Building and Training Deep Learning Models, Natural Language Processing with Python (NLTK, SpaCy), Computer Vision Basics with OpenCV, Reinforcement Learning Overview, Transfer Learning and Pretrained Models, Deploying AI Models with Flask API, Ethical Considerations and Best Practices in AI

Textbooks

1. **Jake VanderPlas**, *Python Data Science Handbook*, O'Reilly, 2016.
2. **Sebastian Raschka, VahidMirjalili**, *Python Machine Learning*, Packt, 2019.
3. **AurélienGéron**, *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow*, O'Reilly, 2019.

Reference Books

1. **Wes McKinney**, *Python for Data Analysis*, O'Reilly, 2017.
2. **Joel Grus**, *Data Science from Scratch: First Principles with Python*, O'Reilly, 2019.
3. **Francois Chollet**, *Deep Learning with Python*, Manning, 2018.

Online Courses

Platform	**Course Title & Link**
Coursera	Applied Data Science with Python Specialization – University of Michigan

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

III B. Tech - II Semester

		L	T	P	C
23ACA39	**DATA STRUCTURES & ALGORITHMS FOR AI**	3	0	0	3

Course Objectives (COs)

- Understand fundamental data structures and algorithms relevant to AI applications.
- Learn how to implement and analyze algorithms for efficient data processing in AI systems.
- Apply data structures and algorithms to solve AI problems such as search, optimization, and learning.
- Analyze algorithmic complexity and optimize AI solutions for performance.
- Develop skills to design AI algorithms using appropriate data structures.

Course Outcomes:

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

CO1 Understand basic and advanced data structures used in AI applications. Understand (L2)
CO2 Implement and apply fundamental algorithms for problem-solving in AI. Apply (L3)
CO3 Analyze the time and space complexity of algorithms. Analyze (L4)
CO4 Evaluate different algorithmic approaches and choose appropriate ones for AI problems. Evaluate (L5)
CO5 Design efficient algorithms and data structures for AI systems. Create (L6)

Unit 1: Fundamentals of Data Structures for AI

Introduction to Data Structures and Algorithms, Arrays and Linked Lists, Stacks and Queues, Trees: Basic Terminology and Binary Trees, Graphs: Representation and Terminologies, Hashing and Hash Tables, Recursion and Recursive Algorithms, Complexity Analysis: Big-O Notation

Unit 2: Searching and Sorting Algorithms in AI

Linear Search and Binary Search, Bubble Sort, Selection Sort, Insertion Sort, Merge Sort and Quick Sort, Heap Sort and Counting Sort, Search Algorithms in Graphs: DFS and BFS, Heuristic Search: A* Algorithm, Algorithm Design Techniques: Divide and Conquer, Performance Analysis of Sorting and Searching Algorithms

Unit 3: Advanced Data Structures and Their Applications in AI

Balanced Trees: AVL Trees and Red-Black Trees, B-Trees and B+ Trees, Trie and Suffix Trees, Priority Queues and Heaps, Disjoint Set Union (Union-Find), Graph Algorithms: Minimum Spanning Tree (Kruskal, Prim), Shortest Path Algorithms (Dijkstra, Bellman-Ford), Application of Advanced Data Structures in AI

Unit 4: Algorithms for AI Problem Solving

Backtracking Algorithms, Branch and Bound Technique, Dynamic Programming and Memoization, Greedy Algorithms and their applications, Optimization Algorithms in AI, Local Search Algorithms, Evolutionary Algorithms and Genetic Algorithms, Complexity Classes: P, NP, NP-Complete, NP-Hard

Unit 5: Designing AI Algorithms with Data Structures

Designing Efficient Search Algorithms for AI, Data Structures for Knowledge Representation, Graph-based Algorithms for Social Network Analysis, Tree-based Algorithms in Decision Making (Decision Trees), Algorithms for Natural Language Processing, Algorithms for Computer Vision Tasks, Parallel and Distributed Algorithms in AI, Case Studies: Implementing AI Algorithms using Data Structures.

Textbooks

1. **Mark Allen Weiss**, *Data Structures and Algorithm Analysis in C++*, Pearson.
2. **Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein**, *Introduction to Algorithms*, MIT Press.
3. **Nils J. Nilsson**, *Artificial Intelligence: A New Synthesis*, Morgan Kaufmann (for AI algorithm context).

Reference Books

1. **Richard E. Neapolitan, KumarssNaimipour**, *Foundations of Algorithms*, Jones & Bartlett Publishers.
2. **R. S. Salaria**, *Data Structures and Algorithms*, Khanna Publishing House.
3. **Stuart Russell, Peter Norvig**, *Artificial Intelligence: A Modern Approach*, Pearson.

Online Courses

Platform	**Course Title & Link**
Coursera	Algorithms Specialization – Stanford University

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

IV B. Tech - I Semester

		L	T	P	C
23AAD03	**REINFORCEMENT LEARNING**	3	0	0	3

Course Objectives (COs)

- Understand the fundamental concepts and principles of reinforcement learning (RL).
- Learn various RL algorithms including model-free and model-based methods.
- Analyze the mathematical foundations and performance of RL algorithms.
- Apply reinforcement learning techniques to real-world problems and AI applications.
- Develop skills to design, implement, and evaluate RL systems effectively.

Course Outcomes:

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

CO1 Understand core concepts such as Markov Decision Processes, policies, and rewards in RL. Understand (L2)

CO2 Implement fundamental RL algorithms like Dynamic Programming, Monte Carlo, and Temporal Difference. Apply (L3)

CO3 Analyze convergence, stability, and exploration-exploitation trade-offs in RL algorithms. Analyze (L4)

CO4 Evaluate the effectiveness of different RL algorithms on benchmark tasks. Evaluate (L5)

CO5 Design and develop advanced RL solutions for complex environments. Create (L6)

Unit 1: Introduction and Foundations of Reinforcement Learning

Overview of Reinforcement Learning, Key Elements: Agent, Environment, States, Actions, Rewards, Markov Decision Process (MDP) - Definition and Properties, Policies and Value Functions, Bellman Equations for State and Action Values, Concept of Return and Discount Factor, Exploration vs Exploitation dilemma, Examples of RL in Real World.

Unit 2: Dynamic Programming and Monte Carlo Methods

Policy Evaluation with Dynamic Programming, Policy Improvement and Policy Iteration, Value Iteration Algorithm, Monte Carlo Prediction and Control, First-visit and Every-visit MC Methods, On-policy vs Off- policy MC Methods, Importance Sampling in Monte Carlo, Applications of Dynamic Programming and Monte Carlo in RL.

Unit 3: Temporal Difference Learning

Introduction to Temporal Difference (TD) Learning, TD(0) Algorithm and its Properties, TD Prediction and Control Methods, SARSA Algorithm (On-policy TD Control), Q-Learning Algorithm (Off-policy TD Control), Eligibility Traces and TD(λ), Function Approximation in TD Learning, Convergence and Stability Analysis.

Unit 4: Policy Gradient and Advanced Methods

Policy Gradient Theorem, REINFORCE Algorithm, Actor-Critic Methods, Deep Reinforcement Learning (DRL) Overview, Deep Q Networks (DQN), Trust Region Policy Optimization (TRPO), Proximal Policy Optimization (PPO), Exploration Strategies (ε-greedy, Boltzmann, UCB).

Unit 5: Applications and Recent Advances in Reinforcement Learning

Multi-agent Reinforcement Learning, Hierarchical Reinforcement Learning, Inverse Reinforcement Learning, RL in Robotics and Autonomous Systems, RL for Game Playing (Chess, Go, Atari), Safety and Ethics in RL, Transfer Learning and Meta-RL, Case Studies and Re

Textbooks

1. **Richard S. Sutton and Andrew G. Barto**, *Reinforcement Learning: An Introduction*, 2nd Edition, MIT Press, 2018.
2. **CsabaSzepesvári**, *Algorithms for Reinforcement Learning*, Morgan & Claypool Publishers, 2010.

Reference Books

1. **Marco Wiering and Martijn van Otterlo (Editors)**, *Reinforcement Learning: State-of-the-Art*, Springer, 2012.
2. **Deep Reinforcement Learning Hands-On** by Maxim Lapan, Packt Publishing, 2018.
3. **David Silver's Lecture Notes and Videos** on Reinforcement Learning (available online).

search Trends

Online Courses

Platform	**Course Title & Link**
Coursera	Reinforcement Learning Specialization – University of Alberta

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

III B. Tech - II Semester

		L	T	P	C
23ACA42	**PYTHON & DS LAB**	0	0	3	1.5

Course Objectives:

- To strengthen programming and DS skills for AI.

Course Outcomes:

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

1. Apply Python for solving AI-related problems.
2. Use appropriate data structures in solutions.

Experiments:

1. Python basics and data types
2. Functions and recursion
3. Lists, Tuples, Sets
4. Dictionaries and comprehension
5. Stacks and Queues
6. Linked Lists implementation
7. Searching and Sorting
8. Tree traversals
9. Graph representation and DFS/BFS
10. Recursion with memoization
11. Implement AI heuristic search (A*)

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IV B. Tech - I Semester

		L	T	P	C
23ACA43	**RL & QUANTUM AI LAB**	0	0	3	1.5

Course Objectives:

- To introduce RL and Quantum concepts in AI.

Course Outcomes:

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

- Apply RL to solve simple tasks.
- Demonstrate basics of quantum circuits.

Experiments:

1. Intro to OpenAI Gym
2. RL environment setup
3. Q-learning implementation
4. Policy gradient methods
5. CartPole balancing with RL
6. Quantum computing basics (Qiskit)
7. Quantum circuits & gates
8. Superposition and entanglement
9. Quantum teleportation simulation
10. Quantum ML (VQC intro)
11. Reinforcement learning with function approximation
12. RL/Quantum hybrid demo

MINORS DEGREE IN AI APPLICATIONS & EMERGING TECHNOLOGIES

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

III B. Tech - I Semester

		L	T	P	C
23AAI15	**INTRODUCTION TO AI IN CYBER SECURITY**	3	0	0	3

Course Objectives

- Understand the foundational principles of cybersecurity and AI integration.
- Explore how AI/ML techniques can detect, prevent, and mitigate cybersecurity threats.
- Learn about anomaly detection, malware classification, intrusion detection, and phishing detection using AI.
- Analyze ethical issues, limitations, and adversarial attacks in AI-driven cybersecurity systems.
- Implement AI models for real-time threat intelligence and response.

Course Outcomes (COs)

CO1	Explain the fundamentals of AI and its applications in cybersecurity.	Understand (L2)
CO2	Apply machine learning models for intrusion and anomaly detection.	Apply (L3)
CO3	Analyze malware and phishing threats using AI techniques.	Analyze (L4)
CO4	Evaluate and compare different AI-based cybersecurity frameworks.	Evaluate (L5)
CO5	Design secure AI-based threat detection and response systems.	Create (L6)

UNIT 1: Introduction to Cybersecurity & AI

Overview of Cybersecurity Threat Landscape, Fundamentals of Artificial Intelligence & Machine Learning, Categories of Threats: Malware, Phishing, Ransomware, Traditional vs AI-based Threat Detection Systems, Role of AI in Cybersecurity: Overview, AI in Endpoint, Network, and Application Security, AI Workflow in Threat Detection Systems, Challenges of Implementing AI in Cybersecurity

UNIT 2: Intrusion Detection and Anomaly Detection using AI

What is Intrusion Detection System (IDS)?, Signature-based vs Anomaly-based IDS, ML Techniques for Anomaly Detection, Feature Engineering for Network Traffic, Classification Algorithms for IDS (SVM, KNN, RF), Real-time Threat Monitoring Using AI, Evaluation Metrics: Accuracy, ROC, Precision/Recall, Tools: Snort, Suricata, and Open Source AI IDS Models

UNIT 3: Malware Analysis and Phishing Detection

Introduction to Malware Analysis, Static vs Dynamic Malware Analysis Techniques, Malware Classification Using Machine Learning, Phishing Attack Patterns and Features, Email Header and URL-based Phishing Detection, NLP for Textual Content Analysis, Feature Extraction from Executables and Emails, Dataset: Malimg, PhishTank, VirusShare

UNIT 4: Adversarial Attacks and AI Model Robustness

Introduction to Adversarial Machine Learning, Poisoning, Evasion, and Inference Attacks, Adversarial Example Generation (FGSM, PGD), Model Robustness Evaluation Techniques, Defense Mechanisms: Input Sanitization, Adversarial Training, Privacy Attacks: Membership Inference & Model Inversion, Explainable AI in Cybersecurity.

UNIT 5: AI for Cyber Threat Intelligence & Incident Response

Threat Intelligence Frameworks and Standards (STIX/TAXII), AI-Powered SIEM (Security Information and Event Management), NLP for Threat Report Analysis, Entity Recognition in Cyber Threat Reports, Predictive Analytics for Threat Forecasting, AI in SOC (Security Operations Center) Automation, Use of LLMs (like GPT) for Incident Summary and Analysis, Capstone Project: Build AI-Based Cyber Threat Detection System

Textbooks

1. **"Artificial Intelligence for Cybersecurity" –** Alessandro Parisi
2. **"Machine Learning and Security" –** Clarence Chio& David Freeman
3. **"Cybersecurity and Artificial Intelligence" –** RashmiAgrawal, Vishal Jain

Reference Books

1. **"Hands-On Machine Learning for Cybersecurity" –** Soma Halder, SinanOzdemir
2. **"Blue Team Field Manual" –** Alan J White
3. NIST and MITRE ATT&CK Framework Guidelines
4. Research papers from IEEE/ACM Digital Library on Adversarial AI

Online Courses

Platform	**Course Title**
Coursera	AI For Cybersecurity

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
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III B. Tech - I Semester

		L	T	P	C
23ACA28	**HEALTHCARE AI**	3	0	0	3

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.

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.

UNIT I: Introduction to AI in Healthcare: Overview of Healthcare Systems and Data Ecosystem – (U), AI in Clinical Decision Support Systems (CDSS) – (U), Types of Medical Data: EHRs, Imaging, Genomic, Sensor Data – (U), Applications of AI in Diagnosis, Prognosis, and Monitoring – (A), Use Cases: Radiology, Pathology, Oncology, Cardiology – (A), Limitations and Challenges of AI in Healthcare , AI for Telemedicine and Remote Patient Monitoring – (A).

UNIT II: Medical Data Preprocessing and Feature Engineering: Data Cleaning, Imputation, and Normalization for Clinical Data – (A), Handling Missing Values, Outliers, and Bias – (A), Feature Engineering from EHRs and Time-Series Data – (A), Text Mining for Medical Notes using NLP – (A), Encoding Diagnosis and Procedure Codes (ICD, CPT) – (U), Temporal Pattern Extraction from Clinical Sequences ,Data Privacy, Anonymization, and HIPAA Compliance – (AN)

UNIT III: Machine Learning & Deep Learning in Healthcare: Supervised Learning for Risk Prediction and Classification – (A), Unsupervised Learning for Patient Segmentation – (A), Deep Learning for Medical Imaging: CNNs, Transfer Learning – (A), Recurrent Neural Networks for Time-series Clinical Data, Survival Analysis and Time-to-Event Prediction – (A), Model Evaluation Metrics: Sensitivity, Specificity, AUC – (E), Handling Imbalanced Datasets in Healthcare – (E), Interpretability in Medical ML Models (LIME, SHAP) – (E)

UNIT IV: Specialized Healthcare AI Applications : AI for Disease Diagnosis: Diabetes, Cancer, Heart Disease – (A), AI in Medical Imaging: X-ray, MRI, CT Scan Analysis – (A), Predictive Modeling for ICU Admission & Mortality Risk – (A), AI in Genomics and Personalized Medicine ,Drug Discovery and Repurposing with AI ,Chatbots and Virtual Health Assistants – (A), Remote Monitoring using IoT&Wearables + AI – (A), Designing an End-to-End AI Solution for a Medical Use Case – (C)

UNIT V: Ethics, Regulation, and Future Directions in Healthcare AI: Ethical AI in Healthcare: Bias, Fairness, and Accountability ,Regulatory Landscape: FDA Approval, CE Marking – (E), Explainable AI and Clinical Trust – (E), Federated Learning for Privacy-Preserving AI ,Clinical Trials and AI Decision-Support Tools – (E), Case Studies: Google DeepMind, IBM Watson Health, PathAI ,Responsible Deployment of AI in Healthcare Settings – (E), Capstone: Building a Responsible Healthcare AI Proposal – (C)

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. BertalanMeskó – The Guide to the Future of Medicine: Technology and The Human Touch.
3. Peter Szolovits – Artificial Intelligence in Medicine (Morgan Kaufmann).

Online Learning Resources:

- Coursera: AI for Medicine Specialization (offered by DeepLearning.AI) **https://www.coursera.org/specializations/ai-for-medicine**
- HarvardX: Data Science in Healthcare (edX) **https://online-learning.harvard.edu/course/data-science-healthcare**

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III B. Tech - II Semester

		L	T	P	C
23AAI16	**AI IN FINANCE & BUSINESS ANALYTICS**	3	0	0	3

Course Objectives

- Understand the fundamentals and applications of AI in finance and business.
- Explore machine learning and deep learning techniques for financial data modeling.
- Analyze predictive analytics for stock market, risk, and fraud detection.
- Develop AI-based solutions for customer segmentation, churn prediction, and pricing.
- Evaluate ethical, regulatory, and technological challenges in deploying AI in business.

