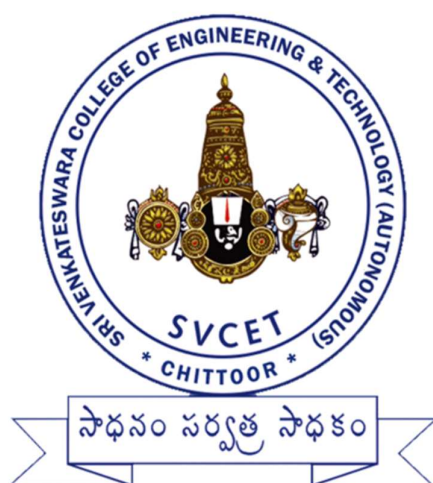


ACADEMIC REGULATIONS-R23
COURSE STRUCTURE AND DETAILED SYLLABI
for
B. Tech Regular (Full - Time) Four Year Degree Program
(For the batches admitted from the Academic Year 2023-24)
and
B. Tech. (Lateral Entry Scheme)
(For the batches admitted from the Academic Year 2024-25)



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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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

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

- Familiarization to Dept./Branch & Innovations etc., are included as per the guidelines issued by AICTE.
- 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: $(25 \times 0.8) + (20 \times 0.2) = 24$

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

Marks obtained in first mid: Absent

Marks obtained in second mid: 25

Final mid semester Marks: $(25 \times 0.8) + (0 \times 0.2) = 20$

b) End Examination Evaluation:

End examination of theory subjects shall have the following pattern:

- i) There shall be 6 questions and all questions are compulsory.
- ii) Question I shall contain 10 compulsory short answer questions for a total of 20 marks such that each question carries 2 marks. 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 weightage of 80% to better mid marks and 20% for the other. The subjective paper shall contain 3 either or type questions of equal weightage 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 consist 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% weightage 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 desirous 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.,

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

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

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

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

Where " S_i " is the SGPA of the 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	$\geq 6.5 < 7.5$
Second Class	$\geq 5.5 < 6.5$
Pass Class	$\geq 5.0 < 5.5$

CGPA to Percentage conversion Formula – $(CGPA - 0.5) \times 10$

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 Counseling	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 ELECTRICAL AND ELECTRONICS ENGINEERING**

Course Structure & Scheme of Examination

I B.Tech I Semester-EEE

Regulations: R23

S. No	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L/D	T	P		CIA	SEE	Total
1	ES	23AEE01	Basic Electrical and Electronics Engineering	3	0	0	3	30	70	100
2	ES	23AME01	Engineering Graphics	1	0	4	3	30	70	100
3	PC	23ACS01	Introduction to programming	3	0	0	3	30	70	100
4	BS	23AHS04	Linear Algebra and calculus	3	0	0	3	30	70	100
5	BS	23AHS05	Engineering Physics	3	0	0	3	30	70	100
6	ES	23AIT01	IT Workshop	0	0	2	1	30	70	100
7	ES	23AEE02	Electrical and Electronics Engineering Workshop	0	0	3	1.5	30	70	100
8	PC	23ACS02	Computer Programming Lab	0	0	3	1.5	30	70	100
9	BS	23AHS09	Engineering Physics Lab	0	0	2	1	30	70	100
10	MC	23AHS10	Health and Wellness, Yoga and Sports	0	0	1	0.5	100	00	100
TOTAL				13	0	15	20.5	370	630	1000

I B.Tech II Semester, EEE

S.No	Category	Course code	Course title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L/D	T	P		CIA	SEE	Total
1	BS	23AHS01	Communicative English	2	0	0	2	30	70	100
2	ES	23ACE01	Basic Civil and Mechanical Engineering	3	0	0	3	30	70	100
3	BS	23AHS02	Chemistry	3	0	0	3	30	70	100
4	PC	23AEE03	Electrical Circuits Analysis – I	3	0	0	3	30	70	100
5	BS	23AHS11	Differential Equations and vector calculus	3	0	0	3	30	70	100
6	ES	23AME02	Engineering Workshop	0	0	3	1.5	30	70	100
7	PC	23AEE04	Electrical Circuits Lab	0	0	3	1.5	30	70	100
8	BS	23AHS06	Communicative English Lab	0	0	2	1	30	70	100
9	BS	23AHS07	Chemistry Lab	0	0	2	1	30	70	100
10	MC	23AHS12	NSS/NCC/Scouts and Guides / Community Service	0	0	1	0.5	100	00	100
TOTAL				14	0	11	19.5	370	630	1000

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Course Structure & Scheme of Examination

II B.Tech I Semester-EEE

Regulations: R23

S. No	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	BS	23AHS14	Complex Variables & Numerical Methods	3	0	0	3	30	70	100
2	BS	23AMB01	Universal Human Values Understanding Harmony	2	1	0	3	30	70	100
3	PC	23AEE07	Electromagnetic Field Theory	3	0	0	3	30	70	100
4	PC	23AEE08	Electrical Circuit Analysis-II	3	0	0	3	30	70	100
5	PC	23AEE09	DC Machines & Transformers	3	0	0	3	30	70	100
6	PC	23AEE10	Electrical Circuit Analysis-II and Simulation Lab	0	0	3	1.5	30	70	100
7	PC	23AEE11	DC Machines & Transformers Lab	0	0	3	1.5	30	70	100
8	SC	23ACS10	Data Structures	0	1	2	2	30	70	100
9	AC	23AHS18	Environmental Science	2	0	0	-	-	-	-
10	AC	23AHS24	Quantitative and Aptitude and Reasoning- I	2	0	0	00	-	-	-
TOTAL				18	02	08	20	240	560	800

II B.Tech II Semester, EEE

S.No	Category	Course code	Course title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	HS	23AMB02	Managerial Economics and Financial Analysis	2	0	0	2	30	70	100
		23AMB03	Organizational Behavior							
		23AMB04	Business Environment							
2	PC	23AEC13	Analog Circuits	3	0	0	3	30	70	100
3	PC	23AEE12	Power Systems-I	3	0	0	3	30	70	100
4	PC	23AEE13	Induction and Synchronous Machine	3	0	0	3	30	70	100
5	PC	23AEE14	Control Systems	3	0	0	3	30	70	100
6	PC	23AEE15	Induction and Synchronous Machines Lab	0	0	3	1.5	30	70	100
7	PC	23AEE16	Control Systems Lab	0	0	3	1.5	30	70	100
8	SC	23ACS09	Python Programming	0	1	2	2	30	70	100
9	ES	23AMB05	Design Thinking & Innovation	1	0	2	2	30	70	100
10	AC	23AHS25	Quantitative and Aptitude and Reasoning- II	2	0	0	-	-	-	-
TOTAL				17	01	10	21	270	630	900
Mandatory Community Service Project of 08 weeks duration during summer vacation										



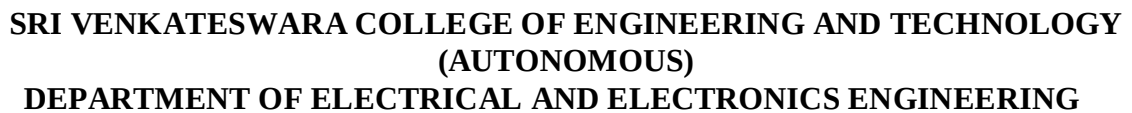
**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

Course Structure & Scheme of Examination

III B.Tech I Semester-EEE

Regulations: R23

S. No	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	PC	23AEE17	Power Electronics	3	0	0	3	30	70	100
2	PC	23AEC26	Digital Circuits	3	0	0	3	30	70	100
3	PC	23AEE18	Power Systems-II	3	0	0	3	30	70	100
4	PC	23ACS27	Introduction To Quantum Technology and Applications	3	0	0	3	30	70	100
5	PE-I	23AEC27	Signals and Systems	3	0	0	3	30	70	100
		23AEE19	Electrical safety and Risk Management							
		23AEE20	Utilization of Electrical Energy							
6	OE-I	23ACE30	Green Buildings	3	0	0	3	30	70	100
		23ACE31	Construction Technology and Management							
		23AME23	Sustainable Energy Technologies							
		23AEC30	Electronic Circuits							
		23ACS06	Object oriented Programming Through Java							
		23ACA13	Fundamentals Of Artificial Intelligence							
		23AHS26	Mathematics for Machine Learning and AI							
		23AHS27	Materials Characterization Techniques							
		23AHS28	Chemistry of Energy Systems							
		23AHS29	English for Competitive Examinations							
		23AMB06	Entrepreneurship and New Venture Creation							
7	PC	23AEE21	Power Electronics Lab	0	0	3	1.5	30	70	100
8	PC	23AEC28	Analog and Digital Circuits Lab	0	0	3	1.5	30	70	100
9	SC	23AHS20	Soft Skills	0	1	2	2	30	70	100
10	ES	23ACO03	Tinkering Lab	0	0	2	1	30	70	100
11	IN	23AEE22	Evaluation of Community Service Internship	-	-	-	2	30	70	100
12	AC	23AHS30	Quantitative and Aptitude and Reasoning- III	2	0	0	-	-	-	-
13	AC	23AHS31	French Language	2	0	0	-	-	-	-
		23AHS32	German Language							
		23AHS33	Japanese Language							
TOTAL				20	00	10	26	360	770	1100



Regulations: R23

S.No	Category	Course code	Course title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	PC	23AEE24	Electrical Measurements and Instrumentation	3	0	0	3	30	70	100
2	PC	23AEC18	Microprocessors and Interfacing	3	0	0	3	30	70	100
3	PC	23AEE25	Power System Analysis	3	0	0	3	30	70	100
4	PE-II	23AEE26	AI&ML for Electrical Engineering	3	0	0	3	30	70	100
		23AEE27	Programmable Logic Controllers							
		23AEE28	Switchgear and Protection							
5	PE-III	23AEC42	Communication systems	3	0	0	3	30	70	100
		23AEE29	Electric Drives							
		23AEE30	Renewable and Distributed Energy Technologies							
6	OE-II	23ACE44	Disaster Management	3	0	0	3	30	70	100
		23ACE45	Sustainability In Engineering Practices							
		23AME39	Automation and Robotics							
		23AEC34	Electronics measurements and Instrumentation							
		23ACD07	Operating Systems and Systems Security							
		23ACM04	Machine Learning for Engineer							
		23AHS35	Optimization Techniques and Applications							
		23AHS37	Physics Of Electronic Materials And Devices							
		23AHS38	Chemistry Of Polymers And Applications							
		23AHS39	Academic Writing and Public Speaking							
23AHS36	Mathematical Foundation of Quantum Technologies									
6	PC	23AEE31	Electrical Measurements and Instrumentation Lab	0	0	3	1.5	30	70	100
7	PC	23AEC23	Microprocessors and Interfacing Lab	0	0	3	1.5	30	70	100
8	SC	23AEE32	Applications of Soft Computing Tools in Electrical Engineering	0	1	2	2	30	70	100
9	AC	23AMB16	Technical paper Writing & IPR	2	0	0	-	-	-	-
TOTAL							23	270	630	900
Mandatory Industry Internship of 08 weeks duration during summer vacation										



SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Course Structure & Scheme of Examination

IV B.Tech I Semester, EEE

Regulations: R23

S.No	Category	Course code	Course title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	PC	23AEE34	Power System Operation and Control	3	0	0	3	30	70	100
2	ME-II	23AMB17	Business Ethics and Corporate Governance	2	0	0	2	30	70	100
		23AMB18	E-Business							
		23AMB19	Management Science							
3	PE-IV	23AEC31	Digital Signal Processing	3	0	0	3	30	70	100
		23AEE35	Electric Vehicle Technology							
		23AEE36	HVDC & FACTS							
4	PE-V	23AEE37	Modern Control Theory	3	0	0	3	30	70	100
		23AEE38	Switched Mode Power Conversion							
		23AEE39	Electrical Distribution System							
5	OE-III	23ACE55	Building Materials and Services	3	0	0	3	30	70	100
		23ACE26	Environmental Impact Assessment							
		23AME52	3D Printing Technologies							
		23AEC38	Satellite Communication							
		23ACS12	Data Base Management Systems							
		23ACC10	Cyber Security							
		23AHS41	Wavelet transforms and its Applications							
		23AHS42	Smart Materials And Devices							
		23AHS43	Introduction to Quantum Mechanics							
		23AHS44	Green Chemistry And Catalysis For Sustainable Environment							
6	OE-IV	23AHS45	Employability Skills	3	0	0	3	30	70	100
		23ACE56	Geo-Spatial Technologies							
		23ACE57	Solid Waste Management							
		23AME46	Total Quality Management							
		23AEC53	Transducers and Sensors							
		23ACS16	Computer Networks							
		23ACO01	Internet of Things							
		23AMB22	Financial Mathematics							
		23AHS46	Sensors And Actuators For Engineering Applications							
		23AHS47	Chemistry Of Nano-materials and Applications							
7	SC	23AHS48	Literary Vibes	0	0	4	2	30	70	100
		23ACS35	Quantum Computing							
8	AC	23AHS49	Gender Sensitization	2	0	0	-			
9	IN	23AEE41	Evaluation of Industry Internship	-	-	-	2	30	70	100
TOTAL							21	240	560	800



SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Course Structure & Scheme of Examination

IV B.Tech II Semester, EEE

Regulations: R23

S.No	Category	Course code	Course title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	IN	23AEE44	Internship	-	-	-	4	30	70	100
2	PR	23AEE45	Project	-	-	-	8	30	70	100
TOTAL				-	-	24	12	30	70	100



**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

Course Structure & Scheme of Examination

Regulations: R23

HONOURS DEGREE IN ELECTRICAL AND ELECTRONICS ENGINEERING

S.No	Category	Course code	Course title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	PC	23AEE46	E - Mobility	3	0	0	3	30	70	100
2	PC	23AEE47	Battery Management Systems	3	0	0	3	30	70	100
3	PC	23AEE48	Special Machines for Electric Vehicles	3	0	0	3	30	70	100
4	PC	23AEE49	Grid Interface of Electric Vehicles	3	0	0	3	30	70	100
5	PC	23AEE50	EV Charging Technologies	3	0	0	3	30	70	100
6	PC	23AEE51	Project on Electric Vehicles	0	0	6	3	60	140	200
TOTAL				15		06	18	210	490	700



**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

Regulations: R23

List of minor degree offered to EEE Department by the other Departments

S.No.	Minor Title	Department offering the Minor
1.	Building Planning & Construction Technology	CIVIL
2.	3D Printing	ME
3.	Industrial Engineering	
4.	Embedded Systems and IoT	ECE
5.	Electronic Systems	
6.	Computer Science and Engineering	CSE
7.	Cyber Security	CSE CS
8.	Internet of Things	CSE (IOT)
9.	Data Science	CSD
10.	Artificial Intelligence & Machine Learning	CSM & CAI
11.	Data Analytics	CSD
12.	Data Science and Analytics	CSD
13.	Programming & Computational Intelligence	CSM & CAI
14.	AI Applications & Emerging Technologies	CSM & CAI
15.	Quantum Computing	CSE
16.	Quantum Technologies	IT
17.	Machine Learning & Generative AI (HCL)	CSM & CAI
18.	Artificial Intelligence & Data science	CSD
19.	Data Science with AWS(HCL)	CSD
20.	Full stack MERN and DEVOPS (HCL)	CSE
21.	Cloud Computing (HCL)	CSE
22.	UX/UI Design	IT
23.	Bio Medical Engineering (BME)	ECE-(Bio Medical Engineering)
24.	Computer Science & Business Systems	CSBS



**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

Course Structure & Scheme of Examination

Regulations: R23

1. MINORS IN BUILDING PLANNING & CONSTRUCTION TECHNOLOGY (CIVIL ENGINEERING)

S.No	Category	Course code	Course title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	PC	23ACE67	Construction Materials	3	0	0	3	30	70	100
2	PC	23ACE68	Construction Methods	3	0	0	3	30	70	100
3	PC	23ACE11	Building Planning And Drawing	3	0	0	3	30	70	100
4	PC	23ACE05	Surveying	3	0	0	3	30	70	100
5	PC	23ACE14	Concrete Technology	3	0	0	3	30	70	100
6	PC	23ACE18	Concrete Technology Lab	0	0	3	1.5	30	70	100
7	PC	23ACE09	Surveying Lab	0	0	3	1.5	30	70	100
TOTAL				15		06	18	180	420	600

2. MINORS IN 3D PRINTING (MECHANICAL ENGINEERING)

S.No	Category	Course code	Course title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	PC	23AME61	Material Science & Engineering	3	0	0	3	30	70	100
2	PC	23AME62	Additive Manufacturing	3	0	0	3	30	70	100
3	PC	23AME63	Material Characterization Techniques	3	0	0	3	30	70	100
4	PC	23AME64	3D Printing Materials and Applications	3	0	0	3	30	70	100
5	PC	23AME25	CAD/CAM	3	0	0	3	30	70	100
6	PC	23AME06	Computer Aided Machine Drawing	0	0	3	1.5	30	70	100
7	PC	23AME38	3D Printing Lab	0	0	3	1.5	30	70	100
TOTAL				15		06	18	180	420	600

3. MINORS IN INDUSTRIAL ENGINEERING (MECHANICAL ENGINEERING)

S.No	Category	Course code	Course title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	PC	23AME65	Production Planning & Control	3	0	0	3	30	70	100
2	PC	23AMB26	Marketing Management	3	0	0	3	30	70	100
3	PC	23AME57	Supply Chain Management	3	0	0	3	30	70	100
4	PC	23AMB27	Strategic Management for Competitive Advantage	3	0	0	3	30	70	100
5	PC	23AME66	Six Sigma & Lean Manufacturing	3	0	0	3	30	70	100
6	PC	23AME67	Applied Project Work	0	0	6	3	30	70	100
TOTAL				15		06	18	180	420	600

4. MINORS IN EMBEDDED SYSTEMS AND IOT (ELECTRONICS AND COMMUNICATION ENGINEERING)

S.No	Category	Course code	Course title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	PC	23AEC63	Embedded Systems Technology	3	0	0	3	30	70	100
2	PC	23AEC64	Real Time Embedded systems design and Analysis	3	0	0	3	30	70	100
3	PC	23AEC65	Principles of IoT	3	0	0	3	30	70	100
4	PC	23ACS25	Wireless Networks	3	0	0	3	30	70	100
5	PC	23ACO19	Industrial Internet of things	3	0	0	3	30	70	100
6	PC	23AEC66	Principles of IoT Lab	0	0	3	1.5	30	70	100
7	PC	23AEC67	Industrial Internet of things Lab	0	0	3	1.5	30	70	100
TOTAL				15		06	18	180	420	600

5. MINORS IN ELECTRONIC SYSTEMS (ELECTRONICS AND COMMUNICATION ENGINEERING)

S.No	Category	Course code	Course title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	PC	23AEC10	Analog and Digital Communications	3	0	0	3	30	70	100
2	PC	23AEC69	Electronic Instrumentation	3	0	0	3	30	70	100
3	PC	23AEC16	Analog & Digital IC Applications	3	0	0	3	30	70	100
4	PC	23AEC68	Principles of Communication Engineering	3	0	0	3	30	70	100
5	PC	23AEC22	Analog & Digital IC Applications Lab	3	0	0	3	30	70	100
6	PC	23AEC33	VLSI Design	0	0	3	1.5	30	70	100
7	PC	23AEC40	VLSI Design Lab	0	0	3	1.5	30	70	100
TOTAL				15		06	18	180	420	600

6. MINORS IN COMPUTER SCIENCE AND ENGINEERING (CSE)

S.No	Category	Course code	Course title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	PC	23ACS24	Cloud computing	3	0	0	3	30	70	100
2	PC	23AIT02	Software Engineering	3	0	0	3	30	70	100
3	PC	23ACS05	Advanced Data Structures & Algorithm Analysis	3	0	0	3	30	70	100
4	PC	23ACS43	Computer Organization	3	0	0	3	30	70	100
5	PC	23ACS44	Web Technologies	3	0	0	3	30	70	100
6	PC	23ACS45	Web Technologies Lab	0	0	3	1.5	30	70	100
7	PC	23ACS07	Advanced Data Structures and Algorithm Analysis Lab	0	0	3	1.5	30	70	100
TOTAL				15		06	18	180	420	600

7. MINORS IN CYBER SECURITY (CSE)

S.No	Category	Course code	Course title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	PC	23ACC05	Introduction to Cyber Security	3	0	0	3	30	70	100
2	PC	23ACC16	Cyber Crimes & Digital Forensics	3	0	0	3	30	70	100
3	PC	23ACC01	Cryptography & Network Security (Pre-requisite: Computer Networks)	3	0	0	3	30	70	100
4	PC	23ACC11	Cyber Laws and Security Policies	3	0	0	3	30	70	100
5	PC	23ACC04	Blockchain Technology	3	0	0	3	30	70	100
6	PC	23ACC02	Cyber Security Lab	0	0	3	1.5	30	70	100
7	PC	23ACC08	Cryptography & Network Security Lab	0	0	3	1.5	30	70	100
TOTAL				15		06	18	180	420	600

8. MINORS IN INTERNET OF THINGS (CSE - IOT)

S.No	Category	Course code	Course title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	PC	23ACO01	Introduction to IoT	3	0	0	3	30	70	100
2	PC	23ACS25	Wireless Sensor Networks	3	0	0	3	30	70	100
3	PC	23ACO16	Communication Protocols for IoT	3	0	0	3	30	70	100
4	PC	23ACO19	Industrial IoT	3	0	0	3	30	70	100
5	PC	23ACS24	Cloud Computing	3	0	0	3	30	70	100
6	PC	23ACO02	IoT Lab	0	0	3	1.5	30	70	100
7	PC	23ACS26	Cloud Computing Lab	0	0	3	1.5	30	70	100
TOTAL				15		06	18	180	420	600

9. MINORS IN DATA SCIENCE (CSD)

S.No	Category	Course code	Course title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	PC	23ACD36	Data Science for Engineers	3	0	0	3	30	70	100
2	PC	23ACD37	Statistical Learning for Data Science	3	0	0	3	30	70	100
3	PC	23ACD38	Introduction to Data Engineering	3	0	0	3	30	70	100
4	PC	23ACM34	Machine learning fundamentals	3	0	0	3	30	70	100
5	PC	23ACD39	Data Science applications	3	0	0	3	30	70	100
6	PC	23ACD40	Data Science Practice Lab (R/Python)	0	0	3	1.5	30	70	100
7	PC	23ACD41	Statistical Learning & ML Lab	0	0	3	1.5	30	70	100
TOTAL				15		06	18	180	420	600

10. MINORS IN ARTIFICIAL INTELLIGENCE & MACHINE LEARNING (CSM)

S.No	Category	Course code	Course title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	PC	23ACM33	Essentials of Artificial Intelligence	3	0	0	3	30	70	100
2	PC	23ACM34	Machine Learning Fundamentals	3	0	0	3	30	70	100
3	PC	23ACM35	Deep Learning & Neural Networks	3	0	0	3	30	70	100
4	PC	23ACM36	Introduction to Natural Language Processing	3	0	0	3	30	70	100
5	PC	23ACM37	Introduction to Computer Vision	3	0	0	3	30	70	100
6	PC	23ACM38	Essentials of AI & ML Lab	0	0	3	1.5	30	70	100
7	PC	23ACM39	NLP & Computer Vision Lab	0	0	3	1.5	30	70	100
TOTAL				15		06	18	180	420	600

11. MINORS IN DATA ANALYTICS (CSD)

S.No	Category	Course code	Course title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	PC	23ACD42	Introduction to Data Analytics	3	0	0	3	30	70	100
2	PC	23ACD43	Data Engineering	3	0	0	3	30	70	100
3	PC	23ACD44	Predictive Analytics	3	0	0	3	30	70	100
4	PC	23ACD45	Big Data Analytics (Hadoop,Spark)	3	0	0	3	30	70	100
5	PC	23ACD46	Data Analytics with Power BI/Tableau/Matplotlib	3	0	0	3	30	70	100
6	PC	23ACD47	Data Analytics Tools Lab	0	0	3	1.5	30	70	100
7	PC	23ACD48	Big Data & NoSQL Lab	0	0	3	1.5	30	70	100
TOTAL				15		06	18	180	420	600

12. MINORS IN DATA SCIENCE AND ANALYTICS (CSD)

S.No	Category	Course code	Course title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	PC	23ACD36	Data Science for Engineers	3	0	0	3	30	70	100
2	PC	23ACD37	Statistical Learning for Data Science	3	0	0	3	30	70	100
3	PC	23ACD49	Data Visualization & Exploratory Data Analysis	3	0	0	3	30	70	100
4	PC	23ACD50	Big Data Analytics Fundamentals	3	0	0	3	30	70	100
5	PC	23ACD51	Introduction to Recommender Systems	3	0	0	3	30	70	100
6	PC	23ACD52	Data Visualization & EDA Lab	0	0	3	1.5	30	70	100
7	PC	23ACD53	Recommender System Lab	0	0	3	1.5	30	70	100
TOTAL				15		06	18	180	420	600

13. MINORS IN PROGRAMMING & COMPUTATIONAL INTELLIGENCE (CSM and CAI)

S.No	Category	Course code	Course title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	PC	23ACA40	Quantum Computing for AI	3	0	0	3	30	70	100
2	PC	23ACA41	Edge AI & IoT	3	0	0	3	30	70	100
3	PC	23ACA38	Python for AI & Data Science	3	0	0	3	30	70	100
4	PC	23ACA39	Data Structures & Algorithms for AI	3	0	0	3	30	70	100
5	PC	23AAD03	Reinforcement Learning	3	0	0	3	30	70	100
6	PC	23ACA42	Python & DS Lab	0	0	3	1.5	30	70	100
7	PC	23ACA43	RL & Quantum AI Lab	0	0	3	1.5	30	70	100
TOTAL				15		06	18	180	420	600

14. MINORS IN AI APPLICATIONS & EMERGING TECHNOLOGIES (CSM and CAI)

S.No	Category	Course code	Course title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	PC	23AAI15	Introduction to AI in Cyber security	3	0	0	3	30	70	100
2	PC	23ACA28	Health Care AI	3	0	0	3	30	70	100
3	PC	23AAI16	AI in Finance & Business Analytics	3	0	0	3	30	70	100
4	PC	23AAI17	Ethical AI & Responsible AI	3	0	0	3	30	70	100
5	PC	23AAI18	Introduction to Generative AI & Prompt Engineering	3	0	0	3	30	70	100
6	PC	23AAI19	Applications Lab	0	0	3	1.5	30	70	100
7	PC	23AAI20	Generative AI Lab	0	0	3	1.5	30	70	100
TOTAL				15		06	18	180	420	600

15. MINORS IN QUANTUM COMPUTING (CSE)

S.No	Category	Course code	Course title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	PC	23ACS47	Introduction to Quantum Computing	3	0	0	3	30	70	100
2	PC	23ACS48	Mathematical Foundations for Quantum Computing	3	0	0	3	30	70	100
3	PC	23ACS49	Quantum Algorithms	3	0	0	3	30	70	100
4	PC	23ACS50	Quantum Information and Communication	3	0	0	3	30	70	100
5	PC	23ACS10	Quantum Machine Learning (QML)	3	0	0	3	30	70	100
6	PC	23ACS52	Quantum Algorithms Lab	0	0	3	1.5	30	70	100
7	PC	23ACS53	Quantum Programming and Simulation Lab	0	0	3	1.5	30	70	100
TOTAL				15		06	18	180	420	600

16. MINORS IN QUANTUM TECHNOLOGIES (IT)

S.No	Category	Course code	Course title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	PC	23AIT24	Foundations of Quantum Technologies	3	0	0	3	30	70	100
2	PC	23AIT25	Solid State Physics for Quantum Technologies	3	0	0	3	30	70	100
3	PC	23AIT26	Quantum Optics Prerequisites for Quantum Technologies	3	0	0	3	30	70	100
4	PC	23AIT27	Introduction to Quantum Communication	3	0	0	3	30	70	100
5	PC	23AIT28	Introduction to Quantum Sensing	3	0	0	3	30	70	100
6	PC	23AIT29	Quantum Communication and Sensing Lab	0	0	3	1.5	30	70	100
7	PC	23AIT30	Quantum Devices and Materials Lab	0	0	3	1.5	30	70	100
TOTAL				15		06	18	180	420	600

17. MINORS IN MACHINE LEARNING AND GENERATIVE AI (CSM & AI)

S.No	Category	Course code	Course title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	PC	23ACM47	Python -Foundation to Mastering	3	0	0	3	30	70	100
2	PC	23ACM48	Essentials Of Python For Data Analysis	3	0	0	3	30	70	100
3	PC	23ACM49	Foundations Of Responsible AI	3	0	0	3	30	70	100
4	PC	23ACM50	Foundations Of Gen AI	3	0	0	3	30	70	100
5	PC	23ACM51	Natural Language Processing With Neural Networks	3	0	0	3	30	70	100
6	PC	23ACM52	Capstone Project	0	0	3	3	30	70	100
TOTAL				15		06	18	180	420	600

18. MINORS IN ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (CSD)

S.No	Category	Course code	Course title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	PC	23ACD57	Predictive Data Analytics using R	3	0	0	3	30	70	100
2	PC	23AAD19	Fundamentals of Generative AI	3	0	0	3	30	70	100
3	PC	23AAD20	Mastering Data Handling - SQL & No-SQL	3	0	0	3	30	70	100
4	PC	23AAD21	Generative AI:Advanced methods & Applications	3	0	0	3	30	70	100
5	PC	23AAD22	Natural Language Processing with Neural Networks	3	0	0	3	30	70	100
6	PC	23AAD23	Capstone Project and Portfolio Development	0	0	3	1.5	30	70	100
7	PC	23ACD57	Predictive Data Analytics using R	0	0	3	1.5	30	70	100
TOTAL				15		06	18	180	420	600

19. MINORS IN DATA SCIENCE WITH AWS (HCL) (CSD)

S.No	Category	Course code	Course title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	PC	23ACD56	Foundations Of Cloud Concepts	3	0	0	3	30	70	100
2	PC	23ACD57	Predictive Data Analytics using R	3	0	0	3	30	70	100
3	PC	23ACD58	Data Engineering With AWS	3	0	0	3	30	70	100
4	PC	23ACD59	Cloud-Native Machine Learning	3	0	0	3	30	70	100
5	PC	23ACD60	Deep Learning: The Modern Approach	3	0	0	3	30	70	100
TOTAL				15		06	15	150	350	500

20. MINORS IN FULL STACK MERN DEVOPS (HCL) (CSE)

S.No	Category	Course code	Course title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	PC	23ACS60	Web fundamentals, advanced javascript & github	3	0	0	3	30	70	100
2	PC	23ACS61	Backend development with node.js & express	3	0	0	3	30	70	100
3	PC	23ACS62	Building user interfaces with react.js	3	0	0	3	30	70	100
4	PC	23ACS63	Devops fundamentals & ci/cd pipelines	3	0	0	3	30	70	100
5	PC	23ACS64	Advanced backend & microservices	3	0	0	3	30	70	100
6	PC	23ACS65	Project on full stack mern and devops	0	0	3	3	30	70	100
TOTAL				15		06	18	180	420	600

21. MINORS IN CLOUD COMPUTING (HCL) (CSE)

S.No	Category	Course code	Course title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	PC	23ACS54	Fundamentals of cloud computing	3	0	0	3	30	70	100
2	PC	23ACS55	Virtualization and cloud infrastructure	3	0	0	3	30	70	100
3	PC	23ACS56	Cloud platforms and development	3	0	0	3	30	70	100
4	PC	23ACS57	Cloud security and compliance	3	0	0	3	30	70	100
5	PC	23ACS58	Cloud application design and devops	3	0	0	3	30	70	100
6	PC	23ACS59	Capstone project	0	0	3	3	30	70	100
TOTAL				15		06	18	180	420	600

22. MINORS IN UX/UI DESIGN (IT)

S.No	Category	Course code	Course title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	PC	23AIT37	Introduction to Design and Visual Communication	3	0	0	3	30	70	100
2	PC	23AIT38	Human Centered Design and Interaction Principles	3	0	0	3	30	70	100
3	PC	23AIT39:	UX Research and Design Thinking	3	0	0	3	30	70	100
4	PC	23AIT40:	Prototyping And Usability Testing	3	0	0	3	30	70	100
5	PC	23AIT41:	Frontend Development For Designers	3	0	0	3	30	70	100
6	PC	23AIT42:	Capstone project and portfolio Development	0	0	3	3	30	70	100
TOTAL				15		06	18	180	420	600

23. MINORS IN BME (ECE)

S.No	Category	Course code	Course title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	PC	23ABM09	Nano biotechnology	3	0	0	3	30	70	100
2	PC	23ABM10	Tissue engineering	3	0	0	3	30	70	100
3	PC	23ABM02	Biomaterials	3	0	0	3	30	70	100
4	PC	23ABM14	Biomems & biomicrofluidics	3	0	0	3	30	70	100
5	PC	23ABM03	Biomaterials lab	3	0	0	3	30	70	100
6	PC	23ABM04	Biosensors & transducers	0	0	3	1.5	30	70	100
7	PC	23ABM05	Biosensors & transducers lab	0	0	3	1.5	30	70	100
TOTAL				15		06	18	180	420	600

24. Computer Science & Business Systems (CSBS)

S.No	Category	Course code	Course title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	PC	23ACB15	Fundamentals Of Computer Systems & Business Environment	3	0	0	3	30	70	100
2	PC	23ACE16	Database Management & Enterprise Systems	3	0	0	3	30	70	100
3	PC	23ACB17	Software Engineering for Business Applications	3	0	0	3	30	70	100
4	PC	23ACB18	Business Intelligence and Analytics	3	0	0	3	30	70	100
5	PC	23ACB19	Digital Transformation & Business Strategy	3	0	0	3	30	70	100
6	PC	23ACB20	Capstone Project and Portfolio Development	0	0	3	1	30	70	100
TOTAL				15		06	18	180	420	600

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY,
(AUTONOMOUS)**

I B.Tech I Semester

L	T	P	C
3	0	0	3

**23AEE01 BASIC ELECTRICAL & ELECTRONICS ENGINEERING
(Common to All branches of Engineering)**

COURSE OBJECTIVES

To expose to the field of Electrical & Electronics Engineering, laws and principles of electrical/ electronic engineering and to acquire fundamental knowledge in the relevant field.

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.

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

TextBooks:

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, DhanpatRai& Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

Reference Books:

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019, Fourth Edition
2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020
3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017
4. Basic Electrical and Electronics Engineering, S. K. Bhattacharya, Person Publications, 2018, Second Edition.

Web Resources:

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

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)
(Common to All branches of Engineering)

23AME01 ENGINEERING GRAPHICS

	L	T	P	C
Course Outcomes: After completion of this course, the student will be able to	1	0	4	3
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, Involute, 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, Projection 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, Section 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 AutoCAD (Not for end examination).

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

TextBooks:

1. N. D.Bhatt,EngineeringDrawing,CharotarPublishingHouse,2016.

ReferenceBooks:

1. EngineeringDrawing,K.L.NarayanaandP.Kannaiah,TataMcGrawHill,2013.
2. EngineeringDrawing, M.B.ShahandB.C. Rana, PearsonEducationInc,2009.
3. EngineeringDrawingwithanIntroductiontoAutoCAD,DhananjayJolhe,TataMcGraw Hill,2017.

**SRIVENKATESWARACOLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)**

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

L	T	P	C
3	-	-	3

23ACS01: INTRODUCTION TO PROGRAMMING

Course Objectives:

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

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

1. Understand basics of computers, the concept of algorithm and algorithmic thinking.
2. Develop the ability to analyze a problem, develop an algorithm to solve it.
3. Proficiently use the C programming language to implement various algorithms.
4. Understand more advanced features of C language.
5. 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 Datatypes, 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. "TheCProgrammingLanguage"byBrianW.KernighanandDennisM.Ritchie
4. Schaum'sOutlineofProgrammingwithCbyByronSGottfried(1996),McGraw-HillEducation(ISBN:978-0070240353)

ReferenceBooks:

1. Balagurusamy,E.(2008).ComputingfundamentalsandCProgramming.McGraw-HillEducation.
2. ProgramminginCRemaTheraja-2ndedition2016
3. C Programming, AProblemSolvingApproach,Forouzan,Gilberg,Prasad,CENGAGE
4. Jeri R. Hanly, Elliot B. Koffman, Problem Solving and Program Design in C, 5/e, Pearson

**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 Objectives:

- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.