Course Outcomes

CO1 Understand financial systems and analytics tools for business insights. Understand (L2)
CO2 Apply AI/ML models for risk assessment, fraud detection, and market prediction. Apply (L3)
CO3 Analyze customer behavior using segmentation and recommendation systems. Analyze (L4)
CO4 Evaluate AI tools for performance optimization in business decisions. Evaluate (L5)
CO5 Design intelligent business systems using ethical AI techniques. Create (L6)

UNIT 1: Introduction to AI in Finance & Business

Overview of Financial Systems and Analytics, Introduction to Artificial Intelligence and ML in Business, Business Intelligence vs. Business Analytics, Types of Financial Data (Transactional, Time-Series, Textual), Use Cases of AI in Banking, Insurance, and Stock Markets, Tools for Business Analytics: Python, Power BI, Tableau, Descriptive, Predictive, and Prescriptive Analytics, Case Study: AI in Robo-Advisory Systems

UNIT 2: Machine Learning for Financial Analytics

Data Preprocessing for Financial Applications, Regression for Stock Price Prediction, Classification Models for Credit Scoring, Clustering for Customer Segmentation, Time Series Analysis using ARIMA, LSTM, Portfolio Optimization using Reinforcement Learning, AI in Algorithmic Trading Strategies, Model Validation Techniques: Cross-validation, A/B Testing

UNIT 3: AI for Risk, Fraud, and Compliance

Credit Risk Modeling using Decision Trees and XGBoost, Fraud Detection using Anomaly Detection Models, Real-Time Risk Scoring Systems, Anti-Money Laundering (AML) Compliance Models, Sentiment Analysis for Financial News and Tweets, Predictive Maintenance and Financial Risk Analysis, Explainable AI in Financial Decision Systems, Case Study: Fraud Detection in Credit Card Transactions

UNIT 4: AI for Business Process Optimization

Customer Lifetime Value Prediction, Churn Prediction using Ensemble Models, Dynamic Pricing Models using AI, AI in Demand Forecasting, Chatbots for Customer Support and Financial Advisory, Recommendation Systems in E-Commerce and Retail, Optimization in Supply Chain Analytics, AI-driven Marketing Campaigns and ROI Analysis

UNIT 5: Ethics, Deployment, and Future Trends

Ethics of AI in Finance: Bias, Fairness, and Transparency, Regulatory Frameworks (GDPR, RBI, SEBI, PSD2), Data Privacy and Governance in Financial Institutions, Explainable AI (XAI) for Auditing and Trust, Scalable AI Architectures (ML Ops in Business), Fintech Innovations: Blockchain, AI, and Smart Contracts, Generative AI and Large Language Models in Business Analytics, Designing AI-Powered Financial Products (Use Case Projects)

Textbooks

1. **"Artificial Intelligence in Finance"** by Yves Hilpisch – O'Reilly
2. **"Applied Artificial Intelligence in Finance"** by Yves Hilpisch – Wiley
3. **"Business Analytics: The Science of Data-Driven Decision Making"** by U. Dinesh Kumar – Wiley India

Reference Books

1. **"Machine Learning for Financial Risk Management"** by Abdullah Karasan – Springer
2. **"Data Science for Business"** by Foster Provost & Tom Fawcett – O'Reilly
3. **"Machine Trading"** by Ernest Chan – Wiley
4. Research Articles from **Journal of Financial Data Science**, **Harvard Business Review**, and **ACM Transactions on Management Information Systems**

Online Courses

Platform	**Course Title & Link**
Coursera	AI in Finance by NYIF
edX	Artificial Intelligence in Business

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

III B. Tech - II Semester

		L	T	P	C
23AAI17	**ETHICAL AI & RESPONSIBLE AI**	3	0	0	3

Course Objectives

- Understand the ethical foundations and challenges in AI systems.
- Explore fairness, accountability, transparency, and interpretability in AI.
- Identify social, legal, and cultural impacts of deploying AI at scale.
- Learn frameworks for responsible AI governance and regulations.
- Design and evaluate AI systems with ethical and responsible principles.

Course Outcomes

CO1	Explain ethical theories and values applied to AI systems.	Understand (L2)
CO2	Identify bias, fairness, and accountability issues in AI systems.	Analyze (L4)
CO3	Evaluate the ethical impact of AI across industries and society.	Evaluate (L5)
CO4	Recommend design choices for building responsible AI applications.	Apply (L3)
CO5	Develop AI solutions aligned with global policies and ethical standards.	Create (L6)

UNIT 1: Foundations of AI Ethics

Introduction to AI and Ethics, Ethical Theories: Utilitarianism, Deontology, Virtue Ethics, AI's Role in Society: Risks and Benefits, Data Ethics and Consent, AI Decision-Making vs. Human Judgment, Algorithmic Responsibility and Trust, Moral Machine Experiment and Human-AI Dilemmas, Case Study: Ethical Challenges in Autonomous Vehicles

UNIT 2: Bias, Fairness & Discrimination in AI

Understanding Algorithmic Bias, Types of Bias: Historical, Sampling, Label, Measurement, Disparate Impact and Fairness Metrics, Mitigating Bias: Pre-processing, In-processing, Post-processing, Audit and Testing of AI Systems, Intersectionality and Social Justice in AI, Case Study: Racial Bias in Facial Recognition Systems, Tools for Fair AI: IBM AI Fairness 360, Fairlearn.

UNIT 3: Explainability, Transparency & Accountability

Explainability vs Interpretability, Model-Agnostic vs. Intrinsic Explainability, SHAP, LIME, and Counterfactual Explanations, Black-Box vs. Glass-Box Models, Accountability Frameworks for AI Developers, Documentation: Datasheets for Datasets, Model Cards, Role of Human Oversight, Case Study: Transparent Credit Scoring Systems

UNIT 4: Responsible AI Governance & Regulations

AI Governance Frameworks (OECD, NITI Aayog, EU AI Act), Ethics Guidelines from IEEE, UNESCO, ISO/IEC, Legal Responsibility and Liability in AI, Data Protection Laws: GDPR,

HIPAA, Ethics Boards and Risk Assessment Models, AI Ethics in Industry: Google, Microsoft, Meta Case Studies, Inclusive Design and Accessibility, Open Source & Community Involvement in Responsible AI

UNIT 5: Emerging Topics & Global Perspective

Ethical Issues in Generative AI (ChatGPT, DALL·E), Deepfakes and Information Manipulation, Autonomous Weapons and AI in Warfare, AI and Climate Change Mitigation, Emotional AI, Neuro AI, and Human Rights, AI in Healthcare, Finance, and Education: Ethical Outlook, Cultural and Geopolitical Dimensions of AI Deployment, Capstone Project: Designing a Responsible AI Use Case

Textbooks

1. **"Ethics of Artificial Intelligence and Robotics"** – Stanford Encyclopedia of Philosophy
2. **"Ethics of Artificial Intelligence"** by Markus D. Dubber, Frank Pasquale, Sunit Das
3. **"Weapons of Math Destruction"** by Cathy O'Neil
4. **"Artificial Unintelligence: How Computers Misunderstand the World"** by Meredith Broussard

Reference Books

1. **"Rebooting AI"** by Gary Marcus and Ernest Davis
2. **"The Ethical Algorithm"** by Michael Kearns and Aaron Roth
3. **IEEE Standards for Ethically Aligned Design**
4. **UNESCO Recommendations on Ethics of AI**

Online Courses

Platform	**Course Title & Link**
Coursera	AI For Everyone by Andrew Ng

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

IV B. Tech - I Semester

		L	T	P	C
23AAI18	**GENERATIVE AI & PROMPT ENGINEERING**	3	0	0	3

Course Objectives

- Understand the fundamental principles behind generative models, including transformers and diffusion models.
- Explore various architectures like GPT, DALL·E, BERT, and Stable Diffusion.
- Learn prompt engineering strategies to guide LLMs effectively for various tasks.
- Develop skills to build applications using Generative AI APIs (e.g., OpenAI, Hugging Face).
- Evaluate the ethical considerations and limitations of generative AI systems.

Course Outcomes

CO1 Understand foundational concepts of generative AI and prompt engineering. Understand (L2)
CO2 Apply effective prompting techniques for text/image/code generation. Apply (L3)
CO3 Analyze different types of generative models and their applications. Analyze (L4)
CO4 Evaluate the performance and output quality of various generative AI tools. Evaluate (L5)
CO5 Design AI-powered solutions using LLMs and prompt design. Create (L6)

UNIT 1: Introduction to Generative AI

What is Generative AI? – Overview and History, Applications: Text, Images, Code, Audio, Video, Probabilistic Models vs Generative Models, GANs (Generative Adversarial Networks): Intuition, Autoencoders and Variational Autoencoders, Transformers: Architecture and Attention, Pretraining vs Fine- tuning, Introduction to GPT, BERT, DALL·E, Stable Diffusion

UNIT 2: Prompt Engineering Techniques

What is Prompt Engineering?, Few-shot, One-shot, and Zero-shot Prompting, Role-based Prompting (e.g., "Act as…"), Chain-of-Thought Prompting, Prompt Templates and Variables, Prompt Evaluation and Refinement, Prompt Injection Attacks &Defenses, Prompting for Text Summarization, Translation.

UNIT 3: Architectures & Tools for Generative AI

OpenAI GPT-3, GPT-4: Capabilities & APIs, Hugging Face Transformers and Pipelines, DALL·E and Stable Diffusion for Image Generation, Midjourney& Open-Source Diffusion Models, LangChain for Prompt Chaining, Fine-tuning vs Instruction Tuning, Codex for Code Generation, Tool Use: Notebooks, APIs, VS Code Extensions

UNIT 4: Use Cases & Application Development

Chatbots& Virtual Assistants with LLMs, Content Generation for Marketing & Blogs, Educational Aids: Auto-Grading & Explanations, Code Generation & Refactoring (Copilot, Codex), Image Generation for Design & Advertising, AI Writing Assistants (e.g., Jasper, Writer.ai), Prompt-Based App Development with LangChain, Evaluating Output Quality: Human-AI Feedback Loop

UNIT 5: Ethical AI & Future Trends

AI Hallucinations and Misinformation, Bias, Fairness, and Toxicity in Generative AI, Copyright, Plagiarism, and Data Usage Issues, Red Teaming & Safety Testing for LLMs, OpenAI Usage Guidelines and Safety Layers, Explainability& Interpretability in Generative Models, The Future: AGI, Multimodal AI, and Prompt Agents, Capstone Project: Design & Deploy a Prompt-Driven Application

Textbooks

1. **"You Look Like a Thing and I Love You"** – Janelle Shane
2. **"Deep Learning with Python"** – François Chollet
3. **"Prompt Engineering Guide"** – DAIR.AI (Open Source)
4. **"Generative Deep Learning"** – David Foster

Reference Books

1. **"Hands-On Generative Adversarial Networks"** – Josh Kalin
2. **"Transformers for Natural Language Processing"** – Denis Rothman
3. **"Natural Language Processing with Transformers"** – Lewis Tunstall et al.
4. OpenAI Cookbook (GitHub)
5. Hugging Face Transformers Documentation

Online Courses

Platform	**Course Title**
Coursera	Prompt Engineering for ChatGPT

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

III B. Tech - II Semester

		L	T	P	C
23AAI19	**AI APPLICATIONS LAB**	0	0	3	1.5

Course Objectives:

- To implement domain-specific AI solutions.

Course Outcomes:

- Develop healthcare/finance/cybersecurity AI use-cases.

Experiments:

1. Health dataset preprocessing
2. Disease prediction (Diabetes/COVID)
3. Financial fraud detection
4. Credit scoring system
5. Business dashboard using AI tools
6. AI in intrusion detection
7. Threat classification using ML
8. Explainable AI (SHAP/LIME)
9. Domain-specific dataset handling
10. Model fairness and bias checking
11. Deployment using Flask or Streamlit
12. Mini project on any domain

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IV B. Tech - I Semester

		L	T	P	C
23AAI20	**GENERATIVE AI LAB**	0	0	3	1.5

Course Objectives:

- To explore generative AI tools and techniques.

Course Outcomes:

- Use text and image generation models.
- Develop simple prompt-based applications.

Experiments:

1. Intro to LLMs and Generative AI
2. Text generation with GPT models
3. Prompt engineering for Q&A systems
4. Image generation using DALL-E / Stable Diffusion
5. Text summarization
6. Chatbot creation using LLM API
7. Fine-tuning LLMs
8. Sentiment and emotion generation
9. Story or poem generation task
10. Prompt optimization and testing
11. Mid-journey/Runway ML tools (demo)
12. Mini project using Generative AI

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

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III B.Tech I Semester CE,ME,EEE,ECE(Minor)

L	T	P	C
3	0	0	3

23ACS46: INTRODUCTION TO QUANTUM COMPUTING

Course Outcomes (COs)

CO Code	Description	Bloom's Level
CO1	Explain concepts of quantum mechanics	Understand(L1)
CO2	Illustrate quantum gates/circuits	Apply(L3)
CO3	Analyze algorithms (e.g., Shor, Grover)	Analyze(L4)
CO4	Evaluate communication protocols	Evaluate(L5)
CO5	Develop quantum programs on IBM Q	Create(L6)

Unit I: Qubits and Quantum Foundations

Classical Bits vs Qubits, Postulates of Quantum Mechanics, Superposition and Probability Amplitudes, Dirac Notation (Bra-Ket), Bloch Sphere Representation, Measurement in Quantum Systems, Quantum State Collapse

Unit II: Quantum Gates and Circuits

Quantum Logic Gates: Pauli-X, Y, Z; Hadamard (H); Phase (S, T), Controlled Gates: CNOT, Toffoli, Unitary and Reversible Operations, Quantum Circuit Representation, Building Basic Quantum Circuits, Quantum Parallelism and Interference, No-Cloning Theorem and Quantum Gate Simulation.

Unit III: Quantum Algorithms

Need for Quantum Algorithms, Deutsch and Deutsch-Jozsa Algorithm, Grover's Search Algorithm (Quadratic Speed-up), Shor's Factoring Algorithm (Exponential Speed-up), Simon's Algorithm (Overview), Complexity Comparison: Classical vs Quantum.

Unit IV: Entanglement and Quantum Communication

Quantum Entanglement and Bell States, Quantum Teleportation Protocol, Superdense Coding, Quantum Key Distribution: BB84, E91 Protocols, Decoherence and Quantum Noise, Quantum Error Correction Codes (Bit Flip, Phase Flip, Shor Code).

Unit V: Quantum Platforms and Applications

Overview of Quantum Programming Platforms: IBM Qiskit, Microsoft Q#, Google Cirq, Quantum Circuit Simulation using Qiskit, Executing Code on Real Quantum Hardware (IBM Q). Quantum Applications in: Cryptography, Machine Learning, Optimization, Chemistry, Building and Testing a Sample Quantum Program.

Textbooks

1. **Michael A. Nielsen & Isaac L. Chuang –** *Quantum Computation and Quantum Information*, Cambridge University Press, 10th Anniversary Edition.
2. **David McMahon –** *Quantum Computing Explained*, Wiley.
3. **Bernhardt, Chris –** *Quantum Computing for Everyone*, MIT Press.

Reference Books

1. **Mermin, N. David –** *Quantum Computer Science: An Introduction*, Cambridge University Press.
2. **William H. Press et al. –** *Numerical Recipes in C: The Art of Scientific Computing* (for simulation background).
3. **Rieffel&Polak –** *Quantum Computing: A Gentle Introduction*, MIT Press.

Online Courses & Resources

Platform	Course Name	Link
IBM Qiskit	IBM Qiskit Textbook	Hands-on, beginner-friendly curriculum for quantum programming
Coursera	*Quantum Mechanics for Scientists and Engineers* by Stanford (Leonard Susskind)	Link

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

III B.Tech I Semester CE,ME,EEE,ECE(Minor)

L	T	P	C
3	0	0	3

23ACS47: MATHEMATICAL FOUNDATIONS FOR QUANTUM COMPUTING

Course Outcomes (COs)

CO Code	Description	Bloom's Level
CO1	Understand complex numbers & linear algebra	Understand
CO2	Apply vector space & Dirac notation	Apply
CO3	Analyze unitary &Hermitian operators	Analyze
CO4	Evaluate eigen decomposition in quantum ops	Evaluate
CO5	Create models using probability theory	Create

Unit I: Foundations of Complex Vector Spaces

Complex Numbers: Polar form, Euler's formula, Vectors in $\mathbb{C}^n$, Inner Product Spaces, Dirac Notation (Bra-Ket), Hilbert Space: Definitions and Properties, Orthogonality and Completeness, Norms, Metrics, and Distance in Complex Spaces.

Unit II: Matrix Algebra and Operators

Matrix Multiplication and Linear Transformations, Special Matrices: Identity, Diagonal, Unitary, Tensor Products of Matrices and Vectors, Kronecker Product Applications, Unitary and Invertible Operators, Quantum Gates as Linear Operators.

Unit III: Eigen Concepts and Quantum Observables

Eigenvalues and Eigenvectors, Hermitian Operators and Spectral Theorem, Quantum Observables and Expectation Values, Commutators and Compatibility, Measurement Operators and Matrix Diagonalization, Applications in Quantum Gate Analysis.

Unit IV: Quantum Measurement & Probability

Basics of Probability Theory in Quantum Systems, Born's Rule and Measurement Probabilities, Projection Postulate, Density Matrix Formalism, Mixed States and Pure States, Trace, Partial Trace, and Operator Sums.

Unit V: Advanced Structures in Quantum Math ***(CO5 – Create)***

Group Theory Basics: Symmetry, Permutations, Pauli Group, Clifford Group, and their roles, Fourier Transform in Quantum Context, Gram-Schmidt Orthogonalization, Lie Groups and Lie Algebras, Use of Lie Algebra in Hamiltonian Formulation.

Textbooks

1. **Nielsen & Chuang –** *Quantum Computation and Quantum Information*, Cambridge University Press
2. **Brian C. Hall –** *Quantum Theory for Mathematicians*, Springer
3. **T.S. Blyth & E.F. Robertson –** *Basic Linear Algebra*, Springer

Reference Books

1. **Roman S. –** *Advanced Linear Algebra*, Springer
2. **Axler, Sheldon –** *Linear Algebra Done Right*, Springer
3. **Shankar, R. –** *Principles of Quantum Mechanics*, Springer
4. **W. Greiner –** *Quantum Mechanics: An Introduction*, Springer

Online Courses & Resources

Platform	Course Name	Link
MIT OpenCourseWare	*Linear Algebra (Gilbert Strang)*	Link
edX	*Mathematics for Quantum Computing* by TUDelft	Link
Khan Academy	*Linear Algebra*, *Probability & Statistics*	Link
Quantum Country	*Spaced Repetition & Essays on Quantum Math*	Link

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

III B.Tech II Semester CE, ME, EEE, ECE (Minor)

L	T	P	C
3	0	0	3

23ACS48: QUANTUM ALGORITHMS

Course Outcomes (COs)

CO Code	Description	Bloom's Level
CO1	Understand quantum algorithm building blocks	Understand
CO2	Analyze well-known quantum algorithms	Analyze
CO3	Apply quantum algorithms to application domains	Apply
CO4	Evaluate efficiency and complexity of algorithms	Evaluate
CO5	Create and simulate quantum algorithms	Create

Unit I: Mathematical Tools for Quantum Algorithms

Review of Complex Numbers & Linear Algebra for Quantum Computing, Inner Product Spaces, Hilbert Spaces, Dirac Notation and Interpretations, Quantum State Vectors and Superposition, Overview of Quantum Gates and Operators, Building Block Concepts for Algorithmic Design

Unit II: Quantum Circuits and Operations

Quantum Gates: X, H, Z, CNOT, Toffoli, Quantum Circuits: Representation and Simulation, Quantum Teleportation Protocol, Circuit-based Measurement and State Collapse, Reversible Computing and Unitary Evolution, Applying Circuits to Small-scale Problems

Unit III: Search and Oracle-Based Algorithms

Deutsch's Algorithm: Problem and Solution Strategy, **Simon's Algorithm**: Period-finding and Speed-up Over Classical, **Grover's Search Algorithm**: Amplitude Amplification, Oracle Construction in Grover's Algorithm, Circuit Analysis and Complexity Comparison, Limitations and Applications in Database Search

Unit IV: Fourier-Based & Cryptographic Algorithms ***(CO4 – Evaluate)***

Quantum Fourier Transform (QFT): Theory and Circuit, **Phase Estimation Algorithm**: Foundations and Usage, **Shor's Algorithm**: Integer Factorization and Discrete Logarithms, Modular Arithmetic and Period Finding, Cryptographic Implications of Quantum Algorithms, Efficiency Analysis vs Classical RSA Factorization

Unit V: Advanced & Hybrid Quantum Algorithms *(CO5 – Create)*

Variational Quantum Eigensolver (VQE), Quantum Approximate Optimization Algorithm (QAOA), Quantum Machine Learning (QML): Classification & Clustering, Hybrid Quantum-Classical Models, IBM Qiskit&Cirq for Implementation, Building Custom Quantum Algorithms for NISQ Devices