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 theorem 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 (Multivariable 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, 10th Edition.

Reference Books:

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

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
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23AHS05 ENGINEERING PHYSICS

COURSE OBJECTIVES

1. Bridging the gap between the Physics in school at 10+2 level and UG level engineering courses.
2. To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications.
3. Enlighten the periodic arrangement of atoms in Crystalline solids by Bragg's law – Learning the structural analysis through X-ray diffraction techniques.
4. Enlightenment of the concepts of Quantum Mechanics and to provide fundamentals of de Broglie matter waves, quantum mechanical wave equation and its application, the importance of free electron theory for metals.
5. To Understand the Physics of Semiconductors and their working mechanism, Concepts utilization of transport phenomenon of charge carriers in semiconductors. To give an impetus on the subtle mechanism of superconductors using the concept of BCS theory and their fascinating applications.
6. To explain the significant concepts of dielectric and magnetic materials that lead to potential applications in the emerging micro devices.

COURSE OUTCOMES

- a. **CO1: Explain** the need of coherent sources and the conditions for sustained interference (L2). **Identify** the applications of interference in engineering (L3). **Analyze** the differences between interference and diffraction with applications (L4). **Illustrate** the concept of polarization of light and its applications (L2). **Classify** ordinary refracted light and extraordinary refracted rays by their states of polarization (L2).
- b. **CO2: Interpret** various crystal systems (L2) and **Analyze** the characterization of materials by XRD (L4). **Identify** the important properties of crystals like the presence of long-range order and periodicity, structure determination using X-ray diffraction technique (L3). **Analysis** of structure of the crystals by Laue's method (L2).
- c. **CO3: Describe** the dual nature of matter (L1). **Explain** the significance of wave function (L2). **Identify** the role of Schrodinger's time independent wave equation in studying particle in one-dimensional infinite potential well (L3). **Identify** the role of classical and quantum free electron theory in the study of electrical conductivity (L3).
- d. **CO4: Classify** the crystalline solids (L2). **Outline** the properties of charge carriers in semiconductors (L2). **Identify** the type of semiconductor using Hall effect (L2). **Classify** superconductors based on Meissner's effect (L2). **Explain** Meissner's effect, BCS theory & Josephson effect in superconductors (L2).
- e. **CO5: Explain** the concept of dielectric constant and polarization in dielectric materials (L2). **Summarize** various types of polarization of dielectrics (L2). **Interpret** Lorentz field and Clausius-Mosotti relation in dielectrics (L2). **Classify** the magnetic materials based on susceptibility (L2).

Unit-I: Wave Optics

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 (hkl) 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.

Textbooks:

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, Sci Tech 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, McGraw Hill.
7. "Solid state physics" - A.J. Dekker, Pan Macmillan publishers
8. "Introduction to Solid State Physics" - Charles Kittel, Wiley

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3		1								
CO2	3	3	1									
CO3	3	2	1	2								
CO4	3	3	1	2	1				1		1	1
CO5	3	2	2		1				2		1	1

SRIVENKATESWARACOLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
IB.TechI Semester
(Common to all branches)

L	T	P	C
0	0	2	1

23AIT01:

IT WORKSHOP

Course Objectives

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

Course Outcomes:

- Perform Hardware troubleshooting.
- Understand Hardware components and inter dependencies.
- Safeguard computer systems from viruses/worms.
- Document/ Presentation preparation.
- Perform calculations using spreadsheets.

PC Hardware

Task1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Internet & World Wide Web

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

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

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

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

LaTeX and WORD

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

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

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

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

Excel

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

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

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

LOOKUP/VLOOKUP

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

Power point

Task 1: Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

AI Tools – ChatGPT

Task 1: Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them.

- Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"

Task 2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas

- Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

Task 3: Code Generation: Test the model's ability to generate code by giving it partial code snippets and asking it to complete them. You can also ask the model to explain programming concepts or help you debug code.

- Ex:Prompt: "Complete the following Python code to swap the values of two variables:
\npython\n a = 5\n b = 10\n temp = a\n a = b\n b = 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)

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, (AUTONOMOUS)

I B.TechI Semester	L	T	P	C
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23AEE02 ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP

(Common to All branches of Engineering)

Course Objectives:

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

Activities:

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

COURSE OUTCOMES:

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

Course Outcomes:

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.

Reference Books:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, FirstEdition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, DhanpatRai& Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, ThirdEdition

SRIVENKATESWARACOLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
IB.TechI Semester
(Common to all branches)

L	T	P	C
-	-	3	1.5

23ACS02: COMPUTER PROGRAMMING LAB

Course Objectives:

1. To use basic data types, operators, expressions and expression evaluation mechanisms using C Programming Language.
2. To implement control flows, construct in C Programming Language and understand the syntax, semantics and usability context of these different constructs.
3. To develop composite data types in C and constructs available to develop their data types, utilize them to model things and dealing with data from and to external files.
4. To design programs with different variations of the constructs available for practicing modular programming and understand the pros and cons of using different variants and apply optimization.

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

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

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 on 1D array.
- iii) The reverse of a 1D integer array
- iv) Find 2's complement of the given binary number.
- v) Eliminate duplicate elements in an array.

WEEK 8:

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

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

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

**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 Objectives:

- Understand the concepts of interference, diffraction and their applications.
- Understand the role of optical fiber parameters in communication.
- Recognize the importance of energy gap in the study of conductivity and Hall Effect in a semiconductor.
- Illustrate the magnetic and dielectric materials applications.
- Apply the principles of semiconductors in various electronic devices.

(Any **TE** No of the following listed experiments)

List of Engineering Physics Experiments

1. Determination of radius of curvature of a given planoconvex 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

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3			2								
CO2	3	2		2								1
CO3	3	1		2								
CO4	3	3		3	2						1	1

References: 1. S. Balasubramanian, M.N.Srinivasan “A Text book of Practical Physics”-
S.ChandPublishers,2017.

URL:www.vlab.co.in

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
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)

23AHS01- COMMUNICATIVE ENGLISH

L	T	P	C
2	0	0	2

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 the set 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

Textbooks:

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

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

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)**

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

23ACE01 BASIC CIVIL AND MECHANICAL ENGINEERING

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

1. Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring a better society.
2. Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying.
3. Realize the importance of Transportation in nation's economy and the engineering measures related to highways in terms of geometrics.
4. Understand the importance of water resources and storage structures so that the social responsibilities of water conservation will be appreciated.
5. Understand the different manufacturing processes and explain the basics of thermal engineering and its applications.
6. Describe the working of different mechanical power transmission systems and power plants; learn basics of robotics.

PART A: BASIC CIVIL ENGINEERING

UNIT I

Basic 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 - Superelevation - 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, Charotar 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 Textbook of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd.
3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengage Learning India Pvt. Ltd.

Reference Books:

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

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

3 - - 3

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

CO5: Summarize the concepts of Instrumental methods.

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

Nanomaterials: Introduction, classification, properties and applications of Fullerenes, carbonnanotubes andGraphenesnanoparticles.

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

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

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

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of polymer formation.

Plastics –Thermo and Thermosetting plastics, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibres.

Elastomers—Buna-S, Buna-N—preparation, properties and applications.

Conducting polymers—polyacetylene, polyaniline,—mechanism of conduction and applications. Bio-Degradable polymers—PolyGlycolic Acid (PGA), Polyl Lactic Acid (PLA).

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV-Visible Spectroscopy, electronic transition, Instrumentation, IR spectroscopies, fundamental modes and selection rules,

Instrumentation. Chromatography-Basic Principle, Classification-
HPLC: Principle, Instrumentation and Applications.

Textbooks:

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

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, (AUTONOMOUS)

I B.Tech II Semester (EEE)

L	T	P	C
3	0	0	3

23AEE03 ELECTRICAL CIRCUIT ANALYSIS –I

Course Objectives:

To develop an understanding of the fundamental laws, elements of electrical circuits and to apply circuit analysis to DC and AC circuits

UNIT-I UNIT I INTRODUCTION TO ELECTRICAL CIRCUITS

Basic Concepts of passive elements of R, L, C and their V-I relations, Sources (dependent and independent), Kirchoff's laws, Network reduction techniques (series, parallel, series - parallel, star-to-delta and delta-to-star transformation), source transformation technique, nodal analysis and mesh analysis to DC networks with dependent and independent voltage and current sources, node and mesh analysis

UNIT II MAGNETIC CIRCUITS

Basic definition of MMF, flux and reluctance, analogy between electrical and magnetic circuits, Faraday's laws of electromagnetic induction – concept of self and mutual inductance, Dot convention – coefficient of coupling and composite magnetic circuit, analysis of series and parallel magnetic circuits

UNIT-III SINGLE PHASE CIRCUITS

R.M.S and Average values and form factor for different periodic and non-periodic wave forms, Steady state analysis of R, L and C (in series, parallel and series parallel combinations) with sinusoidal excitation – Concept of Reactance, Impedance, Susceptance and Admittance – Phase and Phase difference – concept of power factor, Real and Reactive powers – J-notation, Complex and Polar forms of representation, Complex power.

UNIT-IV RESONANCE AND LOCUS DIAGRAMS

Series Resonance: Characteristics of a series resonant circuit, Q-factor, selectivity and bandwidth, expression for half power frequencies; Parallel resonance: Q-factor, selectivity and bandwidth; Locus diagram: RL, RC, RLC with R, L and C variables.

UNIT V NETWORK THEOREMS (DC & AC EXCITATIONS)

Linear Graphs in Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem and compensation theorem

COURSE OUTCOMES:

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

CO1: Remembering the basic electrical elements and different fundamental laws.

CO2: Understand the network reduction techniques, transformations, concept of self-inductance and mutual inductance, phasor diagrams, resonance and network theorems.

CO3: Apply the concepts to obtain various mathematical and graphical representations.

CO4: Analyse nodal and mesh networks, series and parallel circuits, steady state response, different circuit topologies (with R, L and C components).

CO5: Evaluation of Network theorems, electrical, magnetic and single-phase circuits

TEXT BOOKS:

1. Network Theory: - A sudhakar and shyammohan s palli, TMH publication 2nd edition 2004
2. Ravish R. Singh: network analysis and synthesis, tata mc graw hill company, 1st edition 2013
- 3.

REFERENCE BOOKS:

1. Engineering circuit analysis – by William Hayt and Jack E. Kimmerly, Mc Graw Hill Company, 6th edition.
2. Circuit theory -A. Chakrapathi, Dhanpatrai and co, 2nd edition 2015.
3. Fundamentals of Electric circuits, Alexander and sadiku, Mc-Graw Hill

**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 Objectives:

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

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, Application 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, 10th Edition.

Reference Books:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, Dennis G. Zill and Warren S. Wright, Jones and Bartlett, 2018.
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, R.K. Jain and S.R.K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
5. Higher Engineering Mathematics, B. V.R Ramana, , McGraw Hill Education, 2017

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

Course Outcomes:

CO1: Identify workshop tools and their operational capabilities.

C03: Apply fitting operations in various applications.

CO4: Apply basic electrical engineering knowledge for House Wiring Practice.

1. Demonstration: Safety practices and precautions to be observed in workshop.

a) Half- Lap joint b) Mortise and Tenon joint c)
Corner Dovetail joint or Bridle joint.

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

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

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

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, DhanpathRai& Co.,2015&2017.

Reference Books:

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

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, (AUTONOMOUS)

I B.Tech II Semester (EEE)

L	T	P	C
0	0	3	1.5

23AEE04

ELECTRICAL CIRCUITS LAB

COURSE OBJECTIVES:

To impart hands on experience in verification of circuit laws and theorems, measurement of circuit parameters, study of circuit characteristics. It also gives practical exposure to the usage of different circuits with different conditions.

LIST OF EXPERIMENTS:

1. Verification of Kirchhoff's circuit laws.
2. Verification of node and mesh analysis.
3. Verification of network reduction techniques.
4. Determination of cold and hot resistance of an electric lamp
5. Determination of Parameters of a choke coil.
6. Determination of self, mutual inductances, and coefficient of coupling
7. Series and parallel resonance
8. Locus diagrams of R-L (L Variable) and R-C (C Variable) series circuits
9. Verification of Superposition theorem
10. Verification of Thevenin's and Norton's Theorems
11. Verification of Maximum power transfer theorem
12. Verification of Compensation theorem
13. Verification of Reciprocity and Millman's Theorems

REFERENCE BOOKS:

1. Engineering Circuits Analysis, Jack Kemmerly, William Hayt and Steven Durbin, Tata Mc Graw Hill Education, 2005, sixth edition.
2. Network Analysis, M. E. Van Valkenburg, Pearson Education, 2019, Revised Third Edition

COURSE OUTCOMES:

CO1: Understand the concepts of network theorems, node and mesh networks, series and Parallel resonance and Locus diagrams.

CO2: Apply various theorems to compare practical results obtained with theoretical Calculations.

CO3: Determine self, mutual inductances and coefficient of coupling values, parameters of choke coil.

CO4: Analyse different circuit characteristics with the help of fundamental laws and various configurations.

CO5: Create locus diagrams of RL, RC series circuits and examine series and parallel resonance.

**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 Course Objectives:

List of Topics:

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

Suggested Software:

- 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

WebResources:

SpokenEnglish:

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/ArnellsEverydayEnglish/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/UCNfm92h83W2i2jc5Xwp_IA

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(AUTONOMOUS)**

**I B.Tech I SEM (Common to CSE, CSD, CSM
II SEM (Common to EEE, ECE, EBM, CAI, CSO, CSC, IT)**

23AHS07

CHEMISTRY LAB

L T P C

0 0 2 1

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

CO1: Determine the cell constant and conductance of solutions.

CO2: Prepare advanced polymer Bakelite materials.

CO3: Measure the strength of an acid present.

CO4: Analyse the IR spectra of some organic compounds.

CO5: Calculate strength of acid in Pb-Acid battery.

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

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(AUTONOMOUS)**

**I B.Tech I SEM (Common to CSE, CSD, CSM
II SEM (Common to EEE, ECE, EBM, CAI, CSO, CSC, IT)**

**23AHS10 HEALTH AND WELLNESS, YOGA AND SPORTSL
(Mandatory Course)**

**T P C
0 1 0.5**

Course Objectives:

The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

Course Outcomes:

After completion of the course the student will be able to

CO1: Understand the importance of yoga and sports for Physical fitness and sound health.

CO2: Demonstrate an understanding of health-related fitness components.

CO3: Compare and contrast various activities that help enhance their health.

CO4: Assess current personal fitness levels.

CO5: Develop Positive Personality

UNIT I

Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity

Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index (BMI) of all age groups.

Activities:

i) Organizing health awareness programmes in community

ii) Preparation of health profile

iii) Preparation of chart for balance diet for all age groups

UNIT II

Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

Activities:

Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

UNIT III

Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.

Activities:

i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc.

Practicing general and specific warm up, aerobics

ii) Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running.

Reference Books:

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

General Guidelines:

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

Evaluation Guidelines:

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

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)**

**I B.Tech I SEM (Common to CSE, CSD, CSM
II SEM (Common to EEE, ECE, EBM, CAI, CSO, CSC, IT)**

**23AHS12 NSS/NCC/Scouts and Guides / Community ServiceL
(Mandatory Course)**

**T P C
0 1 0.5**

Course Objectives:

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

Course Outcomes:

After completion of the course the students will be able to

CO1: Understand the importance of discipline, character and service motto.

CO2: Solve some societal issues by applying acquired knowledge, facts, and techniques.

CO3: Explore human relationships by analyzing social problems.

CO4: Determine to extend their help for the fellow beings and downtrodden people.

CO5: Develop leadership skills and civic responsibilities.

UNIT I Orientation

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

Activities:

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

UNIT II Nature & Care

Activities:

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

UNIT III Community Service

Activities:

- i) Conducting One Day Special Camp in a village contacting village-area leaders- Survey in the village, identification of problems- helping them to solve via media- authoritiesexperts-etc.
- ii) Conducting awareness programs on Health-related issues such as General Health,

Mental health, Spiritual Health, HIV/AIDS,

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

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

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

Reference Books:

1. Nirmalya Kumar Sinha&SurajitMajumder, A Text Book of National Service Scheme Vol;.I, VidyaKutir Publication, 2021 (ISBN 978-81-952368-8-6)

2. Red Book - National Cadet Corps – Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defence, New Delhi

3. Davis M. L. and Cornwell D. A., “Introduction to Environmental Engineering”, McGraw Hill, New York 4/e 2008

4. Masters G. M., Joseph K. and Nagendran R. “Introduction to Environmental Engineering and Science”, Pearson Education, New Delhi. 2/e 2007

5. Ram Ahuja. Social Problems in India, Rawat Publications, New Delhi.

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities.

2. Institutes are required to provide instructor to mentor the students.

Evaluation Guidelines:

1. Evaluated for a total of 100 marks.

2. A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.

3. A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY,
(AUTONOMOUS)**

II B.Tech I Semester

L T P C
3 0 0 3

**(23AHS14) COMPLEX VARIABLES AND NUMERICAL METHODS
(EEE)**

Course Outcomes:

COs	Statements	Blooms level
CO1	Analyze limit, continuity and differentiation of functions of complex variables and Understand Cauchy-Riemann equations, analytic functions and various properties of analytic functions.	L2, L3
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.	L3, L5
CO3	Apply numerical methods to solve algebraic and transcendental equations	L3
CO4	Derive interpolating polynomials using interpolation formulae	L2, L3
CO5	Solve differential and integral equations numerically	L3, L5

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: Solution of Algebraic & Transcendental Equations

Introduction-Bisection Method-Iterative method, Regula-falsi method and Newton Raphson method System of Algebraic equations: Gauss Elimination, Jacobi and Gauss Seidel method.

UNIT IV 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 V 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).

Textbooks:

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

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2018, 10th Edition.
2. B.V. Ramana, Higher Engineering Mathematics, by McGraw Hill publishers
3. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Alpha Science International Ltd., 2015th Edition (9th reprint).

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc17_ma14/preview
2. https://onlinecourses.nptel.ac.in/noc20_ma50/preview
3. <http://nptel.ac.in/courses/111105090>

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY,
(AUTONOMOUS)**

II B.Tech I Semester

L	T	P	C
2	1	0	3

**(23AMB01) UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY
AND ETHICAL HUMAN CONDUCT
(EEE)**

Course Outcomes:

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

Course Topics

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

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

UNIT I	Introduction to Value Education (6 lectures and 3 tutorials for practice session) Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Lecture 2: Understanding Value Education Tutorial 1: Practice Session PS1 Sharing about Oneself Lecture 3: self-exploration as the Process for Value Education Lecture 4: Continuous Happiness and Prosperity – the Basic Human Aspirations Tutorial 2: Practice Session PS2 Exploring Human Consciousness Lecture 5: Happiness and Prosperity – Current Scenario Lecture 6: Method to Fulfill the Basic Human Aspirations Tutorial 3: Practice Session PS3 Exploring Natural Acceptance
UNIT II	Harmony in the Human Being (6 lectures and 3 tutorials for practice session) Lecture 7: Understanding Human being as the Co-existence of the self and the body. Lecture 8: Distinguishing between the Needs of the self and the body Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body. Lecture 9: The body as an Instrument of the self Lecture 10: Understanding Harmony in the self Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self Lecture 11: Harmony of the self with the body Lecture 12: Programme to ensure self-regulation and Health Tutorial 6: Practice Session PS6 Exploring Harmony of self with the body

UNIT III Harmony in the Family and Society (6 lectures and 3 tutorials for practice session)
Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction
Lecture 14: 'Trust' – the Foundational Value in Relationship
Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust
Lecture 15: 'Respect' – as the Right Evaluation
Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect
Lecture 16: Other Feelings, Justice in Human-to-Human Relationship
Lecture 17: Understanding Harmony in the Society
Lecture 18: Vision for the Universal Human Order
Tutorial 9: Practice Session PS9 Exploring Systems to fulfil Human Goal

UNIT IV Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session)
Lecture 19: Understanding Harmony in the Nature
Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature
Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature
Lecture 21: Realizing Existence as Co-existence at All Levels
Lecture 22: The Holistic Perception of Harmony in Existence
Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence.

UNIT V Implications of the Holistic Understanding –
a Look at Professional Ethics (6 lectures and 3 tutorials for practice session)
Lecture 23: Natural Acceptance of Human Values
Lecture 24: Definitiveness of (Ethical) Human Conduct
Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct
Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order
Lecture 26: Competence in Professional Ethics
Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education
Lecture 27: Holistic Technologies, Production Systems and Management Models – Typical Case Studies
Lecture 28: Strategies for Transition towards Value-based Life and Profession
Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

Practice Sessions for UNIT I – Introduction to Value Education
PS1 Sharing about Oneself
PS2 Exploring Human Consciousness
PS3 Exploring Natural Acceptance

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

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

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

Practice Sessions for UNIT V – Implications of the Holistic Understanding –
a Look at Professional Ethics
PS12 Exploring Ethical Human Conduct
PS13 Exploring Humanistic Models in Education
PS14 Exploring Steps of Transition towards Universal Human Order

READINGS:

Textbook and Teachers Manual

a. The Textbook

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

b. The Teacher's Manual

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

Reference Books

1. 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 every day life, and practicals are how you behave and work in real life. Depending on

the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate

to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

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

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

Online Resources:

1. <https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf>
2. <https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf>
3. <https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf>
4. <https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-S2%20Respect%20July%202023.pdf>
5. <https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf>
6. <https://fdp-si.aicte-india.org/download/FDPTeachingMaterial/3-days%20FDP-SI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-S2A%20Und%20Nature-Existence.pdf>
7. <https://fdp-si.aicte-india.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%2023-25%20Ethics%20v1.pdf>
8. <https://www.studocu.com/in/document/kiet-group-of-institutions/universal-human-values/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385>
9. https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY,
(AUTONOMOUS)**

II B.Tech I Semester

L T P C
3 0 0 3

**(23AEE07) ELECTRO MAGNETIC FIELD THEORY
(EEE)**

Course Outcomes:

CO	Statements	Blooms Level
CO1	Remember the concepts of vector algebra, vector calculus, various fundamental laws, self and mutual inductance	L1
CO2	Understand the concepts of electrostatics, conductors, dielectrics, capacitance, magnetostatics, magnetic fields, time varying fields, self and mutual inductances	L2
CO3	Apply vector calculus, Coulomb's law, Gauss's law, Ohm's law in point form, Biot-Savart's law, Ampere's circuital law, Maxwell's third equation, self and mutual inductances, Faraday's laws, Maxwell's fourth equation, Poynting theorem to solve various numerical problems	L3
CO4	Analyze vector calculus, electrostatic fields, behavior of conductor in electric field, Biot-Savart's law and its applications	L4
CO5	Analyze magnetic force, moving charges in a magnetic field, self-inductance of different cables, mutual inductance between different wires and time varying fields	L4

UNIT I

Vector Analysis:

Vector Algebra: Scalars and Vectors, Unit vector, Vector addition and subtraction, Position and distance vectors, Vector multiplication, Components of a vector.

Coordinate Systems: Rectangular, Cylindrical and Spherical coordinate systems.

Vector Calculus: Differential length, Area and Volume. Del operator, Gradient of a scalar, Divergence of a vector and Divergence theorem (definition only). Curl of a vector and Stoke's theorem (definition only), Laplacian of a scalar

Electrostatics:

Coulomb's law and Electric field intensity (EFI) – EFI due to continuous charge distributions (line and surface charge), Electric flux density, Gauss's law (Maxwell's first equation, $\nabla \cdot \vec{D} = \rho_v$), Applications of Gauss's law, Electric Potential, Work done in moving a point charge in an electrostatic field (second Maxwell's equation for static electric fields, $\nabla \times \vec{E} = 0$), Potential gradient, Laplace's and Poisson's equations.

UNIT II

Conductors–Dielectrics and Capacitance:

Behaviour of conductor in Electric field, Electric dipole and dipole moment – Potential and EFI due to an electric dipole, Torque on an Electric dipole placed in an electric field, Current density-conduction and convection current densities, Ohm's law in point form, Behaviour

of conductors in an electric field, Polarization, dielectric constant and strength, Continuity equation and relaxation time, Boundary conditions between conductor to dielectric, dielectric to dielectric and conductor to free space, Capacitance of parallel plate, coaxial and spherical capacitors, Energy stored and density in a static electric field, Coupled and decoupled capacitors.

UNIT III

Magnetostatics, Ampere's Law and Force in magnetic fields:

Biot-Savart's law and its applications viz. Straight current carrying filament, circular, square, rectangle and solenoid current carrying wire – Magnetic flux density and Maxwell's second Equation ($\nabla \cdot \vec{B} = 0$), Ampere's circuital law and its applications viz. MFI due to an infinite sheet, long filament, solenoid, toroidal current carrying conductor, point form of Ampere's circuital law, Maxwell's third equation ($\nabla \times \vec{H} = \vec{J}$).

Magnetic force, moving charges in a magnetic field – Lorentz force equation, force on a current element in a magnetic field, force on a straight and a long current carrying conductor in a magnetic field, force between two straight long and parallel current carrying conductors, Magnetic dipole, Magnetic torque, and moment.

UNIT IV

Self and mutual inductance:

Self and mutual inductance – determination of self-inductance of a solenoid, toroid, coaxial cable and mutual inductance between a straight long wire and a square loop wire in the same plane – Energy stored and energy density in a magnetic field.

UNIT V

Time Varying Fields:

Faraday's laws of electromagnetic induction, Maxwell's fourth equation ($\nabla \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}$), integral and point forms of Maxwell's equations, statically and dynamically induced EMF, Displacement current, Modification of Maxwell's equations for time varying fields, Poynting theorem and Poynting vector.

Textbooks:

1. "Elements of Electromagnetics" by Matthew N. S. Sadiku, Oxford Publications, 7th edition, 2018.
2. "Engineering Electromagnetics" by William H. Hayt & John A. Buck, McGraw-Hill, 7th Edition, 2006.

Reference Books:

1. "Introduction to Electrodynamics" by D. J. Griffiths, Prentice-Hall of India Pvt. Ltd, 2nd edition.
2. "Electromagnetic Field Theory" by Yaduvir Singh, Pearson India, 1st edition, 2011.
3. "Fundamentals of Engineering Electromagnetics" by Sunil Bhooshan, Oxford University Press, 2012.
4. Schaum's Outline of Electromagnetics by Joseph A. Edminister, Mahmood Navi, 4th Edition, 2014.

Web Resources:

1. <https://archive.nptel.ac.in/courses/108/106/108106073/>
2. <https://nptel.ac.in/courses/117103065>

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY,
(AUTONOMOUS)**

II B.Tech I Semester

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(23AEE08) ELECTRICAL CIRCUIT ANALYSIS-II

Course Outcomes:

CO	Statements	Blooms Level
CO1	Remember the concepts of Laplace transforms, formulation of various circuit topologies (R, L and C components) and basic filters	L1
CO2	Understand three phase balanced and unbalanced circuits, different circuit configurations and its mathematical modeling, network parameters and various filters	L2
CO3	Apply Laplace transforms to solve various electrical network topologies and filter design concepts	L3
CO4	Analyze three phase circuits, transient response of various network topologies, electrical circuits with periodic excitations and filter characteristics	L4
CO5	Design suitable electrical circuits and various filters for different applications	L5

UNIT I

Analysis of three phase balanced circuits:

Phase sequence, star and delta connection of sources and loads, relation between line and phase quantities, analysis of balanced three phase circuits, measurement of active and reactive power.

Analysis of three phase unbalanced circuits:

Loop method, Star-Delta transformation technique, two-wattmeter method for measurement of three phase power.

UNIT II

Laplace transforms – Definition and Laplace transforms of standard functions – Shifting theorem –

Transforms of derivatives and integrals, Inverse Laplace transforms and applications.

Transient Analysis: Transient response of R-L, R-C and R-L-C circuits (Series and parallel combinations) for D.C. and sinusoidal excitations – Initial conditions – Solution using differential equation approach and Laplace transform approach.

UNIT III

Network Parameters: Impedance parameters, Admittance parameters, Hybrid parameters, Transmission (ABCD) parameters, conversion of Parameters from one form to other, Conditions for Reciprocity and Symmetry, Interconnection of Two Port networks in Series, Parallel and Cascaded configurations – problems.

UNIT IV

Analysis of Electric Circuits with Periodic Excitation: Fourier series and evaluation of Fourier coefficients, Trigonometric and complex Fourier series for periodic waveforms, Application to Electrical Systems – Effective value and average value of non-sinusoidal periodic waveforms, power factor, effect of harmonics

UNIT V

Filters: Classification of filters-Low pass, High pass, Band pass and Band Elimination filters, Constant-k filters-Lowpass and High Pass, Design of Filters.

Textbooks:

1. Engineering Circuit Analysis, William Hayt and Jack E. Kemmerly, 8th Edition McGraw-Hill, 2013
2. Fundamentals of Electric Circuits, Charles K. Alexander, Mathew N. O. Sadiku, 3rd Edition, Tata McGraw-Hill, 2019

Reference Books:

1. Network Analysis, M.E. Van Valkenburg, 3rd Edition, PHI, 2019.
2. Network Theory, N. C. Jagan and C. Lakshminarayana, 1st Edition, B. S. Publications, 2012.
3. Circuits and Networks Analysis and Synthesis, A. Sudhakar, Shyam Mohan S. Palli, 5th Edition, Tata McGraw-Hill, 2017.
4. Engineering Network Analysis and Filter Design (Including Synthesis of One Port Networks)-Durgesh C. Kulshreshtha Gopal G. Bhise, Prem R. Chadha, Umesh Publications 2012.
5. Circuit Theory: Analysis and Synthesis, A. Chakrabarti, Dhanpat Rai & Co., 2018, 7th Revised Edition.

Web Resources:

1. <https://archive.nptel.ac.in/courses/117/106/117106108/>
2. <https://archive.nptel.ac.in/courses/108/105/108105159/>

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY,
(AUTONOMOUS)**

II B.Tech I Semester

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**(23AEE09) DC MACHINES & TRANSFORMERS
(EEE)**

UNIT I

DC Generators:

Construction and principle of operation of DC machines – EMF equation for generator – Excitation techniques – characteristics of DC generators – applications of DC Generators, Back-emf and torque equations of DC motor – Armature reaction and commutation, Applications.

UNIT II

Starting, Speed Control and Testing of DC Machines:

Characteristics of DC motors – losses and efficiency – applications of DC motors. Necessity of a starter – starting by 3-point and 4-point starters – speed control by armature voltage and field current control – testing of DC machines – brake test, Swinburne's test – Hopkinson's test – Field Test.

UNIT III

Single-phase Transformers:

Introduction to single – phase Transformers (Construction and principle of operation) – emf equation – operation on no-load and on load – lagging, leading and unity power factors loads – phasor diagrams – equivalent circuit – regulation – losses and efficiency – effect of variation of frequency and supply voltage on losses – all day efficiency, Applications.

UNIT IV

Testing of Transformers:

Open Circuit and Short Circuit tests – Sumpner's test – separation of losses – Parallel operation with equal and unequal voltage ratios – auto transformer – equivalent circuit – comparison with two winding transformers.

UNIT V

Three-Phase Transformers:

Polyphase connections- Y/Y, Y/ Δ , Δ /Y, Δ / Δ , open Δ and Vector groups – third harmonics in phase voltages – Parallel operation – three winding transformers- transients in switching – off load and on load tap changers – Scott connection.

Textbooks:

1. Electrical Machinery by Dr. P.S. Bimbhra, 7th edition, Khanna Publishers, New Delhi, 1995.
2. Performance and analysis of AC machines by M.G. Say, CBS, 2002.

Reference Books:

1. Electrical Machines by D.P. Kothari, I.J. Nagarth, McGraw Hill Publications, 5th edition
2. Electrical Machinery Fundamentals by Stephen J Chapman McGraw Hill education 2011.
3. Generalized Theory of Electrical Machines by Dr. P.S. Bimbhra, 7th Edition, Khanna Publishers, 2021.
4. Theory & Performance of Electrical Machines by J.B. Gupta, S.K. Kataria & Sons, 2007.
5. Electric Machinery by Fitzgerald, A.E., Kingsley, Jr., C., & Umans, S.D, 7th edition, McGraw-Hill Education, 2014.

Web Resources:

1. nptel.ac.in/courses/108/105/108105112
2. nptel.ac.in/courses/108/105/108105155

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY,
(AUTONOMOUS)**

II B.Tech I Semester

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(23AEE10) ELECTRICAL CIRCUIT ANALYSIS –II AND SIMULATION LAB

Course Outcomes:

CO	Statements	Blooms Level
CO1	Understand the power calculations in three phase circuits.	L2
CO2	Analyze the time response of given network.	L4
CO3	Determination of two port network parameters.	L4
CO4	Simulate and analyze electrical circuits using software tools	L4
CO5	Apply various theorems to solve different electrical networks using simulation tools	L3

List of Experiments:

Any 10 of the following experiments are to be conducted:

1. Measurement of Active Power and Reactive Power for balanced loads.
2. Measurement of Active Power and Reactive Power for unbalanced loads.
3. Determination of Z and Y parameters.
4. Determination of ABCD and hybrid parameters
5. Verification of Kirchhoff's current law and voltage law using simulation tools.
6. Verification of mesh and nodal analysis using simulation tools.
7. Verification of superposition and maximum power transfer theorems using simulation tools.
8. Verification of Reciprocity and Compensation theorems using simulation tools.
9. Verification of Thevenin's and Norton's theorems using simulation tools.
10. Verification of series and parallel resonance using simulation tools.
11. Simulation and analysis of transient response of RL, RC and RLC circuits.
12. Verification of self-inductance and mutual inductance by using simulation tools.

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY,
(AUTONOMOUS)**

II B.Tech I Semester

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(23AEE11) DC MACHINES & TRANSFORMERS LAB

Course Outcomes:

CO	Statements	Blooms Level
CO1	Demonstrate starting and speed control methods of DC Machines.	L2
CO2	Apply theoretical concepts to determine the performance characteristics of DC Machines.	L3
CO3	Analyze the parallel operation of single phase transformers	L4
CO4	Determine the performance parameters of single-phase transformer.	L3
CO5	Analyze the performance analysis of transformers using various tests	L4

List of Experiments:

Any 10 of the following experiments are to be conducted:

1. Speed control of DC shunt motor by Field Current and Armature Voltage Control.
2. Brake test on DC shunt motor - Determination of performance curves.
3. Swinburne's test - Predetermination of efficiencies as DC Generator and Motor.
4. Hopkinson's test on DC shunt Machines.
5. Load test on DC compound generator - Determination of characteristics.
6. Load test on DC shunt generator - Determination of characteristics.
7. Field test on DC series machines - Determination of efficiency.
8. Brake test on DC compound motor - Determination of performance curves.
9. OC & SC test on single phase transformer.
10. Sumpner's test on single phase transformer.
11. Scott connection of transformers.
12. Parallel operation of Single-phase Transformers.
13. Separation of core losses of a single-phase transformer.

Reference:

1. <https://ems-iitr.vlabs.ac.in/List%20of%20experiments.html>

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY,
(AUTONOMOUS)**

II B.Tech I Semester

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(23ACS10) Data Structures

Course Outcomes:

	Statements	Blooms Level
CO1	Understand the role of data structures in organizing and accessing data	L2
CO2	Design, implement and apply linked lists for dynamic data storage	L3
CO3	Develop applications using stacks and queues	L5
CO4	Design and implement algorithms for operations on binary trees and binary search trees	L5
CO5	Design novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees	L5

UNIT I

Introduction to Data Structures: Definition and importance of Data structures, Abstract data types (ADTs) and its specifications, **Arrays:** Introduction, 1-D, 2-D Arrays, accessing elements of array, Row Major and Column Major storage of Arrays, **Searching Techniques:** Linear & Binary Search, **Sorting Techniques:** Bubble sort, Selection sort, Quick sort.