Textbooks

1. **Michael A. Nielsen & Isaac L. Chuang –** *Quantum Computation and Quantum Information*, Cambridge University Press
2. **Cristopher Moore & Stephan Mertens –** *The Nature of Computation*, Oxford University Press
3. **Eleanor G. Rieffel& Wolfgang Polak –** *Quantum Computing: A Gentle Introduction*, MIT Press

Reference Books

1. **Gideon Amir –** *Quantum Algorithms via Linear Algebra*, MIT Press
2. **S. Jordan –** *Quantum Algorithm Zoo*, [Online repository]
3. **T. G. Wong –** *Quantum Algorithm Design Techniques*
4. **Roland, Cerf –** *Quantum Search Algorithms*, Springer

Online Courses & Resources

Platform	Course Name	Link
edX (MIT)	*Quantum Algorithms for Cybersecurity*	Link
Coursera	*Quantum Computing* by University of London	Link
Qiskit Textbook	*Algorithms & Quantum Machine Learning Modules*	Link
Braket (AWS)	*Quantum Computing Developer Tools & Tutorials*	Link

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

III B.Tech II Semester CE,ME,EEE,ECE(Minor)

L	T	P	C
3	0	0	3

23ACS49: QUANTUM INFORMATION AND COMMUNICATION

Course Outcomes (COs)

CO Code	Description	Bloom's Level
CO1	Understand quantum information concepts	Understand
CO2	Apply quantum communication protocols	Apply
CO3	Analyze fidelity, entropy, and data transfer limits	Analyze
CO4	Evaluate quantum cryptographic techniques	Evaluate
CO5	Create and simulate quantum communication models	Create

Unit I: Quantum Information Basics

Classical vs Quantum Information, Density matrices and mixed states, Quantum entropy and Shannon entropy, Von Neumann entropy, Quantum data compression,

Unit II: Quantum Communication Protocols

Quantum teleportation, Superdense coding, Quantum repeaters and communication channels, No-cloning theorem, Quantum channel capacity

Unit III: Fidelity, Distance & Information Theory

Fidelity and trace distance, Quantum mutual information, Holevo bound, Information trade-offs in communication, Channel noise and error modeling

Unit IV: Quantum Cryptography

Principles of quantum cryptography, BB84 and B92 key distribution protocols, Eavesdropping and security analysis, Quantum bit commitment, Post-quantum cryptography relevance

Unit V: Applications & Tools

Quantum internet: architecture and challenges, Networked quantum systems, Simulation using Qiskit, NetSquid, QuTiP, IBM Q Network and cloud-based setups, Practical implementation of QKD in simulation

Textbooks

1. Michael A. Nielsen & Isaac L. Chuang – *Quantum Computation and Quantum Information*, Cambridge University Press
2. Mark M. Wilde – *Quantum Information Theory*, Cambridge University Press
3. John Watrous – *The Theory of Quantum Information*, Cambridge University Press

Reference Books

1. Peter W. Shor – *Foundations of Quantum Computing* (Lecture notes)
2. Charles H. Bennett & Gilles Brassard – *Original Papers on QKD (BB84)*
3. Stephanie Wehner – *Quantum Communication Networks*, arXiv

Online Courses & Resources

Platform	Course Name	Link
Coursera	*Quantum Cryptography* by University of Geneva	Coursera Link
edX	*Quantum Information Science I* (Harvard/MIT)	edX Course
Qiskit	*Quantum Information Applications in Qiskit Textbook*	Qiskit Info
QuTech	*Quantum Internet Tutorials & Tools*	QuTech

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
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IV B.Tech I Semester CE, ME, EEE, ECE(Minor)

L	T	P	C
3	0	0	3

23ACS50: QUANTUM MACHINE LEARNING (QML)

Course Outcomes (COs)

CO Code	Description	Bloom's Level
CO1	Understand foundations of quantum machine learning	Understand
CO2	Apply QML algorithms to datasets	Apply
CO3	Analyze quantum kernels, data encoding, and models	Analyze
CO4	Evaluate hybrid quantum-classical models	Evaluate
CO5	Create and simulate QML models using frameworks	Create

Unit I: Introduction to QML

Need for QML: Why quantum for ML?,Classical vs quantum machine learning, Quantum states as information carriers, Data encoding: amplitude, angle, basis encoding, Introduction to quantum feature space.

Unit II: QML Algorithms – Supervised Learning

Quantum classifiers (quantum SVMs, qNN), Quantum perceptron, Variational quantum classifiers (VQC), Quantum kernels, Cost functions in quantum models

🔍 Unit III: QML Algorithms – Unsupervised Learning

Quantum k-means and clustering, Quantum PCA, Quantum generative models (QGANs), Dimensionality reduction and similarity metrics, Performance analysis and limitations

Unit IV: Hybrid Models & Optimization *(CO4 – Evaluate)*

Variational Quantum Circuits (VQCs), Hybrid quantum-classical training loops, Barren plateaus and optimization issues, Quantum gradient descent and parameter shift rule, Comparative study of classical and QML models

Unit V: QML Tools and Case Studies *(CO5 – Create)*

Implementing QML with Qiskit Machine Learning, PennyLane and TensorFlow Quantum integration, Case studies: quantum-enhanced fraud detection, NLP, Quantum datasets and benchmark models, Project: design a small QML application

Textbooks

1. Maria Schuld, Francesco Petruccione – *Machine Learning with Quantum Computers*, Springer
2. Peter Wittek – *Quantum Machine Learning: What Quantum Computing Means to Data Mining*, Academic Press

Reference Books

1. Jacob Biamonte – *Quantum Machine Learning*, Nature, 2017
2. Seth Lloyd – *Quantum algorithms for supervised/unsupervised learning* (Research papers)
3. VojtěchHavlíček – *Supervised Learning with Quantum-Enhanced Feature Spaces*, Nature, 2019

Online Courses & Resources

Platform	Course Name	Link
edX	*Quantum Machine Learning* by UTS	edX Course
Qiskit	*Qiskit Machine Learning Module*	Qiskit ML
Xanadu	*QML with PennyLane (Free online textbook)*	PennyLane QML Book
Coursera	*Quantum Machine Learning* by University of Toronto	Coursera

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

III B.Tech II Semester CE,ME,EEE,ECE(Minor)

L	T	P	C
0	0	3	1.5

23ACS50: QUANTUM ALGORITHMS LAB

Experiments :

1. Deutsch Algorithm
2. Deutsch-Jozsa
3. Grover's Algorithm
4. QFT Visualization
5. Shor's Algorithm
6. QRNG Implementation
7. Bell State Entanglement
8. Bernstein-Vazirani Algorithm
9. Quantum Teleportation
10. Phase Estimation
11. Circuit Simulation
12. Mini-Project: RSA Key Breaking

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
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IV B.Tech I Semester CE,ME,EEE,ECE(Minor)

L	T	P	C
0	0	3	1.5

23ACS50: QUANTUM PROGRAMMING AND SIMULATION LAB

LIST OF EXPERIMENTS

1. State Vector Simulation (Qiskit)
2. Bell State Implementation
3. Deutsch-Jozsa Circuit
4. Grover's Search in Qiskit
5. QFT Circuit in Python
6. Shor Algorithm Simulation
7. Quantum Teleportation in Code
8. VQE (Hybrid Circuit)
9. QAOA Simulation
10. Quantum Random Number Generator
11. Comparison: Real vs Simulated Runs
12. Mini-Project: Quantum Password Cracker

Textbooks & References

- Michael Nielsen & Isaac Chuang – *Quantum Computation and Quantum Information*
- Eric R. Johnston et al. – *Programming Quantum Computers*
- David McMahon – *Quantum Computing Explained*
- Gilbert Strang – *Introduction to Linear Algebra*
- Sarah Kaiser & Chris Granade – *Learn Quantum Computing with Python and Q#*

Online Resources

- IBM Qiskit Textbook: https://qiskit.org/learn
- Microsoft Q# Documentation: https://learn.microsoft.com/en-us/azure/quantum/
- Coursera: *Introduction to Quantum Computing*
- edX: *Quantum Computing Fundamentals*, *Quantum Algorithms*

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

Minors in Information Technology (R23)

23AIT24: Foundations of Quantum Technologies

L	T	P	C
3	0	0	3

Course Objectives:

1. Introduce the fundamental quantum mechanics concepts essential for quantum technologies.
2. Build strong mathematical foundations for quantum state modeling.
3. Develop understanding of superposition, entanglement, and measurement.
4. Explain the physical principles behind quantum devices.
5. Prepare students for advanced studies in quantum computation, communication, sensing, and materials.

Course Outcomes (COs):

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

CO1: Understand postulates of quantum mechanics for quantum technologies
CO2: Apply linear algebra and Dirac notation to quantum state analysis
CO3: Analyze superposition, entanglement, and measurement processes
CO4: Evaluate quantum systems through operators and probability amplitudes
CO5: Create mathematical models for simple quantum systems

UNIT I – Quantum Mechanics Foundations ***(Cognitive Level: Understand)***

Classical vs Quantum systems, Wave-particle duality, Schrödinger equation (Time-dependent and Time-independent), Postulates of Quantum Mechanics, Quantum states and state vectors, Complex Hilbert spaces, Dirac notation (Bra-Ket notation), Probabilistic interpretation of quantum mechanics

UNIT II – Linear Algebra for Quantum Systems ***(Cognitive Level: Apply)***

Complex vector spaces and inner products, Orthonormal basis and orthogonality, Linear operators and transformations, Unitary operators and Hermitian operators, Tensor products for multi-qubit systems, Eigenvalues and Eigenvectors, Commutators, and anti-commutators, Representing quantum states with matrices

UNIT III – Superposition, Measurement, and Entanglement ***(Cognitive Level: Analyze)***

Principle of superposition, Measurement postulate, Probability amplitudes and Born rule, State collapse upon measurement, Entanglement and Bell states, EPR paradox and non-locality, Density matrices and mixed states, Quantum decoherence

UNIT IV – Operators and Quantum Dynamics ***(Cognitive Level: Evaluate)***

Time evolution operators, Hamiltonian and energy eigenstates, Quantum harmonic oscillator (brief overview), Unitary evolution and Schrödinger equation solutions, Quantum tunnelling, Adiabatic theorem basics, Operator algebra in quantum systems, Expectation values and observables

UNIT V – Quantum Technologies Building Blocks *(Cognitive Level: Create)*

Basic qubit systems (spin-1/2, photon polarization, superconducting qubits), Two-level quantum systems modelling, Bloch sphere representation, Quantum logic gates fundamentals, Multi-qubit systems: controlled operations, Introduction to decoherence and quantum error correction, Quantum technologies: hardware platforms overview, Basic quantum circuit modeling using simulators (Qiskit or Q# demo examples)

Textbooks:

[1] M. A. Nielsen and I. L. Chuang, Quantum Computation and Quantum Information, 10th Anniversary ed., Cambridge, U.K.: Cambridge Univ. Press, 2010.

[2] N. D. Mermin, Quantum Computer Science: An Introduction, Cambridge, U.K.: Cambridge Univ. Press, 2007.

[3] D. McMahon, Quantum Computing Explained, Hoboken, NJ, USA: Wiley, 2008.

Reference Books:

[1] D. J. Griffiths, Introduction to Quantum Mechanics, 2nd ed., Upper Saddle River, NJ, USA: Pearson Prentice Hall, 2005.

[2] J. J. Sakurai and J. Napolitano, Modern Quantum Mechanics, 2nd ed., Cambridge, U.K.: Cambridge Univ. Press, 2020.

[3] J. Watrous, The Theory of Quantum Information, Cambridge, U.K.: Cambridge Univ. Press, 2018.

[4] V. K. Krishnan, Linear Algebra and Its Applications to Quantum Computing, Singapore: Springer, 2021.

Online Courses & Resources

Platform	Course Title
MIT OpenCourseWare	Quantum Physics I, II (MIT OCW 8.04 & 8.05)
edX (Berkeley)	Quantum Mechanics and Quantum Computation

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

Minors in Information Technology (R23)

23AIT25: Solid State Physics for Quantum Technologies

L	T	P	C
3	0	0	3

Course Objectives:

1. Understand fundamental solid-state physics principles relevant to quantum technologies.
2. Study the electronic properties of materials used in quantum hardware.
3. Explore quantum confinement and nanostructures for qubit implementation.
4. Analyze crystal structures, band theory, and defects influencing quantum devices.
5. Build foundations for material selection and engineering for quantum systems.

Course Outcomes (COs):

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

CO1: Understand crystal structures and band theory
CO2: Apply knowledge of semiconductors, insulators, and conductors in quantum materials
CO3: Analyze quantum confinement effects and low-dimensional systems
CO4: Evaluate defects, phonons, and interactions in solid-state systems
CO5: Create models for quantum device material systems

UNIT I – Crystal Structure and Electronic Properties *(Cognitive Level: Understand)*

Crystal lattices and unit cells, Bravais lattices, Miller indices, Reciprocal lattice and Brillouin zones, atomic bonding in solids (covalent, ionic, metallic, van der Waals), X-ray diffraction and crystal structure determination, electronic structure of solids, Free electron theory, Energy bands: metals, semiconductors, and insulators

UNIT II – Semiconductor Physics for Quantum Devices *(Cognitive Level: Apply)*

Intrinsic and extrinsic semiconductors, Charge carriers: electrons, holes, effective mass, Carrier concentration and Fermi level, p-n junctions and semiconductor heterostructures, Quantum wells and quantum dots as qubits, Superconductors and Josephson junctions, Semiconductor fabrication basics, Materials for quantum hardware: Si, GaAs, diamond NV centers, topological insulators

UNIT III – Quantum Confinement and Low-Dimensional Systems *(Cognitive Level: Analyze)*

Quantum size effects: nanowires, nanotubes, 2D materials, Quantum dots: discrete energy levels, Quantum Hall effect, Topological quantum materials, Spintronics and spin qubits, Quantum confinement in superconducting qubits, Heterostructure-based quantum devices, Valleytronics and emerging 2D materials (MoS_2, graphene)

UNIT IV – Lattice Vibrations and Phonon Interactions *(Cognitive Level: Evaluate)*

Lattice vibrations and phonons, Heat capacity and thermal conductivity of solids, Electron-phonon interaction, Decoherence in solid-state qubits due to phonons, Magnetic impurities and Kondo effect,

Defects and dislocations in crystals, Dopants and quantum impurity systems, nuclear spin environments and coherence times

UNIT V – Materials for Quantum Technologies *(Cognitive Level: Create)*

Material engineering for superconducting qubits, NV centers in diamond for quantum sensing, Topological materials for robust qubits, Photonic crystal materials for optical qubits, Hybrid quantum systems: coupling different materials, Fabrication challenges and material purity, Advances in quantum materials research, Designing material systems for long coherence time

Textbooks:

[1] C. Kittel, Introduction to Solid State Physics, 8th ed., Hoboken, NJ, USA: Wiley, 2004.

[2] M. A. Nielsen and I. L. Chuang, Quantum Computation and Quantum Information, 10th Anniversary ed., Cambridge, U.K.: Cambridge Univ. Press, 2010.

[3] S. L. Altmann, Band Theory of Solids: An Introduction from the Point of View of Symmetry, Oxford, U.K.: Oxford Univ. Press, 1994.

Reference Books:

[1] N. W. Ashcroft and N. D. Mermin, Solid State Physics, Boston, MA, USA: Cengage Learning, 1976.

[2] P. Y. Yu and M. Cardona, Fundamentals of Semiconductors: Physics and Materials Properties, 4th ed., Berlin, Germany: Springer, 2010.

[3] D. D. Awschalom, D. Loss, and N. Samarth, Semiconductor Spintronics and Quantum Computation, Berlin, Germany: Springer, 2002.

[4] D. Vollhardt and P. Wölfle, Theoretical Methods for Strongly Correlated Electrons: Introduction to the Theory of Many-Body Systems, Mineola, NY, USA: Dover Publications, 2013.

Online Courses & Resources:

Platform	Course Title
MIT OpenCourseWare	Solid State Physics (MIT 8.231)
edX	Quantum Materials and Devices (U. Tokyo)
Coursera	Quantum Materials (ÉcolePolytechnique)

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

Minors in Information Technology (R23)

23AIT26: Quantum Optics Prerequisites for Quantum Technologies

L	T	P	C
3	0	0	3

Course Objectives:

1. Introduce fundamentals of light-matter interaction relevant for quantum technologies.
2. Explain the quantization of electromagnetic fields.
3. Study the role of photons as quantum information carriers.
4. Explore coherent states, squeezed states, and single-photon sources.
5. Prepare for quantum sensing, communication, and photonic quantum computing applications.

Course Outcomes (COs):

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

CO1: Understand quantum nature of light
CO2: Apply Maxwell's equations to optical fields
CO3: Analyze interaction of photons with matter
CO4: Evaluate coherence, squeezing, and quantum noise
CO5: Create models for photonic quantum systems

UNIT I – Classical and Quantum Description of Light *(Cognitive Level: Understand)*

Review of electromagnetic waves, Maxwell's equations for light propagation, Plane waves, polarization, Poynting vector, Classical interference, diffraction, coherence, Blackbody radiation & Planck's hypothesis, Photoelectric effect, Photons as quantized light energy, Introduction to quantum theory of radiation

UNIT II – Quantization of Electromagnetic Field *(Cognitive Level: Apply)*

Harmonic oscillator quantization, Field quantization in free space, Photon number (Fock) states, Coherent states and classical-quantum correspondence, Vacuum fluctuations and zero-point energy, Single-mode vs multi-mode quantization, Spontaneous and stimulated emission, Quantum field operators and commutation relations

UNIT III – Light-Matter Interaction *(Cognitive Level: Analyze)*

Two-level atom model, Absorption, stimulated emission, spontaneous emission, Einstein coefficients, Rabi oscillations, Jaynes-Cummings model, Resonant and non-resonant interaction, Cavity Quantum Electrodynamics (Cavity-QED), Atom-photon entanglement

UNIT IV – Quantum Coherence and Quantum Noise *(Cognitive Level: Evaluate)*

Classical vs quantum coherence, First- and second-order coherence functions, Photon antibunching, Hanbury Brown and Twiss experiment, Quantum squeezing of light, Phase-sensitive amplification, Quantum noise, shot noise, and standard quantum limit, Quantum nondemolition measurements

UNIT V – Quantum Photonics Applications *(Cognitive Level: Create)*

Single-photon sources (quantum dots, NV centers, SPDC), Entangled photon pair generation, Photonic qubits and linear optical quantum computing, Quantum key distribution with photons, Photonic integrated circuits, Quantum sensors based on squeezed light, Quantum metrology using entangled photons, Designing experiments for quantum optics labs

Textbooks:

[1] M. Fox, Quantum Optics: An Introduction, Oxford, U.K.: Oxford Univ. Press, 2006.

[2] R. Loudon, The Quantum Theory of Light, 3rd ed., Oxford, U.K.: Oxford Univ. Press, 2000.

[3] M. O. Scully and M. S. Zubairy, Quantum Optics, Cambridge, U.K.: Cambridge Univ. Press, 1997.

Reference Books:

[1] S. M. Barnett, Quantum Information, Oxford, U.K.: Oxford Univ. Press, 2009.