Sample experiments:

1. Program to find min & max element in an array.
2. Program to implement matrix multiplication.
3. Find an element in given list of sorted elements in an array using Binary search.
4. Implement Selection and Quick sort techniques.

UNIT II

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

Sample experiments:

1. Write a program to implement the following operations.
 - a. Insert b. Deletion c. Traversal
2. Write a program to store name, roll no, and marks of students in a class using circular double linked list.
3. Write a program to perform addition of given two polynomial expressions using linked list.

UNIT III

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

Sampleexperiments:

1. Implementstackoperationsusing
 - a. Arrays
 - b. Linked list
2. Convertgiveninfixexpressionintopostfixexpressionusingstacks.
3. Evaluategivenpostfixexpressionusingstack.
4. Writeaprogramtoreversegivenlinkedlistusingstack.

UNITIV

Queues:Introductiontoqueues:propertiesandoperations,Circularqueues,implementingqueuesusing arraysandlinkedlists,Applicationsofqueues scheduling,etc.

Dequeues:Introductiontodequeues(double-endedqueues),Operationsondequeuesandtheirapplications.

Sampleexperiments:

1. ImplementQueueoperationsusing
 - a. Arrays
 - b. Linked list
2. Implement CircularQueueusing
 - a. Arrays
 - b. Linked list
3. ImplementDequeueusinglinkedlist.

UNITV

Trees:IntroductiontoTrees,Binarytreesandtraversals,BinarySearchTree–Insertion,Deletion&Traversal

Sampleexperiments:

1. Implementbinarytreetraversalsusinglinkedlist.
2. Writeprogramtcreatebinarysearchtreeforgivenlistofintegers.Performin-ordertraversalofthe tree. Implementinsertionanddeletionoperations.

Textbooks:

1. DataStructuresandalgorithmanalysis inC,MarkAllenWeiss,Pearson,2ndEdition.
2. FundamentalsofdatastructuresinC,EllisHorowitz,SartajSahni,SusanAnderson-Freed,SiliconPress,2008

ReferenceBooks:

1. AlgorithmsandDataStructures:TheBasicToolboxbyKurtMehlhornandPeterSanders
2. CDataStructuresandAlgorithmsbyAlfredV.Aho,JeffreyD.Ullman,andJohnE.Hopcroft
3. ProblemSolvingwithAlgorithmsandDataStructuresbyBradMillerandDavidRanum
4. IntroductiontoAlgorithmsbyThomasH.Cormen,CharlesE.Leiserson,RonaldL.Rivest,andCliffordStein
5. AlgorithmsinC,Parts1-5(Bundle):Fundamentals,DataStructures,Sorting,Searching,andGraphAlgorithms"byRobertSedgewick

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY,
(AUTONOMOUS)**

II B.Tech I Semester

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(23AHS18) ENVIRONMENTAL SCIENCE

Course Objectives:

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

UNIT I

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

Natural Resources : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

UNIT II

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

Introduction, types, characteristic features, structure and function of the following ecosystem:

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

Biodiversity and its Conservation: Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

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, hillslopes, etc..

Textbooks:

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

References:

1. Deeksha Dave and E. Sai Baba Reddy, “Textbook of Environmental Science”, Cengage Publications.
2. M. Anji Reddy, “Textbook 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.

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY,
(AUTONOMOUS)**

II B.Tech I Semester

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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 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 – 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, Dividend, 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.Chand Publications-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
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	2	2	-	-	-	-	-	-	-	-	-	-
CO3	2	-	-	-	-	-	-	-	-	-	-	-

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

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY,
(AUTONOMOUS)**

II B.Tech II Semester

L	T	P	C
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(23AMB02) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Course Outcomes:

- Define the concepts related to Managerial Economics, financial accounting and management (L2)
- Understand the fundamentalsof Economics viz., Demand, Production, cost, revenue and markets (L2)
- Apply the Concept of Production cost and revenues for effective Business decision (L3)
- Analyze how to invest their capital and maximize returns (L4)
- Evaluate the capital budgeting techniques. (L5)
- Develop the accounting statements and evaluate the financial performance of business entity (L5)

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.

Textbooks:

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

Reference Books:

1. Ahuja H I 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>

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY,
(AUTONOMOUS)**

II B.Tech II Semester

L	T	P	C
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**(23AMB03) ORGANISATIONAL BEHAVIOUR
(EEE)**

Course Outcomes:

- Define the Organizational Behaviour, its nature and scope. (L2)
- Understand the nature and concept of Organizational behaviour (L2)
- Apply theories of motivation to analyse the performance problems (L3)
- Analyse the different theories of leadership (L4)
- Evaluate group dynamics (L5)
- Develop a powerful leader (L5)

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 - Herzberg's Two Factor Theory - Vroom's theory of expectancy - McClelland's theory of needs - McGregor'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 for organization's change and development

Textbooks:

1. Luthans, Fred, Organisational Behaviour, McGraw-Hill, 12th edition.
2. P SubbaRan, Organizational 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>

[9608857s://www.slideshare.net/AbhayRajpoot3/motivation-165556714](https://www.slideshare.net/AbhayRajpoot3/motivation-165556714)

<https://www.slideshare.net/harshrastogi1/group-dynamics-159412405>

<https://www.slideshare.net/vanyasingla1/organizational-change-development-26565951>

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(AUTONOMOUS)**

II B.Tech II Semester

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**(23AMB04) BUSINESS ENVIRONMENT
(EEE)**

Course Outcomes:

- Define Business Environment and its Importance. (L2)
- Understand various types of business environment. (L2)
- Apply the knowledge of Money markets in future investment. (L3)
- Analyse India's Trade Policy. (L4)
- Evaluate fiscal and monetary policy. (L5)
- Develop a personal synthesis and approach for identifying business opportunities. (L5)

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.

Textbooks:

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.
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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(AUTONOMOUS)**

II B.Tech II Semester

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**(23AEC13) ANALOG CIRCUITS
(EEE)**

Course Outcomes:

CO	Statements	Blooms Level
CO1	Understand the concepts of diode clipping and clamping circuits, different amplifier configurations, operation of oscillator circuits, operational amplifiers, timers, ADC and DAC	L2
CO2	Apply the above concepts for different circuit design	L3
CO3	Analyze various circuit characteristics by using Amplifiers, Transistors, Comparators, Waveform generators, ADC and DAC	L4
CO4	Analyze various circuit characteristics by using timers, Phase-locked loops and operational amplifiers	L4
CO5	Evaluate different system configurations by using various amplifier, transistor and waveform generators	L5

UNIT I

Diode clipping and clamping circuits: Diode clippers, clipping at two independent levels, Transfer characteristics of clippers, clamping circuit operation.

DC biasing of BJTs: Load lines, Operating Point, Bias Stability, Collector-to-Base Bias, Self-Bias, Stabilization against Variations in V_{BE} and β for the Self-Bias Circuit, Bias Compensation, Thermal Runaway, Thermal Stability.

UNIT II

Small Signals Modeling of BJT: Analysis of a Transistor Amplifier Circuit using h-parameters, Simplified CE Hybrid Model, Analysis of CE, CC, CB Configuration using Approximate Model, Frequency Response of CE and CC Amplifiers.

Feedback Amplifiers: Classification of Amplifiers, the Feedback Concept, General Characteristics of Negative-Feedback Amplifiers, Effect of Negative Feedback upon Output and Input Resistances, Voltage-Series Feedback, Current-Series Feedback, Current-Shunt Feedback, Voltage-Shunt Feedback.

UNIT III

Oscillator Circuits: Barkhausen Criterion of oscillation, Oscillator operation, R-C phase shift oscillator, Wien bridge Oscillator, Crystal Oscillator.

Operational Amplifiers: Introduction, Basic information of Op-Amp, Ideal Operational Amplifier, Block Diagram Representation of Typical Op-Amp, Op-Amps Characteristics: Introduction, DC and AC characteristics, 741 op-amp & its features.

UNIT IV

OP-AMPS Applications: Introduction, Basic Op-Amp Applications, Instrumentation Amplifier, AC Amplifier, V to I and I to V Converter, Sample and Hold Circuit, Log and Antilog Amplifier, Multiplier and Divider, Differentiator, integrator.

Comparators and Waveform Generators: Introduction, Comparator, Square Wave Generator, Monostable Multivibrator, Triangular Wave Generator, Sine Wave Generators.

UNIT V

Timers and Phase Locked Loop: Introduction to 555 timer, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger, PLL block schematic, principles and description of individual blocks, 565 PLL, Applications of VCO (566).

Digital To Analog And Analog To Digital Converters: Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, A-D Converters

– parallel Comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC, DAC and ADC Specifications.

Textbooks:

1. Electronic Devices and Circuits – J. Millman, C. Halkias, Tata McGraw Hill, 2nd Edition, 2010.
2. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p) Ltd, 2nd Edition, 2003.

Reference Books:

1. Electronic Devices and Circuit Theory – Robert L. Boylestad and Louis Nashelsky, Pearson Edition, 2021.
2. Electronic Devices and Circuits – G.K. Mithal, Khanna Publisher, 23rd Edition, 2017.
3. Electronic Devices and Circuits – David Bell, Oxford, 5th Edition, 2008.
4. Electronic Principles – Malvino, Albert Paul, and David J. Bates, McGraw-Hill/Higher Education, 2007.
5. Operational Amplifiers and Linear Integrated Circuits – Gayakwad R. A, Prentice Hall India, 2002.
6. Operational Amplifiers and Linear Integrated Circuits – Sanjay Sharma, Kataria & Sons, 2nd Edition, 2010.
7. Design of Analog CMOS Integrated Circuits – Behzad Razavi

Web Resources:

1. <https://nptel.ac.in/courses/122106025>.
2. <https://nptel.ac.in/courses/108102112>.

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(AUTONOMOUS)**

II B.Tech II Semester

L T P C
3 0 0 3

**(23AEE12) POWER SYSTEMS- I
(EEE)**

Course Outcomes:

CO	Statements	Blooms Level
CO1	Understand the different types of power plants, operation of power plants	L2
CO2	Understand the concepts of distribution systems, underground cables, economic aspects and tariff	L2
CO3	Understand various substations that are located in distribution systems	L2
CO4	Apply the above concepts to illustrate different power generation layouts	L3
CO5	Analyze various economic aspects related to power generation and distribution	L4

UNIT I

Hydroelectric Power Stations:

Selection of site, general layout of a hydroelectric power plant with brief description of major components and principle of operation

Thermal Power Stations:

Selection of site, general layout of a thermal power plant. Brief description of components: boilers, superheaters, economizers and electrostatic precipitators, steam turbines: impulse and reaction turbines, condensers, feed water circuit, cooling towers and chimney.

UNIT II

Nuclear Power Stations:

Location of nuclear power plant, working principle, nuclear fission, nuclear fuels, nuclear chain reaction, nuclear reactor components: moderators, control rods, reflectors and coolants, types of nuclear reactors and brief description of PWR, BWR and FBR. Radiation: radiation hazards and shielding, nuclear waste disposal.

UNIT III

Substations:

Air Insulated Substations – indoor & outdoor substations, substations layouts of 33/11 kV showing the location of all the substation equipment. Busbar arrangements in the sub-stations: simple arrangements like single bus bar, sectionalized single bus bar, double bus bar with one and two circuit breakers, main and transfer busbar system with relevant diagrams.

Gas Insulated Substations (GIS) – advantages of gas insulated substations, constructional aspects of GIS, comparison of air insulated substations and gas insulated substations.

UNIT IV

Distribution Systems:

Classification of Distribution systems, A.C Distribution, Overhead versus Underground system, Connection schemes of Distribution system, Requirements of Distribution system, Design considerations in Distribution system.

Underground Cables:

Types of cables, construction, types of insulating materials, calculation of insulation resistance, stress in insulation and power factor of cable. Capacitance of single and 3-Core belted Cables.

Grading of cables: capacitance grading and intersheath grading.

UNIT V**Economic Aspects & Tariff:**

Economic Aspects—load curve, load duration and integrated load duration curves, discussion on economic aspects: connected load, maximum demand, demand factor, load factor, diversity factor, plant capacity factor and plant use factor, base and peak load plants.

Tariff Methods— Costs of generation and their division into fixed, semi-fixed and running costs, desirable characteristics of a tariff method, tariff methods: simple rate, flat rate, block-rate, two-part, three-part, and power factor tariff methods, Time of Day (ToD) tariff and Time of Use (ToU) tariff.

Textbooks:

1. S.N. Singh, Electric Power Generation, Transmission and Distribution, PHI Learning Pvt Ltd, New Delhi, 2nd Edition, 2010
2. J.B. Gupta, Transmission and Distribution of Electrical Power, S.K. Kataria and sons, 10th Edition, 2012

Reference Books:

1. I.J. Nagarath & D.P. Kothari, Power System Engineering, McGraw-Hill Education, 3rd Edition, 2019.
2. C.L. Wadhwa, Generation, Distribution and Utilization of Electrical Energy, New Age International Publishers, 6th Edition, 2018.
3. V.K. Mehta and Rohit Mehta, Principles of Power System, S. Chand, 4th Edition, 2005.
4. Turan Gonen, Electric Power Distribution System Engineering, McGraw-Hill, 1985.
5. Handbook of switchgear, BHEL, McGraw-Hill Education, 2007.

Web Resources:

1. <https://nptel.ac.in/courses/108102047>

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY,
(AUTONOMOUS)**

II B.Tech II Semester

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3 0 0 3

**(23AEE13) INDUCTION AND SYNCHRONOUS MACHINES
(EEE)**

Course Outcomes:

COs	Statements	Blooms Level
CO1	Understand the construction, principle and operation of single phase and three phase induction motors	L2
CO2	Understand the construction, principle and operation of synchronous generator and synchronous motor	L2
CO3	Understand various applications of various alternating machines	L2
CO4	Apply the above concepts to solve various mathematical and complex problems	L3
CO5	Analyze the characteristics of induction motor, synchronous motor and synchronous generators	L4

UNIT I

3-phase induction motors:

Construction of Squirrel cage and Slipring induction motors – production of rotating magnetic field – principle of operation – rotor emf and rotor frequency – rotor current and power factor at standstill and during running conditions – rotor power input, rotor copper loss and mechanical power developed and their inter-relationship – equivalent circuit – phasor diagram, Applications.

UNIT II

Performance of 3-Phase induction motors:

Torque equation – expressions for maximum torque and starting torque – torque-slip characteristics – double cage and deep bar rotors – No load, Brake test and Blocked rotor tests – circle diagram for predetermination of performance – methods of starting – starting current and torque calculations – speed control of induction motor with V/f control method, rotor resistance control and rotor emf injection technique – crawling and cogging – induction generator operation.

UNIT III

Single Phase Motors:

Single phase induction motors – constructional features – double revolving field theory, Cross field theory – equivalent circuit – starting methods: capacitor start capacitor run, capacitor start induction run, split phase & shaded pole, AC series motor, Applications.

UNIT IV

Synchronous Generator:

Constructional features of non-salient and salient pole type alternators – armature windings – distributed and concentrated windings – distribution & pitch factors – E.M.F equation – armature reaction – voltage regulation by synchronous impedance method – MMF method and Potier triangle method – two reaction analysis of salient pole machines – methods of synchronization – Slip test – Parallel operation of alternators.

UNIT V

Synchronous Motor:

Synchronous motor principle and theory of operation – Effect of excitation on current and power factor– synchronous condenser –expression for power developed – hunting and its suppression– methods of starting, Applications.

Textbooks:

1. Electrical Machinery, Dr. P. S. Bhimbhra, Khanna Publishing, 2021, First Edition.
2. Performance and analysis of AC machines by M. G. Say, CBS, 2002.

Reference Books:

1. Electrical machines, D. P. Kothari and I. J. Nagrath, McGraw Hill Education, 2017, Fifth Edition.
2. Theory & Performance of Electrical Machines by J. B. Gupta, S. K. Kataria & Sons, 2007.
3. Electric Machinery, A. E. Fitzgerald, Charles Kingsley, Stephen D. Umans, McGraw-Hill, 2020, Seventh edition.

Web Resources:

1. <https://nptel.ac.in/courses/108/105/108105131>
2. <https://nptel.ac.in/courses/108/106/108106072>

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY,
(AUTONOMOUS)**

II B.Tech II Semester

L T P C
3 0 0 3

**(23AEE14) CONTROL SYSTEMS
(EEE)**

Course Outcomes:

CO	Statements	Blooms Level
CO1	Understand the concepts of various mathematical representations of control systems, Time response of first order and second order systems, stability, frequency response and fundamentals of modern control systems	L2
CO2	Apply Block diagram reduction, Signal flow graph, Routh criterion, Root locus, Bode, Polar, Nyquist concepts for solving various numerical problems	L3
CO3	Analyze time response characteristics, frequency response characteristics, stability analysis of various control systems	L4
CO4	Design various compensators and controllers for different control systems by using design procedures	L5
CO5	Create suitable control systems for various real time applications	L5

UNIT I

CONTROL SYSTEMS CONCEPTS

Open loop and closed loop control systems and their differences - Examples of control systems - Classification of control systems, Feedback characteristics, Effects of positive and negative feedback, Mathematical models - Differential equations of translational and rotational mechanical systems and electrical systems, Analogous Systems, Block diagram reduction methods - Signal flow graphs - Reduction using Mason's gain formula. Principle of operation of DC and AC Servomotor, Transfer function of DC servomotor - AC servomotor, Synchros.

UNIT II

TIME RESPONSE ANALYSIS

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

UNIT III

STABILITY ANALYSIS IN TIME DOMAIN

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

UNIT IV

FREQUENCY RESPONSE ANALYSIS

Introduction, Frequency domain specifications - Bode diagrams - Determination of Frequency domain specifications and transfer function from the Bode Diagram - Stability Analysis from Bode Plots. Polar Plots - Nyquist Plots - Phase margin and Gain margin - Stability Analysis.

Compensation techniques - Lag, Lead, Lag-Lead Compensator design in frequency Domain.

UNIT V

STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS

Concepts of state, state variables and state model, state models -differential equations & Transfer function models - Block diagrams. Diagonalization, Transfer function from state model, Solving the Time invariant state Equations-State Transition Matrix and its Properties.

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

Textbooks:

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

Reference Books:

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

Web Resources:

1. <https://nptel.ac.in/courses/108102043>
2. <https://nptel.ac.in/courses/108106098>.

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY,
(AUTONOMOUS)**

II B.Tech II Semester

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**(23AEE15) INDUCTION AND SYNCHRONOUS MACHINES LAB
(EEE)**

Course Outcomes:

CO	Statements	Blooms Level
CO1	Analyze various performance characteristics of 3-phase and 1-phase induction motors	L4
CO2	Evaluate the performance of 3-phase Induction Motor by obtaining the circle diagram and equivalent circuit of 3-phase Induction Motor and single phase induction motor	L4
CO3	Adapt the power factor improvement methods for single phase Induction Motor	L3
CO4	Pre-determine the regulation of 3-phase alternator	L3
CO5	Determine the synchronous machine reactance of 3-phase alternator	L3

List of Experiments:

Any 10 experiments of the following are required to be conducted

1. Brake test on three phase Induction Motor.
2. Circle diagram of three phase induction motor.
3. Speed control of three phase induction motor by V/f method.
4. Equivalent circuit of single-phase induction motor.
5. Power factor improvement of single-phase induction motor by using capacitors.
6. Load test on single phase induction motor.
7. Regulation of a three-phase alternator by synchronous impedance & MMF methods.
8. Regulation of three-phase alternator by Potier triangle method.
9. V and Inverted V curves of a three-phase synchronous motor.
10. Determination of X_d , X_q & Regulation of a salient pole synchronous generator.
11. Determination of efficiency of three phase alternator by loading with three phase induction motor.
12. Parallel operation of three-phase alternator under no-load and load conditions.
13. Determination of efficiency of a single-phase AC series Motor by conducting Braketest.

Reference:

1. <https://em-coep.vlabs.ac.in/List%20of%20experiments.html>

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY,
(AUTONOMOUS)**

II B.Tech II Semester

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**(23AEE16) CONTROL SYSTEMS LAB
(EEE)**

Course Outcomes:

COs	Statements	Blooms Level
CO1	Understand how to use feedback control system to determine transfer function of DC servo motor and any other given circuit with R, L and C components	L2
CO2	Model the systems and able to design the controllers and compensators.	L3
CO3	Get the knowledge about the effect of poles and zeros location on transient and steady state behavior of second order systems and implement through software tools	L4
CO4	Determine the performance and time domain specification of first and second order systems.	L4
CO5	Understand the stability analysis	L2

List of Experiments:

Any 10 of the Following Experiments are to be conducted.

1. Time response of Second order system
2. Characteristics of Synchros
3. Programmable logic controller – Study and verification of truth tables of logic gates, simple Boolean expressions and application of speed control of motor.
4. Effect of feedback on DC servomotor
5. Transfer function of DC Machine
6. Effect of P, PD, PI, PID Controller on a second order system
7. Lag and lead compensation – Magnitude and phase plot
8. Temperature controller using PID
9. Characteristics of magnetic amplifiers
10. Characteristics of AC servomotor
11. Linear system analysis (Time domain analysis, Error analysis) using MATLAB.
12. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using MATLAB
13. State space model for classical transfer function using MATLAB – Verification.

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY,
(AUTONOMOUS)**

II B.Tech II Semester

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(23ACS09) PYTHON PROGRAMMING

Course Objectives:

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

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

- Showcase adept command of Python syntax, deftly utilizing variables, data types, control structures, functions, modules, and exception handling to engineer robust and efficient code solutions. (L4)
- Apply Python programming concepts to solve a variety of computational problems (L3)
- Understand the principles of object-oriented programming (OOP) in Python, including classes, objects, inheritance, polymorphism, and encapsulation, and apply them to design and implement Python programs (L3)
- Proficient in using commonly used Python libraries and frameworks such as JSON, XML, NumPy, pandas (L2)
- Exhibit competence in implementing and manipulating fundamental data structures such as lists, tuples, sets, dictionaries (L3)

UNIT-I:

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

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

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

Sample Experiments:

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

UNIT-II:

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

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

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

Sample Experiments:

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

UNIT-III:

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

Tuples and Sets: Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function, Sets, Set Methods, 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's os and 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. Write a Python program to print each line of a file in reverse order.
20. Write a 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 a complex object or not.
25. Python program to demonstrate NumPy array creation using `array()` function.
26. Python program to demonstrate use of `ndim`, `shape`, `size`, `dtype`.
27. Python program to demonstrate basic slicing, integer and Boolean indexing.
28. Python program to find `min`, `max`, `sum`, `cumulative sum` of array
29. Create a dictionary with at least five keys and each key represent value as a list where this list contains at least ten values and convert this dictionary as a pandas data frame and explore the data through the data frame as follows:
 - a) Apply `head()` function to the pandas data frame
 - b) Perform various data selection operations on Data Frame
30. Select any two columns from the above data frame, and observe the change in one attribute with respect to other attribute with scatter and plot operations in matplotlib

Reference Books:

1. Gowrishankar S, Veena A., Introduction to Python Programming, CRC Press.
2. Python Programming, S Sridhar, J Indumathi, VM Hariharan, 2nd Edition, Pearson, 2024
3. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

Online Learning Resources/Virtual Labs:

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

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY,
(AUTONOMOUS)**

II B.Tech II Semester

L	T	P	C
1	0	2	2

(23AMB05) DESIGN THINKING & INNOVATION

Course Objectives:

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

Course Outcomes:

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

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, customer, 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.

Textbooks:

1. Tim Brown, Change by design, HarperCollins (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- Kritina Holden, 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

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY,
(AUTONOMOUS)**

II B.Tech - II Semester (Common to All Branches)	L	T	P	C
	2	0	0	0

(23AHS 25) Quantitative and Aptitude and Reasoning -II

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 $\frac{1}{2}$ to $\frac{1}{30}$, 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.Chand Publications-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
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	1	2	-	-	-	-	-	-	-	-	-	-
CO3	2	-	-	-	-	-	-	-	-	-	-	-

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

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY,
(AUTONOMOUS)**

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

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 Projects 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 two-fold 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 communications 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 SERVICEPROJECT

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. Aquaculture
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 ratio 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 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. Program on Environment
10. Health and Hygiene
11. Hand wash programmes
12. Commemoration and Celebration of important days

Programs for Youth Empowerment

1. Leadership
2. Anti-alcoholism and Drug addiction
3. Anti-tobacco
4. Awareness on Competitive Examinations
5. Personality Development

Common Programs

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

Role of Students:

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

Timeline for the Community Service Project

Activity Duration: 8 weeks

1. Preliminary Survey (One Week)

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

2. Community Awareness Campaigns (One Week)

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

3. Community Immersion Programme (Three Weeks)

Along with the Community Awareness Programmes, the student batch can also work with any one of the below-listed governmental agencies and work in tandem with them. This community involvement programme will involve the students in exposing themselves to experiential learning about the community and its dynamics. 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 habitation. The same reports submitted to the teacher-mentor will be evaluated by the mentor and suitable marks are awarded for onward submission to the University. Throughout the Community Service Project, a daily logbook need to be maintained by the students batch, which should be countersigned by the governmental agency representative and the teacher-mentor, who is required to periodically visit the students and guide them.



**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

Regulations: R23

List of minors offered to other Departments by the Department Of Electrical and Electronics Engineering :

S.No.	Minor Title	Department offering the Minor
1.	Energy systems	EEE
2.	Micro grid technology	



SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Course Structure & Scheme of Examination

Regulations: R23

1. MINORS DEGREE IN ENERGY SYSTEMS

S.No	Category	Course code	Course title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	PC	23AEE52	Energy Audit and Management	3	0	0	3	30	70	100
2	PC	23AEE53	Energy Management in Building	3	0	0	3	30	70	100
3	PC	23AEE54	Energy Storage Technologies	3	0	0	3	30	70	100
4	PC	23AEE55	Energy Scenario and Energy Policy	3	0	0	3	30	70	100
5	PC	23AEE56	Waste Energy Management	3	0	0	3	30	70	100
6	PR	23AEE57	Project in Energy Systems	0	0	6	3	30	70	100
TOTAL				15		06	18	180	420	600

2. MINORS DEGREE IN MICRO GRID TECHNOLOGY

S.No	Category	Course code	Course title	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
1	PC	23AEE58	Futuristic Power Systems	3	0	0	3	30	70	100
2	PC	23AEE59	Power Electronic Converters for Energy Sources	3	0	0	3	30	70	100
3	PC	23AEE60	Microgrid Power and Control Architecture	3	0	0	3	30	70	100
4	PC	23AEE61	Microgrid System Design	3	0	0	3	30	70	100
5	PC	23AEE62	Analysis of Smart Grid Systems	3	0	0	3	30	70	100
6	PR	23AEE63	Project in Micro Grid Technology	0	0	6	3	30	70	100
TOTAL				15		06	18	180	420	600

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech I Semester

L	T	P	C
3	0	0	3

23AEE17

POWER ELECTRONICS

(Professional core)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Understand the I-V Characteristics and Gate Drive Requirements of Power Devices Including Diodes, Thyristors, MOSFETs, and IGBTs. -L2
- CO2. Design Single-Phase and Three-Phase Rectifiers with Different Load Conditions and Evaluate Power Factor and Source Inductance Effects. -L5
- CO3. Apply Duty Ratio Control and Analyze Steady-State Waveforms of Buck, Boost, and Buck-Boost Converters.-L3
- CO4. Analyze the Operation of Inverters, AC Voltage Controllers, and Cyclo Converters with Various Load Conditions and Commutation Techniques.L4
- CO5. Explore advanced power electronic devices like GaN and SiC, understanding their applications in modern power systems. L3

UNIT I Power Switching Devices:

Diode, Thyristor, MOSFET, IGBT: I-V Characteristics; Firing circuit for thyristor; Voltage and current commutation of a thyristor; Gate drive circuits for MOSFET, IGBT and GTO. Introduction to Gallium Nitride and Silicon Carbide Devices.

UNIT II Rectifiers:

Single-phase half-wave and full-wave rectifiers, Single-phase full-bridge thyristor rectifier with R-load and highly inductive load; Three-phase full-bridge thyristor rectifier with R-load and highly inductive load; Input current wave shape, power factor and effect of source inductance; Analysis of rectifiers with filter capacitance, Dual Converter -Numerical problems.

UNIT III DC-DC Converters:

Elementary chopper with an active switch and diode, concepts of duty ratio, control strategies and average output voltage: Power circuit, analysis and waveforms at steady state, duty ratio control and average output voltage of Buck, Boost and Buck- Boost Converters.

UNIT IV Inverters:

Single phase Voltage Source inverters – operating principle - steady state analysis, Simple forced commutation circuits for bridge inverters – Voltage control techniques for inverters and Pulse width modulation techniques, single phase current source inverter with ideal switches, basic series inverter, single phase parallel inverter – basic principle of operation only, Three phase bridge inverters (VSI) – 180 degree mode – 120 degree mode of operation - Numerical problems.

UNIT V AC Voltage Controllers & Cyclo Converters:

AC voltage controllers – Principle of phase control – Principle of integral cycle control - Single phase two SCRs in anti-parallel – With R and RL loads – modes of operation of Triac – Triac with R and RL loads – RMS load voltage, current and power factor - wave forms – Numerical problems. Cyclo converters - Midpoint and Bridge connections - Single phase to single phase step-up and step-down Cyclo converters with Resistive and inductive load, Principle of operation, Waveforms, output voltage equation.

TEXTBOOKS:

1. M. H. Rashid, —Power Electronics: Circuits, Devices and Applications, 4th edition, Prentice Hall of India, 2017.
2. M. D. Singh & K. B. Kanchandhani, —Power Electronics, 2nd edition, Tata Mc Graw Hill Publishing Company, 2013.
3. P.S. Bimbhra, —Power Electronics, 4th Edition, Khanna Publishers, 2010.

REFERENCE BOOKS:

1. Mohan, —Power Ned Electronics, Wiley, 2011.
2. Robert W. Erickson and Dragan Maksimovic, —Fundamentals of Power Electronics 2nd Edition, Kluwer Academic Publishers, 2004.
3. Vedam Subramanyam, —Power Electronics, New Age International (P) Limited, 1996.
4. V. R. Murthy, —Power Electronics, 1st Edition, Oxford University Press, 2005.
5. P. C. Sen, —Power Electronics, Tata Mc Graw-Hill Education, 1987.
6. J. M. D. Murphy —Power Electronic Control of Alternating Current Motors.

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech I Semester

L	T	P	C
3	0	0	3

23AEC26 DIGITAL CIRCUITS
(Professional core)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Learn Boolean algebra, logic simplification techniques, and combinational circuit design. L1
- CO2. Analyze combinational circuits like adders, sub tractors, and code converters. L2
- CO3. Explore combinational logic circuits and their applications in digital design. L3
- CO4. Understand sequential logic circuits, including latches, flip-flops, counters, and shift registers.L1
- CO5. Gain knowledge about programmable logic devices and digital ICs.L3

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, De-multiplexers, 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).

TEXTBOOKS:

1. M.Morris Mano & Michel D. Ciletti , Digital Design, , 5th Edition, Pearson Education, 1999.
2. Zvi Kohavi and Nirah K.Jha Switching theory and Finite Automata Theory, , 2nd Edition, Tata McGraw Hill, 2005.

REFERENCE BOOKS:

1. *Charles H Roth,Jr., Fundamentals of Logic Design, 5th Edition, Brooks/Cole Cengage Learning, 2004.*

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech I Semester

L	T	P	C
3	0	0	3

23AEE18 POWER SYSTEMS-II
(Professional core)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Analyse the transmission lines and obtain the transmission line parameters and constants. L4
- CO2. Analyse transmission line performance. L4
- CO3. Design transmission lines to meet the day to day power requirements.L5
- CO4. Understand and apply Per Unit System for Fault Calculations.L2
- CO5. Apply load compensation techniques to control reactive power.L3

UNIT I

Transmission Line Parameters:

Types of Conductors - Calculation of Resistance for Solid Conductors, Bundle Conductors, Skin effect, Proximity effect, Concept of GMR & GMD- Transposition of Power lines- Calculation of inductance for single phase and three phase, Single and Double circuit lines, Symmetrical and asymmetrical conductor configurations with and without transposition. Calculation of Capacitance for 2 wire and 3 wire systems, effect of ground on Capacitance, Capacitance calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines, Numerical Problems

UNIT II

Performance Of Transmission Lines:

Classification of Transmission Lines-Short, medium and long line and their models representation - Nominal-T, Nominal- π and A, B, C, D Constants for symmetrical networks, Numerical Problems and solutions for estimating regulation and efficiency of all types of lines. Ferranti effect and Charging Current.

UNIT III

Overhead Line Insulators:

Types of Insulators, String efficiency and Methods for improvement, – Voltage Distribution, Calculation of String efficiency, Capacitance Grading and Static Shielding., Numerical Problems.

Sag and Tension: Sag and Tension Calculations with equal and unequal heights of towers, Effect of wind and ice on weight of conductor, Stringing chart, Sag template and its applications Numerical Problems.

Corona: Corona- factors affecting corona, critical voltages and Power loss due to Corona. Radio Interference.

UNIT IV

Short Circuit Analysis:

Per-Unit System, Per-Unit equivalent reactance network of a three phase power system. Short circuit current and MVA calculations, fault levels, application of Series Reactors. Numerical problems.

Symmetrical Components and Fault Analysis: Symmetrical component theory, symmetrical component transformation. Positive, negative and zero sequence components of voltages, currents and impedances. Positive, negative and zero sequence networks LG, LL, LLG faults with and without fault impedance and LLL fault. Numerical Problems

UNIT V

Voltage Control and Power Factor Improvement:

Methods of voltage control, shunt and series capacitors / Inductors, tap changing transformers, synchronous phase modifiers, power factor improvement methods.

Compensation in Power Systems: Concepts of Load compensation Load ability characteristics of overhead lines – Uncompensated transmission line – Symmetrical line – Radial line with asynchronous load – Compensation of lines

TEXTBOOKS:

1. C.L. Wadhwa, —Electrical Power Systems, New Age International Pub. Co, Third Edition, 2001.
2. D.P. Kothari and I.J. Nagrath, —Modern Power System Analysis, Tata Mc Graw Hill Pub. Co., New Delhi, Fourth edition, 2011.
3. B.R.Gupta,—Power System Analysis and Design, S.ChandPublishing.1998.

REFERENCE BOOKS:

1. A. Chakrabarti, M.L. Soni, P.V. Gupta, U.S. Bhatnagar, —A Text book on Power System Engineering, Dhanpat Rai Publishing Company (P) Ltd, 2008.
2. John J. Grainger & W.D. Stevenson, —Power System Analysis, Mc Graw Hill International, 1994.
3. Hadi Sadat, —Power System Analysis, Tata Mc Graw Hill Pub. Co. 2002.
4. W.D. Stevenson, —Elements of Power system Analysis, McGraw Hill International Student Edition.

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(AUTONOMOUS)

III B.Tech I Semester

L	T	P	C
3	0	0	3

23ACS27 INTRODUCTION TO QUANTUM TECHNOLOGY AND APPLICATIONS
(Professional core)

COURSE OUTCOMES:

After the completion of the course students will be able to

CO1. Explain core quantum principles in a non-mathematical manner.

CO2. Compare classical and quantum information systems.

CO3. Identify theoretical issues in building quantum computers.

CO4. Discuss quantum communication and computing concepts.

CO5. Recognize applications, industry trends, and career paths in quantum technology.