[2] P. Meystre and M. Sargent, Elements of Quantum Optics, 4th ed., Berlin, Germany: Springer, 2007.

[3] M. Le Bellac, Quantum Physics, Cambridge, U.K.: Cambridge Univ. Press, 2006.

[4] D. F. Walls and G. J. Milburn, Quantum Optics, 2nd ed., Berlin, Germany: Springer, 2008.

Online Courses & Resources:

Platform	Course Title
MIT OpenCourseWare	Quantum Optics (MIT 8.421)
edX	Principles of Photonics (EPFL)
Coursera	Quantum Optics 1 & 2 (U. Rochester)
YouTube	Quantum Optics Lectures (Various universities)

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

Minors in Information Technology (R23)

23AIT27: Introduction to Quantum Communication

L	T	P	C
3	0	0	3

Course Objectives:

1. Introduce fundamental principles of quantum communication.
2. Study quantum key distribution (QKD) protocols.
3. Analyze quantum teleportation, entanglement swapping, and quantum repeaters.
4. Evaluate quantum security principles and their advantages.
5. Prepare students for designing secure communication protocols for future quantum networks.

Course Outcomes (COs):

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

CO1: Understand quantum communication concepts
CO2: Apply quantum entanglement to communication protocols
CO3: Analyze QKD protocols and teleportation mechanisms
CO4: Evaluate security of quantum communication
CO5: Design quantum communication networks and protocols

UNIT I – Introduction to Quantum Communication *(Cognitive Level: Understand)*

Classical communication vs quantum communication, No-cloning theorem and quantum information security, Qubits and qubit transmission channels, Quantum entanglement fundamentals, EPR paradox and Bell's inequalities, Quantum states and measurement, Role of superposition and measurement collapse, Overview of quantum internet and its architecture

UNIT II – Quantum Key Distribution (QKD) Protocols *(Cognitive Level: Apply)*

Classical cryptography limitations, BB84 protocol, B92 protocol, E91 entanglement-based protocol, Decoy-state QKD, Device-independent QKD, Practical implementation challenges in QKD, Experimental QKD systems (fiber, free-space, satellites)

UNIT III – Quantum Teleportation and Entanglement Distribution *(Cognitive Level: Analyze)*

Quantum teleportation protocol, Entanglement swapping, Quantum repeaters for long-distance communication, Error sources in quantum teleportation, Resource requirements for teleportation, Entanglement purification techniques, Bell state measurements, Applications of teleportation in distributed quantum computing

UNIT IV – Quantum Networks and Quantum Internet *(Cognitive Level: Evaluate)*

Architecture of quantum networks, Quantum routers and switching, Quantum memories and storage nodes, Distributed entanglement generation and management, Multiparty quantum communication

Blind quantum computing, Performance metrics for quantum networks (fidelity, key rate), Challenges in large-scale quantum network deployment

UNIT V – Advanced Quantum Communication Protocols and Applications *(Cognitive Level: Create)*

Quantum secure direct communication, Quantum digital signatures, Position-based quantum cryptography, Quantum secret sharing, post-quantum cryptography overview, Quantum cloud communication protocols, Building hybrid quantum-classical communication models, Future directions in quantum communication technology

Textbooks:

[1] M. A. Nielsen and I. L. Chuang, Quantum Computation and Quantum Information, 10th Anniversary ed., Cambridge, U.K.: Cambridge Univ. Press, 2010.

[2] M. M. Wilde, Quantum Information Theory, 2nd ed., Cambridge, U.K.: Cambridge Univ. Press, 2017.

[3] V. Scarani, Quantum Cryptography: A Primer, Oxford, U.K.: Oxford Univ. Press, 2019.

Reference Books:

[1] V. Dunjko and E. Diamanti, Introduction to Quantum Communication and Cryptography, Cham, Switzerland: Springer, 2023.

[2] N. Lütkenhaus, "Practical security in quantum key distribution," in Quantum Communication, Measurement and Computing (QCMC), New York, NY, USA: AIP Conf. Proc., vol. 734, pp. 241–248, 2004.

[3] D. McMahon, Quantum Computing Explained, Hoboken, NJ, USA: Wiley, 2008.

[4] D. Bouwmeester, A. K. Ekert, and A. Zeilinger, The Physics of Quantum Information: Quantum Cryptography, Quantum Teleportation, Quantum Computation, Berlin, Germany: Springer, 2000.

Online Courses & Resources:

Platform	Course Title
edX	Quantum Cryptography (ETH Zurich)
Coursera	Quantum Communication (Delft University of Technology)
MIT OpenCourseWare	Quantum Information Science (MIT 6.443)
YouTube	Quantum Internet & Quantum Networking Tutorials
IBM Qiskit	Qiskit tutorials on quantum teleportation and QKD

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

Minors in Information Technology (R23)

23AIT28: Introduction to Quantum Sensing

L	T	P	C
3	0	0	3

Course Objectives:

1. Introduce the principles of quantum sensing and metrology.
2. Explain how quantum superposition and entanglement enhance measurement sensitivity.
3. Study applications of quantum sensors across multiple domains.
4. Analyze noise, decoherence, and quantum limits on measurement.
5. Prepare students to design and analyze quantum-enhanced sensors.

Course Outcomes (COs):

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

CO1: Understand the basic principles of quantum sensing
CO2: Apply quantum superposition and entanglement to sensing
CO3: Analyze quantum sensor architectures
CO4: Evaluate sensitivity and error limits in quantum measurements
CO5: Design quantum sensing systems for real-world applications

UNIT I – Introduction to Quantum Sensing and Metrology *(Cognitive Level: Understand)*

Classical vs quantum sensing, Precision limits: Standard Quantum Limit (SQL), Quantum metrology fundamentals, Heisenberg limit, Quantum phase estimation for precision measurements, Quantum non-demolition measurements, Quantum error correction in sensing, Importance of coherence and entanglement in sensors

UNIT II – Quantum Measurement Principles *(Cognitive Level: Apply)*

Superposition and interference in measurement, Quantum Fisher information, squeezed states for noise reduction, Photon counting and single-photon detectors, Spin-based measurements (NV centers, trapped ions), Ramsey interferometry, Quantum state tomography, Applications of quantum-enhanced interferometry

UNIT III – Quantum Sensor Technologies *(Cognitive Level: Analyze)*

Atomic clocks (optical & microwave), Gravimeters and accelerometers, Magnetometers (SQUIDs, NV centers), Quantum gyroscopes, Quantum imaging & super-resolution microscopy, Quantum lidar and radar, Force and electric field sensing, Photonic quantum sensing systems

UNIT IV – Decoherence, Noise, and Error Mitigation in Quantum Sensing *(Cognitive Level: Evaluate)*

Sources of decoherence in quantum sensors, Thermal noise and quantum noise sources, Quantum back-action, Squeezing and noise reduction techniques, Dynamical decoupling techniques, Noise

spectroscopy for sensor calibration, Robust error mitigation protocols, Evaluating sensitivity vs noise tradeoffs

UNIT V – Advanced Applications and Future Quantum Sensing Systems *(Cognitive Level: Create)*

Quantum sensing for biological and medical imaging, Navigation and positioning without GPS, Quantum-enhanced gravitational wave detection (LIGO), Quantum-enhanced environmental monitoring, Sensors for national defense and security, Space-based quantum sensors, Integrated quantum photonic sensing platforms, Design of hybrid quantum-classical sensor systems

Textbooks:

[1] C. L. Degen, F. Reinhard, and P. Cappellaro, "Quantum sensing," Rev. Mod. Phys., vol. 89, no. 3, pp. 035002-1–035002-39, Jul. 2017.

[2] V. Giovannetti, S. Lloyd, and L. Maccone, "Advances in quantum metrology," Nature Photon., vol. 5, pp. 222–229, Apr. 2011.

[3] D. Budker and D. F. Jackson Kimball, Optical Magnetometry, Cambridge, U.K.: Cambridge Univ. Press, 2013.

Reference Books:

[1] K. Jacobs, Quantum Measurement Theory and Its Applications, Cambridge, U.K.: Cambridge Univ. Press, 2014.

[2] H. Rauch and S. A. Werner, Neutron Interferometry: Lessons in Experimental Quantum Mechanics, Wave-Particle Duality, and Entanglement, 2nd ed., Oxford, U.K.: Oxford Univ. Press, 2015.

[3] M. O. Scully and M. S. Zubairy, Quantum Optics, Cambridge, U.K.: Cambridge Univ. Press, 1997, ch. 16–18.

[4] V. Vedral, Introduction to Quantum Information Science, Oxford, U.K.: Oxford Univ. Press, 2006.

Online Courses & Resources:

Platform	Course Title
edX	Quantum Sensing & Metrology (LMU Munich)
Coursera	Quantum Optics and Sensing (University of Colorado Boulder)
MIT OpenCourseWare	Quantum Measurement and Sensing (MIT)
YouTube	Quantum Sensing Lectures
IBM Qiskit	Tutorials on Quantum Phase Estimation

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

Minors in Information Technology (R23)

23AIT29: Quantum Communication and Sensing Lab

L	T	P	C
0	0	3	1.5

Course Objectives:

1. Simulate and analyze quantum communication protocols.
2. Implement quantum key distribution (QKD) and teleportation.
3. Perform quantum sensing simulations for precision measurements.
4. Evaluate sensor performance with noise and decoherence.
5. Gain hands-on experience with quantum simulation tools.

Course Outcomes (COs):

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

CO1: Simulate and evaluate quantum communication protocols using appropriate quantum tools.
CO2: Implement and analyze quantum key distribution (QKD) and quantum teleportation techniques.
CO3: Perform simulations for quantum sensing applications in precision measurements.
CO4: Analyze and interpret the effects of noise and decoherence on quantum sensor performance.
CO5: Demonstrate hands-on proficiency in using quantum simulation software for communication and sensing experiments.

List of Experiments:

1. Simulation of Qubits and Bloch Sphere Visualization
2. Implementation of BB84 Quantum Key Distribution Protocol
3. Simulation of B92 and E91 QKD Protocols
4. Quantum Entanglement Generation and Bell Inequality Testing
5. Quantum Teleportation Protocol using Qiskit/Cirq
6. Simulation of Quantum Repeaters and Entanglement Swapping
7. Noise and Decoherence Modeling in Quantum Communication Channels
8. Ramsey Interferometry Simulation for Quantum Sensing
9. Implementation of NV Center Magnetometry Simulation
10. Quantum Gravimeter and Accelerometer Simulation
11. Quantum Phase Estimation for High-Precision Metrology

Reference Textbooks:

[1] M. A. Nielsen and I. L. Chuang, Quantum Computation and Quantum Information, 10th Anniversary ed., Cambridge, U.K.: Cambridge Univ. Press, 2010.

[2] C. H. Bennett and G. Brassard, "Quantum cryptography: Public key distribution and coin tossing," in Proc. IEEE Int. Conf. Computers, Systems and Signal Processing, Bangalore, India, Dec. 1984, pp. 175–179.

[3] J. Preskill, "Quantum computing in the NISQ era and beyond," Quantum, vol. 2, pp. 1–20, Aug. 2018.

[4] V. Giovannetti, S. Lloyd, and L. Maccone, "Quantum-enhanced measurements: Beating the standard quantum limit," Science, vol. 306, no. 5700, pp. 1330–1336, Nov. 2004.

[5] M. G. A. Paris, "Quantum estimation for quantum technology," Int. J. Quantum Inform., vol. 7, no. supp01, pp. 125–137, 2009.

Platforms & Tools:

- IBM Qiskit
- Google Cirq
- RigettiPyQuil
- Quantum Inspire
- MATLAB / Python with quantum libraries

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

Minors in Information Technology (R23)

23AIT30: Quantum Devices and Materials Lab

L	T	P	C
0	0	3	1.5

Course Objectives:

1. Simulate quantum devices and materials behavior.
2. Explore quantum optics and solid-state quantum systems.
3. Model quantum dots, superconductors, and photonic devices.
4. Perform quantum simulation of condensed matter systems.
5. Build foundational skills for quantum hardware understanding.

Course Outcomes (COs):

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

CO1: Simulate the behavior of quantum devices and quantum materials using computational tools.
CO2: Analyze the properties of quantum optical systems and solid-state quantum structures.
CO3: Model and interpret the behavior of quantum dots, superconductors, and photonic devices.
CO4: Perform quantum simulations of condensed matter systems and interpret the results.
CO5: Demonstrate foundational understanding of quantum hardware components and their physical principles.

List of Experiments:

1. Simulation of Single-Qubit Optical Devices
2. Modeling Quantum Dots and Energy Level Transitions
3. Simulation of Two-Level Atom and Rabi Oscillations
4. Quantum Harmonic Oscillator: Energy Levels Visualization
5. Spin-1/2 Systems and Magnetic Resonance Simulation
6. Superconducting Qubits Circuit Simulation
7. Josephson Junction Modeling for Quantum Circuits
8. Quantum Photonic Interferometer Simulation
9. Simulation of NV Centers in Diamond for Quantum Sensing
10. Solid-State Quantum Materials Simulation (Band Structures)
11. Modeling Quantum Light-Matter Interactions (Jaynes-Cummings Model)

Reference Textbooks:

[1] Y. V. Nazarov and Y. M. Blanter, Quantum Transport: Introduction to Nanoscience, Cambridge, U.K.: Cambridge Univ. Press, 2009.

[2] D. Bouwmeester, A. K. Ekert, and A. Zeilinger, The Physics of Quantum Information: Quantum Cryptography, Quantum Teleportation, Quantum Computation, Berlin, Germany: Springer, 2000.

[3] B. E. Kane, "A silicon-based nuclear spin quantum computer," Nature, vol. 393, no. 6681, pp. 133–137, May 1998.

[4] M. Fox, Quantum Optics: An Introduction, Oxford, U.K.: Oxford Univ. Press, 2006.

Platforms & Tools:

- QuTiP (Quantum Toolbox in Python)
- Qiskit Nature / Qiskit Metal
- MATLAB Simulink
- COMSOL Multiphysics (for materials simulation)
- Silvaco TCAD (for device-level modeling)

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

III B. Tech-I Semester

23ACS53: FUNDAMENTALS OF CLOUD COMPUTING

L	T	P	C
3	0	0	3

Course Outcomes:

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

CO1: Explain the fundamental concepts, history, characteristics, benefits, and challenges of cloud computing.

CO2: Differentiate between various cloud service and deployment models and evaluate their use cases.

CO3 : Analyze the role of virtualization and cloud architecture in delivering cloud services.

Unit 1: Introduction to Cloud Computing

Definition and core concepts-History and evolution of cloud computing-Key characteristics: on-demand, scalability, elasticity, multitenancy-Benefits: cost, performance, speed, productivity-Challenges and limitations.

Unit 2: Service Models

Infrastructure as a Service (IaaS): definition, examples (AWS EC2, Azure VM)-Platform as a Service (PaaS): definition, examples (Google App Engine)-Software as a Service (SaaS): definition, examples (Salesforce, Office 365)-Comparison of models and use cases.

Unit 3: Deployment Models

Public, Private, Hybrid, and Community Clouds-Use-case analysis of each model Inter-cloud and multi-cloud strategies-Cloud bursting concept.

Unit 4: Virtualization Basics

Role of virtualization in cloud-Types: hardware, OS, storage, network-Hypervisors: Type 1 and Type 2-Benefits of virtualization for cloud-Tools: VMware, VirtualBox.

Unit 5: Cloud Architecture

Components: clients, data centers, distributed servers-NIST reference architecture, Cloud delivery architecture-Design considerations and industry standards.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

III B. Tech-I Semester

L	T	P	C
3	0	0	3

23ACS54: VIRTUALIZATION AND CLOUD INFRASTRUCTURE

Course Outcomes:
At the end of the course, the student will be able to
CO1: Explain virtualization technologies including virtual machines, containers, Docker, and Kubernetes, and apply them to cloud-native application development.
CO2: Analyze and design cloud infrastructure and networking components including compute, storage, VPCs, load balancing, and secure network configurations.
CO3: Utilize cloud monitoring tools, logging, and cost optimization strategies to manage cloud resources effectively and ensure service level agreement (SLA) compliance

Unit 1: Advanced Virtualization

Virtual Machine management-Containerization vs Virtual Machines-Docker architecture and components- Kubernetes concepts: pods, services, deployments-Use cases in cloud-native development

Unit 2: Cloud Infrastructure

Cloud data centers: physical infrastructure, energy efficiency-Compute resources: CPU, GPU, memory optimization-Storage types: block, object, file -Networking: switches, routers, virtual networks

Unit 3: Cloud Networking

IP addressing and subnetting-Virtual Private Cloud (VPC)-Load balancing techniques-DNS in cloud Network isolation and firewalling

Unit 4: Storage Systems

File systems in the cloud -Cloud storage gateways-Distributed storage concepts-Storage security and compliance-Backup and recovery strategies

Unit 5: Monitoring and Resource Management

Cloud monitoring tools: AWS CloudWatch, Azure Monitor -Logging and alerting-Resource provisioning and scaling-Cost management and optimization-SLAs and service uptime monitoring

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

III B. Tech-II Semester

L	T	P	C
3	0	0	3

23ACS55: CLOUD PLATFORMS AND DEVELOPMENT

Course Outcomes:

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

CO1: Demonstrate proficiency in core services of major cloud platforms—AWS, Azure, and GCP—including virtual machines, storage, databases, and identity management.

CO2: Use command-line interfaces, SDKs, and deployment tools to configure and manage cloud resources efficiently across multiple platforms.

CO3: Design and develop scalable cloud-native applications using the 12-factor app model, CI/CD pipelines, and stateless architecture principles.

CO4: Implement serverless solutions using AWS Lambda, Azure Functions, and API Gateways, and evaluate their performance, cost-effectiveness, and real-world applications.

Unit 1: AWS Services Overview

EC2, S3, RDS, Lambda, VPC-AWS CLI and SDK-IAM and role-based access-Billing and cost estimation

Unit 2: Microsoft Azure Overview

Virtual Machines, Blob Storage, SQL Database-Azure Functions and App Services- Azure DevOps and Pipelines-Role assignments and resource groups

Unit 3: Google Cloud Platform (GCP)

Compute Engine, Cloud Storage, BigQuery -GCP IAM and security-Cloud Shell and Cloud SDK Deployment Manager

Unit 4: Application Development in Cloud

Cloud-native app principles -12-factor application model-CI/CD integration
Stateless architecture design

Unit 5: Serverless Architecture

Definition and comparison with traditional architectures-FaaS (Functions as a Service): AWS Lambda, Azure Functions-Event-driven programming -API Gateway integration-Use cases and cost implications

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(AUTONOMOUS)

III B. Tech-II Semester

L	T	P	C
3	0	0	3

23ACS56: CLOUD SECURITY AND COMPLIANCE

COURSE OUTCOMES:

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

CO1: Explain cloud security principles, including the shared responsibility model, IAM, and data protection strategies to ensure confidentiality, integrity, and availability in cloud environments.
CO2: Utilize security tools and technologies such as firewalls, VPNs, encryption mechanisms, and access controls to design and implement secure cloud infrastructures.
CO3: Analyze compliance requirements, legal challenges, and risk management strategies, and apply auditing techniques and disaster recovery planning to maintain regulatory and operational integrity.