Unit 1: Introduction to Quantum Theory and Technologies

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

Unit 2: Theoretical Structure of Quantum Information Systems

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

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

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

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

Unit 4: Quantum Communication and Computing – Theoretical Perspective

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

Unit 5: Applications, Use Cases, and the Quantum Future

Real-world application domains: Healthcare (drug discovery), Material science, Logistics and optimization, Quantum sensing and precision timing, Industrial case studies: IBM, Google, Microsoft, Psi Quantum, Ethical, societal, and policy considerations, Challenges to adoption: cost, skills,

standardization, Emerging careers in quantum: roles, skill sets, and preparation pathways, Educational and research landscape – India's opportunity in the global quantum race

TEXTBOOKS:

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

REFERENCE BOOKS:

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

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech I Semester

L	T	P	C
3	0	0	3

23AEC27

SIGNALS AND SYSTEMS

(Professional Elective -I)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Explain the basic properties of signal & systems and LTI systems. L2
- CO2. Apply Fourier series to represent periodic signals. L3
- CO3. Represent signals in continuous and discrete time Fourier transform. L2
- CO4. Analyze the sampling theorem and characterize signals & systems in time & frequency domain.
L3
- CO5. Analyse the stability of systems by applying Laplace transform and Z transform. L3

UNIT I

Signals and Systems : Continuous and Discrete Time Signals, Transformations of the Independent Variable, Elementary Signals-Unit Impulse, Unit Step Functions, Ramp Signal, Rectangular function, Signum Function, Sinc & Sa Function, Exponential and Sinusoidal Signals, Classification of Signals & Systems, Continuous and Discrete Time Systems, Basic System Properties, Linear Time Invariant (LTI) Systems, Discrete-Time LTI Systems, Convolution Sum, Continuous Time LTI Systems, Convolution Integral, Properties of LTI Systems, Causal LTI Systems described by Differential and Difference Equations, Singularity Functions.

UNIT II

Fourier series representation of periodic signals: Response of LTI Systems to Complex Exponentials. Fourier Series Representation of Continuous Time Periodic Signals, Trigonometric, Polar, Exponential fourier Series & related problems, Convergence of the Fourier Series, Properties of Continuous Time Fourier Series, Fourier Series Representation of Discrete Time Periodic Signals, Properties of Discrete Time Fourier Series, Fourier Series and LTI Systems.

UNIT III

The Continuous-Time Fourier Transform: Representation of aperiodic Signals, Continuous Time Fourier Transform, Fourier Transform for Periodic Signals, Properties of the Continuous Time Fourier Transform, Systems characterized by Linear constant coefficient differential equations, Discrete Time Fourier Transform - Representation of Aperiodic Signals, Discrete Time Fourier Transform, Frequency Response, Systems Characterized by Linear Constant-Coefficient Difference Equations.

UNIT IV

Time & Frequency Characterization of Signals and Systems : The Magnitude Phase Representation of the Fourier Transform, Magnitude Phase Representation of the Frequency Response of LTI Systems, Time-Domain Properties of Ideal Frequency Selective Filters, Time Domain and Frequency Domain Aspects of Non-ideal Filters, Examples of Continuous time filters and Discrete time filters described by differential equations, First-Order and Second-Order Continuous and Discrete-Time Systems, Examples of Time and Frequency Domain Analysis of Systems,

Sampling: Representation of a Continuous Time Signal by Its Samples, Sampling Theorem, Reconstruction of a Signal from Its Samples Using Interpolation, Effect of under sampling: Aliasing, Discrete Time Processing of Continuous-Time Signals.

UNIT V

Laplace and z-Transforms : The Laplace Transform, Region of Convergence for Laplace Transforms, Inverse Laplace Transform, Geometric Evaluation of the Fourier Transform from the Pole-Zero Plot, Properties of the Laplace Transform, Some Laplace Transform Pairs, Analysis and Characterization of LTI Systems Using the Laplace Transform, System Function Algebra and Block Diagram Representations, Unilateral Laplace Transform, Z-Transform - Region of Convergence for the z-Transform, Inverse z-Transform, Geometric Evaluation of the Fourier Transform from the Pole-Zero Plot, Properties of the z-Transform, Some Common z-Transform Pairs, Analysis and Characterization of LTI Systems Using z-Transforms, System Function Algebra and Block Diagram Representations, Unilateral z-Transforms.

TEXTBOOKS:

1. Alan V. Oppenheim, Alan S. Willsky, & S. Hamid, Signals and Systems, 2nd Edition, Pearson Higher Education, 1997.
2. B.P. Lathi, Principles of Linear Systems and Signals, 2nd Edition, Oxford University Press, 2011.

REFERENCE BOOKS:

1. Simon Haykin and B. Van Veen, Signals & Systems, 2nd Edition, John Wiley, 2003.
2. Narayana Iyer and K Satya Prasad, Signals and systems, 1st Edition, CENGAGE Learning, 2011.
3. C. L. Philips, J. M. Parr and Eve A. Riskin, Signals, Systems and Transforms, 4th Edition, Pearson education, 2008

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)**

III B.Tech I Semester

L	T	P	C
3	0	0	3

**23AEE19 ELECTRICAL SAFETY AND RISK MANAGEMENT
(Professional Elective -I)**

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Explain the objectives and precautions of Electrical Safety, effects of Shocks and their Prevention. L2
- CO2. Summarize the Safety aspects during Installation of Plant and Equipment. L3
- CO3. Describe the electrical safety in residential, commercial and agricultural installations. L3
- CO4. Describe the various Electrical Safety in Hazardous Areas, Equipment Earthing and System Neutral Earthing. L3
- CO5. State the electrical systems safety management and IE rules.

UNIT-I

Introduction to Electrical Safety, Shocks and Their Prevention:

Terms and definitions, objectives of safety and security measures, Hazards associated with electric current and voltage, who is exposed, principles of electrical safety, Approaches to prevent Accidents, scope of subject electrical safety. Primary and secondary electrical shocks, possibilities of getting electrical shock and its severity, medical analysis of electric shocks and its effects, shocks due to flash/ Spark over's, prevention of shocks, safety precautions against contact shocks, flash shocks, burns, residential buildings and shops.

UNIT-II

Safety during Installation of Plant and Equipment:

Introduction, preliminary preparations, preconditions for start of installation work, during, risks during installation of electrical plant and equipment, safety aspects during installation, field quality and safety during erection, personal protective equipment for erection personnel, installation of a large oil immersed power transformer, installation of outdoor switchyard equipment, safety during installation of electrical rotating machines, drying out and insulation resistance measurement of rotating machines.

UNIT-III

Electrical Safety In Residential, Commercial and Agricultural Installations:

Wiring and fitting – Domestic appliances – water tap giving shock – shock from wet wall – fan firing shock – multi-storied building – Temporary installations – Agricultural pump installation – Do's and Don'ts for safety in the use of domestic electrical appliances.

UNIT-IV

Electrical Safety in Hazardous Areas: Hazardous zones – class 0,1 and 2 – spark, flashovers and corona discharge and functional requirements – Specifications of electrical plants, equipments for hazardous locations – Classification of equipment enclosure for various hazardous gases and vapours – classification of equipment/enclosure for hazardous locations.

Equipment Earthing and System Neutral Earthing: Introduction, Distinction between system grounding and Equipment Grounding, Equipment Earthing, Functional Requirement of earthing system, description of a earthing system, , neutral grounding(System Grounding), Types of Grounding, Methods of Earthing Generators Neutrals.

UNIT-V

Safety Management of Electrical Systems:

Principles of Safety Management, Management Safety Policy, Safety organization, safety auditing, Motivation to managers, supervisors, employees.

Review of IE Rules and Acts and Their Significance: Objective and scope – ground clearances and section clearances – standards on electrical safety - safe limits of current, voltage –Rules regarding first aid and fire fighting facility.

The Electricity Act, 2003, (Part1, 2, 3, 4 & 5)

TEXTBOOKS:

1. S. Rao, Prof. H.L. Saluja, —Electrical safety, fire safety Engineering and safety managementll, Khanna Publishers, 2nd edition, New Delhi, 2012.(units-I to V)
2. www.apeasternpower.com/downloads/elecact2003.pdf (Part of unit-V).

REFERENCE BOOKS:

1. *Pradeep Chaturvedi, “Energy management policy, planning and utilization”, Concept Publishing company, New Delhi, 1997.*

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech I Semester

L	T	P	C
3	0	0	3

23AEE20 UTILIZATION OF ELECTRICAL ENERGY
(Professional Elective -I)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Apply the appropriate electric drives for various industrial applications.L4
- CO2. Understand the different types of heating and welding techniques. -L2
- CO3. Design an illumination system for the proper lighting system. -L5
- CO4. Understand the basic principle and different braking techniques of electric traction. -L2
- CO5. Understand the basic principle and applications of the electrolytic process.-L1

UNIT I

Electric Drives:

Type of electric drives – rating and choice of motor - starting and running characteristics – particular applications of electric drives - types of industrial loads - Continuous - intermittent and variable loads.

UNIT II

Electric Heating & Welding:

Introduction: Advantages and methods of electric heating - resistance heating - induction heating and dielectric heating.

Electric welding: Classification- resistance and arc welding - electric welding equipment - comparison between AC and DC Welding.

UNIT III

Illumination: Introduction - terms used in illumination - laws of illumination - sources of light. Discharge lamps – mercury vapor and sodium vapor lamps–comparison between tungsten filament lamps and fluorescent tubes–compact fluorescent lamp–LED-Basic principles of light control-Types and design of good lighting system and practice - flood lighting.

UNIT IV

Electric Traction:

Traction systems: System of electric traction and track electrification - Review of existing electric traction systems in India - Special features of traction motor - Speed-time curves for different services - methods of electric braking - plugging - rheostatic braking - regenerative braking. Introduction to Magnetic Levitation vehicles.

UNIT V

Electrolytic Process:

Introduction - Basic principles - Faradays laws of electrolysis - Energy efficiency – Electro deposition - Factors governing deposition Processes - Deposition of Alloys – Extraction and refining of metals. Fuel Cells.

TEXTBOOKS:

1. C.L Wadhwa, Generation Distribution and Utilization of Electrical Energy, New age International Publishers.
2. J. B. Gupta, Utilization of Electrical Power and Electric Traction, S. K. Kataria and sons, 2002.
3. G. C. Garg (2005), Utilization of Electrical Power & Electric traction, 8th edition, Khanna publishers, New Delhi.
4. N. V. Suryanarayana, Utilization of Electrical Power including Electric drives and Electric traction, New Age International (P) Limited, Publishers, 1996.

REFERENCE BOOKS:

1. *Partab (2007), Art & Science of Utilization of electrical Energy, 2nd edition, Dhanpat Rai & Sons, New Delhi.*
2. *Alan. V. Oppenheim, Ronald. W. Schafer, John R Buck, Discrete Time Signal Processing, Prentice Hall, 2nd edition, 2006. E.Openshaw Taylor, Utilization of Electric Energy, Orient Longman, 1971*

RESOURCES:

1. <https://nptel.ac.in/courses/108105060>
2. <https://nptel.ac.in/courses/112105221>
3. https://vssut.ac.in/lecture_notes/lecture1426861925.pdf
4. <https://vpmpee.wordpress.com/uee-3340903/>

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech I Semester

L	T	P	C
3	0	0	3

23ACE30 GREEN BUILDINGS

(Open elective-I)

COURSE OUTCOMES:

After the completion of the course students will be able to

- 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 indoor 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 On site 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.

TEXTBOOKS:

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

REFERENCE BOOKS:

1. *Complete Guide to Green Buildings* by Trish riley.
2. *StandardforthedesignforHighPerformanceGreenBuildingsbyKentPeterson*, 2009

ONLINE LEARNING RESOURCES:

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

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech I Semester	L	T	P	C
	3	0	0	3

23ACE31 CONSTRUCTION TECHNOLOGY AND MANAGEMENT
(Open elective-I)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Understand (Cos)project management fundamentals, organizational structures, and leadership principles in construction.
- CO2. Analyzemanpowerplanning,equipmentmanagement,andcostestimationincivilengineeringprojects ..
- CO3. Apply planning, scheduling, and project management techniques such as CPM and PERT..
- CO4. Evaluatevariouscontracttypes,contractformation,andlegalaspectsinconstructionmanagement.
- CO5. Assess safety management practices, accident prevention strategies, and quality management systems in construction.

UNIT – I

Introduction:Projectforms,ManagementObjectivesandFunctions;OrganizationalChartofAConstruction 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 Labor, 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 QMSin 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.

TEXTBOOKS:

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

REFERENCE BOOKS:

1. *Brien, J.O. and Plotnick, F.L.,CP Min 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, MandCatoB, Construction Management and Organisational Behaviour,Wiley-Blackwell, 2016.*

ONLINE LEARNING RESOURCES:

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

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech I Semester	L	T	P	C
	3	0	0	3

23AME23 SUSTAINBLE ENERGY TECHNOLOGIES

(Open elective-I)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Illustrate the importance of solar radiation and solar PV modules. L1, L2
- CO2. Discuss the storage methods in PV systems L2,L3
- CO3. Explain the solar energy storage for different applications L2,L3
- CO4. Understand the principles of wind energy, and bio-mass energy. L2, L3
- CO5. Attain knowledge in geothermal energy, ocean energy and fuel cells. L1,L2,L3, L4.

UNIT – 1

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

SOLAR PV MODULES AND PV SYSTEMS:

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

UNIT – 2

STORAGE IN PV SYSTEMS:

Battery Operation, Types of Batteries, Battery Parameters, Application and Selection of Batteries for Solar PV System, Battery Maintenance and Measurements, Battery Installation for PV System.

UNIT – 3

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

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

UNIT – 4

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

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

UNIT – 5

GEOTHERMALENERGY: Origin, Applications, Types of Geothermal Resources, Relative Merits.

OCEANENERGY: Ocean Thermal Energy; Open Cycle & Closed Cycle OTEC Plants, Environmental Impacts, Challenges.

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

TEXTBOOKS:

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

REFERENCE BOOKS:

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

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

		L	T	P	C
III B.Tech I Semester (EEE)		3	0	0	3
23AEC30	ELECTRONIC CIRCUITS (Open Elective-I)				

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Understand semi conductor 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: Introduction, PN junction diode –structure, operation and VI characteristics, Half-wave, Full-wave and Bridge Rectifiers with and without Filters, Positive and Negative Clipping and Clamping circuits (Qualitative treatment only). Special Diodes: Zener and Avalanche Break downs, VI Characteristics of Zener diode, Zener diode as voltage regulator, Construction, operation and VI characteristics of Tunnel Diode, LED, Varactor Diode, Photo Diode .

UNIT-II

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

UNIT-III

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

Multi stage 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.

TEXTBOOKS:

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

REFERENCE BOOKS:

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

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech I Semester

L	T	P	C
3	0	0	3

23ACS06 OBJECT ORIENTED PROGRAMMING THROUGH JAVA
(OPEN ELECTIVE-I)

COURSE OUTCOMES:

After the completion of the course students will be able to

- 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 behavior, 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, and graphical user interface (GUI) programming using JavaFX.

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, type casting, scope of variable, identifier, literal constants, symbolic constants, formatted output with printf () method, static variables and methods, attribute final.

Operators:

Introduction to operators, precedence and associativity, assignment operator (=), basic arithmetic operators, increment (++) and decrement (--) operators, ternary operator, relational operators, boolean logical operators, bitwise logical operators.

Control Statements:

if expression, nested if, if–else, ternary operator ?:, switch statement, while, do–while, for loop, nested for, for–each, break, continue.

UNIT – II: CLASSES AND OBJECTS

Class declaration and modifiers, class members, declaration of class objects, assigning one object to another, access control, accessing private members, constructors, overloaded constructors, nested classes, final class and methods, passing arguments by value/reference, keyword this.

Methods:

Defining methods, overloaded methods and constructors, class objects as parameters, recursive methods, method nesting, method overriding, final and static attributes.

UNIT – III: ARRAYS AND INHERITANCE

Arrays:

Declaration and initialization, storage in memory, accessing elements, operations, assigning arrays, dynamic resizing, sorting, searching, class arrays, two-dimensional arrays, variable-length arrays, three-dimensional arrays, arrays as vectors.

Inheritance:

Process and types, universal super class Object, inhibiting inheritance using final, access control, multilevel inheritance, keyword super, constructors and inheritance, method overriding, dynamic method dispatch, abstract classes.

Interfaces:

Declaration, implementation, multiple and nested interfaces, inheritance of interfaces, default and static methods, functional interfaces, annotations.

UNIT – IV: PACKAGES, EXCEPTION HANDLING, AND I/O

Packages and Java Library:

Defining and importing packages, class path, access control, Java SE packages, java.lang classes (e.g., Object, Math, wrapper classes), auto-boxing/unboxing, java.util (e.g., Formatter, Random), java.time package (e.g., Instant, TemporalAdjusters).

Exception Handling:

Standard exception hierarchy, keywords (throws, throw, try, catch, finally), multiple catch clauses, Throwable, checked/unchecked exceptions.

Java I/O and File:

Java I/O API, standard streams, byte and character streams, Scanner class, file handling.

UNIT – V: STRINGS, MULTITHREADING, JDBC, AND JAVA FX

String Handling:

Interface CharSequence, class String, methods for character extraction, comparison, modification, searching, class StringBuffer.

Multithreaded Programming:

Need for threads, multi-core programming, Thread class, main thread, creating new threads, thread states, thread priority, synchronization, deadlock, race conditions, inter-thread communication (suspend, resume, stop).

Java Database Connectivity (JDBC):

Architecture, installing My SQL and connector, environment setup, database connection, ResultSet interface.

Java FX GUI:

Scene builder, application window structure, displaying text/image, event handling, layout in scene graph, mouse events.

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

REFERENCE BOOKS:

1. *The Complete Reference Java – Herbert Schildt, 11th Edition, TMH*
2. *Introduction to Java Programming – Y. Daniel Liang, 7th Edition, Pearson*

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech I Semester	L	T	P	C
	3	0	0	3

23ACA13 FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE
(OPEN ELECTIVE-I)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Learn the distinction between optimal reasoning vs. human-like reasoning and formulate an efficient problem space for a problem expressed in natural language. Also, select a search algorithm for a problem and estimate its time and space complexities.
- CO2. Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.
- CO3. Learn different knowledge representation techniques.
- CO4. Understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
- CO5. Comprehend the applications of Probabilistic Reasoning and Bayesian Networks.
- CO6. 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.

Constraint Satisfaction – 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 Edition, E. Rich and K. Knight (TMH)*
2. *Artificial Intelligence, 3rd Edition, Patrick Henry Winston, Pearson Education*
3. *Artificial Intelligence, Shivani Goel, Pearson Education*
4. *Artificial Intelligence and Expert Systems, Patterson, Pearson Education*

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech I Semester	L	T	P	C
	3	0	0	3

23AHS26 MATHEMATICS FOR MACHINE LEARNING AND AI
(OPEN ELECTIVE-I)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Apply linear algebra concepts to ML techniques like PCA and regression.-L3 (Apply)
- CO2. Analyze probabilistic models and statistical methods for AI applications.-L4 (Analyze)
- CO3. Implement optimization techniques for machine learning algorithms.-L3 (Apply)
- CO4. Utilize vector calculus and transformations in AI-based models.-L3 (Apply)
- CO5. Develop graph-based AI models using mathematical representations.-L5 (Evaluate)

UNIT I: LINEAR ALGEBRA FOR MACHINE LEARNING

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

UNIT II: PROBABILITY AND STATISTICS FOR AI (08)

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

UNIT III: OPTIMIZATION TECHNIQUES FOR ML

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.*

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech I Semester	L	T	P	C
	3	0	0	3

23AHS27 MATERIALS CHARACTERIZATION TECHNIQUES
(OPEN ELECTIVE-I)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Analyze the crystal structure and crystallite size by various methods.-L1,L2,L3,L4
- CO2. Analyze the morphology of the sample by using a Scanning Electron Microscope.-L1,L2,L4
- CO3. Analyze the morphology and crystal structure of the sample by using a Transmission Electron Microscope.-L1,L2,L3
- CO4. Explain the principle and experimental arrangement of various spectroscopic techniques.-L1,L2
- CO5. Identify the construction and working principle of various Electrical & Magnetic Characterization techniques.-L1,L2

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 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, Differences between SEM and TEM, Advantages and limitations of TEM.

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 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.
2. Micro structural Characterization of Materials – David Brandon, Wayne D. Kalpan – John Wiley & Sons Ltd., 2008.

REFERENCE BOOKS:

1. *Fundamentals of Molecular Spectroscopy (4th Ed.)* – Colin Neville Banwell and Elaine M. McCash – Tata McGraw-Hill, 2008.
2. *Elements of X-ray Diffraction* – Bernard Dennis Cullity & Stuart R. Stocks – Prentice Hall, 2001.
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.

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SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
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III B.Tech I Semester	L	T	P	C
	3	0	0	3

23AHS28 CHEMISTRY OF ENERGY SYSTEMS
(OPEN ELECTIVE-I)

COURSE OUTCOMES:

After the completion of the course students will be able to

- 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 a fuel cell. Explain the efficiency of the fuel cell.
Discuss about the basic design of fuel cells. Classify the fuel cells.
- CO3. Differentiate between photo and photo electrochemical conversions, illustrate the photochemical cells. Identify the applications of photochemical reactions.
Interpret the advantages of photo electronic catalytic conversion.
- CO4. Apply the photovoltaic technology. Demonstrate about solar energy and its prospects.
Illustrate the solar cells. Discuss about concentrated solar power.
- CO5. Differentiate chemical and physical methods of hydrogen storage. Discuss the metal-organic framework. Illustrate the carbon and metal oxide porous structures.
Describe the liquefaction methods.

UNIT-1: ELECTROCHEMICAL SYSTEMS

Galvanic cell, Nernst equation, standard electrode potential, application of EMF, electrical double layer, polarization.

Batteries – Introduction, Lead-acid, Nickel-cadmium, Lithium-ion batteries and their applications.

UNIT-2: FUEL CELLS

Fuel cell – Introduction, basic design of fuel cell, working principle, classification of fuel cells, Polymer Electrolyte Membrane (PEM) fuel cells, Solid Oxide Fuel Cells (SOFC), fuel cell efficiency and applications.

UNIT-3: PHOTO AND PHOTO ELECTROCHEMICAL CONVERSIONS

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

UNIT-4: SOLAR ENERGY

Introduction and prospects, Photovoltaic (PV) technology, Concentrated Solar Power (CSP), solar cells and applications.

UNIT-5: HYDROGEN STORAGE

Hydrogen storage and delivery: state-of-the-art, established technologies.

Chemical and physical methods of hydrogen storage: compressed gas storage, liquid hydrogen storage, other storage methods.

Hydrogen storage in metal hydrides, metal-organic frameworks (MOF), metal oxide porous structures, hydrogel, and organic hydrogen carriers.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. *Fuel Cell Handbook, 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: Fundamentals, Technology and Systems by Klaus Jäger et al.*
4. *Hydrogen Storage by Levine Klebanoff*

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

	L	T	P	C
III B.Tech I Semester	3	0	0	3

23AHS29 ENGLISH FOR COMPETITIVE EXAMINATIONS
(OPEN ELECTIVE-I)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Identify the basics of English grammar and its importance-L1, L2
- CO2. Explain the use of grammatical structures in sentences-L1, L2
- CO3. Demonstrate the ability to use various concepts in grammar and vocabulary and their applications in everyday use and in competitive exams-L3
- CO4. Analyze an unknown passage and reach conclusions about it.-L4
- CO5. Choose the appropriate form of verbs in framing sentences-L5
- CO6. Develop speed reading and comprehending ability there by perform better in competitive exams.

UNIT-I GRAMMAR-1

Nouns-classification-errors-Pronouns-types-errors-Adjectives-types-errors-Articles-definite-indefinite-Degrees of Comparison-Adverbs-types-errors-Conjunctions-usage-repositions-usage-TagQuestions,types-identifyingerrors-Practice

UNIT-II GRAMMAR-2

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

UNIT-III VERBALABILITY

Sentence completion-Verbal analogies-Word groups-Instructions-Critical reasoning-Verbal deduction-Select appropriate pair-Reading Comprehension-Paragraph-Jumbles-Selecting the proper statement by reading a given paragraph.

UNIT-IV READING COMPREHENSION AND VOCUBULARY

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

UNIT-V WRITING FOR COMPETITIVE EXAMINATIONS

Punctuation- Spelling rules- Word order-Sub Skills of Writing- Paragraph meaning-salient features-types - Note-making, Note-taking, summarizing-precise writing- Paraphrasing-Expansion of proverbs-Essay writing-types

TEXT BOOKS:

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

REFERENCE BOOKS:

1. *Hari Mohan Prasad, Objective Englishfor Competitive Examination, Tata McGraw Hill, New Delhi, 2014.*
2. *Philip Sunil Solomon, English for Successin Competitive Exams,Oxford2016.*
3. *Shalini Verma, Word Power Made Handy, S Chand Publications.*
4. *Neira, Anjana Dev & Co.Creative Writing: ABeginner's Manual. Pearson Education India, 2008.*
5. *Abhishek Jain, Vocabulary Learning Techniques Vol. I & II, RR Global Publishers2013.*
6. *MichelSwan,PracticalEnglishUsage,Oxford,2006.*

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech I Semester	L	T	P	C
	3	0	0	3

23AMB06 ENTREPRENEURSHIP AND NEW VENTURE CREATION
(OPEN ELECTIVE-I)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Develop an entrepreneurial mindset and appreciate the concept of entrepreneurship-L3
- CO2. Comprehend the process of problem-opportunity identification through design thinking, identify market potential and customers while developing a compelling value proposition solution-L3
- CO3. Analyze and refine business models to ensure sustainability and profitability-L3
- CO4. Build Proto type for Proof of Concept and validate MVP of their practice venture idea-L4
- CO5. Create business plan, conduct financial analysis and feasibility analysis to assess the financial viability of a venture L5
- CO6. Prepare and deliver an investible pitch deck of their practice venture to attract stake holdersL6

UNIT-I: ENTREPRENEURSHIP FUNDAMENTALS AND CONTEXT

Topics Covered:

- Meaning and concept, attributes and mindset of entrepreneurial and entrepreneurial leadership
- Role models in each and their contribution to economic development
- Understanding how to build entrepreneurial mindset, skill sets, attributes, and networks while on campus

Core Teaching Tools:

Simulation, Game, Industry Case Studies (Personalized for students – 16 industries to choose from),
Venture Activity

Learning Outcomes:

At the end of the unit, the learners will be able to:

- Understand the concept of Entrepreneur and Entrepreneurship in India
- Analyze recent trends in Entrepreneurship and its role in economic development
- Develop a creative mindset and personality to start a business

UNIT–II: PROBLEM & CUSTOMER IDENTIFICATION

Topics Covered:

- Understanding and analyzing macro-problems and industry perspectives: technological, socioeconomic, and urbanization trends
- Identifying passion
- Defining problems using Design Thinking principles
- Validating problems with potential customers
- Understanding customer segmentation and creating customer personas

Core Teaching Tools:

Class activities, games, Generative AI, ‘Get out of the Building’ tasks, and Venture Activity

Learning Outcomes:

At the end of the unit, the learners will be able to:

- Understand the problem and customer identification
- Analyze problems and validate with potential customers
- Evaluate customer segmentation and customer personas

UNIT–III: SOLUTION DESIGN, PROTOTYPING & OPPORTUNITY ASSESSMENT AND SIZING

Topics Covered:

- Understanding customer jobs-to-be-done
- Crafting innovative solution designs and creating a strong value proposition
- Understanding prototyping and Minimum Viable Product (MVP)
- Developing feasibility prototypes with differentiating features
- Assessing relative market position through competition analysis
- Sizing the market and assessing opportunity scale

Core Teaching Tools:

Venture Activity, No-code innovation tools, Class activity

Learning Outcomes:

At the end of the unit, the learners will be able to:

- Analyze jobs-to-be-done
- Evaluate customer needs to create a strong value proposition
- Design and draw prototypes and MVPs

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

Topics Covered:

- Introduction to business models and types
- Lean approach, 9-block lean canvas model, identifying riskiest assumptions
- Importance of Build–Measure–Learn approach
- Components of a business plan: Sales, People, and Financial plans
- Financial planning: Types of costs, profitability, unit economics, and performance analysis

- Marketing and sales: Choosing channels, digital presence, and customer acquisition
- Choosing a form of business organization and identifying funding sources (Debt & Equity)
- Mapping the start-up lifecycle to funding options

Core Teaching Tools:

Founder case studies (Sama and Securely Share), Class activity and discussions, Venture **Activities**

Learning Outcomes:

At the end of the unit, the learners will be able to:

- Understand the lean approach in business models
- Apply business, sales, and financial planning
- Analyze financial planning and marketing channels
- Design their own venture and identify funding sources

UNIT–V: SCALE OUTLOOK AND VENTURE PITCH READINESS

Topics Covered:

- Understanding potential and aspiration for scaling your venture idea
- Persuasive storytelling and its key components
- Building an investor-ready pitch deck

Core Teaching Tools:

Expert talks, Case studies, Class activities, Discussions, Venture Activities

Learning Outcomes:

At the end of the unit, the learners will be able to:

- Understand aspirations for scale
- Analyze venture ideas and key components
- Evaluate and build investor-ready pitch decks

TEXT BOOKS:

1. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha – Entrepreneurship, McGraw Hill, 11th Edition (2020)
2. Ries, E. – The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses, Crown Business (2011)
3. Osterwalder, A., & Pigneur, Y. – Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers, John Wiley & Sons (2010)

REFERENCE BOOKS:

1. Simon Sinek – *Start with Why*, Penguin Books Ltd. (2011)
2. Brown, Tim – *Change by Design: Revised & Updated*, Harper Business (2019)
3. .Philip Sunil Solomon, *English for Success in Competitive Exams*, Oxford 2016.
4. Saras D. Sarasvathy – *Effectuation: Elements of Entrepreneurial Expertise*, Elgar Publishing Ltd. (2008)

E-RESOURCES:

1. Learning Resource: Ignite 5.0 Course, Wadhwani Platform

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech I Semester (EEE)

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23AHS31 FRENCH LANGUAGE

(Audit Course)

COURSE OUTCOMES:

After the completion of the course students will be able to

- 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-1

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-2 RENDEZVOUS:

Conversations, approaching someone, Tele conversation, Buying a train ticket, Number the formula to write a post card, Culture and Life in France.

UNIT-3

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-4

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-5

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.

TEXTBOOKS:

1. CAMPUS 1 Methode de Francais, Jacky Girardet, CLE International Paris, Nouvelle Edition, 2002.
2. La France de tous les jours: 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.

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech I Semester (EEE)

L	T	P	C
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23AHS32 GERMAN LANGUAGE
(Audit Course)

COURSE OUTCOMES:

After the completion of the course students will be able to

- 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-1

UNIT-1 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-2 SENTENCE FORMATION

Infinite sentences, use of conjunctive-I and conjunctive-II, plusquam perfect, modal verb, Conjunction, temporal, subordinate clauses & complex sentences.

UNIT-3 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-4 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-5 GERMANADVANCEDCOMMUNICATIONLEVEL-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.

TEXTBOOKS:

1. Korbinian, Lorenz Nieder Deutschals Fremdsprache IA. Ausländer, “German Language”, Perfect Paperback Publishers, 1st Edition, 1992
2. DeutschalsFremdsprache, IB, Ergänzungskurs, “German Language”, Front Cover. Klett, Glossar Deutsch-Spanisch Publishers, 1st Edition, 1981.

REFERENCE BOOKS:

1. *Griesbach, “ModernerGebrauch der deutschenSprache”, Schulz Publishers, 10th Edition, 2011.*
- Anna Quick, Hermann Glaser U.A, “Intermediate German: A Grammar and workbook”, Paperback, 1 st Edition, 2006.

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech I Semester (EEE)

L	T	P	C
0	0	0	0

23AHS33 JAPANESE LANGUAGE
(Audit Course)

COURSE OUTCOMES:

After the completion of the course students will be able to

- 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 the min Japanese.
- CO4. Demonstrate the formation of simple questions and answers in Japanese to know the Japanese culture and etiquette.

UNIT-1

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 20 pronouns, Greetings.

UNIT-2

DEMONSTRATIVE PRONOUNS, VERBS AND SENTENCE FORMATION-Grammar:

N1waN2 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-3

CONJUNCTION, ADJECTIVES, VOCABULARY AND ITS MEANING -

Conjunction-Ya.....nado Classification of Adjectives 'I' and 'na'-ending Setphrase— One gaishimasu – Sumimasen, wakarimasen Particle—Wa, Particle-Ni 'Gaimasu' and 'Gaarimasu' 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-4

FORMING QUESTIONS AND GIVING ANSWERS-

Classification of Question words (Dare, Nani, Itsu, Doyatte, dooshite, Ikutsu, Ikura); Classification of Teforms, 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.

TEXTBOOKS:

1. Easy Japanese: Learn to Speak Japanese Quickly, Emiko Koromi, Tuttle Publishing, 2018.

REFERENCE BOOKS:

1. Japanese Hiragana and Katakana Made Easy: An Easy Step-By-Step Work book to Learn the Japanese Writing System, Lingo Mastery, 2022..

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech I Semester	L	T	P	C
23AEE21 POWER ELECTRONICS LAB	0	0	3	1.5
(Professional Core)				

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Analyze the Characteristics of Power Semiconductor Devices (SCR, MOSFET, IGBT) and their Role in Power Converters. L4
- CO2. Design and Implement Gate Firing Circuits for SCR-based Power Converters. L4
- CO3. Evaluate the Performance of Single-phase and Three-phase Power Converters with R and RL Loads. L5
- CO4. Apply Different Commutation Techniques to Analyze Inverter for Efficient Power Control. L3
- CO5. Apply Different Commutation Techniques to Analyze Chopper Circuits for Efficient Power Control. L3

LIST OF EXPERIMENTS:

1. Study of Characteristics of SCR, MOSFET & IGBT.
2. Gate firing circuits for SCR's: (a) R triggering (b) R-C triggering.
3. Single Phase AC Voltage Controller with R and RL Loads.
4. Single Phase fully controlled bridge converter with R and RL loads Forced Commutation circuits (Class A, Class B, Class C, Class D & Class E).
5. DC Jones chopper with R and RL Loads.
6. Single Phase Parallel inverter with R and RL loads.
7. Single Phase Cycloconverter with R and RL loads.
8. Single Phase Half controlled converter with R and RL load.
9. Single Phase Fully controlled converter with R and RL load.
10. Three Phase half-controlled bridge converter with R, RL-load.
11. Three Phase fully controlled bridge converter with R, RL-load.
12. Single Phase series inverter with R and RL loads.
13. Single Phase Bridge converter with R and RL loads.
14. Single Phase dual converter with RL loads.

REFERENCE BOOKS:

1. O.P. Arora, —Power Electronics Laboratory: Theory, Practice and Organization (Narosa series in Power and Energy Systems), Alpha Science International Ltd., 2007.
2. M. H. Rashid, —Simulation of Electric and Electronic circuits using PSPICE, M/s PHI Publications.
3. PSPICE A/D user's manual – Microsim, USA.
4. PSPICE reference guide – Microsim, USA.
5. MATLAB and its Tool Books user's manual and – Math works, USA.