Unit 1: Cloud Security Fundamentals

Shared responsibility model -Cloud security architecture-IAM principles and RBAC Data confidentiality and integrity

Unit 2: Security Tools and Technologies

Firewalls, IDS, IPS-Data encryption (at-rest, in-transit)-SSL/TLS, VPNs-Security groups and network ACLs

Unit 3: Compliance and Legal Issues

GDPR, HIPAA, PCI-DSS -Data sovereignty and jurisdiction-Legal implications of multi-tenancy Vendor lock-in issues

Unit 4: Auditing and Risk Management

Security auditing tools and logs-Risk analysis frameworks-Disaster recovery and business continuity Penetration testing and vulnerability scanning

Unit 5: Identity and Access Management

Single Sign-On (SSO) -Multi-Factor Authentication (MFA)-Federated identity management OAuth2 and OpenID Connect protocols

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(AUTONOMOUS)

IV B. Tech-I Semester

L	T	P	C
3	0	0	3

23ACS57: CLOUD APPLICATION DESIGN AND DEVOPS

COURSE OUTCOMES:

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

CO1: Design and implement cloud-native applications using microservices architecture, ensuring effective inter-service communication, service discovery, and fault tolerance mechanisms.

CO2: Apply DevOps principles by building CI/CD pipelines, automating infrastructure deployment with Infrastructure as Code (IaC), and managing monitoring and deployment strategies.

CO3: Develop and test robust APIs and cloud applications using industry-standard practices, including automated testing, load testing, and security mechanisms like OAuth.

Unit 1: Microservices Architecture

Basics of microservices - Inter-service communication: REST, Grpc -Service discovery and registry Fault tolerance and retry mechanisms

Unit 2: DevOps Principles

CI/CD pipelines: Jenkins, GitHub Actions -Infrastructure as Code: Terraform, CloudFormation Monitoring: Prometheus, Grafana -Blue/green and canary deployments

Unit 3: API Development and Management

RESTful API design -API versioning and documentation -API gateway integration OAuth, rate limiting, caching

Unit 4: Testing Cloud Applications

Unit and integration testing -Automated testing frameworks- Load testing: JMeter, Locust Chaos engineering

Unit 5: Cloud Application Deployment

Deployment strategies - CI/CD for Kubernetes -Docker Compose and Helm Scaling and rollback strategies

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(AUTONOMOUS)

IV B. Tech-I Semester

L	T	P	C
0	0	6	3

23ACS58: CAPSTONE PROJECT

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(AUTONOMOUS)

III B. Tech-I Semester

23ACS59: WEB FUNDAMENTALS, ADVANCED JAVASCRIPT & GITHUB

L	T	P	C
3	0	0	3

Course Outcomes:

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

CO1: Understand the structure of modern web pages and create accessible HTML5 content using semantic elements, multimedia, and form validation.

CO2: Apply CSS concepts such as box model, Flexbox, and media queries to design visually appealing and responsive web layouts.

CO3: Demonstrate proficiency in core JavaScript concepts including asynchronous programming, API integration, and robust error handling.

CO4: Collaborate using GitHub tools like pull requests, issues, and GitHub Pages while integrating advanced browser features and APIs.

CO5: Design, build, and deploy a complete web application by utilizing acquired front-end skills and practicing effective team collaboration.

UNIT I: WEB DEVELOPMENT AND HTML5

Overview of the Internet, HTTP/HTTPS protocols, and DNS -Understanding web servers, clients, and hosting infrastructure- Introduction to web browsers and developer tools- Anatomy and structure of modern web pages Basic HTML elements: headings, paragraphs, lists, and tables- Creating forms with built-in validation features -Utilizing semantic HTML for accessibility and SEO - Embedding multimedia: audio, video, iframes.

UNIT II: STYLING WITH CSS

CSS syntax: selectors, colors, fonts, and units- Box model: margins, padding, and borders Layout with display types and Flexbox- Creating responsive layouts with media queries.

UNIT III: JAVASCRIPT CONCEPTS

JavaScript scope, hoisting, and closures - Arrow functions and template literals - Destructuring and spread/rest operators- Callback functions and higher-order functions.

ASYNCHRONOUS JAVASCRIPT Working with JSON: parsing and stringifying - Promises and async/await syntax Making API requests using Fetch - Error handling using try-catch.

UNIT IV: COLLABORATIVE DEVELOPMENT WITH GITHUB

Using pull requests, issues, and tagging - Writing documentation in Markdown - Hosting with custom domains on GitHub Pages - Managing projects using GitHub Projects and Discussions- Event delegation and advanced event handling - Web storage: Local Storage and Session Storage - Browser APIs: Geolocation, Notifications - Timers, intervals, and performance monitoring.

UNIT 5: PROJECT AND DEPLOYMENT

Develop a weather application using public APIs- Deploy the app using GitHub Pages - Team collaboration and peer code reviews.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

III B. Tech-I Semester

23ACS60: BACKEND DEVELOPMENT WITH NODE.JS & EXPRESS

L	T	P	C
3	0	0	3

Course Outcomes:

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

CO1: Develop server-side applications using Node.js and Express, incorporating middleware, routing, and RESTful API principles.

CO2: Integrate MongoDB with Node.js applications using Mongoose for data modeling, and perform CRUD operations securely and efficiently.

CO3: Design, build, test, and document a complete backend RESTful API project using best practices in version control, environment management, and security.

UNIT 1: GETTING STARTED WITH NODE.JS

Node.js architecture and event-driven programming - Using Node Package Manager (NPM) - Performing file system operations and path management - Creating basic servers with Node.js.

UNIT 2: DEVELOPING WITH EXPRESS.JS

Introduction to Express and route handling - Implementing middleware functions- Organizing routes using Express Router - RESTful API design principles.

UNIT 3: WORKING WITH MONGODB & MONGOOSE

Introduction to NoSQL databases and MongoDB - Setting up cloud-hosted databases with MongoDB Atlas - CRUD operations using Mongo Shell - Creating schemas and models using Mongoose.

UNIT 4: APPLICATION ENVIRONMENT AND SECURITY

Connecting Node.js applications to MongoDB - Securing configurations with environment variables - Implementing error handling and logging - Securing APIs with CORS, Helmet, and Morgan.

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UNIT 5: BACKEND API PROJECT

Build a Notes or Tasks RESTful API - Use Postman to test and document endpoints- Apply Git-based version control best practices.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

III B. Tech-II Semester

23ACS61: BUILDING USER INTERFACES WITH REACT.JS

L	T	P	C
3	0	0	3

Course Outcomes:

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

CO1: Apply React fundamentals such as JSX, component-based architecture, props, state management, and event handling to build interactive UIs.

CO2: Implement advanced state management techniques using hooks (useState, useEffect, custom hooks) and Context API for global state handling.

CO3: Develop dynamic, user-friendly applications by integrating React Router for navigation, handling forms with validation, and managing data using APIs.

CO4: Build, connect, and deploy a complete full-stack React application with backend integration, environment configuration, and modern styling practices.

UNIT 1: REACT FUNDAMENTALS

Introduction to JSX and component-based architecture - Using props and managing component state- Handling user input with event listeners- Implementing conditional rendering.

UNIT 2: REACT HOOKS AND STATE MANAGEMENT

useState and useEffect hooks - Creating and using custom hooks- Context API for global state management - Lifting state and prop drilling concepts.

UNIT 3: ROUTING AND FORM HANDLING

Setting up navigation with React Router DOM- Implementing nested and dynamic routes Controlled vs. uncontrolled forms- Form validation with Formik and Yup.

UNIT 4: STYLING AND COMPONENT INTEGRATION

Fetching and handling data using Axios - Managing loading and error states - Styling with Tailwind CSS or Styled Components - Using UI libraries like Material UI (MUI).

UNIT 5: FULLSTACK APP DEVELOPMENT

Connecting React frontend to backend API - Managing environment variables in React Building and deploying React apps - Final Project: Blog or Task Manager Application.

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(AUTONOMOUS)

III B. Tech-II Semester

23ACS62: DEVOPS FUNDAMENTALS & CI/CD PIPELINES

L	T	P	C
3	0	0	3

Course Outcomes:

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

CO1: Explain DevOps principles, lifecycle, and tools, and relate them to Agile and Scrum methodologies.

CO2: Automate routine tasks using shell scripting, process control, and scheduled jobs to improve operational efficiency.

CO3: Design and implement CI/CD pipelines using GitHub Actions for automated testing, deployment, and code quality assurance.

CO4: Build, containerize, and deploy full-stack applications using Docker and apply DevOps best practices in a collaborative project.

UNIT 1: INTRODUCTION TO DEVOPS

DevOps principles and culture - CI/CD fundamentals and benefits - DevOps lifecycle and tools overview- Introduction to Agile and Scrum.

UNIT 2: SHELL SCRIPTING & AUTOMATION

Bash scripting basics: variables, loops, conditionals - Automating repetitive tasks -File permissions and process control - Scheduling with cron jobs.

UNIT 3: GITHUB ACTIONS FOR CI/CD

Creating and managing GitHub workflows - Using actions and jobs for automation - Testing and linting in CI pipelines - Continuous deployment using GitHub Actions.

UNIT 4: CONTAINER- ZATION WITH DOCKER

Understanding images and containers - Creating Dockerfiles and using Docker Compose Building and running containerized MERN apps - Managing Docker volumes and networks.

UNIT 5: DEVOPS LAB PROJECT

CI/CD setup for a MERN app using GitHub Actions - Containerizing the app using Docker - Automating tests and deployments -Peer review and code quality assessments.

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(AUTONOMOUS)

IV B. Tech-I Semester

23ACS63: ADVANCED BACKEND & MICROSERVICES

L	T	P	C
3	0	0	3

Course Outcomes:

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

CO1: Understand the core AWS services including EC2, S3, IAM, and RDS, and manage access control, billing, and resource provisioning.

CO2: Deploy and configure scalable web applications on AWS using services like EC2, S3, Route 53, and Certificate Manager.

CO3: Implement cloud-based database and storage solutions with RDS and S3, integrating them into Node.js applications and ensuring data reliability.

CO4: Design and deploy a full-stack cloud application using AWS services, incorporating load balancing, auto-scaling, monitoring, and CI/CD pipelines.

UNIT 1: AWS ESSENTIALS

Overview of AWS global infrastructure - Introduction to EC2, S3, IAM, and RDS- Managing permissions and access control - Billing, pricing, and Free Tier usage

UNIT 2: DEPLOYING WEB APPS ON AWS

Launching and configuring EC2 instances - Hosting static sites on S3- Using Route 53 for custom domain configuration- Setting up HTTPS with AWS Certificate Manager

UNIT 3: DATABASE AND STORAGE SOLUTIONS

Using RDS for PostgreSQL/MongoDB - Setting up S3 buckets and managing lifecycle policies Integrating AWS SDK with Node.js - Backup and recovery strategies

UNIT 4: LOAD BALANCING & SCALING

AWS Elastic Load Balancer (ELB) - Auto Scaling Groups for EC2 -Monitoring with CloudWatch - Application health checks and alerts

UNIT 5: DEPLOYMENT PROJECT

Deploy a full stack MERN app on AWS - Use RDS and S3 in the architecture - Setup CI/CD from GitHub to AWS - Document and present deployment architecture

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

IV B. Tech-I Semester

23ACS64: PROJECT ON FULL STACK MERN AND DEVOPS

L	T	P	C
0	0	6	3

MINORS - MACHINE LEARNING AND GENERATIVE AI

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

III B. Tech - I Semester CSE(AI&ML) MINORS

L	T	P	C
3	0	0	3

Course objectives

The objective of the course is,

1. Build a strong understanding of Python fundamentals.
2. Master data structures and object-oriented programming in Python.
3. Utilize Python for file handling, exception handling, and modularization.
4. Create interactive web applications using Streamlit.
5. Use Python for data analysis, automation, and visualization.

Unit – I: Python Programming Basics

Variables, data types, operators, expressions, Input/output, conditionals, loops, Functions: definition, parameters, return values, Practice: Control flow problems.

Unit – II: Core Data Structures in Python

Lists, tuples, dictionaries, sets, Mutability, comprehensions, Practice: CRUD operations on data.

Unit III - Object-Oriented Programming and Modules

Classes, objects, constructors, Inheritance, encapsulation, polymorphism, Modules, packages, pip installations, Practice: Class-based mini-applications.

Unit IV - File Handling and Exception Management

Working with text, CSV, JSON files, Exception handling techniques, File and directory operations, Practice: File-based utilities.

Unit V - Streamlit and Python Integration

Streamlit components and layouts, Integrating data analysis libraries (Pandas, Matplotlib)

Creating web dashboards, Hands-on: Build interactive data applications.

Text Books:

1. Eric Matthes, Python Crash Course.
2. Luciano Ramalho, Fluent Python.

Online Software:

1. Python
2. VS Code
3. Streamlit
4. Jupyter

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

III B. Tech - I Semester CSE(AI&ML) MINORS

23ACM48 -ESSENTIALS OF PYTHON FOR DATA ANALYSIS

L	T	P	C
3	0	0	3

Course objectives

The objective of the course is,

1. Understand supervised and unsupervised learning techniques.
2. Develop and evaluate models using Scikit-learn.
3. Perform data preprocessing and feature engineering.
4. Apply classification and regression models to real-world datasets.
6. Interpret model results and improve performance.

Course Outcome (COs)

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

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create Learning Level

1. Understand the ML pipeline and its components	Un
2. Apply supervised and unsupervised models	Ap
3. Evaluate models using performance metrics	An
4. Perform feature engineering and preprocessing	Ap
5. Tune and interpret ML models effectively	Cr

Unit I: Machine Learning Fundamentals

ML vs AI vs Deep Learning, ML workflow and pipeline structure, Data splitting: train/test/validation, Introduction to Scikit-learn, Hands-on: Build your first ML model.

Unit II: Supervised Learning – Regression

Simple and multiple linear regression, Polynomial regression, Error metrics: MAE, MSE, RMSE, R2 Hands-on: Predictive analytics using housing/sales data.

Unit III: Supervised Learning – Classification

Logistic regression, Decision Trees, KNN, Random Forest, SVM, Naive Bayes overview, Evaluation: confusion matrix, precision, recall, F1-score, Hands-on: Binary and multi-class classification tasks.

Unit IV: Unsupervised Learning and Preprocessing

K-Means clustering, Hierarchical clustering, Dimensionality reduction: PCA, Feature scaling, encoding, imputation, Hands-on: Segmentation and anomaly detection.

Unit V: Model Tuning and Interpretation

Hyperparameter tuning with GridSearchCV, Cross-validation strategies, Introduction to model explainability (SHAP/LIME), Hands-on: Full pipeline project with reporting.

Online Software:

1 Python

2 Scikit-learn

3 Jupyter

4 Pandas

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

III B. Tech - II Semester CSE(AI&ML) MINORS

23ACM49 - FOUNDATIONS OF RESPONSIBLE AI

L	T	P	C
3	0	0	3

Course Objectives

By the end of this course, students will:

1. Understand the need for responsible development and deployment of AI systems.
2. Explore core principles such as fairness, accountability, transparency, and ethics in AI.
3. Learn to identify and mitigate bias in AI algorithms and datasets.
4. Analyze the societal, legal, and environmental impact of AI technologies.
5. Evaluate responsible AI frameworks, guidelines, and international regulations.

Course Outcomes (COs)

CO1	Explain the concepts of ethics, fairness, and accountability in AI.	Understanding
CO2	Identify potential bias and risks in AI models and datasets.	Analyzing
CO3	Apply responsible AI practices in model design and deployment.	Applying
CO4	Evaluate AI systems using fairness, explainability, and governance principles.	Evaluating
CO5	Discuss legal, social, and regulatory frameworks guiding responsible AI adoption.	Understanding

Unit -I: Introduction to Responsible AI

What is Responsible AI?, AI for good vs AI at risk, Principles: Fairness, Accountability, Transparency, Explainability (FATE), Stakeholders in AI ecosystems (developers, users, society)

Unit- II: Bias and Fairness in AI

Types of bias: dataset bias, algorithmic bias, labeling bias, Detecting and mitigating bias in datasets and models, Fairness metrics: Demographic parity, Equal opportunity, Calibration, Hands-on: Bias detection in datasets using Python/AI Fairness 360 (IBM)

Unit-III: Explainability and Interpretability

Need for explainable AI (XAI), Black-box vs White-box models, SHAP, LIME, and model transparency tools, Explainability in NLP and Vision models

Unit-IV: AI Governance and Ethical Frameworks

IEEE, OECD, UNESCO, EU AI Act, India's AI ethics initiatives (e.g., NITI Aayog #AIForAll), Corporate RAI frameworks (Google, Microsoft, IBM), Risk management in AI development lifecycle.

Unit-V: Social Impact and Future of Responsible AI

AI and Human Rights, Privacy (GDPR), AI in law, health, finance – risks & responsibilities, Environmental impact of AI (energy consumption, carbon footprint), Responsible innovation and AI for Social Good (AI4SG)

Text books:

1. Patrick Hall, James Curtis, Parul Pandey, Responsible AI: Best Practices for Creating Trustworthy AI Systems, O'Reilly Media.

2. Vincent C. Müller (Ed.), Ethics of Artificial Intelligence and Robotics *(Stanford Encyclopedia of Philosophy),* **Free Online Resource**: https://plato.stanford.edu/entries/ethics-ai/

3. Solon Barocas, Moritz Hardt, Arvind Narayanan, Fairness and Machine Learning: Limitations and Opportunities; **Free PDF**: https://fairmlbook.org

Reference Resources:

1. **AI Fairness 360 Toolkit –** IBM (open-source)
2. **Explainable AI (XAI) –** DARPA project
3. Google's Responsible AI practices: https://ai.google/responsibility/
4. Microsoft's RAI dashboard and documentation

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

III B. Tech - II Semester CSE(AI&ML) MINORS

23ACM50- FOUNDATIONS OF GEN AI

	L	T	P	C
Course objectives	**3**	**0**	**0**	**3**

The objective of the course is,

1. **Understand** the fundamental principles, architectures, and evolution of Generative AI systems.
2. **Explore** various generative models like GANs, VAEs, and Transformer-based architectures.
3. **Gain proficiency** in training, fine-tuning, and evaluating generative models using modern ML frameworks.
4. **Apply** Gen AI tools for tasks such as text, image, and code generation across real-world applications.
5. **Analise** the ethical, social, and regulatory implications of Generative AI technologies.

Course Outcomes (COs)

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

CO1	Explain the foundational concepts and applications of Generative AI.	Understanding
CO2	Describe and differentiate among key generative models (GANs, VAEs, Transformers).	Understanding
CO3	Implement and train basic generative models using tools such as TensorFlow or PyTorch.	Applying
CO4	Utilize Gen AI platforms (e.g., ChatGPT, DALL·E) and perform effective prompt engineering.	Applying
CO5	Evaluate the ethical concerns, limitations, and governance aspects of deploying Gen AI systems.	Evaluating

Unit I: Introduction to Generative AI:

Overview of Artificial Intelligence & Machine Learning, What is Generative AI?, Traditional AI vs Generative AI, History and evolution of Gen AI (GANs to Transformers), Applications in NLP, Computer Vision, Healthcare, Education, etc., Tools and platforms: ChatGPT, GitHub Copilot, DALL·E, Bard, Claude.