Online Learning Resources/Virtual Labs:

1. http://vlabs.iitb.ac.in/vlabs-ev/labs/mit_bootcamp/power_electronics/labs/index.php

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

	L	T	P	C
III B.Tech I Semester (EEE)	0	0	3	1.5
23AEC28 ANALOG AND DIGITAL CIRCUITS LAB				
(Professional Core)				

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Interpret the characteristics of diodes and transistors for circuit design. L3
- CO2. Construct and evaluate rectifiers, amplifiers, and oscillator circuits. L3
- CO3. Implement basic Op-Amp applications, combinational and sequential circuits using logic gates. L4
- CO4. Design digital systems using universal gates, multiplexers, and comparators. L4.
- CO5. Develop and realize fundamental digital components such as adders, converters, flip-flops, encoders, and decoders. L4

LIST OF EXPERIMENTS:

1. CB Characteristics
2. CE Characteristics
3. CE Amplifier
4. CC Amplifier
5. Clippers
6. Clampers
7. Hartley & Colpitt's Oscillators.
8. RC Phase shift oscillator
9. Astable multivibrator
10. Monostable multivibrator
11. A to D Convertor
12. D to A Convertor
13. Op-Amp Applications-Adder, subtractor, comparator

DIGITAL CIRCUITS

List of Experiments:

1. Realization of Boolean Expressions using Gates
2. Design and realization of logic gates using universal gates
3. Generation of clock using NAND / NOR gates
4. Design a 4 – bit Adder / Subtractor
5. Design and realization of a 4 – bit Gray to Binary and Binary to Gray Converter
6. Design and realization of 8x1 MUX using 2x1 MUX
7. Design and realization of 4 bit comparator

8. Design and realization of Flip-Flops.
9. Design and realization of Encoders
10. Design and realization of Decoders
11. Design and realization of Comparator

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech I Semester (EEE)	L	T	P	C
23AHS20	0	1	2	2
SOFT SKILLS				
(Professional Core)				

COURSE OUTCOMES:

After the completion of the course students will be able to

CO6. List out various elements of soft skills.L1, L2,

CO7. Describe methods for building professional image.L1, L2

CO8. Apply critical thinking skills in problem solving.L3

CO9. Analyse the needs of an individual and team for well-being.L4

CO10. Assess the situation and take necessary decisions.L5

CO11. Create a productive work place atmosphere using social and work-life skills ensuring personal and emotional well-being.L6

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 Lecture Hrs **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, and 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.

TEXTBOOKS:

3. Mitra Barun K, Personality Development and Soft Skills, Oxford University Press, Pap/Cdr edition 2012.
4. 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. Dr. Rajiv Kumar Jain, Dr. Usha Jain, Life Skills (Paperback English) Publisher : Vayu Education of India, 2014

WEB RESOURCES:

1. https://youtu.be/DUlsNJtg2L8?list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q
2. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7 KlJ
3. <https://youtu.be/-Y-R9hDI7IU>
4. <https://youtu.be/gkLsn4ddmTs>
5. <https://youtu.be/2bf9K2rRWwo>
6. <https://youtu.be/FchfE3c2jzc>
7. <https://www.businesstrainingworks.com/training-resource/five-free-business-etiquette-training-games/>
8. https://onlinecourses.nptel.ac.in/noc24_hs15/previe
9. https://onlinecourses.nptel.ac.in/noc21_hs76/preview

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

L	T	P	C
0	0	2	1

III B.Tech I Semester (EEE)

23ACO03 TINKERING LAB

COURSE OUTCOMES:

After the completion of the course students will be able to

CO1. Encourage Innovation and Creativity

CO2. Provide Hands-on Learning and Impart Skill Development

CO3. Foster Collaboration and Teamwork

CO4. Enable Interdisciplinary Learning, Prepare for Industry and Entrepreneurship

CO5. Impart Problem-Solving mind-set

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.

Online Learning RESOURCES:

- 1) <https://aim.gov.in/pdf/equipment-manual-pdf.pdf>
- 2) <https://atl.aim.gov.in/ATL-Equipment-Manual/>
- 3) <https://aim.gov.in/pdf/Level-1.pdf>
- 4) <https://aim.gov.in/pdf/Level-2.pdf>
- 5) <https://aim.gov.in/pdf/Level-3.pdf>

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

	L	T	P	C
III B.Tech I Semester (EEE)	0	0	0	2

23AEE22 EVALUATION OF COMMUNITY SERVICE INTERNSHIP

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

	L	T	P	C
III B.Tech I Semester (EEE)	2	0	0	0

23AHS30 QUANTITATIVE AND APTITUDE AND REASONING- III
(Audit Course)

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech I Semester (EEE)

L	T	P	C
2	0	0	0

23AHS31 FRENCH LANGUAGE

(Audit Course)

COURSE OUTCOMES:

After the completion of the course students will be able to

CO5. Understand basic knowledge of French language and several core competencies.

CO6. Develop and improve comprehensive capabilities and apply simple phrases & sentences in real-life conversation.

CO7. Analyze ability to ask and answer questions about the self, personal interest, everyday life, and the immediate environment.

CO8. Demonstrate knowledge of tenses in making sentences for day-to-day conversations in different time frame.

UNIT-1

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-2 RENDEZVOUS:

Conversations, approaching someone, Tele conversation, Buying a train ticket, Number the formula to write a post card, Culture and Life in France.

UNIT-3

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-4

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-5

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.

TEXTBOOKS:

3. CAMPUS 1 Methode de Francais, Jacky Girardet, CLE International Paris, Nouvelle Edition, 2002.
4. La France de tous les jours: Civilisation, Nelly Mauchamp; CLE International, 2004.

REFERENCE BOOKS:

3. *Declic 1: method francais*; Jacques Balnc, Jean-Michel Cartier, Pierre Lederlion; CLE International, 2004.
4. *Nouveau Sans Frontieres*; P Dominique, Jacky Girardet , et al. – Vols. 1, 2 & 3. French Edition, 1989.

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech I Semester (EEE)

L	T	P	C
2	0	0	0

23AHS32 GERMAN LANGUAGE
(Audit Course)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO5. Understand fundamentals of German language, sounds, pronunciations, sentence structures and the verb conjugation.
- CO6. Comprehend and apply the knowledge of vocabulary and phrases in day-to-day real-life conversation.
- CO7. Analyze various sentence structures by examining the rules of grammar in speaking and writing.
- CO8. Demonstrate various verb structures of English and German language effectively in professional writing.

UNIT-1

UNIT-1 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-2 SENTENCE FORMATION

Infinite sentences, use of conjunctive-I and conjunctive-II, plusquam perfect, modal verb, Conjunction, temporal, subordinate clauses & complex sentences.

UNIT-3 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-4 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-5 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.

TEXTBOOKS:

3. Korbinian, Lorenz Nieder Deutschals Fremdsprache IA. Ausländer, “German Language”, Perfect Paperback Publishers, 1st Edition, 1992
4. DeutschalsFremdsprache, IB, Ergänzungskurs, “German Language”, Front Cover. Klett, Glossar Deutsch-Spanisch Publishers, 1st Edition, 1981.

REFERENCE BOOKS:

2. Griesbach, “*Moderner Gebrauch der deutschen Sprache*”, Schulz Publishers, 10th Edition, 2011.
- Anna Quick, Hermann Glaser U.A, “Intermediate German: A Grammar and workbook”, Paperback, 1st Edition, 2006.

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech I Semester (EEE)

L	T	P	C
0	0	0	0

23AHS33 JAPANESE LANGUAGE
(Audit Course)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO5. Remember and understand Japanese alphabet and demonstrate basic structures of sentences in reading and writing.
- CO6. Examine the limitations of language by examining pronouns, verbs form, adjectives and conjunctions.
- CO7. Analyze the skills of vocabulary and apply it to learn time and dates and express the min Japanese.
- CO8. Demonstrate the formation of simple questions and answers in Japanese to know the Japanese culture and etiquette.

UNIT-1

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 20 pronouns, Greetings.

UNIT-2

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-3

CONJUNCTION, ADJECTIVES, VOCABULARY AND ITS MEANING -

Conjunction-Ya.....nado Classification of Adjectives 'I' and 'na'-ending Set phrase— One gaishimasu – Sumimasen, wakarimasen Particle—Wa, Particle-Ni 'Gaimasu' and 'Gaarimasu' 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-4

FORMING QUESTIONS AND GIVING ANSWERS-

Classification of Question words (Dare, Nani, Itsu, Doyatte, dooshite, Ikutsu, Ikura); Classification of Teforms, 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.

TEXTBOOKS:

2. Easy Japanese: Learn to Speak Japanese Quickly, Emiko Koromi, Tuttle Publishing, 2018.

REFERENCE BOOKS:

1. Japanese Hiragana and Katakana Made Easy: An Easy Step-By-Step Work book to Learn the Japanese Writing System, Lingo Mastery, 2022..

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech II Semester	L	T	P	C
	3	0	0	3

23AEE24 ELECTRICAL MEASUREMENTS & INSTRUMENTATION

(Professional core)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Understand principle and working of electrical measuring instruments.L2
- CO2. Understand the principle of operation of instrument transformers, energy meters and analog instruments.L2
- CO3. Understand the principle and working of various DC and AC bridges for the measurement of Resistance, Inductance and Capacitance.L2
- CO4. Understand the principle and working of different digital voltmeters and transducers.L2
- CO5. Understand the working of various sensors and data acquisition systems.L2

UNIT-I

Measuring instruments & Digital Meters:

Fundamentals: True Value, Errors (Gross, Systematic, Random); Static Characteristic of Instruments (Accuracy, Precision, Sensitivity, Resolution & threshold); Error Analysis- Simple problems; Statistical treatment of data-Simple problems.

Indicating Instruments: Three forces in Electromechanical indicating instrument (Deflecting, controlling & damping forces); Moving iron type (attraction and repulsion), PMMC, Electrodynamometer Type instruments: Torque equation (Expression only, no derivation), shape of scale – simple problems on torque equations; Measurement of voltage and current - Extension of Range of ammeter and voltmeter – problems on extension of range of ammeter and voltmeter.

UNIT-II

Measurement Of Power, Power Factor And Energy:

Instrument transformers: Types, CT and PT – Ratio and phase angle errors; (Expression only, no derivation)

Measurement of power: Principle and Operation of Single-phase dynamometer wattmeter, expression (Expression only no derivation) for deflecting and control torques, errors and compensations.

Measurement of power factor: Principle and operation of Single-phase Electrodynamometer Power factor meter.

Measurement of Frequency: Principle and Operation of single phase frequency meter- vibrating reed type,- ferro dynamic type meter.

Measurement of Energy: Principle and Operation of Single phase induction type energy meter, driving and braking torques (expression only no derivation), errors and compensations, testing by phantom loading.

UNIT-III

D.C&A.C Bridges:

Measurement of Resistance: Methods of measuring low, medium and high resistances –Sensitivity of Whetstone's bridge– Kelvin's double bridge for Measuring low resistance, Megger for measurement of high resistance.

Measurement of Inductance: - Maxwell's bridge, Anderson's bridge.

Measurement of Capacitance: De Sauty bridge. Wien's bridge–Schering bridge–Numerical problems.

UNIT-IV

Digital Volt Meters And Transducers:

Digital Voltmeters: Ramp type, Dual Slope integrating type, successive approximation, Potentiometric type DVMs.

Classification of transducers: Active/passive, analog/digital- Strain Gauge-gauge factor (Elementary treatment only)-applications of strain gauge, Q-Meter.

UNIT-V

Transducers, Sensors and Data Acquisition:

Definition of Transducers, Classification of Transducers, Advantages of Electrical Transducers, Characteristics and Choice of Transducers; Principle Operation of Resistor, Inductor and Capacitive Transducers; LVDT and its Applications, Strain Gauge and Its Principle of Operation, Gauge Factor, Thermistors, Thermocouples, Piezo Electric Transducers, Photo electric Transducers, Hall effect, Photo Diodes. Opt coupler.

Silicon based micro sensors: Pressure sensor, Gyro sensor, Accelerometer, Flow sensor, Proximity sensor, Temperature sensor, Humidity sensor. (Elementary treatment only)

Introduction to PLC and SCADA Systems: Data acquisition systems (DAS) and interfacing techniques.

TEXTBOOKS:

1. A.K. Sawhney, *Electrical & Electronic Measurement & Instruments*, 19th edition, Dhanpat Rai & Co. Publications, 2022
2. R.K.Rajput , *Electrical & Electronic Measurement & Instrumentation* , 4th Edition, S. Chand & Co., 2015.
3. E.W.Golding and F.C. Widdis, *Electrical Measurements and measuring Instruments*, 5th Edition, Reem Publications, 2011.

REFERENCE BOOKS:

1. Reissl and, M.U , *Electrical Measurements: Fundamentals, Concepts, Applications*, 1st edition , New Age International (P) Limited, 2012.
2. H.S.Kalsi, *Electronic Instrumentation*, 3rd Edition, Tata McGraw-Hill, , 2011.

3. Sensor Technology: Hand Book by JonS. Wilson, ELSEVIER publications, 2005.

WEB RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc22_ee112/preview

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech II Semester	L	T	P	C
	3	0	0	3

23AEC18 MICROPROCESSORS AND INTERFACING
(Professional core)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Gain knowledge on the architecture, operation, and configurations of the 8086 microprocessors.L1
- CO2. Get familiar with 8086 programming concepts, instruction set, and assembly language development tools.L2
- CO3. Know the interfacing of 8086 with memory, peripherals, and controllers for various applications.L2
- CO4. Learn the architecture, instruction set, and programming of the 8051 microcontrollers.L2
- CO5. Understand microcontroller interfacing techniques, peripheral programming, and processor comparisons.L1

UNIT I

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

UNIT II

8086 Programming: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

UNIT III

8086 Interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDs, Interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.

UNIT IV

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

UNIT V

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

TEXTBOOKS:

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

REFERENCE BOOKS:

1. Atul P. Godse & Deepali A. Godse, *Microprocessor and Interfacing*, 1st edition, Technical Publications, 2020 .
2. Ramesh S Gaonkar, *Microprocessor Architecture Programming and Applications with the 8085*, 6th edition, Penram International Publishing, 2013.
3. Kenneth J. Ayala, *The 8051 Microcontroller*, 3rd edition, Cengage Learning, 2004.

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech II Semester

L	T	P	C
3	0	0	3

23AEE25 POWER SYSTEM ANALYSIS
(Professional core)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Remember and understand the concepts of per unit values, Y Bus and Z bus formation, load flow studies, symmetrical and unsymmetrical fault calculations.L1
- CO2. Apply the concepts of good algorithm for the given power system network and obtain the converged load flow solution and experiment some of these methods using modern tools and examine the results.L4
- CO3. Analyse the symmetrical faults and unsymmetrical faults and done the fault calculations, analyse the stability of the system and improve the stability.L3
- CO4. Demonstrate the use of these techniques through good communication skills-L5
- CO5. Develop accurate algorithms for different networks and determine load flow studies and zero, positive and negative sequence impedances to find fault calculations.L5

UNIT I

PER-UNIT System and Y-bus Formation:

Per-Unit representation of Power system elements - Per-Unit equivalent reactance network of a three phase Power System - Graph Theory: Definitions, Bus Incidence Matrix, Y-Bus formation by Direct and Singular Transformation Methods, Numerical Problems.

UNIT II

Formation of Z-bus:

Formation of Z-Bus: Partial network, Algorithm for the Modification of Z-Bus Matrix for addition element for the following cases: Addition of element from a new bus to reference, Addition of element from a new bus to an old bus, Addition of element between an old bus to reference and Addition of element between two old busses - Modification of Z-Bus for the changes in network

UNIT III

Power Flow Analysis:

Static load flow equations – Load flow solutions using Gauss Seidel Method: Algorithm and Flowchart. Acceleration Factor, Load flow Solution for Simple **Power Systems (Max. 3-Buses)**: Newton Raphson Method in Polar Co-Ordinates Form: Load Flow Solution- Jacobian Elements, Algorithm and Flowchart. Decoupled and Fast Decoupled Methods.- Comparison of Different Methods

UNIT IV

Short Circuit Studies:

Short Circuit Current and MVA Calculations, Fault levels, Application of Series Reactors. Symmetrical Component Theory: Positive, Negative and Zero sequence components, Positive, Negative and Zero sequence Networks. Symmetrical Fault Analysis: LLLG faults with and without fault impedance, Unsymmetrical Fault Analysis: LG, LL and LLG faults with and without fault impedance, Numerical Problems.

UNIT V

Stability Analysis:

Elementary concepts of Steady State, Dynamic and Transient Stabilities. Derivation of Swing Equation, Power Angle Curve and Determination of Steady State Stability. Determination of Transient Stability by Equal Area Criterion, Application of Equal Area Criterion, Critical Clearing Angle Calculation. Numerical methods for solution of swing equation - Methods to improve Stability - Application of Auto Reclosing and Fast Operating Circuit Breakers.

TEXTBOOKS:

1. I.J.Nagrath & D.P.Kothari, *Modern Power system Analysis*, 5th Edition, Tata McGraw-Hill Publishing Company, 2022.
2. P.S.R. Murty, *Power Systems Analysis*, 2nd edition, Elsevier, 2017.
3. G.W.Stagg and A.H.El-Abiad, *Computer Methods in Power System Analysis*, Mc Graw-Hill, 2006.

REFERENCE BOOKS:

1. *Power System Analysis by Grainger and Stevenson*, 2nd edition, McGraw Hill, 2016.
2. *Power System Analysis and Design by B.R.Gupta, S. Chand & Company*, 2005.
3. *Power System Analysis by Hadi Saadat*, McGraw Hill, 1998.

WEB RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc22_ee120/preview

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
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III B.Tech I Semester	L	T	P	C
	3	0	0	3

23AEE26 AI & ML for ELECTRICAL ENGINEERING
(Professional elective-II)

COURSEOUTCOMES:

After the completion of the course students will be able to

- CO1. Understanding the Basics and Architecture of Artificial Intelligence -L1
- CO2. Analyzing and Applying Artificial Neural Networks (ANN) Concepts –n-L3
- CO3. Implementing ANN Applications in Real-World Problems -L5
- CO4. Understanding and Applying Fuzzy Logic Concepts -L2
- CO5. Designing and Implementing Fuzzy Logic Applications -L5

UNIT I

Introduction to Artificial Intelligence:

Introduction and motivation - Approaches to AI - Architectures of AI - Symbolic Reasoning System - Rule based Systems - Knowledge Representation - Expert Systems.

UNIT II

Overview of Machine Learning:

The Motivation & Applications of Machine Learning: Learning Associations, Classification, Regression; Supervised Learning; Unsupervised Learning; Reinforcement Learning; Gradient Descent: Batch Gradient Descent, Stochastic Gradient Descent; Data pre processing; Under fitting and Over fitting issues

UNIT III

Artificial Neural Networks:

Basics of ANN - Comparison between Artificial and Biological Neural Networks - Basic Building Blocks of ANN - Artificial Neural Network Terminologies - McCulloch Pitts Neuron Model - Learning Rules - ADALINE and MADALINE Models - Perceptron Networks (Continuous and Discrete) – Perceptron Convergence Theorem - Back Propagation Neural Networks - Associative Memories – BAM and Hopfield networks.

UNIT IV

Fuzzy Logic:

Classical Sets - Fuzzy Sets - Fuzzy Properties, Operations and relations - Fuzzy Logic System - Fuzzification - Defuzzification - Membership Functions - Fuzzy Rule base - Fuzzy Logic Controller Design.

UNIT V

Applications of AI Techniques:

Load forecasting, Load flow studies, Economic load dispatch, Speed control of DC Motor, Speed Control of Induction Motors.

TEXTBOOKS:

1. Ussell. S and Norvig. P, —*Artificial Intelligence - A Modern Approach*, 4th edition, Pearson, 2022
2. Ethem Alpaydin, —*Introduction to Machine Learning*, MIT Press, 3rd edition, 2014.
3. Timothy J. Ross, "*Fuzzy Logic with Engineering Applications*", Third Edition, WILEY India Edition, 2012
4. S. N. Sivanandam, S. Sumathi and S. N. Deepa, "*Introduction to Neural Networks using MATLAB*", 1st edition, McGraw Hill Edition, 2006.

REFERENCE BOOKS:

1. S. N. Sivanandam, S. Sumathi and S. N. Deepa, "*Introduction to Fuzzy Logic using MATLAB*", Springer International Edition, 2013.
2. Kevin P. Murphy, —*Machine Learning: A Probabilistic Perspective*, 1st Edition, MIT Press, 2012.
3. Yung C. Shin and Chengying Xu, "*Intelligent System - Modeling, Optimization & Control*", CRC Press, 2009.

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech II Semester	L	T	P	C
	3	0	0	3

23AEE27 PROGRAMMABLE LOGIC CONTROLLERS
(Professional elective-II)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Understand different types of PLCs, Its classification and the usage of Easy Veep software- L2
- CO2. Analyze the hardware details of Allen Bradley PLC -L3
- CO3. Design PLC Programming for various applications – L5
- CO4. Apply PLC programming concepts in different fields of Science and Technology -L4
- CO5. Develop Instruction using ADD and SUB functions, UP and Down counters – L5

UNIT I

Introduction to PLCs:

Basic functions of PLCs, Mechanical relays versus PLC, Different types of PLC's – Allen-Bradley – Micrologix: ML1000, ML1100, SLC500, Compact Logix, Mitsubishi FX series, HMI's, Processor and I/O cards

UNIT II

PLC Computational Tool:

Introduction to Easy Veep software, Link between mechanical, electrical and programming documentation, Logic diagrams, Flip-Flop Logic, M8000, M8001 internal bits interpretation, Binary code, data table, manipulation and search engine in Mitsubishi environment Communication between PC and PLC, Communication between PC and HMI, PLC and HMI Serial Local network, Introduction to SLC500

UNIT III

PLC Development:

PLC software and applications, Boolean algebra – understanding binary code, ADD and SUB functions, UP and Down Counters, Introduction to k1Y0, MOV function, CPR and ZCP functions, SHWT and SHRD instructions, Introduction to Absolutely Drum Instruction. Allen Bradley PLC: Introduction to Rockwell Software, Hardware focus, Hardware considerations (Field wiring, Master Control Relay, VFD), Basic programming and applications, Cascade control – subroutine, Different programs.

UNIT IV

PLC Programming:

Programming instructions: Instructions and binary interpretation, Bit Instruction, Timers and counters, Comparison instructions, Programming Instructions - Math instructions, Move and Logical Instructions, Discussions of programming, communications for PLC-Robotic arm, Exercise of setup and monitoring.

UNIT V

Applications:

Analog and Digital parameters by using SLC5/03-VFD-Panel Mate series 1700, Practical Troubleshooting, troubleshooting technique, Control system stability and tuning basics. Applications: Process to rewind, test, and integrate with extrusion process for wiring and fibre optic industries, Food industry – yeast, flour distribution and control. Process Medical equipment Industry – Gas analyzer, Leak tester (using CO₂), plastic wrapping machines etc.

TEXTBOOKS:

1. Gary Anderson, PLC Programming Using RS Logix 500: Basic Concepts of Ladder Logic Programming, 1st Edition, Gary Anderson Tech writing, 2020.
2. Hugh Jack , *Automating manufacturing systems with PLCs*, 7th edition, 2010.
3. PLC Hand Book (Automation direct Siemens).

REFERENCE BOOKS:

1. W. Bolton , Programmable Logic Controllers, 4th Edition, Newnes, 2006.
2. Jay F. Hooper , Introduction to PLCs, 2nd Edition, Carolina Academic Press, 2006.
3. R. Bliesener, F Ebel, Festo , Programmable Logic Controllers, 1st edition, Didactic publishers, 2002.

WEB RESOURCES:

1. <https://nptel.ac.in/courses/108105088>

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech II Semester	L	T	P	C
	3	0	0	3

23AEE28 SWITCHGEAR AND PROTECTION
(Professional elective-II)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Understand the operation of different circuit breakers and their specifications. -L2
- CO2. Analyze the concepts of different relays which are used in real time power system operation. - L3
- CO3. Apply various protective schemes for Transformers, Rotating machines. L4
- CO4. Explain different protective schemes used for Bus bars and Feeders. L3
- CO5. Understand the methods of protection against over voltages and importance of neutral grounding. L2

UNIT I

Circuit Breakers:

Circuit Breakers: Elementary principles of arc interruption, Recovery, Restriking Voltage and Recovery voltages - Restriking Phenomenon, Average, Max. RRRV, Current Chopping and Resistance Switching - CB ratings and Specifications, Selection of CB: Types and Numerical Problems. – Auto reclosures. Description and Operation of- Minimum Oil Circuit breakers, Air Blast Circuit Breakers, Vacuum and SF6 circuit breakers.

UNIT II

Electromagnetic, Static and Numerical Relays:

Basic Requirements of Relays – Primary and Backup protection - Construction details of – Attracted armature, balanced beam, inductor type and differential relays – Universal Torque equation – Characteristics of over current, Direction and distance relays. Static Relays – Advantages and Disadvantages – Definite time, Inverse and IDMT static relays – Comparators – Amplitude and Phase comparators. Microprocessor based relays – Advantages and Disadvantages – Block diagram for over current (Definite, Inverse and IDMT), Distance Relays, Impedance Relays and Reactance Relays with their Flow Charts.

UNIT III

Protection of Generators and Transformers:

Protection of generators: Protection of generators against Stator faults, Rotor faults, and Abnormal Conditions. Restricted Earth fault and Inter-turn fault Protection. Numerical Problems on percentage winding unprotected. Protection of transformers: Percentage Differential Protection, Numerical Problem on Design of CTs Ratio, Buchholtz relay Protection.

UNIT IV

Protection of Feeders, Transmission Lines and Bus bars:

Protection of Feeders (Radial & Ring main) using over current Relays. Protection of Transmission lines – 3 Zone protection using Distance Relays. Carrier current protection. Protection of Bus bars - Differential protection, Differential Pilot wire protection.

UNIT V

Protection Against Over Voltages:

Generation of Over Voltages in Power Systems. -Protection against Lightning Over Voltages - Valve type and Zinc-Oxide Lighting Arresters - Insulation Coordination –BIL. Neutral Grounding, Grounded and Ungrounded Neutral Systems. - Effects of Ungrounded Neutral on system performance. Methods of **Neutral Grounding**: Solid, Resistance, Reactance – Arcing Grounds and Grounding Practices.

TEXTBOOKS:

1. Badari Ram, D.N Viswakarma , *Power System Protection and Switchgear*, 3rd edition, TMH Publications, 2022
2. Sunil S Rao, *Switchgear and Protection*, 13th edition, Khanna Publishers, 2008.

REFERENCE BOOKS:

1. *Protective Relaying Principles and Applications* – J Lewis Blackburn, CRC Press.
2. *Numerical Protective Relays, Final Report 2004* – 1009704 EPRI, USA.
3. *Protective Relaying Theory and Applications* - Walter A Elmore, Marcel Dekker.
4. *Transmission network Protection* by Y.G. Paithankar, Taylor and Francis, 2009.
5. *Power System Protection*- P. M. Anderson, Wiley Publishers.

WEB RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc22_ee101/preview

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech II Semester	L	T	P	C
	3	0	0	3

23AEC42 COMMUNICATION SYSTEMS
(Professional elective-III)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Understand the fundamentals of communication systems and amplitude modulation techniques.
L1
- CO2. Learn about the angle modulation techniques and bandwidth considerations in communication systems.L2
- CO3. Gain knowledge on pulse analog modulation and multiple access techniques used in digital communication systems. L3
- CO4. Get familiar with pulse modulation and digital modulation techniques used in modern communication systems.L3
- CO5. Know about wireless communication systems, cellular networks, and GSM technology.L2

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, 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.

TEXTBOOKS:

1. H Taub, D. Schilling and Gautam Sahe, —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. Rappaport, —Wireless Communications, Pearson Education, 2nd Edition, 2002.

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech II Semester

L	T	P	C
3	0	0	3

23AEE29

ELECTRIC DRIVES

(Professional elective-III)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Evaluate the characteristics and operational aspects of drives operating in different modes. -L3
- CO2. Analyze the operational aspects of various controlled rectifiers fed DC drives operating in different sustainable modes of operation. -L3
- CO3. Analyze the operational aspects of various controlled chopper fed DC drives operating in different sustainable modes of operation. -L3
- CO4. Analyze the operational aspects of various asynchronous motor drives operating in different sustainable modes of operation. -L3
- CO5. Analyze the operational aspects of synchronous motor and stepper motor drives operating in different sustainable modes of operation. -L3

UNIT I

Introduction to Electric Drives:

Electrical drives — block diagram, advantages of electric drive, parts of electric drives, choice of electrical drives, the status of DC and AC drives. Dynamics of electrical drives-fundamental torque equations, speed-torque conventions, and multi-quadrant operation; Equivalent values of drive parameters - loads with rotational and translational motion; Load torques — components, nature and classification. Concept of steady-state stability. Electric braking methods — regenerative, dynamic and plugging. Modes of operation of electrical drive — steady state, acceleration including starting and deceleration including stopping. Speed control and drive classifications, closed-loop control of drives — current limit control, torque control, speed control and position control (Block diagram only).

UNIT II

Single-Phase and Three Phase Converter Fed DC Drives:

Control of DC separately excited motor by single-phase and three-phase half and full bridged converters — voltage and current waveforms for continuous and discontinuous conduction, speed-torque expressions and characteristics. Single phase half-controlled rectifier fed DC series motor — voltage and current waveforms for continuous and discontinuous conduction, speed-torque expressions and characteristics. Multi-quadrant operation of DC separately excited DC motor fed from fully controlled rectifier - mechanical reversible switch in armature, dual converter and field current reversal.

UNIT III

DC Chopper Fed Drives:

Control of DC separately excited motor by one, two and four quadrant choppers - voltage and current waveforms for continuous conduction (motoring, regenerative and dynamic braking), speed-torque expressions and characteristics. Chopper control of DC series motor—operation, speed-torque expressions and characteristics. Closed loop chopper control of separately excited DC motor (Block diagram only).

UNIT IV

Induction Motor Drives:

Three phase induction motors — Introduction, Stator variable voltage control — speed-torque characteristics, AC voltage controllers and efficiency of induction motor under voltage control. Stator variable voltage and variable frequency control — slip speed control, torque-power limitations and modes of operation. Voltage Source Inverters (VSIs) and Current Source Inverters (CSIs) fed induction motor and closed loop operation of induction motor drives (Block diagram only). Comparison of VSI and CSI fed drives. Static rotor resistance control, slip power recovery schemes – static scherbius and Kramer drive, speed-torque characteristics.

UNIT V

Synchronous and Stepper Motor Drives:

Synchronous Motor Drives: Separate control and self-control of synchronous motors — operations of self- controlled synchronous motors by VSI and CSI. Load commutated CSI fed Synchronous motor— operation and speed torque characteristics. Closed loop control operation of synchronous motor drives (Block diagram only). Stepper Motor Drives: Variable reluctance and permanent magnet operation — features of stepper motor — torques Vs stepping rate characteristics and drive circuits. BLDC motor operation and control.

TEXTBOOKS:

1. Gopal K. Dubey, Fundamentals of Electric Drives, Narosa Publications, Alpha Science International Ltd, 2nd Edition, 2002.
2. M. H. Rashid (2003), Power Electronic Circuits, Devices and applications, 3rd edition, Prentice Hall of India, New Delhi, India.
3. Krishnan, Ramu. Electric motor drives: modeling, analysis, and control, 1st Edition, Pearson, 2015.

REFERENCE BOOKS:

1. M. D. Singh, K. B. Khanchandani (2008), *Power Electronics*, 2nd Edition, Tata McGraw Hill Publications, New Delhi.
2. VedamSubramanyam (2008), *Thyristor Control of Electric drives*, 1st Edition, Tata McGraw Hill Publications, New Delhi, India.
3. S. K. Pillai (2007), *A First course on Electrical Drives*, 2nd Edition, New Age International (P) Ltd., New Delhi.
4. P.C. Sen, *Principles of Electrical Machines and Power Electronics*, Wiley, 3rd Edition, 2013.

WEB RESOURCES:

1. https://web.iitd.ac.in/~amitjain/Drives_VTR.pdf
2. <https://nptel.ac.in/courses/108/104/108104140/>
3. <https://nptel.ac.in/courses/108/102/108102046/>
4. https://swayam.gov.in/nd1_noc19_ee65/preview
5. <https://nptel.ac.in/courses/108/102/108102046/>

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech II Semester

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23AEE30 RENEWABLE AND DISTRIBUTED ENERGY TECHNOLOGIES
(Professional elective-III)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Comprehend the renewable energy scenario, anticipate future energy demand and to understand the abstraction concept of electrical energy from Solar Energy. -L3
- CO2. Understand the abstraction concept of electrical energy from wind, bio-mass and Tidal energy sources. -L2
- CO3. Understand electrical energy storage along with working of Green Energy. -L2
- CO4. Exemplify rudimentary idea of Distributed Generation. -L3
- CO5. Comprehend the technical impact, control, and economic aspects of Distributed Generation. -L4

UNIT I

Energy Scenario and Solar Energy:

Introduction: Fundamentals of renewable energy sources, Types of energy, Renewable and Non-renewable energy, SWOT analysis, Global warming and climate change, World energy transformation by 2050, Prospects of renewable energy in the world, Renewable energy availability in India.

Solar Energy Fundamentals: Solar Spectrum, propagation of solar radiation from the sun to earth; solar radiation geometry: sun-earth geometry, extra-terrestrial and terrestrial radiation.

Solar Thermal: Solar Collectors, Solar parabolic trough, Solar tower, Solar cooker, Solar water heater, Solar dryer, Solar Pond.

Solar Electric Power Generation: A Generic PV Cell, PV Materials, Equivalent Circuits for PV Cells, Modules and Arrays; I-V Curve under Standard Testing Conditions; Impact of Temperature and Insolation on I-V curves; Shading Impacts on I-V curves; Maximum Power Point Trackers (MPPT).

UNIT II

Wind and Other Energy Systems:

Wind Energy: Air, Wind, Global and Local Wind, availability of wind energy in India, wind velocity and power from wind; major problems associated with wind power, Classification of wind energy conversion system (WECS)- Horizontal axis- single, double and multi-blade system. Vertical axis- Savonius and darrieus types.

Biomass Energy: Introduction; Photosynthesis Process; Biofuels; Biomass Resources; Biomass conversion technologies-fixed dome; Urban waste to energy conversion; Biomass gasification (Downdraft).

Tidal Power: fundamental characteristics of tidal power, harnessing tidal energy, advantages, and limitations.

UNIT III

Energy Storage and Green Energy:

Energy Storage: Stationary Battery Storage – Basics of Lead-Acid batteries, Battery Storage Capacity, Coulomb efficiency instead of energy efficiency, Battery Sizing. Different Battery storage technologies and comparison of their performance. Introduction to Super capacitors.

Green Energy: Historical Development, Basic Operation of a Fuel Cell, Fuel Cell Thermodynamics, Entropy and the theoretical efficiency of Fuel Cells, Gibbs Free Energy and Fuel Cell efficiency, Electrical output of an Ideal Cell, Electrical Characteristics of Real Fuel Cells, Types of Fuel Cells, H₂: Operating principles, Zero energy Concepts. Benefits of hydrogen energy, hydrogen production technologies (electrolysis method only), hydrogen energy storage, applications of hydrogen energy, problem associated with hydrogen energy.

UNIT IV

Introduction to DG and its Grid Integration:

Introduction: Need for Distributed generation, renewable sources in distributed generation, current scenario in Distributed Generation, and Planning of DGs – Siting and sizing of DGs – optimal placement of DG sources in distribution systems.

Grid integration of DGs: Different types of interfaces - Inverter based DGs and rotating machine-based interfaces - Aggregation of multiple DG units. Energy storage elements: Batteries, ultra capacitors, flywheels.

UNIT V

Technical Impact, Economic and Control aspects of DG:

Technical impacts of DGs: Transmission systems, Distribution systems, De-regulation – Impact of DGs upon protective relaying – Impact of DGs upon transient and dynamic stability of existing distribution systems

Economic and control aspects of DGs: Market facts, issues, and challenges - Limitations of DGs. Voltage control techniques, Reactive power control, Harmonics, Power quality issues. Reliability of DG based systems – Steady-state and Dynamic analysis.

TEXTBOOKS:

1. Gopal K. Dubey, Fundamentals of Electric Drives, Narosa Publications, Alpha Science International Ltd, 2nd Edition, 2002.
2. G. D. Rai, Non-Conventional Sources of Energy, Khanna Publisher, 2004

REFERENCE BOOKS:

1. G N Tiwari, *Solar Energy: Fundamentals, Design, Modeling and Applications*, Narosa, 2002.
2. Mukund R Patel, *Wind and Solar Power Systems: Design, Analysis, and Operation*, 2nd Edition, Taylor & Francis, 2006.
3. H. Lee Willis, Walter G. Scott, —*Distributed Power Generation – Planning and Evaluation*®, Marcel Decker Press, 2000.
4. Gilbert M. Masters, —*Renewable and Efficient Electric Power Systems*®, 2nd Edn., IEEE Press, Wiley, 2013.
5. N. Jenkins, J.B. Ekanayake and G. Strbac, —*Distributed Generation*®, 1st Edn, The Institution of Engineering and Technology, London, 2010.

WEB RESOURCES:

1. <https://archive.nptel.ac.in/courses/121/106/121106014/#>
2. https://onlinecourses.nptel.ac.in/noc22_ch27/preview
3. <https://www.nptelvideos.com/lecture.php?id=8517>

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech II Semester	L	T	P	C
	3	0	0	3

23ACE44 DISASTER MANAGEMENT
(Open Elective-II)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO6. Understand the fundamental concepts of natural disasters, their occurrence, and disaster risk reduction strategies -L2
- CO7. Analyze the impact of cyclones on structures and explore retrofitting techniques for adaptive reconstruction. -L4
- CO8. Apply wind engineering principles and computational techniques in designing wind - resistant structures.-L3
- CO9. Evaluate earthquake effects on buildings and develop strategies for seismic retrofitting Assess seismic safety planning, design considerations, and innovative construction materials for disaster-resistant structures.L5

UNIT I

Introduction to Natural Disasters– Brief Introduction to Different Types of Natural Disasters, Occurrence of Disasters in Different Climatic and Geographical Regions, Hazard Maps (Earthquake and Cyclone) of The World and India, Regulations for Disaster Risk Reduction, Post-Disaster Recovery and Rehabilitation (Socioeconomic Consequences).

UNIT II

Cyclones and Their Impact– Climate Change and Its Impact On Tropical Cyclones, Nature of Cyclonic Wind, Velocities and Pressure, Cyclone Effects, Storm Surges, Floods, and Landslides. Behavior of Structures in Past Cyclones and Windstorms, Case Studies. Cyclonic Retrofitting, Strengthening of Structures, and Adaptive Sustainable Reconstruction. Life-Line Structures Such as Temporary Cyclone Shelters

UNIT III

Wind Engineering and Structural Response– Basic Wind Engineering, Aerodynamics of Bluff Bodies, Vortex Shedding, and Associated Unsteadiness Along and Across Wind forces. Lab: Wind Tunnel Testing and Its Salient Features. Introduction to Computational Fluid Dynamics (CFD). General Planning and Design Considerations Under Windstorms and Cyclones. Wind Effects On Buildings, towers, Glass Panels, Etc., and Wind-Resistant Features in Design. Codal Provisions, Design Wind Speed, Pressure Coefficients. Coastal Zoning Regulations for Construction and Reconstruction in

Coastal Areas. Innovative Construction Materials and Techniques, Traditional Construction Techniques in Coastal Areas

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

TEXTBOOKS:

4. David Alexander, Natural Disasters, 1st Edition, CRC Press, 2017.
5. Edward A. Keller and Duane E. DeVecchio, Natural Hazards: Earth's Processes as Hazards, Disasters, and Catastrophes, 5th Edition, Routledge, 2019.

REFERENCE BOOKS:

7. Ben Wisner, J.C. Gaillard, and Ilan Kelman (Editors), Handbook of Hazards and Disaster Risk Reduction and Management, 2nd Edition, Routledge, 2012.
8. Damon P. Coppola, Introduction to International Disaster Management, 4th Edition, Butterworth-Heinemann, 2020.
9. Bimal Kanti Paul, Environmental Hazards and Disasters: Contexts, Perspectives and Management, 2nd Edition, Wiley-Blackwell, 2020.

WEB RESOURCES:

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

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech II Semester	L	T	P	C
	3	0	0	3

23ACE45 SUSTAINABILITY IN ENGINEERING PRACTICES

(Open Elective-II)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO6. Understand the fundamentals of sustainability, the carbon cycle, and the environmental impact of construction materials .L1
- CO7. Analyze sustainable construction materials, their durability, and life cycle assessment. L4
- CO8. Apply energy calculations in construction materials and assess their embodied energy. L3
- CO9. Evaluate green building standards, energy codes, and performance ratings registers. Assess the environmental effects of energy use, climate change, and global warming. L5

UNIT I

INTRODUCTION: Introduction and Definition of Sustainability - Carbon Cycle - Role of Construction Material: Concrete and Steel, Etc. - CO₂ Contribution From Cement and Other Construction Materials.

UNIT II

MATERIALS USED IN SUSTAINABLE CONSTRUCTION: Construction Materials and Indoor Air Quality - No/Low Cement Concrete - Recycled and Manufactured Aggregate - Role of QC and Durability - Life Cycle and Sustainability.

UNIT III

ENERGY CALCULATIONS: Components of Embodied Energy - Calculation of Embodied Energy for Construction Materials - Energy Concept and Primary Energy - Embodied Energy Via-A-Vis Operational Energy in Conditioned Building - Life Cycle Energy Use.

UNIT IV

GREEN BUILDINGS: Control of Energy Use in Building - ECBC Code, Codes in Neighboring Tropical Countries - OTTV Concepts and Calculations – Features of LEED and TERI – GRIHA Ratings - Role of Insulation and Thermal Properties of Construction Materials - Influence of Moisture Content and Modeling - Performance Ratings of Green Buildings - Zero Energy Building.

UNIT V

ENVIRONMENTAL EFFECT: 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

TEXTBOOKS:

1. Charles J Kibert, Sustainable Construction: Green Building Design & Delivery, 4th Edition , Wiley Publishers 2016
2. Steve Goodhew, Sustainable Construction Process, Wiley Blackwell, UK, 2016.

REFERENCE BOOKS:

1. *Craig A. Langston & Grace K.C. Ding, Sustainable Practicesin the Built Environment, Butterworth Heinemann Publishers, 2011.*
2. William P Spence, Construction Materials, Methods & Techniques (3e), Yesdee Publication Pvt. Ltd, 2012.

WEB RESOURCES:

1. <https://archive.nptel.ac.in/courses/105/105/105105157/>

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech II Semester

L	T	P	C
3	0	0	3

23AME39 AUTOMATION AND ROBOTICS
(Open Elective-II)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO6. Understand and analyze the structure and functions of automated manufacturing systems, and evaluate hardware components for efficient production.L2
- CO7. Analyze and design automated flow lines with or without buffer storage, perform quantitative evaluations, apply assembly line balancing techniques .L4
- CO8. Classify robot configurations, select suitable actuators and sensors, analyze and apply. automation and robotics principles to optimize production efficiency and flexibility .L4
- CO9. Apply kinematic and dynamic modeling using D-H notation and select appropriate. hardware and control strategies for real-world industrial scenario to analyze and design automated and robotic systems.L3
- CO10. Assign, program, and implement robotic systems, understand and apply robotics technology to manufacturing tasks L5

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 translation - D-H notation, Forward inverse kinematics. Manipulator Dynamics: Differential transformations, Jacobians, Lagrange - Euler and Newton – Euler formulations. 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.

TEXTBOOKS:

4. Automation , Production systems and CIM,M.P. Groover /Pearson Edu
5. Industrial Robotics - M.P. Groover, TMH.

REFERENCE BOOKS:

5. *Robotics , Fu K S, McGraw Hill, 4th edition, 2010..*
6. *An Introduction to Robot Technology, P. Coiffet and M. Chaironze, Kogam Page Ltd. 1983 London..*
7. *Robotic Engineering , Richard D. Klafter, Prentice Hall.*
8. *Robotics, Fundamental Concepts and analysis – Ashitave Ghosal ,Oxford Press, 1/e, 2006.*
9. *Robotics and Control , Mittal R K &Nagrath I J , TMH*

WEB RESOURCES:

<https://www.youtube.com/watch?v=yxZm9WQJUA0&list=PLRLB5WCqU54UJG45UnazSYmnmhl-gt76o>

<https://www.youtube.com/watch?v=6f3bvIhSWyM&list=PLRLB5WCqU54X5Vy4DwjfSODT3ZJgwEjyE>

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech II Semester	L	T	P	C
	3	0	0	3

23AEC34 ELECTRONICS MEASUREMENTS AND INSTRUMENTATION

(Open Elective-II)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO6. Learn about the performance characteristics of instruments and measurement of electrical quantities.L1
- CO7. Understand the construction, working and applications of different types of CRO's.L2
- CO8. Compare the working of different types of bridges.L4
- CO9. Know the working of signal & function generators and analyzers L1
- CO10. Grasp the working of sensors and transducers in measuring physical parametersL2

UNIT 1: PERFORMANCE CHARACTERISTICS OF INSTRUMENTS:

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

UNIT 2: OSCILLOSCOPES:

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

UNIT 3 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 4: SIGNAL GENERATORS:

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

UNIT 5: SENSORS AND TRANSDUCERS –

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

TEXT BOOKS:

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

REFERENCE BOOKS:

11. David A. Bell, “*Electronic Instrumentation & Measurements*”, 2nd Edition, PHI, 2003
12. K. Lal Kishore, “*Electronic Measurements & Instrumentations*”, Pearson Education, 2009

WEB 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

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech II Semester	L	T	P	C
	3	0	0	3

23ACD07 OPERATING SYSTEMS AND SYSTEMS SECURITY
(Open Elective-II)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO6. Describe the basics of the operating systems, mechanisms of OS to handle processes, threads, and their communication. L1
- CO7. Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection. L2
- CO8. Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system. L3
- CO9. Illustrate different conditions for deadlock and their possible solutions Analyze the memory management and its allocation policies. L4
- CO10. Able to design and implement file systems, focusing on file access methods directory structure, free space management, and also explore various protection mechanisms

UNIT I

OPERATING SYSTEMS OVERVIEW, SYSTEM STRUCTURES

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

UNIT II

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

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

UNIT III

MEMORY-MANAGEMENT STRATEGIES, VIRTUAL MEMORY MANAGEMENT

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

UNIT IV

DEADLOCKS, FILE SYSTEMS

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

UNIT V

SYSTEM PROTECTION, SYSTEM SECURITY

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

TEXTBOOKS:

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. Dhamdhare 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

WEB RESOURCES:

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

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech II Semester

L	T	P	C
3	0	0	3

23ACM04 MACHINE LEARNING FOR ENGINEER

(Open Elective -II)

COURSE OUTCOMES:

After the completion of the course students will be able to

CO6. Understand and distinguish among different types of learning methods .L2

CO7. Apply supervised and unsupervised learning algorithms to datasets. L3

CO8. Analyze model performance using cross-validation and error metrics.L4

CO9. Build, test, and improve machine learning models for classification and prediction . L3

CO10. Use Python-based libraries (e.g., Scikit-learn) to implement ML algorithms.L2

UNIT-I

INTRODUCTION TO MACHINE LEARNING AND LINEAR MODELS

Definition and Scope of Machine Learning, Applications and Types of Learning: Supervised, Unsupervised, Reinforcement, Linear Regression: Least Squares, Cost Function, Gradient Descent, Polynomial Regression and Overfitting, Evaluation Metrics: RMSE, MAE, R² Score, Bias-Variance Trade off.

UNIT-II

CLASSIFICATION ALGORITHMS

Classification Overview and Decision Boundaries, Logistic Regression: Sigmoid Function and Cost, K-Nearest Neighbors (KNN), Naïve Bayes Classifier, Decision Trees and Random Forests, Model Evaluation: Confusion Matrix, Precision, Recall, F1-Score.

UNIT-III

SUPPORT VECTOR MACHINES AND ENSEMBLE METHODS:

Support Vector Machines: Concepts, Kernels, Hyperplane and Margin Concepts, Kernel Tricks: RBF and Polynomial, Ensemble Learning: Bagging, Boosting, and Voting, Gradient Boosting, AdaBoost, and XGBoost, Model Tuning and Hyperparameter Optimization..

UNIT-IV

UNSUPERVISED LEARNING TECHNIQUES

Clustering Overview: Applications, K-Means Clustering Algorithm, Hierarchical Clustering, DBSCAN and Density- Based Methods, Principal Component Analysis (PCA) for Dimensionality Reduction, Silhouette Score, Davies-Bouldin Index for Cluster Validation..

UNIT-V

ADVANCED TOPICS AND APPLICATIONS

Reinforcement Learning Basics and Markov Decision Processes, Introduction to Neural Networks and Deep Learning, Cross-Validation Techniques: k-Fold, Leave-One-Out, Feature Engineering and Feature Selection, Deployment of ML Models (Flask, Streamlit, etc.), Case Studies: Medical Diagnosis, Spam Detection, Credit Scoring.

TEXTBOOKS:

3. Tom Mitchell, Machine Learning, McGraw-Hill Education
4. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, O'Reilly Media
5. Ethem Alpaydin, Introduction to Machine Learning, MIT Press

REFERENCE BOOKS:

1. *Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer*
2. *Kevin P. Murphy, Machine Learning: A Probabilistic Perspective, MIT Press.*
3. *Christopher Bishop, Pattern Recognition and Machine Learning, Springer.*

WEB RESOURCES:

1. *Coursera – Machine Learning by Andrew Ng (Stanford University)*
2. *Scikit-learn Documentation*
3. *Kaggle Learn – Machine Learning*
4. *Google's Machine Learning Crash Course*

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech II Semester

L	T	P	C
3	0	0	3

23AHS35 OPTIMIZATION TECHNIQUES AND APPLICATIONS
(Open Elective -II)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO6. Understand the meaning, purpose, tools of Operations Research and linear programming in solving practical problems in industry.L2
- CO7. Interpret the transportation models' solutions and infer solutions to the real-world problems.L4
- CO8. Develop mathematical skills to analyze and solve nonlinear programming models arising from a wide range of applications.L5
- CO9. Apply the concept of non-linear programming for solving the problems involving non-linear constraints and objectives .L3
- CO10. Apply the concept of unconstrained geometric programming for solving the problems involving non-linear constraints and objectives.-L3

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 INTRODUCTION:

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

TEXTBOOKS:

5. Singiresu S Rao., Engineering Optimization: Theory and Practices, New Age Int. (P) Ltd. Publishers, New Delhi.
6. J. C. Panth, Introduction to Optimization Techniques, (7-e) Jain Brothers, New Delhi.

REFERENCE BOOKS:

3. Harvey M. Wagner, Principles of Operation Research, Printice-Hall of India Pvt. Ltd. New Delhi.
4. Peressimi A.L., Sullivan F.E., Vhl, J. J. *Mathematics of Non-linear Programming*, Springer – Verlag.

WEB 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

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
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L	T	P	C
3	0	0	3

III B.Tech II Semester (EEE)

23AHS37 PHYSICS OF ELECTRONIC MATERIAL AND DEVICES
(Open Elective-II)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1.** To make the students to understand the concept of crystal growth, defects in crystals and thin films.L2
- CO2.** To provide insight into various semiconducting materials and their properties.L1
- CO3.** To develop a strong foundation in semiconductor physics and device engineering.L4
- CO4.** To elucidate excitonic and luminescent processes in solid-state materials.L2
- CO5.** To understand the principles, technologies, and applications of modern display systems.L2

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, Hetero junctions, Transistors, MOSFETs.

UNIT-IV

EXCITONS AND LUMINESCENCE:

Luminescence: Different types of luminescence, basic definitions, Light emission in solids, Inter-band luminescence, Direct and indirect gap materials.

Photoluminescence : General Principles of photoluminescence, Excitation and relaxation, OLED, Quantum-dot. Electro-luminescence : General Principles of electroluminescence, light emitting diode, diode laser.

UNIT-V

DISPLAY DEVICES :

LCD, three-dimensional display: Holographic display, light-field displays: Head-mounted display, MOEMS (Micro- Opto-Electro-Mechanical Systems) and MEMS displays.

TEXTBOOKS:

5. Principles of Electronic Materials and Devices-S.O. Kasap,Hill,2006. McGraw-Hill Education (India) Pvt. Ltd.,4thedition, 2021.
6. *Semiconductor physics & devices: basic principles, 4th Edition, McGraw-Hill, 2012.*

REFERENCE BOOKS:

1. Solid State Electronic Devices -B.G. Streetman and S. Banerjee, PHI Learning,6th edition.
2. Electronic Materials Science- Eugene A. Irene, Wiley, 2005
3. Electronic Components and Materials, Grover and Jamwal, DhanpatRai and Co., New Delhi.
4. An Introduction to Electronic Materials for Engineers-Wei Gao, Zhengwei Li, Nigel Sammes, World Scientific Publishing Co. Pvt. Ltd. 2nd Edition,2011

WEBRESOURCES

<https://nptel.ac.in/courses/113/106/113106062/>

https://onlinecourses.nptel.ac.in/noc20_ph24/preview

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech I Semester

L	T	P	C
3	0	0	3

23AHS38 CHEMISTRY OF POLYMERS AND APPLICATIONS
(Open elective-II)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO6. Classify the polymers, Explain polymerization mechanism, Differentiate addition, condensation polymerizations, Describe measurement of molecular weight of polymer L4
- CO7. Describe the physical and chemical properties of natural polymers and Modified cellulose. L2
- CO8. Differentiate Bulk, solution, Suspension and emulsion polymerization, Describe fibers and elastomers, Identify the thermosetting and thermo polymers. L5
- CO9. Identify types of polymer networks, Describe methods involve in hydrogel preparation, L2
- CO10. Explain classification and mechanism of conducting and degradable polymers. L4

UNIT – I POLYMERS-BASICS AND CHARACTERIZATION:-

Basic concepts: monomers, repeating units, degree of polymerization, linear, branched and network polymers, classification of polymers, Polymerization: addition, condensation, copolymerization and coordination polymerization. Average molecular weight concepts: number, weight and viscosity average molecular weights, polydispersity and molecular weight distribution. Measurement of molecular weight: End group, viscosity, light scattering, osmotic and ultracentrifugation methods, analysis and testing of polymers.

UNIT – II NATURAL POLYMERS & MODIFIED CELLULOSES

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 cellulose: Cellulose esters and ethers such as Ethyl cellulose, CMC, HPMC, cellulose acetals, Liquid crystalline polymers; specialty plastics- PES, PAES, PEEK, PEA..

UNIT – III SYNTHETIC POLYMERS

Addition and condensation polymerization processes– Bulk, Solution, Suspension and Emulsion polymerization.

Preparation and significance, classification of polymers based on physical properties. Thermoplastics, Thermosetting plastics, Fibers and elastomers, General Applications. Preparation of Polymers based on different types of monomers, Olefin polymers(PE,PVC), Butadiene polymers(BUNA-S,BUNA-N), nylons, Urea-formaldehyde, phenol – formaldehyde, Melamine Epoxy and Ion exchange resins

UNIT – IV HYDROGELS OF POLYMER NETWORKS

Definitions of Hydrogel, polymer networks, Types of polymer networks, Methods involved in hydrogel preparation, Classification, Properties of hydrogels, Applications of hydrogels in drug delivery.

UNIT – V CONDUCTING AND DEGRADABLE POLYMERS

Conducting polymers: Introduction, Classification, Mechanism of conduction in Poly Acetylene, Poly Aniline, Poly Thiophene, Doping, Applications.

Degradable polymers: Introduction, Classifications, Examples, Mechanism of degradation, poly lactic acid, Nylon-6, Polyesters, applications.

TEXTBOOKS:

1. A Text book of Polymer science, Billmayer
2. Polymer Chemistry – G.S.Mishra
3. Polymer Chemistry – Gowarikar

REFERENCE BOOKS:

1. Organic polymer Chemistry, K.J.Saunders, Chapman and Hall
2. Advanced Organic Chemistry, B.Miller, Prentice Hall
3. Polymer Science and Technology by Premamoy Ghosh, 3rd edition, McGraw-Hill, 2010.

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech II Semester	L	T	P	C
	3	0	0	3

23AHS39 ACADEMIC WRITING AND PUBLIC SPEAKING
(Open elective-II)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO6. Understand various elements of Academic Writing L2
- CO7. Identify sources and avoid plagiarism L1
- CO8. Demonstrate the knowledge in writing a Research paper.L3
- CO9. Analyse different types of essays.L4
- CO10. Assess the speeches of others and know the positive strengths of speakers.L5
- CO11. Build confidence in giving an impactful presentation to the audience.L3

UNIT – 1

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 – 2

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 – 3

ESSAY & WRITING REVIEWS:

Compare and Contrast – Argumentative Essay – Exploratory Essay – Features and Analysis of Sample Essays – Writing Book Report, Summarizing, Book/film Review- SoP

UNIT – 4

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 – 5

PUBLIC SPEAKING AND NON-VERBAL DELIVERY: Body Language – Facial Expressions- Kinesics – Oculistics – Proxemics – Haptics – Chronemics -Paralanguage - Signs

TEXTBOOKS:

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

WEBRESOURCES:

1. <https://youtu.be/NNhTIT81nH8>
2. <https://www.youtube.com/watch?v=478ccrWKY-A>
3. <https://www.youtube.com/watch?v=nzGo5ZC1gMw>
4. <https://www.youtube.com/watch?v=Qve0ZBmJMh4>
5. <https://courses.lumenlearning.com/publicspeakingprinciples/chapter/chapter-12-nonverbal-aspects-of-delivery/>
6. https://onlinecourses.nptel.ac.in/noc21_hs76/preview
7. <https://archive.nptel.ac.in/courses/109/107/109107172/#>
8. <https://archive.nptel.ac.in/courses/109/104/109104107/>

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech II Semester	L	T	P	C
	3	0	0	3

23AHS36 MATHEMATICAL FOUNDATION OF QUANTUM TECHNOLOGIES
(Open elective-II)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO6. Understand vector spaces, inner products, and linear operators with applications to quantum systems L1,L2
- CO7. Apply linear algebra concepts to function spaces and analyze the transition from finite to infinite dimensional systems.L3,L4
- CO8. Analyze quantum mechanical formalism including measurement theory, uncertainty relations, and time evolution.L4
- CO9. Apply quantum mechanical principles to solve problems in simple quantum systems and evaluate statistical interpretations.L3,L5
- CO10. Evaluate advanced concepts in composite systems and synthesize understanding of measurement processes and modern quantum theory.L5,L6

UNIT – I LINEAR ALGEBRA FOUNDATION FOR QUANTUM MECHANICS

Vector spaces definition and examples ($\mathbb{R}^2$, $\mathbb{R}^3$, function spaces), Inner products (dot product, orthogonality, normalization), Linear operators (matrices, eigenvalues, eigenvectors), Finite-dimensional examples (2×2 matrices, spin- 1/2 systems), Dirac notation introduction ($|\psi\rangle$, $\langle\phi|$, $\langle\phi|\psi\rangle$), Change of basis (transformations, unitary matrices).

UNIT – II FROM FINITE TO INFINITE DIMENSIONS

Function spaces (L^2 space, square-integrable functions), Inner products for functions ($\int \psi^* \phi \, dx$), Orthogonal function sets (Fourier series, basis functions), Introduction to Hilbert space concept (complete inner product spaces), Position and momentum representations (wave functions), Operators on functions (d/dx , multiplication by x).

UNIT – III QUANTUM MECHANICAL FORMALISM

Mathematical formulation (states as vectors, observables as operators), Measurement theory (Born rule, expectation values, probabilities), Uncertainty relations (mathematical derivation from commutators), Time evolution (Schrödinger equation, unitary evolution).

UNIT – IV APPLICATIONS AND STATISTICAL INTERPRETATION

Simple applications (infinite square well, harmonic oscillator), Statistical interpretation (ensembles, pure vs mixed states), Measurement process (von Neumann measurement scheme).

UNIT – V ADVANCED TOPICS

Composite systems (tensor products basic introduction), Reversibility and irreversibility (unitary evolution vs measurement), Thermodynamic connections (equilibrium states, entropy), Modern perspectives (decoherence, measurement problem conceptual).

TEXTBOOKS:

3. David J. Griffiths, Darrell F. Schroeter, —Introduction to Quantum Mechanics, 3rd Edition, Cambridge University Press (2018).
4. R. Shankar, Principles of Quantum Mechanics, 2nd Edition, Kluwer Academy/Plenum Publishers (1994).

REFERENCE BOOKS:

3. George. F. Simmons, —Introduction to Topology and Modern Analysis, MedTech Science Press.
4. Gilbert Strang, Linear Algebra and Its Applications, 4th Edition, Cengage Learning (2006).
5. John von Neumann and Robert T Beyer, Mathematical Foundations of Quantum Mechanics, Princeton Univ. Press (1996).

WEBRESOURCES:

1. <https://eclass.uoa.gr/modules/document/file.php/CHEM248/Griffiths%20-%20Introduction%20to%20Quantum%20Mechanics%203rd%20ed%202018.pdf>
2. <https://fisica.net/mecanica-quantica/Shankar%20-%20Principles%20of%20quantum%20mechanics.pdf>

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

	L	T	P	C
III B.Tech II Semester (EEE)	0	0	3	1.5

23AEE31 ELECTRICAL MEASUREMENTS AND INSTRUMENTATION LAB
(Professional Core)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Determine the unknown Resistance, Inductance and Capacitance using AC and DC bridges. -L3
- CO2. Understand the calibration of single phase energy meter. -L2
- CO3. Understand the measurement of power, power factor in a single phase circuit and real, reactive Power in a three phase circuit. -L2
- CO4. Extend the range of Ammeter and Voltmeter. -L5
- CO5. Understand the working of Transducers, Measure distance, temperature, current, voltage and humidity using sensors. -L2

LIST OF EXPERIMENTS:

1. Measurement of resistance using Wheatstone bridge and Kelvin's Double Bridge.
2. Measurement of inductance using Maxwell's bridge, Anderson bridge.
3. Measurement of capacitance using De-Sauty's bridge, Schering bridge.
4. Calibration of single phase energy meter using direct loading method.
5. Calibration of energy meter using Phantom load kit.
6. Measurement of Power using 3-Voltmeter and 3-Ammeter methods in a single phase Circuit.
7. Measurement to Real and Reactive Power in a three phase circuit.
8. Extension of range of given Ammeter and Voltmeter.
9. Measurement of displacement using LVDT.
10. Study of CRO: Measurement of voltage, current, frequency using lissajous patterns.
11. Measurement of different ranges of temperatures using i) RTD ii) Thermocouple
12. Measurement of strain with the help of strain gauge transducers.

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

III B.Tech II Semester (EEE)	L	T	P	C
	0	0	3	1.5

23AEC23 MICROPROCESSORS AND INTERFACING LAB
(Professional Core)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Formulate a program and implement algorithms using Assembly language. L2
- CO2. Describe an Assembly language program for the 8086 Microprocessor. L3
- CO3. Develop programs for different applications in the 8086 Microprocessor. L4
- CO4. Interface peripheral devices with 8086 and 8051. L4
- CO5. Use an Assembly/Embedded C programming approach for solving real- world problems. L3

LIST OF EXPERIMENTS:

1. Programs for 16 Bit Arithmetic Operations (Using various addressing modes)
 - a) Write an ALP to Perform Addition and Subtraction of Multi precision numbers.
 - b) Write an ALP to Perform Multiplication and division of signed and unsigned Hexadecimal numbers.
 - c) Write an ALP to find square, cube and factorial of a given number.
2. Programs Involving Bit Manipulation Instructions
 - a) Write an ALP to find the given data is positive or negative.
 - b) Write an ALP to find the given data is odd or even.
 - c) Write an ALP to find Logical ones and zeros in a given data.
3. Programs on Arrays for 8086
 - a) Write an ALP to find Addition/subtraction of N nos.
 - b) Write an ALP for finding largest/smallest no.
 - c) Write an ALP to sort given array in Ascending/descending order.\
4. Programs on String Manipulations for 8086
 - a) Write an ALP to find String length.
 - b) Write an ALP for Displaying the given String.
 - c) Write an ALP for Comparing two Strings.
 - d) Write an ALP to reverse String and Checking for palindrome.
5. Programs for Digital Clock Design Using 8086
 - a) Write an ALP for Designing clock using INT 21H Interrupt.
 - b) Write an ALP for Designing clock using DOS Interrupt Functions.
 - c) Write an ALP for Designing clock by reading system time.

6. Interfacing Stepper Motor with 8086
 - a) Write an ALP to 8086 processor to Interface a stepper motor and operate it in clockwise by choosing variable step-size.
 - b) Write an ALP to 8086 processor to Interface a stepper motor and operate it in Anti-clockwise by choosing variable step-size.
7. Interfacing ADC/DAC with 8086
 - a) Write an ALP to 8086 processor to Interface ADC.
 - b) Write an ALP to 8086 processor to Interface DAC and generate Square Wave/Triangular Wave/Step signal.
8. Communication between Two Microprocessors
 - a) Write an ALP to have Parallel communication between two microprocessors using 8255
 - b) Write an ALP to have Serial communication between two microprocessor kits using 8251.
9. Programs using Arithmetic and Logical Instructions for 8051
 - a) Write an ALP to 8051 Microcontroller to perform Arithmetic operations like addition, subtraction,
 - b) Multiplication and Division.
 - c) Write an ALP to 8051 Microcontroller to perform Logical operations like AND, OR and XOR.
 - d) Programs related to Register Banks.
10. Programs to Verify Timers/Counters of 8051
 - a) Write a program to create a delay of 25msec using Timer0 in mode 1 and blink all the Pins of P0.
 - b) Write a program to create a delay of 50 μ sec using Timer1 in mode 0 and blink all the Pins of P2.
 - c) Write a program to create a delay of 75msec using counter0 in mode 2 and blink all the Pins of P1.
 - d) Write a program to create a delay of 80 μ sec using counter1 in mode 1 and blink all the Pins of P3.
11. UART Operation in 8051
 - a) Write a program to transfer a character serially with a baud rate of 9600 using UART.
 - b) Write a program to transfer a character serially with a baud rate of 4800 using UART.
 - c) Write a program to transfer a character serially with a baud rate of 2400 using UART.
12. Interfacing LCD with 8051
 - a) Develop and execute the program to interface 16*2 LCD to 8051.
 - b) Develop and execute the program to interface LCD to 8051 in 4-bit or 8-bit mode.

Reference Books:

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

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	L	T	P	C
III B.Tech II Semester (EEE)	0	1	2	2

23AEE32 APPLICATIONS OF SOFT COMPUTING TOOLS IN ELECTRICAL ENGINEERING
(Skill Enhancement Course)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Understand the basic concepts of Electrical Engineering. -L2
- CO2. Apply the concepts to design MATLAB models. -L4
- CO3. Analyze various Electrical engineering applications through MATLAB. L3
- CO4. Develop real time models using MATLAB. -L5.
- CO5. Design virtual PMU -L5.

LIST OF EXPERIMENTS:

1. Transient analysis of given electrical network
2. Simulation of 1-phase and 3-phase transformers
3. Study of the dynamics of second order system
4. Implementation of buck and boost dc-dc converters
5. Study on the design of PI controllers and stability analysis for a DC-DC buck Converter
6. Sine-PWM techniques for single-phase half-bridge, full-bridge and three-phase inverters
7. Economic Load Dispatch of (i) Thermal Units and (ii) Thermal Plants using Conventional method
8. Transient Stability Analysis of Power Systems using Equal Area Criterion (EAC)
9. Reactive Power Control in a transmission system (Ferranti effect, Effect of shunt Inductor)
10. Fault studies using Z-bus matrix
11. Design of virtual PMU
12. Wide area control of Two area Kundur system

Online Learning Resources/Virtual Labs:

1. <http://vem-iitg.vlabs.ac.in/>
2. <https://vp-dei.vlabs.ac.in/Dreamweaver/>

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(AUTONOMOUS)

	L	T	P	C
III B.Tech II Semester (EEE)	2	0	0	0
23AMB16 TECHNICAL PAPER WRITING & IPR				

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Identify key secondary literature related to their proposed technical paper writing-L1,L2
- CO2. Explain various principles and styles in technical writing-L1, L2
- CO3. Use the acquired knowledge in writing a research/technical paper-L3
- CO4. Analyse rights and responsibilities of holder of Patent, Copyright, Trademark, International Trademark etc-L4
- CO5. Evaluate different forms of IPR available at national & international level-L5
- CO6. Develop skill of making search of various forms of IPR by using modern tools and techniques-L3,L6

UNIT – I:

Principles of Technical Writing: styles in technical writing; clarity, precision, coherence and logical sequence in writing-avoiding ambiguity- repetition, and vague language -highlighting your findings-discussing your limitations -hedging and criticizing -plagiarism and paraphrasing.

UNIT – II:

Technical Research Paper Writing: Abstract- Objectives-Limitations-Review of Literature- Problems and Framing Research Questions- Synopsis

UNIT – III:

Process of research: publication mechanism: types of journals- indexing-seminars- conferences- proof reading –plagiarism style; seminar & conference paper writing; Methodology-discussion-results-citation rules

UNIT – IV:

Introduction to Intellectual property: Introduction, types of intellectual property, International organizations, agencies and treaties, importance of intellectual property rights

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting evaluating trade mark, trade mark registration processes.

UNIT – V:

Law of copy rights: Fundamentals of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer. Patent law, intellectual property audits.

TEXTBOOKS:

1. Deborah. E. Bouchoux, Intellectual Property Rights, Cengage Learning India, 2013.
2. Meenakshi Raman, Sangeeta Sharma. Technical Communication: Principles and practices. Oxford.

REFERENCE BOOKS:

1. R. Myneni, *Law of Intellectual Property*, 9th Ed, Asia law House, 2019.
2. Prabuddha Ganguli, *Intellectual Property Rights* Tata Mcgraw Hill, 2001
3. P. Naryan, *Intellectual Property Law*, 3rd Ed, Eastern Law House, 2007.
4. Adrian Wallwork. *English for Writing Research Papers* Second Edition. Springer Cham Heidelberg New York, 2016
5. Dan Jones, Sam Dragga, *Technical Writing Style*.

Online Learning Resources

1. <https://theconceptwriters.com.pk/principles-of-technical-writing/>
2. <https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.html>
3. <https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.html>
4. <https://www.manuscriptedit.com/scholar-hangout/process-publishing-research-paper-journal/>
5. <https://www.icsi.edu/media/website/IntellectualPropertyRightLaws&Practice.pdf>
6. <https://lawbhoomi.com/intellectual-property-rights-notes/>
7. <https://www.extension.purdue.edu/extmedia/ec/ec-723.pdf>

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

IV B.Tech I Semester (EEE)

L	T	P	C
3	0	0	3

23AEE34 POWER SYSTEM OPERATION AND CONTROL
(Professional core)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. To Understand the Thermal Station Characteristics and Economic Dispatch Problem of Thermal Units and Understand the Optimal Scheduling of Hydro-Thermal Station with minimization of cost of Thermal station – L3.
- CO2. To Develop the First Order Models of Turbine, Governor and Generator Load Model – L4.
- CO3. To Evaluate the Steady State & Dynamic Analysis of Single Area and Two Area Load Frequency Control – L3.
- CO4. To Analyse the Series & Shunt Reactive Power Compensation in Transmission and Load Systems – L3.
- CO5. To Understand the Aspects of Power System Deregulation – L2.

UNIT I

Optimum Operation Thermal Power Station:

Optimum Operation of Thermal Power Station: Heat Rate Curve – Cost Curve – Incremental Fuel Rate – Incremental Fuel Cost and Production Cost, Input – Output Characteristics of Thermal Power Stations and Hydro Power Stations. Optimum Generation Allocation of Thermal Units without Transmission Line Losses and Optimum Generation Allocation with effect of Transmission Line Losses. Transmission Line Loss Formula, Loss coefficients, Numerical Problems.