Unit-II: Key Models and Architectures in Gen AI:

Generative Adversarial Networks (GANs), Architecture: Generator vs Discriminator, Variants: DCGAN, CycleGAN, StyleGAN, Use cases: Image generation, super-resolution, **Variational Autoencoders (VAEs)-**Latent variable models, Encoder-decoder frameworks; **Transformer-based Models-** Self-attention mechanism, GPT (Generative Pre-trained Transformers), BERT vs GPT vs T5 vs LLaMA.

Unit III: Training Generative Models:

Data preparation and preprocessing, Loss functions used in Gen AI (e.g., adversarial loss, reconstruction loss), Transfer learning and fine-tuning large language models (LLMs), RLHF (Reinforcement Learning from Human Feedback), Hands-on: Building and training a simple GAN or transformer-based text generator using Python & TensorFlow/PyTorch.

Unit-IV: Applications and Tools:

Text Generation: Chatbots, code generation (e.g., ChatGPT, Copilot), **Image Generation**: DALL·E, Midjourney, Stable Diffusion, **Audio and Video Generation**: Voice cloning, deepfakes, Sora, **Code Generation**: GitHub Copilot, CodeT5, Codex, **Open-source Gen AI models**: Hugging Face Transformers, LLaMA, Falcon, **Prompt Engineering**: Crafting effective prompts for LLMs.

UNIT-V: Challenges, Ethics, and Future Trends:

Limitations of Gen AI (e.g., hallucinations, data bias, model drift), Ethical issues: deepfakes, misinformation, copyright, Explainability and safety in Gen AI, Regulation and responsible AI development (EU AI Act, India Draft Bill), The future of work and learning with Gen AI, Capstone Project Ideas: AI-generated art, interactive chatbot, content generation tool.

Text Books:

1.David Foster "Generative Deep Learning: Teaching Machines to Paint, Write, Compose, and Play", O'Reilly Media, 2nd Edition, 2022.

2. François Chollet"Deep Learning with Python", Manning Publications, Edition: 2nd Edition, 2021.

3. Denis Rothman, "Transformers for Natural Language Processing", Packt Publishing, 2nd Edition, 2022.

Reference Books:

1.Rafael Valle, "Hands-On Generative Adversarial Networks with Keras", Packt Publishing.

2. Google Cloud, "Introduction to Generative AI" (Free Course).

Online References:

1. Hugging Face Transformers Documentation

https://huggingface.co/docs ; Essential for practical implementation of transformer models in text/image generation.

2. OpenAI Technical Guides: https://platform.openai.com/docs;

For understanding usage of ChatGPT, Codex, and API-based applications of Gen AI.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

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IV B. Tech - I Semester CSE(AI&ML) MINORS

23ACM51- NATURAL LANGUAGE PROCESSING WITH NEURAL NETWORKS

	L	T	P	C
Course objectives	**3**	**0**	**0**	**3**

The objective of the course is,

Course objectives

The objective of the course is,

1. Understand the foundations of natural language processing (NLP).
2. Learn techniques for text preprocessing, tokenization, and representation.
3. Apply deep learning architectures like RNNs and Transformers to NLP tasks.
4. Build models for text classification, sentiment analysis, and sequence generation.
5. Utilize pre-trained language models for downstream applications.

Course Outcome (COs)

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

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev- Evaluate; Cr - Create

CO1.	Understand key concepts in text processing and representation	Un
CO2.	Apply RNNs and LSTMs to NLP tasks	Ap
CO3.	Leverage transformers and attention for sequence modeling	Ap
CO4.	Fine-tune pre-trained language models	An
CO5.	Build and evaluate end-to-end NLP applications	Cr

Unit I: Unit I: Foundations of NLP

Language modeling and basic terminology, Text preprocessing: tokenization, stemming, lemmatization, Vector representations: Bag-of-Words, TF-IDF, Hands-on: Preprocess text and build word-frequency models

Unit II: Word Embeddings and Semantic Understanding

Word2Vec, GloVe, FastText embeddings, Similarity measures and visualization, Contextual vs static embeddings, Hands-on: Explore embeddings and visualizations

Unit III: RNNs and LSTMs for NLP

RNNs and LSTMs for sequence data, Applications: sentiment analysis, entity recognition, Bidirectional RNNs and GRUs, Hands-on: Sentiment classifier using LSTM

Unit IV: Transformers and Attention Mechanism

Self-attention and transformer architecture, BERT, GPT, and encoder-decoder models, fine-tuning pre-trained models for downstream tasks, Hands-on: Text classification with BERT using Hugging Face.

Unit V: NLP Project and Case Study

Choose dataset (IMDB, Twitter, customer reviews), Text classification or summarization task, End-to-end NLP pipeline with evaluation and reporting, Hands-on: Final NLP mini-project

Text Books:

1. Lewis Tunstall, Leandro von Werra, Natural Language Processing with Transformers.
2. Jurafsky & Martin, Speech and Language Processing.
3. Hugging Face Transformers documentation.

Online Software :

1. Python
2. NLTK, SpaCy, TensorFlow/Keras
3. Hugging Face Transformers
4. Google Colab

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IV B. Tech - I Semester CSE(AI&ML) MINORS

23ACM52 - CAPSTONE PROJECT

L	T	P	C
0	0	6	3

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		L	T	P	C
23ACD56	**Foundations Of Cloud Concepts**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:
The objective of the course is,

- Understand the fundamental concepts of cloud computing and its relevance in modern technology.
- Gain knowledge of AWS global infrastructure and its core services.
- Explore essential cloud deployment models and service models.
- Learn about cloud security and compliance in AWS
- Explore overview to deploy, monitor, and scale applications using AWS.

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

- Define fundamental cloud concepts and AWS core services
- Explain the AWS global infrastructure and its key features
- Implement basic AWS services for application deployment and management
- Examine cloud security and compliance strategies in AWS
- Design, deploy and monitor scalable applications using AWS

UNIT-I: Introduction to Cloud Computing 6 Hrs

- Definition and Characteristics of Cloud Computing
- Cloud Deployment Models (Public, Private, Hybrid)
- Cloud Service Models (IaaS, PaaS, SaaS)
- Benefits and Challenges of Cloud Computing
- Overview of AWS as a Cloud Service Provider

UNIT-II: AWS Global Infrastructure and Core Services 10 Hrs

- Understanding AWS Global Infrastructure (Regions, Availability Zones, and Edge Locations)
- AWS Core Services Overview:
  - Compute Services: Amazon EC2, AWS Lambda
  - Storage Services: Amazon S3, Amazon EBS
  - Database Services: Amazon RDS, DynamoDB
  - Networking Services: Amazon VPC, Elastic Load Balancing
- Use Cases of Core Services

UNIT-III: Cloud Security and Identity Management 8 Hrs

- Shared Responsibility Model in AWS
- Introduction to AWS Identity and Access Management (IAM)
- Creating IAM Users, Groups, and Roles
- Security Tools: AWS Key Management Service (KMS), CloudTrail
- Compliance and Governance in AWS

UNIT-IV: Application Deployment and Management in AWS 12 Hrs

- Basics of Application Deployment
- Elastic Beanstalk for Web Application Deployment
- AWS Auto Scaling and Load Balancing
- Monitoring Services: Amazon CloudWatch
- Backup and Disaster Recovery Using AWS Services
- Introduction to AWS Management Console and AWS CL

UNIT V: Project Work and Advanced Topics 7 Hrs

- Project Objective: Deploy and Scale a Web Application using AWS
- Project Execution:
  - Setup and Configure AWS Environment
  - Launch and Monitor an EC2 Instance
  - Design and Implement a Scalable Application
  - Use S3 for Application Storage
  - Use CloudWatch for Monitoring
- Introduction to Advanced AWS Services (AWS Machine Learning, AWS IoT, AWS DevOps)

TEXT BOOKS:

1. AWS Certified Solutions Architect Study Guide by Ben Piper and David Clinton

REFERENCE BOOKS:

1. (2023, 4th Edition) Cloud Computing with AWS by Dipankar Sarkar (2021, 1st Edition)

E-resources

1. AWS Training and Certification E-learning Content
2. AWS Documentation and Whitepapers

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		L	T	P	C
23ACD57	**Predictive Data Analytics using R**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:
The objective of the course is,

- To understand the fundamentals of predictive analytics and statistical modeling.
- To gain hands-on experience in using R for data analysis.
- To learn various predictive modeling techniques for real-world applications.

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

- Explain the fundamental concepts of predictive analytics and the role of R in statistical modeling and data-driven decision-making.
- Apply data preprocessing, cleaning, and transformation techniques using R for predictive modeling.
- Develop and implement regression, classification, and clustering models in R for solving real-world problems.
- Evaluate predictive models using performance metrics such as accuracy, precision, recall, ROC curves, and error measures.
- Interpret and visualize predictive analytics results using R libraries (e.g., ggplot2, caret, randomForest) to support business or research decisions.
- Design and execute end-to-end predictive analytics projects using R, integrating data preparation, model building, validation, and reporting.

UNIT-I: Introduction to Predictive Analytics 8 Hrs

- Overview of Data Analytics and Predictive Analytics
- Importance and Applications in Business and Research
- Introduction to R Programming for Predictive Analytics
- R Studio Environment and Data Handling i

UNIT-II: Data Preparation and Exploration 9 Hrs

- Data Import, Cleaning, and Transformation
- Exploratory Data Analysis (EDA)
- Data Visualization using ggplot2
- Handling Missing Values and Outliers

UNIT-III: Regression Models 8 Hrs

- Simple Linear Regression
- Multiple Linear Regression
- Logistic Regression
- Model Diagnostics and Assumptions Checking

UNIT-IV: Classification Techniques 9 Hrs

- Decision Trees and Random Forests
- Support Vector Machines
- Naïve Bayes Classifier
- Model Evaluation: Accuracy, Precision, Recall, F1 Score

UNIT V: Advanced Predictive Modeling 8 Hrs

- Time Series Forecasting
- Clustering Techniques (K-Means, Hierarchical)
- Ensemble Methods (Bagging, Boosting)
- Case Studies and Applications in Predictive Analytics

TEXT BOOKS:

1. Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani, "An Introduction to Statistical Learning with Applications in R".

REFERENCE BOOKS:

1. Brett Lantz, "Machine Learning with R".
2. Trevor Hastie, Robert Tibshirani, and Jerome Friedman, "The Elements of Statistical Learning"

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		L	T	P	C
23ACD58	**Data Engineering With AWS**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

The objective of the course is,

- Understand the principles of data engineering and its importance in cloud ecosystems.
- Explore AWS services for data storage, processing, and transformation.
- Learn how to design and implement data pipelines using AWS services.
- Gain hands-on experience with real-time and batch data processing on AWS.
- Develop skills to build and manage scalable and efficient data workflows.

COURSE OUTCOMES:

UNIT-I: Introduction to Data Engineering and AWS 6 Hrs

- Overview of Data Engineering
- Key Concepts in Data Storage, Processing, and Transformation
- Introduction to AWS Data Engineering Services
- AWS Data Engineering Use Cases

UNIT-II: Data Storage Solutions on AWS 10 Hrs

- Overview of AWS Storage Services
  - Amazon S3: Object Storage
  - Amazon RDS and DynamoDB: Relational and NoSQL Databases
  - Amazon Redshift: Data Warehousing
- Best Practices for Secure and Efficient Data Storage
- Data Lifecycle Management and Archiving

UNIT-III: Data Processing with AWS 10 Hrs

- Introduction to Data Processing Frameworks
- AWS Glue: Data Catalog and ETL Services
- Amazon EMR: Big Data Processing with Hadoop and Spark
- Real-Time Data Processing with Amazon Kinesis
- Batch Processing vs. Real-Time Processing

UNIT-IV: Data Pipeline Design and Management 12 Hrs

- Designing Scalable Data Pipelines
- AWS Data Pipeline: Workflow Orchestration
- Serverless Data Pipelines with AWS Lambda and Step Functions
- Monitoring and Optimizing Data Pipelines
- Error Handling and Data Validation Techniques

UNIT V: Project Work and Advanced Topics 7 Hrs

- Project Objective: Build a Scalable Data Pipeline on AWS
- Project Execution:
  - Setup AWS Data Storage and Processing Environment
  - Implement Data Extraction, Transformation, and Loading (ETL) Pipeline
  - Integrate Real-Time and Batch Data Processing
  - Optimize Performance and Cost
- Advanced Topics:
  - Introduction to Amazon SageMaker for Data Engineering
  - Data Lake Formation and Management on AWS
  - Advanced Security and Compliance Features

TEXT BOOKS:

1. Data Engineering with AWS by Gareth Eagar (2022, 1st Edition).

REFERENCE BOOKS:

1. Designing Data-Intensive Applications by Martin Kleppmann (2017, 1st Edition).

E-resources

1. AWS Training and Certification E-learning Content.
2. AWS Documentation and Whitepapers.

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		L	T	P	C
23ACD59	**Cloud-Native Machine Learning**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:
The objective of the course is,

- Understand the fundamentals of machine learning (ML) and its applications.
- Gain familiarity with Amazon SageMaker as a platform for building, training, and deploying ML models.
- Learn about different ML algorithms and their use cases.
- Develop skills to preprocess data, train models, and optimize hyperparameters using SageMaker.
- Apply ML techniques to solve real-world problems using cloud-based solutions.

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

- Define key concepts in machine learning and the role of SageMaker
- Explain the workflow for building, training, and deploying ML models.
- Utilize SageMaker for data preparation, model training, and Optimization
- Evaluate the performance of ML models and optimize deployments.
- Build and deploy scalable ML pipelines using SageMaker and AWS services.

UNIT-I: Introduction to Machine Learning and SageMaker

6 Hrs

- Fundamentals of Machine Learning
  - Supervised and Unsupervised Learning
  - Key ML Concepts: Training, Testing, and Validation
- Overview of Amazon SageMaker
  - SageMaker Studio and Key Features
  - Workflow: Build, Train, and Deploy
- Benefits of Using SageMaker for ML Projects

UNIT-II: Data Preparation and Feature Engineering

10 Hrs

- Importing Data into SageMaker (S3 Integration)
- Data Cleaning and Transformation
  - Handling Missing Values and Outliers
  - Scaling and Encoding Data
- Feature Engineering for ML
  - Feature Selection and Extraction
  - Feature Store in SageMaker

UNIT-III: Training and Optimizing ML Models 12 Hrs

- Built-in Algorithms in SageMaker
  - Linear Learner, XGBoost, K-Means, and Factorization Machines
- Training ML Models on SageMaker
  - Choosing the Right Instance Type
  - Configuring Training Jobs
- Hyper parameter Optimization
  - Using SageMaker Automatic Model Tuning
- Debugging and Monitoring Training Jobs

UNIT-IV: Model Deployment and Monitoring 10 Hrs

- Deploying Models with SageMaker
  - Real-time Endpoints
  - Batch Transform Jobs
- Monitoring Deployed Models
  - Using CloudWatch for Metrics
  - Debugging Deployment Issues
- Cost Optimization for Deployment

UNIT V: Project Work and Advanced Topics 7 Hrs

- Project Objective: Build and Deploy an End-to-End ML Pipeline on SageMaker
- Project Execution:
  - Data Preparation and Feature Engineering
  - Model Training and Hyper parameter Tuning
  - Deploying and Monitoring the Model
- Advanced Topics:
  - SageMaker Pipelines for Automation
  - Leveraging SageMaker for Time-Series Forecasting
  - Integration with AWS ML Services (Rekognition, Comprehend, and Polly)

TEXT BOOKS:

1. Practical Machine Learning with Amazon SageMaker by Oliver Zeigermann (2021, 1st Edition)

REFERENCE BOOKS:

1. Hands-On Machine Learning with Scikit-Learn by Aurélien Géron (2020, 2nd Edition)
2. Data Science on AWS by Chris Fregly and Antje Barth (2021, 1st Edition)

E-resources

1. AWS Training and Certification E-learning Content
2. SageMaker Documentation and Whitepapers

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		L	T	P	C
23ACD60	**Deep Learning: The Modern Approach**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:
The objective of the course is,

- Understand the principles of deep learning and its applications across various domains.
- Explore the capabilities of Amazon SageMaker for training, deploying, and managing deep learning models.
- Gain proficiency in popular deep learning frameworks such as TensorFlow and PyTorch.
- Learn to optimize, scale, and monitor deep learning workflows in cloud environments.
- Apply deep learning techniques to real-world problems using SageMaker.

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

- Define the principles and techniques of deep learning.
- Explain how to build and train deep learning models using SageMaker.
- Utilize SageMaker for deploying and monitoring deep learning models.
- Optimize deep learning workflows for scalability and cost- effectiveness.
- Design, train, and deploy deep learning models for real- world applications.

UNIT-I: Introduction to Deep Learning and Amazon SageMake

6 Hrs

- Fundamentals of Deep Learning
  - Neural Networks: Perceptrons, Activation Functions
  - Forward and Backward Propagation
  - Loss Functions and Optimization Techniques
- Overview of Amazon SageMaker
  - SageMaker Studio Features
  - Workflow: Build, Train, and Deploy
  - Integration with AWS Ecosystem

UNIT-II: Training Deep Learning Models with SageMaker

10 Hrs

- Preparing Data for Deep Learning
  - Loading and Preprocessing Large Datasets
  - Using AWS S3 for Dataset Management
- Training Deep Learning Models
  - Built-in Algorithms in SageMaker for Deep Learning
  - Custom Training with TensorFlow and PyTorch
- Distributed Training
  - Leveraging GPU Instances
  - Optimizing Training Jobs for Scalability

UNIT-III: Hyperparameter Tuning and Model Optimization 10 Hrs

- Hyperparameter Tuning
  - SageMaker Automatic Model Tuning
  - Best Practices for Tuning Deep Learning Models
- Model Optimization
  - Quantization and Pruning Techniques
  - Reducing Latency for Deployment
- Debugging and Profiling
  - Using SageMaker Debugger for Insights
  - Identifying Bottlenecks in Training and Inference

UNIT-IV: Deployment and Monitoring of Deep Learning Models 12Hrs

- Model Deployment Strategies
  - Real-time Inference Endpoints
  - Batch Transform for Large-scale Inference
- Monitoring Deployed Models
  - Using Amazon CloudWatch for Performance Metrics
  - Model Drift Detection and Retraining
- Managing Deployment Costs
  - Cost Optimization Strategies in SageMaker
  - Managing Spot Instances for Training and Inference

UNIT V: Project Work and Advanced Topics 7 Hrs

- Project Objective: Build and Deploy a Deep Learning Model with SageMaker
- Project Execution:
  - Model Training and Hyperparameter Tuning
  - Deploying and Monitoring the Model
- Advanced Topics:
  - Using SageMaker Neo for Optimized Inference
  - Explainability in Deep Learning Models
  - Integration with AWS AI Services (Rekognition, Translate, Comprehend)

TEXT BOOKS:

1. Deep Learning with Python by Francois Chollet (2021, 2nd Edition).
2. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow by Aurélien Géron (2022, 3rd Edition).

REFERENCE BOOKS:

1. Practical Deep Learning for Cloud, Mobile, and Edge by Anirudh Koul, Siddha Ganju, Meher Kasam (2020, 1st Edition).

E-resources

1. AWS SageMaker Documentation.
2. TensorFlow and PyTorch Tutorials.
3. AWS AI and Machine Learning Whitepapers.

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		L	T	P	C
23ACD61	Capstone Project and Portfolio Development	0	0	6	3

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III B.Tech-I Semester

L	T	P	C
3	0	0	3

23AIT37: Introduction to Design and Visual Communication

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

CO1. Understand the foundational elements and principles of design and visual communication.
CO2. Analyze visual compositions using concepts like balance, contrast, hierarchy, and typography.
CO3. Apply color theory, layout principles, and design grids in creative visual projects.
CO4. Create effective visual messages for print and digital media using industry-standard tools.
CO5. Critically evaluate design work based on functionality, aesthetics, and target audience.
CO6. Develop a personal visual style and portfolio through practical assignments and critiques.

Unit 1: Elements and Principles of Design
Line, Shape, Color, Texture, Space, Form Balance, Contrast, Emphasis, Movement, Proportion, Rhythm, Unity

Unit 2: Fundamentals of Visual Literacy
Introduction to Color Theory: Primary, Secondary, Tertiary Colors Color Psychology and Branding, Typography Basics: Typeface vs Font, Font Pairing, Readability

Unit 3: History and Evolution of Design
Historical Art Movements: Bauhaus, Minimalism, Modernism, Evolution from Print to Digital Design, Milestones in Graphic and Interaction Design

Unit 4: Communication Design
Visual Hierarchy and Storytelling, Semiotics and Symbols in Design, Branding Elements and Logo Design Basics

Unit 5: Introduction to Design Tools
Overview of Adobe Photoshop, Illustrator, Introduction to Figma/Sketch, File formats, resolutions, and design output standards.

Text books:

1. D. Landa, Graphic Design Solutions, 6th ed., Boston, MA, USA: Cengage Learning, 2018.
2. K. Lidwell, J. Holden, and W. Butler, Universal Principles of Design, Rev. ed., Beverly, MA, USA: Rockport Publishers, 2010..

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III B.Tech-I Semester

L	T	P	C
3	0	0	3

23AIT38: Human Centered Design and Interaction Principles

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

CO1. Understand and explain the fundamental principles of human-centered design (HCD) and user experience (UX) design.
CO2. Analyze human factors and cognitive models to inform interface and interaction design decisions.
CO3. Apply design thinking methodologies to identify user needs and generate user-centric solutions.
CO4. Design and develop user interfaces based on usability heuristics and interaction principles.
CO5. Evaluate the effectiveness and usability of user interfaces using empirical methods and usability testing.
CO6. Demonstrate proficiency in using prototyping tools and conducting iterative design processes.

Unit 1: Foundations of Human-Centered Design
HCD Process: Discover, Define, Develop, Deliver - Benefits and Implementation in UX/UI - User Goals vs Business Goals

Unit 2: Cognitive Psychology in Design
Perception, Memory, Mental Models, Decision Making, Cognitive Load, Visual Perception in UI

Unit 3: Design Principles for Usability
Affordances, Signifiers, Feedback, Constraints, Consistency and Standards, Visibility and Mapping

Unit 4: Human-Computer Interaction
History of HCI, Interaction Paradigms (WIMP, Touch, Voice), Input/Output Devices and Modalities

Unit 5: Usability Heuristics
Nielsen's 10 Heuristics, Real-world ExamplesM Application and Evaluation.

Text books:

1. D. A. Norman, The Design of Everyday Things, Revised and Expanded Edition, New York, NY, USA: Basic Books, 2013.
2. J. Preece, Y. Rogers, and H. Sharp, Interaction Design: Beyond Human-Computer Interaction, 5th ed., Hoboken, NJ, USA: Wiley, 2019.

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III B.Tech-II Semester

L	T	P	C
3	0	0	3

23AIT39: UX Research and Design Thinking

Course Outcomes

After completing this course, students will be able to:

CO1. Understand the fundamentals of User Experience (UX) design and its role in product development.

CO2. Apply UX research methods such as user interviews, surveys, persona creation, and journey mapping.

CO3. Utilize design thinking principles to identify problems and develop innovative user-centric solutions.

CO4. Create wireframes, prototypes, and mockups to represent design solutions.

CO5. Conduct usability testing and evaluate user feedback to refine designs iteratively.

CO6. Collaborate in teams using agile and iterative methods to deliver human-centered design solutions.

Unit 1: UX Research Foundations

Types of Research: Qualitative, Quantitative, Desk Research and Competitive Analysis, Ethics in UX Research

Unit 2: Design Thinking Process

Empathize, Define, Ideate, Prototype, Test, Ideation Techniques: SCAMPER, Brainstorming Divergent vs Convergent Thinking

Unit 3: User Research Methods

User Interviews, Surveys, Field Studies, Contextual Inquiry
Affinity Diagramming

Unit 4: Persona and Empathy Mapping

Creating Personas, Building Empathy Maps, Using Insights for Design Decisions

Unit 5: Journey Mapping and Task Flows

Mapping Touchpoints and Emotions, Defining Happy Path and Edge Cases, Task Analysis and Flow Diagrams

Textbook:

1. G. Gothelf and J. Seiden, Lean UX: Designing Great Products with Agile Teams, 2nd ed., Sebastopol, CA, USA: O'Reilly Media, 2016.
2. T. Brown, Change by Design: How Design Thinking Creates New Alternatives for Business and Society, Boston, MA, USA: Harvard Business Press, 2009.

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III B.Tech-II Semester

L	T	P	C
3	0	0	3

23AIT40: PROTOTYPING AND USABILITY TESTING

Course Outcomes

After completing this course, students will be able to:

CO1. Understand the principles and importance of prototyping in the user-centered design process.

CO2. Create low-, mid-, and high-fidelity prototypes using appropriate tools and techniques.

CO3. Apply usability heuristics and guidelines in prototype development.

CO4. Plan and conduct usability testing sessions, including task design, facilitation, and data collection.

CO5. Analyze user feedback and usability test results to identify design improvements.

CO6. Iterate prototypes based on usability insights and present findings effectively.

Unit 1: Prototyping Basics

Paper vs Digital Prototypes, Low to High Fidelity Transitions, Tools Comparison: Figma, InVision, Marvel

Unit 2: Usability Testing Methods

Moderated vs Unmoderated Testing, Think-Aloud Protocol, Remote Testing Tools

Unit 3: Metrics and Analysis

Task Success Rate, Time on Task, SUS, NPS, Heatmaps, Using Analytics for Usability

Unit 4: A/B and Multivariate Testing

Setting Hypotheses, Test Design and Execution, Interpreting Results

Unit 5: Iterative Design Cycle

Gathering Feedback, Prioritizing Issues, Documenting Iterations

Textbook:

1. C. Snyder, Paper Prototyping: The Fast and Easy Way to Design and Refine User Interfaces, San Francisco, CA, USA: Morgan Kaufmann, 2003.
2. J. Rubin and D. Chisnell, Handbook of Usability Testing: How to Plan, Design, and Conduct Effective Tests, 2nd ed., Indianapolis, IN, USA: Wiley, 2008.

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IV B.Tech-I Semester

L	T	P	C
3	0	0	3

23AIT41: FRONTEND DEVELOPMENT FOR DESIGNERS

Course Outcomes

After completing this course, students will be able to:

CO1. Understand the core concepts of HTML, CSS, and JavaScript for creating responsive user interfaces.

CO2. Apply frontend frameworks and libraries (e.g., Bootstrap, React) to build dynamic web applications.

CO3. Translate design mockups and wireframes into functional web pages.

CO4. Implement accessibility and usability standards in frontend development.

CO5. Optimize web performance and ensure cross-browser compatibility.

CO6. Collaborate effectively with designers and developers using version control and frontend tooling.

Unit 1: Web Technologies Overview

Basics of HTML5, Structuring Pages with Semantic Tags, Introduction to CSS

Unit 2: Responsive Design

Media Queries, Flexbox and Grid, Mobile-First Development

Unit 3: JavaScript Fundamentals

DOM Manipulation, Event Handling, Fetch API and Async Basics

Unit 4: Frameworks and Libraries

Bootstrap and Tailwind, Intro to React for Designers, Using Design Systems with Frameworks

Unit 5: Accessibility in Code

ARIA Roles, Tab Index and Screen Reader Testing, Keyboard Navigation

Textbook:

1. J. Duckett, *HTML and CSS: Design and Build Websites*, Indianapolis, IN, USA: Wiley, 2011.
2. E. Freeman and E. Robson, *Head First HTML and CSS: A Learner's Guide to Creating Standards-Based Web Pages*, 2nd ed., Sebastopol, CA, USA: O'Reilly Media, 2012.

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IV B.Tech-II Semester

L	T	P	C
0	0	6	3

23AIT42: CAPSTONE PROJECT AND PORTFOLIO DEVELOPMENT

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III B.Tech. I SEM, AI & DS

		L	T	P	C
23AAD19	**Data Analytics using R**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES: The objective of the course is,
1. Understand the fundamentals of data analytics and the role of R in data analysis.
2. Perform data manipulation, cleaning, and preprocessing using R packages.
3. Apply statistical techniques and visualizations using R.
4. Develop models for descriptive, predictive, and prescriptive analytics.
5. Work on real-world datasets and develop end-to-end analytics solutions using R.

COURSE OUTCOMES: After the completion of the course, student will be able to
1. Apply R programming to read, process, and analyze structured data
2. Use data visualization tools in R to summarize and present findings
3. Perform exploratory data analysis (EDA) and interpret outputs
4. Build basic predictive models using regression and classification techniques
5. Execute real-time mini projects involving data collection, analysis, and visualization.

UNIT-I: Introduction to Data Analytics and R 9 Hrs
Introduction to Data Analytics: Definitions, types (Descriptive, Predictive, Prescriptive) Overview of R: History, features, RStudio - Installing and using R packages - Basic syntax, data types, and operators in R

UNIT-II: Data Manipulation and Exploration 8 Hrs
Importing data: CSV, Excel, Web APIs, Databases - Data frames, lists, matrices, factors - Data wrangling with `dplyr` and `tidyr` – Handling missing data, filtering, sorting, summarizing - Exploratory Data Analysis (EDA)

UNIT-III: Data Visualization using R 7 Hrs
Introduction to visualization principles - Base R graphics vs. `ggplot2` – Bar charts, histograms, box plots, scatter plots, line graphs - Advanced visualization: heatmaps, correlation matrices - Interactive visualizations using `plotly` and `shiny` (intro)

UNIT-IV: Statistical Analysis and Machine Learning in R 8 Hrs
Statistical inference: mean, median, variance, standard deviation - Hypothesis testing: t-test, chi-square test - Linear regression, logistic regression - Clustering: k-means - Classification: Decision Trees, Naive Bayes (intro)

UNIT V: Advanced Topics in R for Data Analytics 9 Hrs
Time series analysis: basics, decomposition, forecasting with `forecast` and `ts` packages - Text analytics: basic text mining using `tm`, `wordcloud`, and `tidytext` – Web scraping using `rvest` – Introduction to dashboards using `shiny` – Automation and reporting with `RMarkdown` and `knitr` – Introduction to Big Data integration (connecting R with Hadoop/Spark via `sparklyr` - optional/overview)

TEXT BOOKS:

1. **"R for Data Science"** by Hadley Wickham & Garrett Grolemund, O'Reilly Media
2. **"The Art of R Programming"** by Norman Matloff, No Starch Press

REFERENCE BOOKS:

1. **"Practical Data Science with R"** by Nina Zumel & John Mount, Manning Publications
2. **"Hands-On Programming with R"** by Garrett Grolemund, O'Reilly Media
3. **"Data Science for Business"** by Foster Provost & Tom Fawcett, O'Reilly Media (for conceptual understanding)
4. **"Advanced R"** by Hadley Wickham, CRC Press.

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		L	T	P	C
23AAD20	**Creative Intelligence with Generative Models**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES: The objective of the course is,
1. Understand the theoretical foundations of creative intelligence and generative models.
2. Explore various generative architectures (e.g., GANs, VAEs, Transformers).
3. Analyze and evaluate the creative output of generative systems.
4. Apply generative models to domains such as text, image, music, and video.
5. Examine ethical, philosophical, and legal issues related to AI-generated content.
6. Design and implement creative projects using generative AI tools and frameworks.

COURSE OUTCOMES: After the completion of the course, student will be able to
1. Explain the principles of creative intelligence in artificial systems.
2. Differentiate between various types of generative models and their applications.
3. Use state-of-the-art generative tools (e.g., GPT, DALL·E, Diffusion Models) to produce creative content.
4. Critically evaluate the originality and value of AI-generated outputs.
5. Build a mini-project involving multi-modal AI creativity (e.g., text-to-image, music generation).
6. Address ethical challenges in deploying generative models in real-world applications.

UNIT-I: Foundations of Creative Intelligence 10 Hrs
Introduction to creativity: Human vs. machine creativity - Theories of creativity (Guilford, Sternberg, Boden) - Computational creativity: History and goals - Basics of creative cognition and associative thinking

UNIT-II: Generative Models – Concepts & Techniques 7 Hrs
Introduction to generative modeling - Probabilistic models: VAEs - Adversarial models: GANs and their variants - Transformer-based models (GPT, BERT, T5) - Diffusion models (DDPMs, Stable Diffusion)

UNIT-III: Generative Creativity in Text, Image, and Audio 8 Hrs
Text generation: GPT, prompting, narrative generation - Image synthesis: DALL·E, Midjourney, Stable Diffusion - Music/audio generation: MusicLM, Suno, AudioCraft - Prompt engineering & prompt chaining

UNIT-IV: Evaluation and Ethics 9 Hrs
Measuring creativity in AI (novelty, value, surprise) - Turing Test vs. Lovelace Test - Deepfakes, plagiarism, and bias in generative content - Ownership, copyright, and ethical concerns

UNIT V: Applications and Project Work 8 Hrs
Multi-modal generation (text-to-image, text-to-video, text-to-audio) - Applications in design, storytelling, game development, marketing - Creative AI tools: Runway, ChatGPT, Canva AI, Adobe Firefly - Final creative project planning, implementation, and review

TEXT BOOKS:

1. **"Artificial Intelligence and Creativity: An Interdisciplinary Approach" –** Tarek R. Besold et al.
2. **"Deep Learning" –** Ian Goodfellow, Yoshua Bengio, and Aaron Courville (for GANs and VAEs)
3. **"The Creativity Code: Art and Innovation in the Age of AI" –** Marcus du Sautoy

REFERENCE BOOKS:

1. **"Architects of Intelligence" –** Martin Ford
2. **"Reclaiming Art in the Age of Artificial Intelligence" –** Jared Marcel Pollen
3. **"Computational Creativity: The Philosophy and Engineering of Autonomously Creative Systems" –** Tony Veale and Feyaad Alladin
4. Papers from **AAAI, NeurIPS, ICML**, and **IJCAI** on generative models and computational creativity
5. Online platforms: **Hugging Face**, **Runway ML**, **Google Colab**, **Kaggle Notebooks**

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		L	T	P	C
23AAD21	**Data Management with SQL & No-SQL**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES: The objective of the course is,
1. Understand the fundamentals of data management and database systems.
2. Design and implement relational databases using SQL.
3. Explore NoSQL databases and their applications in modern data environments.
4. Compare and contrast SQL and NoSQL approaches for different use cases.
5. Apply data modeling, querying, and optimization techniques in both paradigms.

COURSE OUTCOMES: After the completion of the course, student will be able to
1. Design normalized relational schemas and write efficient SQL queries.
2. Implement CRUD operations and manage transactions in SQL databases.
3. Understand NoSQL data models (document, key-value, column, graph).
4. Choose appropriate database systems based on application requirements.
5. Demonstrate proficiency in using tools like MySQL, PostgreSQL, MongoDB, and Cassandra.

UNIT-I: **Introduction to Data Management** 7 Hrs
Data, databases, and DBMS - Types of databases: Relational vs Non-relational - Overview of SQL and NoSQL - Database design principles

UNIT-II: Relational Databases and SQL 9 Hrs

SQL syntax and commands (SELECT, INSERT, UPDATE, DELETE) - Joins, subqueries, and views - Normalization and schema design - Transactions and indexing

UNIT-III: NoSQL Databases 8 Hrs
Types of NoSQL databases: Document, Key-Value, Column, Graph -Data modeling in NoSQL - CAP theorem and BASE properties - Use cases and limitations

UNIT-IV: Working with SQL and NoSQL Tools 7 Hrs
MySQL/PostgreSQL setup and usage - MongoDB and Cassandra basics - Querying and managing data - Performance tuning and scalability

UNIT V: Comparative Analysis and Real-World Applications 6 Hrs
SQL vs NoSQL: strengths and trade-offs - Hybrid architectures and polyglot persistence - Case studies: e-commerce, social media, IoT - Future trends in data management

TEXT BOOKS:
1. *Database System Concepts* by Abraham Silberschatz, Henry F. Korth, and S. Sudarshan (McGraw-Hill)
2. *NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence* by Pramod J. Sadalage and Martin Fowler (Addison-Wesley)
3. *Learning SQL* by Alan Beaulieu (O'Reilly Media).

REFERENCE BOOKS:

1. *SQL in a Nutshell* by Kevin Kline – O'Reilly Media
2. *MongoDB: The Definitive Guide* by Kristina Chodorow – O'Reilly Media
3. *Cassandra: The Definitive Guide* by Jeff Carpenter and Eben Hewitt – O'Reilly Media
4. *Designing Data-Intensive Applications* by Martin Kleppmann – O'Reilly Media

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		L	T	P	C
23AAD22	**Applied Generative AI**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES: The objective of the course is,
1. Understand the principles and techniques behind generative AI.
2. Apply foundational models like GANs, VAEs, and LLMs to real-world problems.
3. Develop and deploy GenAI applications using tools such as LangChain, Hugging Face, and Azure AI Studio.
4. Explore advanced topics like agentic AI, retrieval-augmented generation (RAG), and AI governance.
5. Gain hands-on experience through projects and capstone work.

COURSE OUTCOMES: After the completion of the course, student will be able to
1. Build and fine-tune generative models for text, image, and code generation.
2. Implement prompt engineering and agentic workflows.
3. Use industry-standard GenAI tools and frameworks.
4. Evaluate ethical and governance considerations in AI deployment.
5. Create portfolio-worthy projects demonstrating applied GenAI skills.

UNIT-I: Foundations of Generative AI 6 Hrs
Introduction to GenAI and its evolution - Overview of GANs, VAEs, and LLMs - Applications across industries

UNIT-II: Tools and Technologies 7 Hrs
LangChain, Hugging Face, Azure AI Studio - Prompt engineering and model APIs - Deployment environments

UNIT-III: Advanced Architectures 6 Hrs
Transformer models and attention mechanisms - Fine-tuning LLMs - Retrieval-Augmented Generation (RAG)

UNIT-IV: Agentic AI and Governance 7 Hrs
Agentic frameworks and autonomous agents - AI ethics, bias, and governance -Responsible AI deployment

UNIT V: Capstone and Real-World Applications 7 Hrs
Hands-on projects and case studies - Building end-to-end GenAI applications - Career pathways and industry trends

TEXT BOOKS:
1. *Generative Deep Learning* by David Foster (O'Reilly Media)
2. *Designing Data-Intensive Applications* by Martin Kleppmann (O'Reilly Media)

REFERENCE BOOKS:
1. *Hands-On Generative AI with Python* by John Smith
2. *Transformers for Natural Language Processing* by Denis Rothman

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		L	T	P	C
23AAD23	**Text Analytics & NLP**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES: The objective of the course is,
1. Understand the core concepts and challenges in NLP and text analytics.
2. Learn syntax, semantics, and morphological analysis of natural language.
3. Explore word and sentence representation models for NLP applications.
4. Apply machine learning and deep learning techniques to NLP tasks.
5. Implement NLP solutions using Python and modern libraries.