UNIT II

Economic Operation of Hydro – Thermal Scheduling:

Optimum Operation of Hydrothermal Power Stations: Hydrothermal Coordination Methods – Optimal power flow problem formulation for loss and cost minimization, Solution of optimal power flow problem using Newton's method and Linear Programming technique – Numerical problems.

UNIT III

Load Frequency Control:

Modelling of Turbine & Governor: The first order Turbine model, Block Diagram representation of Steam Turbines and approximate Linear models, Mathematical Modelling of Speed Governing Systems – Derivation of small Signal Transfer function – Block Diagram.

Single Area Load Frequency Control:

Necessity of Keeping Frequency constant, Definition of Control Area – Single Area Control – Block Diagram representation of an Isolated Power System – Steady State Analysis – Dynamic Response – Controlled & Uncontrolled case.

Two Area Load Frequency Control:

Load Frequency control of Two Area system – Controlled and Uncontrolled case, Tie – Line Bias Control. Proportional Plus Integral Control of Single Area and Its Block Diagram Representation, Steady State Response – Load Frequency Control and Economic Dispatch Control.

UNIT IV

Reactive Power Control:

Overview of Reactive Power Control – Reactive Power Compensation in Transmission Systems – Advantages and Disadvantages of Different Types of Compensating Equipment for Transmission Systems; Load Compensation – Specifications of Load Compensator, Uncompensated and Compensated Transmission Lines: Shunt and Series Compensation.

UNIT V

Power System Deregulation:

Principle of economics, utility functions, power exchanges, electricity market models, market power indices, ancillary services, transmission and distribution charges, principles of transmission charges, transmission pricing methods, demand-side management, regulatory framework – Numerical problems.

TEXTBOOKS:

1. Modern Power System Analysis, D.P.Kothari and I.J.Nagrath, Tata McGraw Hill Publishing Company Ltd.
2. Electric Energy Systems Theory: An Introduction, Olle I. Elgerd, TMH Publishing Company Ltd., New Delhi, 2nd edition, 1983.

REFERENCE BOOKS:

1. *Power Generation, Operation and Control*, Allen J. Wood and Bruce F. Wollenberg, John Wiley & Sons, Inc., New York, 2nd edition, 1996.
2. *Reactive Power Control in Electric Systems*, T J E Miller, John Wiley & Sons, New York, 1982.
3. *Power System Analysis Operation and Control*, Abhijit Chakrabarti and Sunita Halder, PHI Learning Pvt. Ltd., 3rd Edition, 2010.

Online Learning Resources

1. <https://archive.nptel.ac.in/courses/108/104/108104052/>
2. <http://kcl.digimat.in/nptel/courses/video/108104191/L01.html>

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

IV B.Tech I Semester (EEE)

L	T	P	C
2	0	0	2

23AMB17 BUSINESS ETHICS AND CORPORATE GOVERNANCE
Management Course- II

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Understand the Ethics and different types of Ethics.L2
- CO2. Understand business ethics and ethical practices in management.L2.
- CO3. Understand the role of ethics in management.L2.
- CO4. Apply the knowledge of professional ethics & technical ethics.L3
- CO5. Analyze corporate law, ethics, codes & principles.L4.
- CO6. Evaluate corporate governance & corporate scams.L5

UNIT-I: Ethics

Introduction – Meaning – Nature, Scope, significance, Loyalty, and ethical behavior.. Value systems - Business Ethics - Types, Characteristics, Factors, Contradictions and Ethical Practices in Management - Corporate Social Responsibility – Issues of Management – Crisis Management.

LEARNING OUTCOMES:- After completion of this unit student will

- Understand the meaning of loyalty and ethical Behavior
- Explain various types of Ethics
- Analyze issues & crisis of management

UNIT-II: ETHICS IN MANAGEMENT

Introduction- Ethics in production, finance, Human resource management and Marketing Management - The Ethical Value System – Universalism, Utilitarianism, Distributive Justice, Social Contracts, Individual Freedom of Choice, Professional Codes; Culture and Ethics – Ethical Values in different Cultures - Culture and Individual Ethics – professional ethics and technical ethics.

LEARNING OUTCOMES:- After completion of this unit student will

- Understand the meaning of Ethics in various areas of management
- Compare and contrast professional ethics and technical ethics
- Develop ethical values in self and organization

UNIT-III : CORPORATE CULTURE

Introduction - Meaning, definition, Nature, and significance – Key elements of corporate culture, shared values, beliefs and norms, rituals, symbols and language - Types of corporate culture, hierarchical culture, market driven culture – Organization leadership and corporate culture, leadership styles and their impact on culture, transformational leadership and culture change.

LEARNING OUTCOMES:- After completion of this unit student will

- Define corporate culture
- Understand the key elements of corporate culture
- Analyze organization leadership and corporate culture

UNIT- IV: LEGAL FRAME WORK

Law and Ethics -Agencies enforcing Ethical Business Behavior - Legal Impact – Environmental Protection, Fair Trade Practices, legal Compliances, Safeguarding Health and wellbeing of Customers – Corporate law, Securities and financial regulations, corporate governance codes and principles.

LEARNING OUTCOMES:- After completion of this unit student will

- Understand Law and Ethics
- Analyze Different fair trade practices
- Make use of Environmental Protection and Fair Trade Practices

UNIT -V: CORPORATE GOVERNANCE

Introduction - Meaning – Corporate governance code, transparency & disclosure -Role of auditors, board of directors and shareholders. Global issues, accounting and regulatory frame work - Corporate scams - Committees in India and abroad, corporate social responsibility. BoDs composition, Cadbury Committee - Various committees - Reports - Benefits and Limitations.

LEARNING OUTCOMES:- After completion of this unit student will

- Understand corporate governance code.
- Analyze role of auditors, board of directors and shareholders in corporate governance.
- Implementing corporate social responsibility in India.

TEXTBOOKS:

1. Murthy CSV: Business Ethics and Corporate Governance, HPH July 2017.
2. Bholananth Dutta, S.K. Podder – Corporation Governance, VBH. June 2010.

REFERENCE BOOKS:

1. Dr. K. Nirmala, KarunakaraReaddy. *Business Ethics and Corporate Governance*, HPH.
2. H.R.Machiraju: *Corporate Governance*, HPH, 2013.
3. K. Venkataramana, *Corporate Governance*, SHBP..
4. N.M.Khandelwal. *Indian Ethos and Values for Managers*

Online Learning Resources

1. https://onlinecourses.nptel.ac.in/noc21_mg46/
2. <https://archive.nptel.ac.in/courses/110/105/110105138/>
3. https://onlinecourses.nptel.ac.in/noc21_mg54/
4. https://onlinecourses.nptel.ac.in/noc22_mg54/
5. <https://archive.nptel.ac.in/courses/109/106/109106117/>

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

IV B.Tech I Semester (EEE)

L	T	P	C
2	0	0	2

23AMB18 E-BUSINESS

Elective-2

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Remember E-Business & its nature, scope and functions.L1
- CO2. Understand E-market-Models which are practicing by the organizations.L2
- CO3. Apply the concepts of E-Commerce in the present globalized world.L3.
- CO4. Analyze the various E-payment systems & importance of net banking.L4
- CO5. Evaluate market research strategies & E-advertisements.L5.
- CO6. Understand importance of E-security & control.L2

UNIT-I: Electronic Business

Introduction – Nature, meaning, significance, functions and advantages - Definition of Electronic Business - Functions of Electronic Commerce (EC)-Advantages & Disadvantages of E-Commerce –E-Commerce and E-Business, Internet Services, Online Shopping- E-Commerce Opportunities for Industries.

Learning Outcomes: -After completion of this unit student

- Understand the concept of E-Business
- Contrast and compare E-Commerce & E-Business
- Evaluate opportunities of E-commerce for industry

UNIT-II: Electronic Markets and Business Models

Introduction –E-Shops-E-Malls E-Groceries - Portals - Vertical Portals-Horizontal Portals - Advantages of Portals - Business Models- Business to Business (B2B)-Business to Customers(B2C) - Business to Government(B2G)-Auctions- B2B Portals in India

Learning Outcomes: -After completion of this unit student will

- Understand the concept of business models
- Contrast and compare Vertical portal and Horizontal portals
- Analyze the B2B,B2C and B2G model

UNIT-III: Electronic Payment Systems:

Introduction to electronic payment systems (EPS) -Types of electronic payments - Credit/debit cards, e-wallets, UPI, and crypto currencies -Smart cards and digital wallets: Features and usage -

Electronic Fund Transfer (EFT): Role in business transactions -Infrastructure requirements and regulatory aspects of e-payments

Learning Outcomes: -After completion of this unit student will

- Understand the Electronic payment system
- Contrast and compare EFT and smart cards
- Analyze debit card and credit cards

UNIT-IV: E-Security

Security risks and challenges in electronic commerce - Cyber threats - Phishing, hacking, identity theft, and malware - Digital Signatures & Certificates - Security protocols over public networks (HTTP, SSL, TLS) -Firewalls in securing e- business platforms.

Learning Outcomes: -After completion of this unit student will

- Understand E-Security
- Contrast and compare security protocols and public network
- Evaluate on Digital signature

UNIT-V: E-Marketing:

Introduction – Online Marketing – Advantages of Online Marketing – Internet Advertisement – Advertisement Methods – Conducting Online Market Research– – E-marketing planning: Online branding, social media marketing, and email marketing - E-business strategies: Digital advertising, content marketing, and analytics – E-Customer Relationship Management (eCRM) E-supply chain management (e-SCM)

Learning Outcomes: -After completion of this unit student will

- Understand the concept of online marketing
- Apply the knowledge of online marketing
- Compare e-CRM and e-SCM

TEXTBOOKS:

1. Arati Oturkar&Sunil Khilari. E-Business. Everest Publishing House, 2022
2. P.T.S Joseph. E-Commerce, Fourth Edition, Prentice Hall of India, 2011

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, RaymondLeathamWiley India 2007.*
4. *S. Jaiswal. E-Commerce GalgotiaPublication Pvt Ltd., 2003.*

Online Learning Resources

1. <https://www.slideshare.net/fatimahAlkreem/e-businessppt-67935771>
2. <http://kcl.digimat.in/nptel/courses/video/108104191/L01.html>
3. <https://www.slideshare.net/RiteshGoyal/electronic-payment-system>

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(AUTONOMOUS)

	L	T	P	C
IV B.Tech I Semester (EEE)	2	0	0	2

23AMB19 Management Science
Elective-2

COURSEOUTCOMES:

After the completion of the course students will be able to

- CO1. Remember the concepts & principles of management and designs of organization in a practical world.L1
- CO2. Understand the knowledge of Work-study principles & Quality Control techniques in industry.L2
- CO3. Apply the process of Recruitment & Selection in organization.L3
- CO4. Analyze the various E-payment systems & importance of net banking.L4
- CO5. Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project & to analyze the business through SWOT.L5
- CO6. Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project & to analyze the business through SWOT.L5

UNIT- I INTRODUCTION TO MANAGEMENT

Management - Concept and meaning - Nature-Functions - Management as a Science and Art and both. Schools of Management Thought - Taylor's Scientific Theory-Henry Fayol's principles - Elton Mayo's Human relations - Organizational Designs - Line organization - Line & Staff Organization - Functional Organization - Matrix Organization
-Project Organization - Committee form of Organization - Social responsibilities of Management.

LEARNING OUTCOMES: At the end of the Unit, the students will be able to

- Understand the concept of management and organization
- Apply the concepts & principles of management in real life industry
- Analyze the organization chart & structure of an enterprise.

UNIT - II OPERATIONS MANAGEMENT

Principles and Types of Plant Layout - Methods of Production (Job, batch and Mass Production), Work Study - Statistical Quality Control- Material Management - Objectives - Inventory-Functions - Types, Inventory Techniques - EOQ-ABC Analysis - Marketing Management - Concept - Meaning - Nature-Functions of Marketing - Marketing Mix - Channels of Distribution - Advertisement and Sales Promotion - Marketing Strategies based on Product Life Cycle.

LEARNING OUTCOMES: At the end of the Unit, the students will be able to

- Understand the core concepts of Operations Management
- Apply the knowledge of Quality Control, Work-study principles in real life industry.
- Evaluate Materials departments & Determine EOQ
- Analyze Marketing Mix Strategies for an enterprise
- Create and design advertising and sales promotion

UNIT - III HUMAN RESOURCES MANAGEMENT (HRM)

HRM - Definition and Meaning – Nature - Managerial and Operative functions - Job Analysis - Human Resource Planning(HRP) - Employee Recruitment-Sources of Recruitment - Employee Selection - Process - Employee Training and Development - methods - Performance Appraisal Concept - Methods of Performance Appraisal – Placement - Employee Induction - Wage and Salary Administration

LEARNING OUTCOMES: At the end if the Unit, the students will be able to

- Understand the concepts of HRM, Recruitment, Selection, Training & Development
- Analyze the need of training
- Evaluate performance appraisal
- Design the basic structure of salaries and wages

UNIT - IV STRATEGIC & PROJECT MANAGEMENT

Definition& Meaning - Setting of Vision - Mission - Goals - Corporate Planning Process - Environmental Scanning - Steps in Strategy Formulation and Implementation - SWOT Analysis - Project Management - Network Analysis - Programme Evaluation and Review Technique (PERT) - Critical Path Method (CPM) Identifying Critical Path - Probability of Completing the project within given time - Project Cost- Analysis - Project Crashing (Simple problems).

LEARNING OUTCOMES: At the end of the Unit, the students will be able to

- Understand Mission, Objectives, Goals & strategies for an enterprise
- Apply SWOT Analysis to strengthen the project
- Analyze Strategy formulation and implementation
- Evaluate PERT and CPM Techniques

UNIT - V CONTEMPORARY ISSUES IN MANAGEMENT

Customer Relations Management(CRM) - Total Quality Management (TQM) - Six Sigma Concept - Supply Chain Management(SCM) - Enterprise Resource Planning (ERP) - Performance Management – employee engagement and retention - Business Process Re-engineering and Bench Marking - Knowledge Management – change management – sustainability and corporate social responsibility.

LEARNING OUTCOMES At the end if the Unit, the students will be able to

- Understand modern management techniques
- Apply Knowledge in Understanding in TQM, SCM

- Analyze CRM, BPR
- Evaluate change management & sustainability

TEXTBOOKS:

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

Online Learning Resources

1. <https://www.slideshare.net/slideshow/introduction-to-management-and-organization-231308043/231308043><https://nptel.ac.in/courses/112107238>
2. <https://www.slideshare.net/RiteshGoyal/electronic-payment-system>
3. <https://archive.nptel.ac.in/courses/110/104/110104068/>
4. <https://archive.nptel.ac.in/courses/110/105/110105069/>
5. https://onlinecourses.nptel.ac.in/noc24_mq112/t

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

IV B.Tech I Semester (EEE)

L	T	P	C
3	0	0	3

23AEC31 DIGITAL SIGNAL PROCESSING

(Professional Elective - IV)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Familiar with the properties of discrete time signals, systems and z-transform. L2
- CO2. Learn the importance of FFT algorithm for computation of Discrete Fourier Transform and Fast Fourier Transform with decimations. L3
- CO3. Understand the implementations of digital filter structures. L1
- CO4. Analyse the FIR filter design using Fourier series and windowing methods. L3
- CO5. Gain the knowledge on Programmable DSP Devices. L2

UNIT I

Introduction to discrete time signals and systems: Introduction to digital signal processing, Review of discrete-time signals and systems, Analysis of discrete-time linear time invariant systems, frequency domain representation of discrete time signals and systems.

Z-Transform: Definition, ROC, Properties, Poles and Zeros in Z-plane, the inverse Z-Transform, System analysis, Transfer function, BIBO stability, System Response to standard signals, Solution of difference equations with initial conditions, Illustrative Problems, analysis of linear time-invariant systems in the z-domain, pole-zero stability

UNIT II

Discrete Fourier Transform : Introduction, Discrete Fourier Series, properties of DFS, Discrete Fourier Transform, Inverse DFT, properties of DFT, Linear and Circular convolution, convolution using DFT.

Fast Fourier Transform: Introduction, Fast Fourier Transform, Radix-2 Decimation in time and Decimation in frequency FFT, Inverse FFT (Radix-2).

UNIT III

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

UNIT IV

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

UNIT V

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

TEXTBOOKS:

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

REFERENCE BOOKS:

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

Online Learning Resources

1. https://onlinecourses.nptel.ac.in/noc22_ee99/preview,
2. <https://nptel.ac.in/courses/108105055>

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

IV B.Tech I Semester (EEE)

L	T	P	C
3	0	0	3

23AEE35 ELECTRIC VEHICLE TECHNOLOGY
(Professional Elective - IV)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Illustrate electric vehicles. (L2)
- CO2. Understand drive-train topologies. (L2)
- CO3. Classify various electrical drives (L2)
- CO4. Classify energy storage technologies. (L2)
- CO5. Gain the knowledge on Programmable DSP Devices. L2
- CO6. Classify different energy management strategies. (L2)

UNIT-I:

Introduction To Electric Vehicles:

History of electric vehicles, social and environmental importance of electric vehicles, impact of modern drive-trains on energy supplies.

CASE STUDY

Comparison by efficiency of Conventional, Hybrid, Electric and Fuel cell Vehicles.

UNIT-II:

Electric Drive-Trains:

Basic concept of electric traction, Introduction to various electric drive-train topologies, Power flow control in electric drive-train topologies.

UNIT-III

Electric Drives & Control:

Introduction to electric components used in electric vehicles, Control of BLDC Motor, Control of Induction Motor Drive, Permanent Magnet (PM) motor Drive & Switched Reluctance Motor (SRM) Drive.

UNIT-IV:

Energy Storage:

Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its modeling, SOC, Different Types of Batteries, Super Capacitor based energy storage and its analysis, Fuel Cells, Hybridization of different energy storage devices.

UNIT-V:

Energy Management Strategies & Charging Infrastructure:

Introduction to energy management strategies used in electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies, Types of EV charging Infrastructure & Standardized Communication protocols for EV charging.

CASE STUDIES

Current issues in electric Vehicles, Thermal Protection of Battery.

TEXTBOOKS:

1. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, —Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2nd Edition, 2017. (Unit-I, II)
2. Ali Emadi, —Advanced Electric Drive Vehicles (Energy, Power Electronics, and Machines), CRC Press, 2015. (Unit-III).
3. John G. Hayes and A. Goodarzi, —Electric Powertrain - Energy Systems, Power electronics and drives for Hybrid, electric and fuel cell vehicles, Wiley, 2018. (Unit-IV & V)

REFERENCE BOOKS:

1. James Larminie, John Lowry, —*Electric Vehicle Technology Explained*, Wiley, 2nd Edition 2012.

Online Learning Resources

1. <https://nptel.ac.in/courses/108106170>
2. https://onlinecourses.nptel.ac.in/noc22_ee53
3. https://onlinecourses.nptel.ac.in/noc21_ee112

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

IV B.Tech I Semester (EEE)

L	T	P	C
3	0	0	3

23AEE36

HVDC AND FACTS

(Professional Elective - IV)

COURSEOUTCOMES:

After the completion of the course students will be able to

- CO1. Remember various conventional control mechanisms, transmission networks.-L1
- CO2. Understand the necessity of HVDC systems as emerging transmission networks.-L2
- CO3. Understand the necessity of reactive power compensation devices.-L2
- CO4. Design equivalent circuits of various HVDC system configurations.-L5
- CO5. Design and analysis of various FACTS devices.-L5

UNIT I

Introduction:

Electrical Transmission Networks, Conventional Control Mechanisms-Automatic Generation Control, Excitation Control, Transformer Tap-Changer Control, Phase-Shifting Transformers; Advances in Power- Electronic Switching Devices, Principles and Applications of Semiconductor Switches; Limitations of Conventional Transmission Systems, Emerging Transmission Networks, HVDC and FACTS. Concepts of virtual inertia

UNIT II

High Voltage Dc Transmission – I:

Types of HVDC links - Monopolar, Homopolar, Bipolar and Back-to-Back, Advantages and disadvantages of HVDC Transmission, Analysis of Graetz circuit, Analysis of bridge circuit without overlap, Analysis of bridge with overlap less than 600, Rectifier and inverter characteristics, complete characteristics of rectifier and inverter, Equivalent circuit of HVDC Link.

UNIT III

High Voltage DC Transmission – II:

Desired features and means of control, control of the direct current transmission link, Constant current control, Constant ignition angle control, Constant extinction angle control, Converter firing- angle control- IPC and EPC, frequency control and Tap changer control, Starting, Stopping and Reversal of power flow in HVDC links.

UNIT IV

Flexible AC Transmission Systems-I:

Types of FACTS Controllers, brief description about various types of FACTS controllers, Operation of 6- pulse converter, Transformer Connections for 12-pulse, 24-pulse and 48-pulse operation, principle of operation of various types of Controllable shunt VAR Generation, Principle of switching converter type shunt compensator, principles of operation of various types of Controllable Series VAR Generation, Principle of Switching Converter type series compensator.

UNIT V

Flexible AC Transmission Systems-II:

Unified Power Flow Controller (UPFC) – Principle of operation, Transmission Control Capabilities, Independent Real and Reactive Power Flow Control; Interline Power Flow Controller (IPFC) – Principle of operation and Characteristics, UPFC and IPFC control structures (only block diagram description), objectives and approaches of voltage and phase angle regulators

TEXTBOOKS:

1. Narain G. Hingorani and Laszlo Gyugyi, Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems, IEEE Press, Wiley-Interscience, New Jersey, 2000.
2. E.W. Kimbark, Direct current transmission, Vol. I, Wiley Interscience, New York, 1971.

REFERENCE BOOKS:

1. K R Padiyar, *FACTS Controllers in Power Transmission and Distribution*, New Age International Publishers, New Delhi, 2007.
2. Enrique Acha, Claudio R. Fuerte-Esquivel, Hugo Ambriz-Pérez and César Angeles-Camacho, *FACTS: Modelling and Simulation in Power Networks*, John Wiley & Sons, West Sussex, 2004.
3. R Mohan Mathur and Rajiv K Varma, *Thyristor-Based FACTS Controllers for Electrical Transmission Systems*, IEEE Press, Wiley-Interscience, New Jersey, 2002.

Online Learning Resources

1. <https://nptel.ac.in/courses/108104013>,
2. <https://nptel.ac.in/courses/108107114>

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

IV B.Tech I Semester (EEE)

L	T	P	C
3	0	0	3

23AEE37 MODERN CONTROL THEORY
(Professional Elective - V)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Remember basic concepts of various converters.-L1
- CO2. Understand the problems and to design of various DC-DC converters, advanced converters of SMPCs.-L2
- CO3. Evaluate the performance of resonant converters.-L3
- CO4. Analyze the performance characteristics of 1- ϕ and 3- ϕ inverters with single/multi levels, power conditioners, UPS and filters.-L3
- CO5. Design various applications of the above in Power Systems, EVE, Renewable Energy Systems, etc.-L5

UNIT I

DC-DC Converters:

Principles of step-down and step-up converters – Analysis and state space modelling of Buck, Boost, Buck- Boost and Cuk converters – Numerical Examples

UNIT II

Switching Mode Power Converters:

Analysis and state space modelling of flyback, Forward, Luo, Half bridge and full bridge converters- control circuits and PWM techniques – Numerical Examples

UNIT III

Resonant Converters:

Introduction- classification- basic concepts- Resonant switch- Load Resonant converters- ZVS, Clamped voltage topologies- DC link inverters with Zero Voltage Switching- Series and parallel Resonant inverters- Voltage control – Numerical Examples.

UNIT IV

DC-AC Converters:

Single phase and three phase inverters, control using various (sine PWM, SVPWM and advanced modulation) techniques, various harmonic elimination techniques- Multilevel inverters- Concepts - Types: Diode clamped- Flying capacitor- Cascaded types- Applications.

UNIT V

Power Conditioners, UPS & Filters:

Introduction- Power line disturbances- Power conditioners –UPS: offline UPS, Online UPS, Applications – Filters: Voltage filters, Series-parallel resonant filters, filter without series capacitors, filter for PWM VSI, current filter, DC filters – Design of inductor and transformer for PE applications – Selection of capacitors.

TEXTBOOKS:

1. Power Electronics: Essentials and Applications by L. Umanand, Wiley, 2009.
2. M.H. Rashid – Power Electronics handbook, Elsevier Publication, 2001.
3. Course material on Switched Mode Power Conversion by V Ramanarayanan, Dept. of Electrical Engg. IISc. Bangalore.

REFERENCE BOOKS:

1. Philip T. Krein, —*Elements of Power Electronics*‡, Oxford University Press, 2012.
2. Ned Mohan, Tore.M.Undeland, William.P.Robbins, *Power Electronics converters, Applications and design*, 3rd Edition, John Wiley and Sons, 2006.
3. M.H. Rashid, *Power Electronics circuits, devices and applications*, 3rd Edition Prentice Hall of India New Delhi, 2007.

Online Learning Resources

1. <https://nptel.ac.in/courses/108108036>.
2. <https://nptel.ac.in/courses/108105180>

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

	L	T	P	C
IV B.Tech I Semester (EEE)	3	0	0	3

23AEE38	Switched Mode Power Conversion (Professional Elective - V)
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SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

	L	T	P	C
IV B.Tech I Semester (EEE)	3	0	0	3

23AEE39 ELECTRICAL DISTRIBUTION SYSTEM
(Professional Elective - V)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Understand fundamental aspects of distribution system and various factors affecting the distribution systems. -L2
- CO2. Analysis of substations and modeling of loads. -L3
- CO3. Understand difference between conventional load flow studies of power system and distribution system load flow. -L2
- CO4. Evaluation of voltage drop and power loss calculations and capacitor location and cost analysis. -L3
- CO5. Analyse the concepts of SCADA, Automation distribution system and management. -L3

UNIT I

Distribution System Fundamentals:

Brief description about electrical power transmission and distribution systems, Different types of distribution sub-transmission systems, Substation bus schemes, Factors effecting the substation location, Factors effecting the primary feeder rating, types of primary feeders, Factors affecting the primary feeder voltage level, Factors effecting the primary feeder loading.

UNIT II

Distribution System Substations and Loads:

Substations: Rating of a distribution substation for square and hexagonal shaped distribution substation, Service area with —n|| primary feeders, K constant, Radial feeder with uniformly and non-uniformly distributed loading. Benefits derived through optimal location of substations.

Loads: Various types of loads, Definitions of various terms related to system loading, Distribution transformer loading, feeder loading, Relationship between the Load Factor and Loss Factor, Modelling of star and delta connected loads.

UNIT III

Distribution System Load Flow:

Exact line segment model, Modified line model, approximate line segment model, Step-Voltage Regulators, Line drop compensator, Forward/Backward sweep distribution load flow algorithm – Numerical problems

UNIT IV

Voltage Drop and Power Loss Calculation:

Analysis of non-three phase primary lines, concepts of four-wire multi-grounded common-neutral distribution system, Percent power loss calculation, Distribution feeder cost calculation methods, Capacitor installation types, Series and Shunt Capacitors, Types of three-phase capacitor-bank connections, Procedure for best capacitor location, Economic justification for capacitors – Numerical problems.

UNIT V

Distribution Automation:

Distribution automation, distribution management systems, distribution automation system functions, Basic SCADA system, Consumer Information Service (CIS) – Geographical Information System (GIS) – Automatic Meter Reading (AMR), Outage management, decision support applications, substation automation, control feeder automation.

TEXTBOOKS:

1. Distribution System Modeling and Analysis, William H. Kersting, CRC Press, Newyork, 2002.
2. Electric Power Distribution System Engineering, TuranGonen, McGraw-Hill Inc., New Delhi, 1986.

REFERENCE BOOKS:

1. *Control and automation of electrical power distribution systems*, James Northcote-Green and Robert Wilson, CRC Press (Taylor & Francis), New York, 2007.
2. Biswarup Das, *Power distribution Automation*, IET publication, 2016..
3. Dr. M. K. Khedkar, Dr. G.M. Dhole, *Electric Power Distribution Automation*, Laxmi Publications, First edition, 2017.

Online Learning Resources

1. https://onlinecourses.nptel.ac.in/noc22_ee126/preview

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

IV B. Tech I Semester	L	T	P	C
	3	0	0	3

23ACE55 BUILDING MATERIALS AND SERVICES
(Open elective –III)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO10. Understand the properties, classifications, and applications of building materials like stones, bricks, tiles, wood, aluminum, glass, paints, and plastics.
- CO11. Analyze the composition, manufacturing process, and properties of cement and admixtures.
- CO12. Apply knowledge of building components such as lintels, arches, walls, stairs, floors, roofs, foundations, and joinery.
- CO13. Evaluate masonry, mortars, finishing techniques, and formwork systems.
- CO14. 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

umbing Services: Water Distribution, Sanitary – Lines & Fittings; Ventilations: Functional Requirements Systems of Ventilations. Air-Conditioning - Essentials and Types; Acoustics – Characteristic – Absorption – Acoustic Design; Fire Protection – Fire Hazards – Classification of Fire Resistant Materials and Constructions.

TEXT BOOKS:

1. Building Materials and Construction – Arora & Bindra, Dhanpat Roy Publications.
2. Building Materials and Construction by G C Sahu, Joygopal Jena McGraw hill Pvt Ltd 2015.

REFERENCE BOOKS:

1. Building Construction by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New 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, Longman Publishing Group, 1973.
5. S. K. Duggal, Building Materials, Oxford & IBH Publishing Co. Ltd., New Delhi, 2019

Online Learning Resources:

1. <https://archive.nptel.ac.in/courses/105/102/105102088/>

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

IV B. Tech I Semester	L	T	P	C
	3	0	0	3

23ACE26 ENVIRONMENTAL IMPACT ASSESSMENT
(Open elective –III)

COURSE OUTCOMES:

After the completion of the course students will be able to

CO10. Apply various methodologies for conducting Environmental Impact Assessments.

CO11. Analyze the impact of land-use changes on soil, water, and air quality.

CO12. Evaluate the environmental impact on vegetation, wildlife, and conduct risk assessments.

CO13. Develop environmental audit reports and assess compliance with environmental policies.

CO14. 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 Base Map, Classification of Environmental Parameters- Criteria for The Selection of EIA Methodology, E I A Methods, Ad-Hoc Methods, Matrix Methods, Network Method Environmental Media Quality Index Method, Overlay Methods and Cost/Benefit Analysis.

UNIT II

Impact of Developmental Activities and Land Use

Introduction and Methodology for The Assessment of Soil and Ground Water, Delineation of Study Area, Identification of Actives. Procurement of Relevant Soil Quality, Impact Prediction, Assessment of Impact Significance, Identification and Incorporation of Mitigation Measures. E I Ain Surface Water, Air and Biological Environment: Methodology for The Assessment of Impacts On Surface Water Environment, Air Pollution Sources, Generalized Approach for Assessment of Air Pollution Impact.

UNIT III

Assessment of Impact On Vegetation, Wildlife and Risk Assessment

Introduction - Assessment of Impact of Development Activities On Vegetation and Wildlife, Environmental Impact of Deforestation – Causes and Effects of Deforestation - Risk Assessment and Treatment of Uncertainty-Key Stages in Performing An Environmental Risk Assessment- Advantages of Environmental Risk Assessment.

UNIT IV

Environmental Audit

Introduction - Environmental Audit & Environmental Legislation Objectives of Environmental Audit, Types of Environmental Audit, Audit Protocol, Stages of Environmental Audit, Onsite Activities, Evaluation of Audit

Data and Preparation of Audit Report

UNIT V

Environmental Acts and Notifications

The Environmental Protection Act, The Water Preservation Act, The Air (Prevention & Control of Pollution Act), Wild Life Act - Provisions in The EIA Notification, Procedure for Environmental Clearance, Procedure for Conducting Environmental Impact Assessment Report- Evaluation of EIA Report. Environmental Legislation Objectives, Evaluation of Audit Data and Preparation of Audit Report. Post Audit Activities, Concept of ISO and ISO 14000.

TEXT BOOKS:

- 1.Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B. S. Publication, Hyderabad 2nd edition 2011
- 2.Environmental Impact Assessment, by Canter Larry W., McGraw-Hill education Edi (1996)

REFERENCE BOOKS:

- 1.Environmental Engineering, by Peavy, H. S, Rowe, D. R, Tchobanoglous, G.Mc-Graw Hill International Editions, New York 1985.
- 2.Environmental Science and Engineering, by Suresh K. Dhaneja, S.K., Katania& Sons Publication, New Delhi
- 3.Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke, Prentice Hall Publishers.
- 4.Environmental Pollution and Control, by H. S. Bhatia, Galgotia Publication (P) Ltd, Delhi

Online Learning Resources:

<https://archive.nptel.ac.in/courses/124/107/124107160/>

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

IV-B. Tech I Semester	L	T	P	C
	3	0	0	3

23AME52 3D PRINTING TECHNOLOGIES
(Open Elective-III)

COURSE OUTCOMES:

After the completion of the course students will be able to

CO11. Define and explain the evolution and need for rapid prototyping in modern product development.

CO12. Compare and contrast various 3D printing technologies based on working principles, materials, and limitations.

CO3. Apply knowledge of rapid tooling and reverse engineering techniques for industrial and design applications.

CO4. Diagnose and interpret different types of errors encountered in 3D printing processes and recommend solutions.

CO5. Use RP-specific software tools to manipulate STL files and prepare models for printing in real-world scenarios.

UNIT I

Introduction to 3D Printing

Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Need for time compression in product development, Usage of RP parts, Generic RP process, Distinction between RP and CNC, other related technologies, Classification of RP.

UNIT II

Solid and Liquid Based RP Systems

Working Principle, Materials, Advantages, Limitations and Applications of Fusion Deposition Modelling (FDM), Laminated Object Manufacturing (LOM), Stereo lithography (SLA), Direct Light Projection System (DLP) and Solid Ground Curing (SGC).

UNIT III

Powder Based & Other RP Systems

Powder Based RP Systems: Working Principle, Materials, Advantages, Limitations and Applications of Selective Laser Sintering (SLS), Direct Metal Laser Sintering (DMLS), Laser Engineered Net Shaping (LENS) and Electron Beam Melting (EBM).

Other RP Systems: Working Principle, Materials, Advantages, Limitations and Applications of Three Dimensional Printing (3DP), Ballistic Particle Manufacturing (BPM) and Shape Deposition Manufacturing (SDM).

UNIT IV

Rapid Tooling & Reverse Engineering

Rapid Tooling: Conventional Tooling Vs. Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling Methods, Soft and Hard Tooling methods.

Reverse Engineering (RE): Meaning, Use, RE – The Generic Process, Phases of RE Scanning, Contact Scanners and Noncontact Scanners, Point Processing, Application Geometric Model, Development

UNIT V

Errors in 3D Printing and Applications:

Pre-processing, processing and post-processing errors, Part building errors in SLA, SLS, etc. Software: Need for software, MIMICS, Magics, SurgiGuide, 3-matic, 3D-Doctor, Simplant, Velocity2, VoXim, Solid View, 3DView, etc., software, Preparation of CAD models, Problems with STL files, STL file manipulation, RP data formats: SLC, CLI, RPI, LEAF, IGES, HP/GL, CT, STEP. Applications: Design, Engineering Analysis and planning applications, Rapid Tooling, Reverse Engineering, Medical Applications of RP.

TEXT BOOKS

1. Chee Kai Chua and KahFaiLeong,—3D Printing and Additive Manufacturing Principles and Applications 5/e, World Scientific Publications, 2017.
2. Ian Gibson, David W.Rosen, Brent Stucker,—Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, Springer, 2/e, 2010.

REFERENCE BOOKS:

1. Frank W.Liou,—Rapid Prototyping & Engineering Applications, CRC Press, Taylor & Francis Group, 2011.
2. Rafiq Noorani,—Rapid Prototyping: Principles and Applications in Manufacturing, John Wiley & Sons, 2006.