COURSE OUTCOMES: After the completion of the course, student will be able to
1. Apply computational linguistics tools to analyze text.
2. Implement word representation models like TF-IDF and embeddings.
3. Develop ML/DL models for NLP tasks such as sentiment analysis and translation.
4. Evaluate NLP models using appropriate metrics and visualization techniques.

UNIT-I: **Introduction to Text Mining & NLP** 8 Hrs
Difference between text mining and NLP - Challenges in NLP: ambiguity, context, syntax - Language models and NLP workflow - Applications of NLP in business and research

UNIT-II: Fundamentals of Text Analytics 9 Hrs
Text preprocessing: tokenization, stop word removal, stemming, lemmatization - Removing noise: HTML tags, emojis, special characters - Text vectorization: Bag-of-Words, TF-IDF - Topic modeling and text visualization

UNIT-III: Word Embeddings & Representation 6 Hrs
Limitations of count-based models - Co-occurrence matrices and cosine similarity - Word2Vec, GloVe, and pre-trained embeddings - Manipulating words in vector space

UNIT-IV: Sentiment Analysis & Classification 7 Hrs
Supervised learning for sentiment analysis - Feature extraction from text - Logistic regression for classification - Visualizing tweet sentiment and model performance

UNIT V: Python Applications for NLP 8 Hrs
Processing text and PDF files - Regular expressions for pattern matching - Tokenization and vocabulary matching with spaCy - Named Entity Recognition (NER), speech tagging - Building chatbots and natural language generation (NLG)

TEXT BOOKS:
1. *Speech and Language Processing* by Daniel Jurafsky & James H. Martin
2. *Foundations of Statistical Natural Language Processing* by Christopher Manning & Hinrich Schütze
3. *Natural Language Processing with Python* by Steven Bird, Ewan Klein, and Edward Loper

REFERENCE BOOKS:

1. *Text Analytics with Python* by Dipanjan Sarkar
2. *Deep Learning for Natural Language Processing* by Palash Goyal, Sumit Pandey, and Karan Jain
3. *Practical Natural Language Processing* by Sowmya Vajjala, Bodhisattwa Majumder, Anuj Gupta, and Harshit Surana
4. *Machine Learning for Text* by Charu C. Aggarwal
5. *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow* by Aurélien Géron
6. *Introduction to Information Retrieval* by Manning, Raghavan, and Schütze

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23AAD24	Capstone Project and Portfolio Development	L	T	P	C
		0	0	6	3

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		L	T	P	C
23ACB15	**Fundamentals of Computer Systems & Business Environment**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES: The objective of the course is,

1. **Understand the fundamentals** of data, information, knowledge, and systems in a business context.
2. **Familiarize students** with the various types of business information systems (BIS) and their strategic roles.
3. **Explore the components** of computer hardware and software and their relevance in BIS.
4. **Introduce database concepts** and the application of business intelligence for decision-making.
5. **Describe networks, telecommunications**, and how the Internet enables business connectivity and e-commerce.
6. **Analyze enterprise and functional systems** used across different business departments.

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

1. Distinguish between data, information, knowledge, and wisdom in a business setting.
2. Explain the role of BIS in supporting managerial decisions and gaining competitive advantage.
3. Identify the major components of computer hardware and software and assess their applications in business.
4. Describe various types of databases and apply BI tools to improve organizational decision-making.
5. llustrate the role of networks and the Internet in enabling business communication and e-commerce.
6. Analyze the use of enterprise systems and departmental applications in streamlining business operations.

UNIT-I: INTRODUCTION TO BUSINESS INFORMATION SYSTEMS 8 Hrs

Data and information, creating information, Qualities of information, Knowledge and wisdom, the business environment, Managerial decision making, Knowledge management. Introduction to systems, Different types of systems, Business information systems, Resources that support BIS, Categories of business information system, E-business systems, Enterprise systems, BIS and strategic advantage.

UNIT-II: HARDWARE AND SOFTWARE 10 Hrs

Components of a computer system, Major categories of computers, Types of microcomputers, selecting input devices, selecting output devices, selecting storage devices, Processors, Categories of software, Document production software, Graphics packages, Spreadsheets, Management applications of productivity software, Multimedia software, Software for using the Internet.

UNIT-III: DATABASES AND BUSINESS INTELLIGENCE 12 Hrs

Databases: Business-level advantages of databases an overview of the types of database-File processing databases, Database management systems, Relational database management systems, Object-oriented databases, Network and hierarchical databases; Business intelligence, Data warehouses: Data warehouse, Data Mart, Architecture Data mining: Text and Web Mining Business analytics: OLAP, Cube Analysis Case Study: Making business intelligence.

UNIT-IV: NETWORKS, TELECOMMUNICATIONS AND THE INTERNET 10 Hrs

Computer networks, Network components, Network types, The Internet, Case Study: Asian apps challenge western dominance

UNIT V: ENTERPRISE AND FUNCTIONAL BUSINESS INFORMATION SYSTEMS 5 Hrs

Enterprise systems, Operations information systems, Management information systems, Departmental applications, Case Study: Managing the supply chain. Total Periods: 45 Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Paul Bocij, Andrew Greasley, and Simon Hickie, "Business Information Systems Technology, Development and Management for the E-Business", Fifth edition, Pearson Education Limited, 2015.

REFERENCE BOOKS:

1. R. Kelly Rainer Jr., Casey G. Cegielski, "Introduction to Information Systems Supporting and Transforming Business", Fourth Edition, John Wiley & Sons. Inc, 2012.

2. Witold Abramowicz, Heinrich C. Mayr, "Technologies for Business Information Systems", Springer, 2007.

ADDITIONAL LEARNING RESOURCES:

1. https://www.edx.org/micromasters/iux-information-systems.
2. https://www.coursera.org/learn/business-model-canvas.

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		L	T	P	C
23ACB16	**Database Management & Enterprise Systems**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES: The objective of the course is,

1. **Introduce fundamental concepts** of database systems, including their architecture, models, and advantages.
2. **Develop skills in the relational model**, relational algebra, SQL, and database normalization.
3. **Understand transaction management**, concurrency control, and recovery in database systems.
4. **Familiarize students with enterprise systems**, their components, architecture, and implementation lifecycle.
5. **Explain modern enterprise platforms**, integration technologies, and their role in business process improvement.

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

1. Describe the characteristics, components, and architecture of a DBMS and its advantages over file systems.
2. Apply relational algebra and SQL commands to model and manipulate data in relational databases.
3. Demonstrate the process of database normalization and construct ER models with appropriate keys.
4. Explain transaction processing concepts, concurrency control mechanisms, and database recovery techniques.
5. Identify the structure and modules of enterprise systems like ERP, SCM, and CRM, and their business roles.
6. Evaluate enterprise integration techniques, cloud/on-premise ERP solutions, and their impact on businesses.

UNIT-I: Introduction to DBMS 8 Hrs

Definition and Characteristics of DBMS, Advantages over File Systems, Database Models (Relational, Hierarchical, Network, Object-Oriented), Three-level Architecture, Data Independence, DBMS Components and Architecture

UNIT-II: Relational Model and SQL 9 Hrs

Relational Algebra & Relational Calculus, Keys (Primary, Candidate, Foreign), Entity-Relationship (ER) Model, Normalization: 1NF to BCNF, SQL: DDL, DML, DCL, TCL, Joins, Subqueries, Views, Indexes

UNIT-III: Transaction Management & Concurrency Control 8 Hrs

Transactions and ACID Properties, Serializability, Lock-based Concurrency Control, Deadlock Handling, Recovery Techniques, Log-based Recovery

UNIT-IV: Introduction to Enterprise Systems 9 Hrs

Overview of Enterprise Systems (ERP, SCM, CRM), Enterprise Architecture, ERP Modules: Finance, HR, Production, Sales, Procurement, ERP Implementation Lifecycle, Benefits and Challenges of ERP Systems

UNIT V: Enterprise System Platforms and Integration 8 Hrs

Major ERP Vendors (SAP, Oracle, Microsoft Dynamics), Cloud ERP vs On-Premise ERP, Enterprise Application Integration (EAI), Middleware, SOA, Web Services, Business Process Reengineering (BPR)

TEXT BOOKS:

1. **"Database System Concepts"** by Abraham Silberschatz, Henry F. Korth, and S. Sudarshan 7th Edition, McGraw-Hill

2. "Fundamentals of Database Systems" by Ramez Elmasri and Shamkant Navathe 7th Edition, Pearson

REFERENCE BOOKS:

1. "Database Management Systems" by Raghu Ramakrishnan and Johannes Gehrke,3rd Edition, McGowan-Hill.

2. "Enterprise Resource Planning: Concepts and Practice" by Mahadeo Jaiswal and Ganesh Vanapalli,2nd Edition, Pearson.

3. "Modern ERP: Select, Implement, and Use Today's Advanced Business Systems" by Marianne Bradford,3rd Edition, Lulu Press.

4. "ERP Demystified" by Alexis Leon,2nd Edition, Tata McGowan-Hill.

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		L	T	P	C
23ACB17	**Software Engineering for Business Applications**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:
The objective of the course is,

1. **Understand the fundamentals** of software engineering and various software process models.
2. **Analyze and model requirements** using structured and object-oriented approaches.
3. **Gain insight into Agile methodologies** and apply them to modern software development projects.
4. **Explore the principles of software project management**, including planning, risk analysis, and evaluation.
5. **Comprehend software quality concepts** and apply estimation techniques for project planning.

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

1. Describe the nature of software and various software engineering practices and myths.
2. Compare different software process models and select an appropriate model for a given software project.
3. Apply requirements engineering techniques including elicitation, modeling, and validation.
4. Illustrate various modeling strategies such as scenario-based, class-based, flow-oriented, and behavioral.
5. Explain the principles of Agile development and various agile methodologies like XP, Scrum, etc.
6. Demonstrate knowledge of software project management practices and tools.
7. Evaluate software projects using quality models, estimation techniques, and risk evaluation strategies.

UNIT-I: Software and Software Engineering 9Hrs

The nature of Software, The unique nature of WebApps, Software Engineering, The software Process, Software Engineering Practice, Software Myths.

Process Models: A generic process model, Process assessment and improvement, Prescriptive process models: Waterfall model, Incremental process models, Evolutionary process models, Concurrent models, Specialized process models. Unified Process, Personal and Team process models.

UNIT-II: Understanding Requirements 8 Hrs

Requirements Engineering, Establishing the ground work, Eliciting Requirements, developing use cases, Building the requirements model, Negotiating Requirements, Validating Requirements. Requirements Modeming Scenarios, Information and Analysis classes: Requirement Analysis, Scenario based modeling, UML models that supplement the Use Case, Data modeling Concepts, Class-Based Modeling. Requirement Modeling Strategies: Flow oriented Modeling, Behavioral Modeling.

UNIT-III: Agile Development 10 Hrs

What is Agility, Agility and the cost of change. What is an agile Process? Extreme Programming (XP), Other Agile Process Models, A tool set for Agile process. Principles that guide practice: Software Engineering Knowledge, Core principles, Principles that guide each framework activity.

UNIT-IV: Introduction to Project Management 9 Hrs

Introduction, Project and Importance of Project Management, Contract Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, some ways of categorizing Software Projects, Stakeholders, Setting Objectives, Business Case, Project Success and Failure, Management and Management Control, Project Management life cycle, Traditional versus Modern Project Management Practices. Project Evaluation: Evaluation of Individual projects, Cost–benefit Evaluation Techniques, Risk Evaluation.

UNIT V: Software Quality 8 Hrs

Introduction, the place of software quality in project planning, Importance of software quality, Defining software quality, Software quality models, product versus process quality management. Software Project Estimation: Observations on Estimation, Decomposition Techniques, Empirical Estimation Models.

TEXT BOOKS:

1. Roger S. Pressman: Software Engineering-A Practitioners approach, 7th Edition, Tata McGraw Hill.
2. Bob Hughes, Mike Cotterell, Rajib Mall: Software Project Management, 6th Edition, McGraw Hill Education, 2018.

REFERENCE BOOKS:

1. Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India.
2. “Software Engineering: Principles and Practice", Hans van Vliet, Wiley India, 3rd Edition, 2010.

Web links and Video Lectures (e-Resources):

- https://onlinecourses.nptel.ac.in/noc20_cs68/preview
- https://onlinecourses.nptel.ac.in/noc24_mg01/preview

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		L	T	P	C
23ACB18	**Business Intelligence and Analytics**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES: The objective of the course is,

1. Introduce the role and structure of **business intelligence (BI)** and **decision support systems (DSS)** in organizational decision-making.
2. Provide a comprehensive understanding of the **decision-making process** and how it is supported by DSS.
3. Familiarize students with **neural networks, sentiment analysis**, and other intelligent systems used in modern analytics.
4. Equip students with knowledge of **model-based decision-making techniques**, including mathematical and spreadsheet-based models.
5. Introduce **automated decision systems** and **expert systems** as advanced tools in AI-driven business analytics.

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

1. Describe the evolution and components of Business Intelligence and its role in decision-making.
2. Explain the phases and structure of the decision-making process and the capabilities of Decision Support Systems.
3. Apply basic concepts of neural networks, SVM, and sentiment analysis in real-world decision-making scenarios.
4. Construct and evaluate decision models using mathematical programming, spreadsheets, and decision trees.
5. Describe the architecture, development, and application of expert systems and automated decision-making tools.

UNIT-I:An Overview of Business Intelligence, Analytics, and Decision Support 8 Hrs

Information Systems Support for Decision Making, An Early Framework for Computerized Decision Support, The Concept of Decision Support Systems, A Framework for Business Intelligence, Business Analytics Overview, Brief Introduction to Big Data Analytics.

UNIT-II: Decision Making 8 Hrs

Introduction and Definitions, Phases of the Decision, Making Process, The Intelligence Phase, Design Phase, Choice Phase, Implementation Phase, Decision Support Systems Capabilities, Decision Support Systems Classification, Decision Support Systems Components**.**

UNIT-III: Neural Networks and Sentiment Analysis 12 Hrs

Basic Concepts of Neural Networks, Developing Neural Network-Based Systems, Illuminating the Black Box of ANN with Sensitivity, Support Vector Machines, A Process Based Approach to the Use of SVM, Nearest Neighbour Method for Prediction, Sentiment Analysis Overview, Sentiment Analysis Applications, Sentiment Analysis Process, Sentiment Analysis, Speech Analytics.

UNIT-IV: Model-Based Decision Making 12 Hrs

Decision Support Systems modeling, Structure of mathematical models for decision support, Certainty, Uncertainty, and Risk, Decision modeling with spreadsheets, Mathematical programming optimization, Decision Analysis with Decision Tables and Decision Trees, Multi-Criteria Decision Making with Pairwise Comparisons.

UNIT V: Automated Decision Systems and Expert Systems 5 Hrs

Automated Decision Systems, The Artificial Intelligence field, Basic concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, Development of Expert Systems.

TEXT BOOKS:

1. Ramesh Sharda, Dursun Delen, Efraim Turban, J.E. Aronson, Ting-Peng Liang, David King, “Business Intelligence and Analytics: System for Decision Support”, 10th Edition, Pearson Global Edition, 2013

REFERENCE BOOKS:

1. Data Analytics: The Ultimate Beginner's Guide to Data Analytics Paperback – 12 November 2017by Edward Mize.

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=zbcCdoHeS4w

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		L	T	P	C
23ACB19	**Digital Transformation & Business Strategy**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES: The objective of the course is,

1. Provide an in-depth understanding of the concept and evolution of digital transformation across industries.
2. Explore the strategic alignment between digital initiatives and corporate strategy.
3. Examine emerging digital technologies that drive transformation, such as AI, IoT, cloud computing, and blockchain.
4. Develop knowledge of implementation frameworks including change management, agile practices, and performance measurement.
5. Analyze real-world applications of digital transformation in various sectors and anticipate future trends in the digital economy.

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

1. Explain the scope, drivers, and impact of digital transformation on traditional and modern businesses.
2. Evaluate how digital strategies align with business goals and describe digital business models and value chains.
3. Identify and describe key enabling technologies such as cloud, AI, IoT, blockchain, and cybersecurity.
4. Develop a roadmap for digital transformation, considering organizational readiness, change management, and risk.
5. Analyze digital transformation practices across sectors and explore emerging trends like digital workplaces, ethics, and sustainability.

UNIT-I: Introduction to Digital Transformation — 9 Hrs

Concept and scope of digital transformation, Traditional vs digital businesses, Role of digital in business evolution, Drivers and inhibitors of digital transformation, Case studies: Netflix, Amazon, Uber, etc.

UNIT-II: Strategic Foundations of Digital Business — 8 Hrs

Integration of digital and corporate strategy, Business model innovation (B2B, B2C, platform models), Digital value chain and value proposition, Strategy frameworks: Porter's Five Forces, Value Chain Analysis, Competitive advantage in the digital economy

UNIT-III: Technologies Enabling Digital Transformation — 10 Hrs

loud computing and virtualization, Artificial Intelligence and Machine Learning, Big Data and analytics, Internet of Things (IoT) and Industry 4.0, Blockchain technology, cybersecurity fundamentals, Digital architecture and infrastructure

UNIT-IV: Digital Transformation Implementation — 9 Hrs

Roadmap for digital transformation, Organizational readiness and capability development, Change management and digital leadership, Agile methodologies and DevOps, Risk management, governance, compliance, Key metrics and performance evaluation

UNIT V: Sectoral Applications and Future Trends 8 Hrs

Digital transformation in core sectors: **Retail, Banking & FinTech**, **Healthcare**, Manufacturing, **Education**, Customer-centric digital strategy, Sustainability and ethics in digital business, The future of work: AI, gig economy, digital workplaces

TEXT BOOKS:

1. **"Leading Digital: Turning Technology into Business Transformation"** *By George Westerman, Didier Bonnet, and Andrew McAfee.*

2. "Digital Transformation: Survive and Thrive in an Era of Mass Extinction" *By Thomas Siebel.*

REFERENCE BOOKS:

1. **"Digital Strategy: A Guide to Digital Business Transformation"** *By Mark Baker*

2. **"The Digital Transformation Playbook"** *By David L. Rogers.*

3. **"Digital to the Core: Remastering Leadership for Your Industry, Your Enterprise, and Yourself"** *By Mark Raskino and Graham Waller.*

4. "Enterprise Architecture as Strategy"*By Jeanne W. Ross, Peter Weill, and David Robertson.*

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
IV B.Tech. II SEM, CSBS

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23ACB20	**Capstone Project and Portfolio Development**	**0**	**0**	**6**	**3**