ONLINE LEARNING RESOURCES:

1. NPTEL Course on Rapid Manufacturing.
2. <https://nptel.ac.in/courses/112/104/112104265/>
3. <https://www.hubs.com/knowledge-base/introduction-fdm-3d-printing/>
4. <https://slideplayer.com/slide/6927137/>
5. <https://www.mdpi.com/2073-4360/12/6/1334>
6. <https://www.centropiaggio.unipi.it/sites/default/files/course/material/2013-11-29%20-%20FDM.pdf>
7. <https://lecturenotes.in/subject/197>
8. https://www.cet.edu.in/noticefiles/258_Lecture%20Notes%20on%20RP-ilovepdfcompressed.pdf

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

IV- B. Tech I Semester

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23AEC38

SATELLITE COMMUNICATIONS

(Open Elective-III)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO6. Learn the principles of orbital mechanics & satellite launch system with performance parameters.
- CO7. Describe the elements of communication satellite design for matching reliability.
- CO8. Gain knowledge on various multiple access techniques and Onboard processing.
- CO9. Analyze the satellite links design with communication links.
- CO10. Evaluate the working of earth station design with satellite broadcasting.

UNIT I

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

UNIT II

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

UNIT- III

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

UNIT IV

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

UNIT- V: Earth station design. Configurations. Antenna and tracking systems. Satellite broadcasting.

TEXTBOOKS:

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

REFERENCES:

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

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(AUTONOMOUS)

IV B. Tech I Semester	L	T	P	C
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23ACS12

DATA BASE MANAGEMENT SYSTEM
(Open Elective-III)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Understand the basic concepts of database systems and their architecture.
- CO2. Apply ER modeling and relational algebra for database design.
- CO3. Analyze and implement normalization techniques for schema refinement.
- CO4. Evaluate transaction management techniques, concurrency control, and recovery.
- CO5. Explore non-relational databases and recent trends in database systems.

UNIT I

Introduction to Databases

Database System Applications and Purpose, View of Data: Data Abstraction and Data Independence, Database Users and Administrators, DBMS Architecture and Data Models, ER Model: Entities, Attributes, Relationships, ER Diagrams, Reduction of ER Model to Tables

UNIT II

Relational Model and Algebra

Structure of Relational Databases, Relational Model Concepts and Integrity Constraints, Relational Algebra: Selection, Projection, Set Operations, Joins, Tuple Relational Calculus, Introduction to SQL: DDL, DML, DCL, Advanced SQL: Sub queries, Joins, Views, Indexes

UNIT III

Database Design and Normalization

Schema Design and Logical Database Design, Functional Dependencies, Normal Forms: 1NF, 2NF, 3NF, BCNF, Decomposition and Lossless Join, Dependency Preservation, Multi-Valued and Join Dependencies.

UNIT IV

Transaction Management and Concurrency Control

Concept of a Transaction, ACID Properties, Serializability and Schedules, Concurrency Control: Lock-Based, Timestamp-Based Protocols, Deadlock Handling, Recovery Techniques: Log-Based, Shadow Paging

UNIT V

Advanced Topics and NoSQL Databases

Distributed Databases and Parallel Databases, Introduction to NoSQL: Types – Document, Columnar, Key-Value, Graph, CAP Theorem, MongoDB: Basics and CRUD Operations, Big Data and New SQL Overview, Case Studies on Real-World Databases

Textbooks:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan – Database System Concepts, 7th Edition, McGraw Hill

2. Ramez Elmasri, Shamkant B. Navathe – Fundamentals of Database Systems, 7th Edition, Pearson Education Reference Books:

1. C.J. Date – An Introduction to Database Systems, 8th Edition, Addison-Wesley

2. Raghu Ramakrishnan, Johannes Gehrke – Database Management Systems, 3rd Edition, McGraw Hill

3. Pramod J. Sadalage & Martin Fowler – NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Pearson

Online Resources & Courses:

1. NPTEL – Database Management Systems by IIT Madras

2. Coursera – Databases by Stanford University

3. Khan Academy – Intro to SQL

4. MongoDB University – Free Courses on NoSQL Databases

5. W3Schools SQL Tutorial

6. GeeksforGeeks – DBMS Concepts and Practice Problems

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

IV B. Tech I Semester

L	T	P	C
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23ACC10

CYBER SECURITY
(Open Elective-III)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO11. Understand the fundamentals of cybercrime and information security, and explain the legal and global perspectives, especially with reference to Indian IT Act 2000
- CO12. Analyze how cybercriminals plan and execute cyber offenses using techniques like social engineering, cyber stalking, and botnets, including threats posed by cloud computing.
- CO13. Evaluate the security challenges of mobile and wireless devices and formulate measures to secure mobile environments within an organization.
- CO14. Identify and explain various cyber attack tools and methods such as phishing, key loggers, Trojans, and SQL injection used in committing cybercrimes.
- CO15. 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 and Measures in Mobile Computing Era, Laptops.

UNIT IV

Tools and Methods Used in Cybercrime

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

UNIT V

Cyber Security: Organizational Implications

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

Textbooks:

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

Reference Books:

1. *Cyber Security Essentials*, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. *Introduction to Cyber Security*, Chwan-Hwa(john) Wu, J. 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>

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

IV B.Tech I Semester

L	T	P	C
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23AHS41 WAVELET TRANSFORMS AND ITS APPLICATIONS
(Open Elective-III)

COURSE OUTCOMES:

After the completion of the course students will be able to

CO11. Understand wavelets and wavelet basis and characterize continuous and discrete wavelet transforms

CO12. Illustrate the multi resolution analysis and scaling functions

CO13. Implement discrete wavelet transforms with multirate digital filters

CO14. Understand multi resolution analysis and identify various wavelets and evaluate their time-frequency resolution properties.

CO15. Design certain classes of wavelets to specification and justify the basis of the application of wavelet transforms to different fields.

UNIT I

Wavelets

Wavelets and Wavelet Expansion Systems - Wavelet Expansion- Wavelet Transform- Wavelet System- More Specific Characteristics of Wavelet Systems - Haar Scaling Functions and Wavelets - effectiveness of Wavelet Analysis - The Discrete Wavelet Transform- The Discrete-Time and Continuous Wavelet Transforms.

UNIT II

A Multiresolution Formulation of Wavelet Systems

Signal Spaces - The Scaling Function - Multiresolution Analysis - The Wavelet Functions - The Discrete Wavelet Transform- A Parseval's Theorem - Display of the Discrete Wavelet Transform and the Wavelet Expansion.

UNIT III

Filter Banks and the Discrete Wavelet Transform

Analysis - From Fine Scale to Coarse Scale- Filtering and Down-Sampling or Decimating - Synthesis - From Coarse Scale to Fine Scale - Filtering and Up-Sampling or Stretching - Input Coefficients - Lattices and Lifting - Different Points of View.

UNIT IV

Time-Frequency and Complexity

Multiresolution versus Time-Frequency Analysis- Periodic versus Nonperiodic Discrete Wavelet Transforms -The Discrete Wavelet Transform versus the Discrete-Time Wavelet Transform- Numerical Complexity of the Discrete Wavelet Transform.

UNIT V

Bases and Matrix Examples

Bases, Orthogonal Bases, and Biorthogonal Bases -Matrix Examples - Fourier Series Example - Sine Expansion Example

-Frames and Tight Frames - Matrix Examples -Sine Expansion as a Tight Frame Example.

TEXT BOOK:1.C. Sidney Burrus, Ramesh A. Gopinath, —Introduction to Wavelets and Wavelets Transforms, Prentice Hall, (1997).

2.James S. Walker, —A Primer on Wavelets and their Scientific Applications, CRC Press, (1999)..

REFERENCES:

1.Raghuveer Rao, —Wavelet Transforms, Pearson Education, Asia

2.C. S. Burrus, Ramose and A. Gopinath, Introduction to Wavelets and Wavelet Transform, Prentice Hall Inc.

ONLINE 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->

5. [waveletsefbc88e5b08fe6b3a2e58d81e8aeb2efbc891.pdf](#)

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(AUTONOMOUS)

IV B. Tech I Semester	L	T	P	C
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23AHS42

SMART MATERIALS AND DEVICES
(Open Elective-III)

COURSE OUTCOMES:

After the completion of the course students will be able to

CO11. Identify key discoveries that led to modern applications of shape memory materials, describe the two phases in shape memory alloys.

CO12. Describe how different external stimuli (light, electricity, heat, stress, and magnetism) influence smart material properties.

CO13. Summarize various types of synthesis of smart materials.

CO14. Analyze various characterization techniques used for smart materials

CO15. 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, chromo active materials, magnet or heological materials, photoactive materials, Polymers and polymer composites (Basics).

UNIT II

Properties of Smart Materials

Optical, Electrical, Dielectric, Piezoelectric, Ferroelectric, Pyroelectric and Magnetic properties of smart materials.

UNIT III

Synthesis of Smart Materials

Chemical route: Chemical vapour deposition, Sol-gel technique, Hydrothermal method, Mechanical alloying and Thin film deposition techniques: Chemical etching, Spray pyrolysis.

UNIT IV

Characterization Techniques

Powder X-ray diffraction, Raman spectroscopy (RS), UV-Visible spectroscopy, Scanning electron microscopy (SEM), Transmission electron microscopy (TEM), Atomic force microscopy (AFM).

UNIT V

Smart Materials based Devices

Devices based on smart materials: Shape memory alloys in robotic hands, piezoelectric based devices, MEMS and intelligent devices.

Textbooks:

- 1.YaserDahman, Nanotechnology and Functional Materials for Engineers-, Elsevier, 2017
- 2.E. Zschech,C. Whelan, T. Mikolajick, Materials for Information Technology: Devices, Interconnects and Packaging Springer-Verlag London Limited 2005.

Reference Books:

- 1.Gauenzi,P.,Smart Structures, Wiley, 2009.
 - 2.MahmoodAliofkhazraei, Handbook of functional nanomaterials, Vol (1&2), Nova Publishers, 2014
 - 3.Handbook of Smart Materials, Technologies, and Devices: Applications of Industry,4.0,Chaudhery MustansarHussain, Paolo Di Sia, Springer,2022.
 - 4.Fundamentals of Smart Materials,Mohsen Shahinpoor, Royal Society of Chemistry, 2020
- NPTEL course link: https://onlinecourses.nptel.ac.in/noc22_me17/preview

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

IV B. Tech I Semester

L	T	P	C
3	0	0	3

23AHS43 INTRODUCTON TO QUANTUM MECHANICS
(Open Elective–III)

COURSE OUTCOMES:

After the completion of the course students will be able to

CO11. Explain the key principles of quantum mechanics and wave-particle duality

CO12. Apply Schrödinger equations to solve one-dimensional quantum problems.

CO13. Solve quantum mechanical problems using operator and matrix methods

CO14. Evaluate quantum states using Dirac notation and expectation values

CO15. 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.

BOOKS FOR STUDY

1. Quantum Mechanics. Vol 1, A. Messiah 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.

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>

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

IV B. Tech I Semester	L	T	P	C
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23AHS44 GREEN CHEMISTRY AND CATALYSIS FOR SUSTAINABLE ENVIRONMENT
(Open Elective-III)

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO11. Apply the Green chemistry Principles for day to day life as well as synthesis, describe the sustainable development and green chemistry, Explain economic and un-economic reactions, Demonstrate Polymer recycling.
- CO12. 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
- CO13. Demonstrate Green solvents and importance, Discuss Supercritical carbon dioxide, Explain Supercritical water, recycling of green solvents.
- CO14. Describe importance of Biomass and Solar Power, Illustrate Sonochemistry, Apply Green Chemistry for Sustainable Development; discuss the importance of Renewable resources, mechanochemical synthesis.
- CO15. Discuss Alternative green methods like Photoredox catalysis, single electron transfer reactions (SET), Photochemical Reactions, Microwave-assisted Reactions and Sonochemical reactions, examples and applications.

UNIT 1

PRINCIPLES AND CONCEPTS OF GREEN CHEMISTRY

Introduction, Green chemistry Principles, sustainable development and green chemistry, E factor, atom economy, atom economic Reactions: Rearrangement and addition reactions and atom un-economic reactions: Substitution, elimination and Wittig reactions, Reducing Toxicity. Waste - problems and Prevention: Design for degradation, Polymer recycling

UNIT 2

CATALYSIS AND GREEN CHEMISTRY

Introduction, Types of catalysis, Heterogeneous catalysis: Basics of Heterogeneous Catalysis, Zeolite and the Bulk Chemical Industry, Heterogeneous Catalysis in the Fine Chemical and Pharmaceutical Industries, Catalytic Converters, Homogeneous catalysis: Transition Metal Catalysts with Phosphine Ligands, Greener Lewis Acids, and Phase transfer catalysis, Bio-catalysis and Photo-catalysis with examples.

UNIT 3

GREEN SOLVENTS IN CHEMICAL SYNTHESIS

Green Solvents: Concept, Tools and techniques for solvent selection, supercritical fluids: Super critical carbondioxide, super critical water, Polyethylene glycol (PEG), Ionic liquids, Recycling of green solvents.

UNIT 4

EMERGING GREENER TECHNOLOGIES

Biomass as renewable resource, Energy: Energy from Biomass, Solar Power, Chemicals from Renewable Feedstock's, Chemicals from Fatty Acids, Polymers from Renewable Resources, Alternative Economies: The Syngas Economy, The Biorefinery, Design for energy efficiency, Mechanochemical synthesis.

UNIT 5

ALTERNATIVE GREENER METHODS

Photochemical Reactions - Examples, Advantages and Challenges, Photoredox catalysis, single electron transfer reactions (SET), Examples of Photochemical Reactions, Microwave-assisted Reactions and Sonochemical reactions, examples and applications.

Text Books :

- 1.M. Lancaster, Green Chemistry an introductory text, Royal Society of Chemistry, 2002.
- 2.Paul T. Anastas and John C. Warner, Green Chemistry Theory and Practice, 4th Edition, Oxford University Press, USA

References :

- 1.Green Chemistry for Environmental Sustainability, First Edition, Sanjay K. Sharma and Ackmez Mudhoo, CRC Press, 2010.
- 2.Edited by AlvisePerosa and Maurizio Selva , Hand Book of Green chemistry Volume 8:

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(AUTONOMOUS)

IV B.Tech I Semester

L	T	P	C
3	0	0	3

23AHS45

EMPLOYABILITY SKILLS

(Open elective-III)

COURSE OUTCOMES:

After the completion of the course students will be able to

CO12. Understand the importance of goals and try to achieve them

CO13. Explain the significance of self-management

CO14. Apply the knowledge of writing skills in preparing eye-catching resumes

CO15. Analyze various forms of Presentation skills

CO16. Judge the group behavior appropriately CO6: Develop skills required for employability.

UNIT I

Goal Setting and Self-Management

Definition, importance, types of Goal Setting – SMART Goal Setting – Advantages-Motivation – Intrinsic and Extrinsic Motivation – Self-Management - Knowing about self – SWOC Analysis

UNIT II

Writing Skills

Definition, significance, types of writing skills – Resume writing Vs CV Writing - E-Mail writing, Cover Letters - E-Mail Etiquette -SoP (Statement of Purpose)

UNIT III

Technical Presentation Skills

Nature, meaning & significance of Presentation Skills – Planning, Preparation, Presentation, Stage Dynamics –Anxiety in Public speaking (Gloss phobia)- PPT & Poster Presentation

UNIT IV

Group Presentation Skills

Body Language – Group Behavior - Team Dynamics – Leadership Skills – Personality Manifestation- Group Discussion-Debate –Corporate Etiquette

UNIT V

Job Cracking Skills

Nature, characteristics, importance & types of Interviews – Job Interviews – Skills for success – Job searching skills - STAR method - FAQs- Answering Strategies – Mock Interviews

Textbooks:

- 1.Sabina Pillai, Agna Fernandez. Soft Skills & Employability Skills,2014.Cambridge Publisher.
- 2.Alka Wadkar. Life Skills for Success, Sage Publications, 2016.

Reference Books:

- 1.Gangadhar Joshi. Campus to Corporate Paperback , Sage Publications. 2015
- 2.Sherfield Montgomery Moody,Cornerstone Developing Soft Skills, Pearson Publications. 4 Ed. 2008
- 3.Shikha Kapoor. Personality Development and Soft Skills - Preparing for Tomorrow .1 Edition, Wiley, 2017.
- 4.M. Sen Gupta, Skills for Employability, Innovative Publication, 2019.
- 5.Steve Duck and David T McMahan, The Basics of Communication Skills A Relational Perspective, Sage press, 2012.

Online Learning Resources:

- 1 . <https://youtu.be/gkLsn4ddmTs>
2. <https://youtu.be/2bf9K2rRWwo>
3. <https://youtu.be/FchfE3c2jzc>
4. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ
5. <https://www.youtube.com/c/skillopedia/videos>
6. https://onlinecourses.nptel.ac.in/noc25_hs96/preview
7. https://onlinecourses.nptel.ac.in/noc21_hs76/preview
8. <https://archive.nptel.ac.in/courses/109/107/109107172/#>
9. <https://archive.nptel.ac.in/courses/109/104/109104107/>

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)**

IV B. Tech I Semester

23ACE56

GEO-SPATIAL TECHNOLOGIES

(OPEN ELECTIVE – IV)

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Course Outcomes:

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

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 geo coding, shortest path analysis, and location-allocation problems.

CO4. Valuate surface and geo statistical 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

Customization of GIS: Need, Uses, Scripting Languages –Embedded Scripts – Use of Python Script - Web GIS: Web GIS Architecture, Advantages of Web GIS, Web Applications- Location Based Services: Emergency and Business Solutions - Big Data Analytics.

TEXT BOOKS:

- 1.Kang – Tsung Chang, Introduction to Geographical Information System, 4th Ed., Tata McGraw Hill Edition, 2008.
- 2.Lo,C.P.andYeung,AlbertK.W.,Concepts and Techniques of Geographic Information Systems Prentice Hall, 2002.

REFERENCEBOOKS:

1. Michael N. Demers, Fundamentals of Geographic Information Systems, Wiley,2009
2. Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasaraju, —AnIntroductionto Geographical Information Systems, Pearson Education, 2nd Edition, 2007.
3. John Peter Wilson, The Handbook of Geographic Information Science, Blackwell Pub., 2008

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)**

IV B. Tech I Semester

23ACE57

**SOLID WASTE MANAGEMENT
(OPENELECTIVE – IV)**

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Course Outcomes:

After the completion of the course students will be able to

CO1. Understand the types, sources, and characteristics of solid waste, along with regulatory Frame works.

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; Pyrolysis, 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 HandVigilSA __Integrated Solid Waste Management, Engineering Principles and Management Issues‘ McGraw-Hill, 1993.
2. Vesilind PA, Worrell Wand ReinhartD, __Solid Waste Engineering‘ Brooks/Cole Thomson Learning Inc., 2002.

REFERENCE BOOKS:

1. Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, __Environmental Engineering‘, Mc Graw Hill Inc., New York, 1985.
2. QianX, Koerner RM and GrayDH, __Geotechnical Aspects of Landfill Design and Construction‘ Prentice Hall, 2002.

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY, CHITTOOR
(AUTONOMOUS)**

IV B. Tech I Semester

23AME46

**TOTAL QUALITY MANAGEMENT
(OPEN ELECTIVE-IV)**

L	T	P	C
3	0	0	3

Course Outcomes:

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

CO1. Define and develop quality management philosophies and analyze quality cost frameworks.

CO2. Understand the historical development of Total Quality Management (TQM), its implementation, and real-world applications through case studies.

CO3. Evaluate the cost of poor quality, process effectiveness, and efficiency to analyze areas for improvement.

CO4. Apply benchmarking and business process reengineering to improve management processes.

CO5. Demonstrate a set of indicators to evaluate performance excellence of an organization.

UNIT-I

Introduction

Definition of Quality, Dimensions of Quality, Definition of Total quality management, Quality Planning, Quality costs – Analysis, Techniques for Quality costs, Basic concepts of Total Quality Management.

UNIT-II

Historical Review

Historical Review: Quality council, Quality statements, Strategic Planning, Deming Philosophy, Barriers of TQM Implementation, Benefits of TQM, Characteristics of successful quality leader, Contributions of Gurus of TQM, Case studies.

UNIT-III

TQM Principles

Customer Satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment teams, Continuous Process Improvement–JuranTrilogy,PDSACycle,Kaizen,SupplierPartnership–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.

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)**

IV B.Tech I Semester		L	T	P	C
23AEC53	TRANSDUCERS AND SENSORS	3	0	0	3

(OPEN ELECTIVE-IV)

Course Outcomes:

CO1. Understand the characteristics of Instrumentation Systems and the operating principles of motion transducers.

CO2. Explore the 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 principles 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, Venturi 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.

TEXTBOOKS

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.

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)**

IV B.Tech I Semester		L	T	P	C
23ACS16	COMPUTER NETWORKS (OPEN ELECTIVE-IV)	3	0	0	3

Course Outcomes:

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

CO1. Describe the architecture of the Internet, reference models, and explain different types of transmission media used in networking.

CO2. Apply error detection and correction techniques and analyze data link layer protocols and LAN technologies.

CO3. Explain routing algorithms and the structure of the network layer, including internetworking.

CO4. Analyze the working of transport layer protocols like TCP and UDP, including concepts of connection management and congestion control.

CO5. Explain the principles of network applications and describe the functionality of protocols such as HTTP, SMTP, DNS, and peer-to-peer systems, including multimedia streaming and content delivery networks.

UNIT I: Computer Networks and the Internet

What Is the Internet? The Network Edge, The Network Core Delay, Loss, and Throughput in Packet-Switched Networks Reference Models Example Networks Guided Transmission Media, Wireless Transmission

UNIT II

The Data Link Layer, Access Networks, and LANs

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

UNIT III

The Network Layer

Routing Algorithms Internetworking The Network Layer in the Internet

UNIT IV

The Transport Layer

Connectionless Transport: UDP The Internet Transport Protocols: TCP Congestion Control

UNIT V

Principles of Network Applications

Principles of Network Applications The Web and HTTP Electronic Mail in the Internet DNS — The Internet's Directory Service Peer-to-Peer Applications Video Streaming and Content Distribution Networks

Textbooks:

1. Andrew S. Tanenbaum, David J. Wetherall, *Computer Networks*, 5th Edition, PEARSON.
2. James F. Kurose, Keith W. Ross, *Computer Networking: A Top-Down Approach*, 6th edition, Pearson, 2019.

Reference Books:

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

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)**

IV Year B. Tech. – I Semester

L	T	P	C
3	0	0	3

23ACO01

**INTERNET OF THINGS
(OPEN ELECTIVE-IV)**

Course Outcomes:

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

CO1. Understand general concepts of Internet of Things.

CO2. Apply design concepts to IoT solutions.

CO3. Analyze various M2M and IoT architectures.

CO4. Evaluate design 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 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, Deregistering 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 – Ardupilot, Mission Planner, Internet of Drones(IoD)- Case study Fly t Base.

Textbooks

1.Vijay Madiseti 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 Avesand, Stamatis Karnouskos, David Boyle, From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, 1st Edition, Academic Press, 2014.
2. 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. John Baichtal, Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
IV Year B. Tech. I Semester

L	T	P	C
3	0	0	3

23AMB22

FINANCIAL MATHEMATICS
(OPEN ELECTIVE-IV)

Course Outcomes:

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

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.

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)**

IV Year B. Tech. I Semester

L	T	P	C
3	0	0	3

**23AHS46 SENSORS AND ACTUATORS FOR ENGINEERING APPLICATIONS
(Common to all Branches) (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. Illustrate 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 Deposition, Pattern: photolithography and Etching: Dry and Wet Etching. Actuators: Functional diagram of actuators, Types of actuators and their basic principle of working: Pneumatic, Electromagnetic, Piezo-electric and Piezo-resistive actuators, Applications of Actuators.

UNIT II

Temperature and Mechanical Sensors

Temperature Sensors: Types of temperature sensors and their basic principle of working:

Thermo- resistive sensors: Thermistors, Thermo-electric sensors: Thermocouples, PN junction temperature sensors

Mechanical Sensors: Types of Mechanical sensors and their basic principle of

working: Force sensors: Strain gauges, Tactile sensors, Pressure sensors:

Piezoresistive, Variable Reluctance Sensor (VRP).

UNIT III

Optical and Acoustic Sensors

Optical Sensors: Basic principle and working of: Photodiodes, Phototransistors and Photo resistors based sensors, Photomultipliers, Infrared sensors: thermal, Passive Infra-Red, Fiber based sensors and Thermopiles Acoustic Sensors: Principle and working of Ultrasonic sensors, Piezo-electric resonators, Microphones

UNIT IV

Magnetic and Electromagnetic Sensors

Motors as actuators (linear, rotational, stepping motors), magnetic valves, inductive sensors

(LVDT, RVDT, and Proximity), Hall Effect sensors, Magneto-resistive sensors, Magnetostrictive sensors and actuators.

UNIT V

Chemical and Radiation Sensors

Chemical Sensors: Principle and working of Electro-chemical, Thermo-chemical, Gas, pH, Humidity and moisture sensors.

Radiation Sensors: Principle and working of Ionization detectors, Scintillation detectors, Semiconductor radiation detectors and Microwave sensors (resonant, reflection, transmission)

Textbooks:

- 1.Sensors and Actuators – Clarence W. de Silva, CRC Press, 2nd Edition, 2015
- 2.Sensors and Actuators – D. A. Hall and C. E. Millar, CRC Press, 1999

Reference Books:

- 1.Sensors and Transducers – D. Patranabis, Prentice Hall of India (Pvt.) Ltd., 2003
- 2.Measurement, Instrumentation, and Sensors Handbook – John G. Webster, CRC Press, 1999
- 3.Sensors – A Comprehensive Overview – Henry Bolte, John Wiley
- 4.Handbook of Modern Sensors – Stefan Johann Rupitsch, Springer

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)**

IV Year B. Tech. I Semester

L	T	P	C
3	0	0	3

23AHS47 CHEMISTRY OF NANOMATERIALS AND APPLICATIONS
(Common to all Branches)
(OPEN ELECTIVE-IV)

Course Objectives

CO1. To understand basics and characterization of nanomaterials.

CO2. To understand synthetic methods of nanomaterials.

CO3. To apply various techniques for characterization of nanomaterials.

CO4. To understand studies of nano-structured materials.

CO5. To enumerate the applications of advanced nanomaterials in engineering.

UNIT – I

Basics and Characterization of Nano materials:

Introduction, scope of nano science and nanotechnology, 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 pyrolysis, chemical vapour deposition method, electrodeposition method, high-energy ball milling method.

Bottom-Up Approach: Sol-gel synthesis, microemulsions or reverse micelles, co-precipitation method, solvothermal synthesis, hydrothermal synthesis, microwave heating synthesis, sonochemical synthesis.

UNIT – III

Techniques for Characterization:

Diffraction techniques, 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 nanomaterial (Graphene), core-shell, magnetic nano particles, thermoelectric materials, non-linear optical materials

UNIT – V

Advanced Engineering Applications of Nano materials:

Applications of nano particles, nano rods, nano wires in water treatment, sensors, electronic devices, medical domain, civil engineering, chemical engineering, metallurgy and mechanical engineering, food science, agriculture, pollutants degradation.

TEXTBOOKS:

- 1.NANO: The Essentials – T. Pradeep, McGraw-Hill, 2007.
- 2.Textbook of Nanoscience and Nanotechnology – B. S. Murty, P. Shankar, Baldev Rai, B. B. Rath, and James Murday, University Press, 2012.

REFERENCE BOOKS:

- 1.Concepts of Nano chemistry – Ludovico Cademartiri and Geoffrey A. Ozin, Wiley-VCH, 2011.
- 2.Nanostructures & Nano materials: Synthesis, Properties & Applications – Guozhong Cao, Imperial College Press, 2007.

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)**

IV Year B.Tech. I Semester

	L	T	P	C
23AHS48	3	0	0	3
LITERARY VIBRES				
(Common to all Branches)				
(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 a Woman? – Sojourner Truth
3. The Second Coming – W. B. Yeats
4. Where the Mind is Without Fear – Rabindranath Tagore

UNIT II:

Drama – *Twelfth Night* by 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 Wilde
3. Three Questions – Leo Tolstoy
4. Grief – Anton Chekhov

UNIT IV:

Prose – Essay and Autobiography

1. My Struggle for an Education – Booker T. Washington

2. The Essentials of Education – Richard Livingston
3. The Story of My Life – Helen Keller
4. Student Mobs – J. B. Priestly

UNIT V:

Novel – *Hard Times* by 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

Textbooks:

1. Charles Dickens. *Hard Times*. (Sangam Abridged Texts) Vantage Press, 1983
2. DENT J. C. William Shakespeare: *Twelfth Night*. Oxford University Press, 2016

References:

- 1.W. J. Long. *History of English Literature*, Rupa Publications India; First Edition (4 October 2015)
- 2.R. K. Kaushik and S. C. Bhatia. *Essays, Short Stories and One Act Plays*, Oxford University Press, 2018
- 3.Dhanvel, S. P. *English and Soft Skills*, Orient Blackswan, 2017
- 4.*New Horizon*, Pearson Publications, New Delhi, 2014
- 5.Vimala Ramarao. *Explorations Volume-II*, Prasaraanga Bangalore University, 2014
- 6.Dev Neira, Anjana & Co. *Creative Writing: A Beginner's Manual*, Pearson India, 2008

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)**

IV Year B.Tech. – I Semester

		L	T	P	C
23ACS35	QUANTUM COMPUTING (OPEN ELECTIVE-IV)	3	0	0	3

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY,
CHITTOOR
(AUTONOMOUS)**

IV B.Tech I Semester (EEE)	L	T	P	C
	0	0	4	2

**23AEE40 POWER SYSTEMS AND SIMULATION LAB
(Skill Enhancement Course)**

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Analyze and determine the sequence impedances of both cylindrical rotor and salient pole synchr machines to understand their behavior under various fault conditions. -L3
- CO2. Conduct fault analysis (LG, LL, LLG, and LLLG) on synchronous machines and interpret the faults on system stability and performance. -L2
- CO3. Develop and simulate load flow analysis using various methods (Gauss- Seidel, Newton-Raphson, Decoupled) and formulate the YBus and ZBus for power system networks. -L5
- CO4. Model load frequency control problems for single and two-area systems, employing both uncontrolled, PI-controlled approaches to evaluate system performance.- L4
- CO5. Simulate load frequency control problems for single and two-area systems, employing both uncontrolled, PI-controlled approaches to evaluate the system performance.-L6

LIST OF EXPERIMENTS:

1. Determination of Sequence Impedances of Cylindrical Rotor Synchronous Machine.
2. Determination of Sequence Impedances of salient pole Synchronous Machine.
3. LG Fault Analysis on an un loaded alternator
4. LL Fault Analysis on conventional phases
5. LLG Fault Analysis
6. LLLG Fault Analysis
7. Determination of Sub transient reactance of salient pole synchronous machine.
8. Equivalent circuit of three winding transformer..
9. YBus formation using Soft Tools.
10. ZBus formation using Soft Tools.
11. Gauss-Seidel load flow analysis using Soft Tools.
12. Newton-Raphson load flow analysis using Soft Tools.
13. Fast decoupled load flow analysis using Soft Tools.
14. Solve the Swing equation and Plot the swing curve.

15. Develop a model for a uncontrolled single area load frequency control problem and simulate the same using Soft Tools..
16. Develop a model for PI controlled single area load frequency control problem and simulate the same using Soft Tools.
17. Develop a model for a uncontrolled two area load frequency control problem and simulate the same using Soft Tools.
18. Develop a model for PI controlled two area load frequency control problem and simulate the same using Soft Tools.

REFERENCE BOOKS:

1. O.P. Arora, —Power Electronics Laboratory: Theory, Practice and Organization (Narosa series in Power and Energy Systems)ll, Alpha Science International Ltd., 2007.
2. M. H. Rashid, —Simulation of Electric and Electronic circuits using PSPICEll, M/s PHI Publications.
3. PSPICE A/D user's manual – Microsim, USA.
4. PSPICE reference guide – Microsim, USA. 5. MATLAB and its Tool Books user's manual and – Math works, USA.

Online Learning Resources/Virtual Labs:

1. <https://www.ee.iitb.ac.in/~vlabsync/template/vlab/index.html#>

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY,
CHITTOOR
(AUTONOMOUS)**

IV B.Tech I Semester (EEE)	L	T	P	C
23AHS49	0	0	0	2
GENDER SENSITIZATION				
(Common to All Branches of Engineering)				

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Understand the basic concepts of gender and its related terminology.L1, L2,Understand Various dynamics of Electric Vehicles.-L2
- CO2. Identify the biological, sociological, psychological and legal aspects of gender.L1, L2
- CO3. Use the knowledge in understanding how gender discrimination works in our society and how to counter it.L3
- CO4. To Analyze the gendered division of labour and its relation to politics and economics.L4
- CO5. Appraise how gender-role beliefs and sharing behavior are associated with more well-being in all culture and gender groups.L5
- CO6. Develop students' sensibility with regard to issues of gender in contemporary India.L3

Unit-1 UNDERSTANDING GENDER

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood. Growing up Male. First lessons in Caste.

Unit-2 GENDER ROLES AND RELATIONS

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles- Gender Roles and Relationships Matrix-Missing Women-Sex Selection and its Consequences- Declining Sex Ratio- Demographic Consequences-Gender Spectrum -

Unit-3 GENDER AND LABOUR

Division and Valuation of Labour-Housework: The Invisible Labor- —My Mother doesn't Work. —Share the Load. —Work: Its Politics and Economics -Fact and Fiction- Unrecognized and Unaccounted work -Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

Unit-4 GENDER-BASED VIOLENCE

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment - Domestic Violence - Different forms of violence against women - Causes of violence, impact of violence against women - Consequences of gender-based violence

Unit-5 GENDER AND CULTURE

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language- Just Relationships

TEXTBOOKS:

1. A.Suneetha, Uma Bhugubanda, 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 James Larminie, John Lowry, —*Electric Vehicle Technology Explained*, Wiley, 2003, 2nd Edition.
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 Learning Resources

1. Understanding Gender chrome-extension:
 - a) [a\)/kdpelmjpfafjppnhbloffcjpeomlnpah/https://www.arvindguptatoys.com/arvindgupta/kamla-gender1.pdf](https://www.arvindguptatoys.com/arvindgupta/kamla-gender1.pdf)
2. Gender Roles and Relations :
 - a) <https://www.plannedparenthood.org/learn/gender-identity/sex-gender-identity/what-are-gender-roles-and-stereotypes>
 - b) <https://www.verywellmind.com/understanding-gender-roles-and-their-effect-on-our-relationships-7499408>
 - c) https://onlinecourses.swayam2.ac.in/cec23_hs29/preview
3. Gender and Labour
 - a) <https://www.economicsobservatory.com/what-explains-the-gender-division-of-labour-and-how-can-it-be-redressed>
 - b) https://onlinecourses.nptel.ac.in/noc23_mg67/preview

4. GENDER-BASED VIOLENCE

- a) https://eige.europa.eu/gender-based-violence/what-is-gender-based-violence?language_content_entity=en
- b) <https://www.worldbank.org/en/topic/socialsustainability/brief/violence-against-women-and-girls>
- c) https://onlinecourses.swayam2.ac.in/nou25_ge38/preview

5. GENDER AND CULTURE

- a) <https://gender.study/psychology-of-gender/culture-impact-gender-roles-identities/>
- b) <https://sociology.iresearchnet.com/sociology-of-culture/gender-and-culture/>
- c) <https://archive.nptel.ac.in/courses/109/106/109106136/>
- d) Abdulali Sohaila. —I Fought For My Life...and Won. Available online
- e) (at: <http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/>)

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY,
CHITTOOR
(AUTONOMOUS)**

IV B.Tech I Semester (EEE)	L	T	P	C
	0	0	0	2

23AEE41 EVALUATION OF INDUSTRY INTERNSHIP

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY,
CHITTOOR
(AUTONOMOUS)**

IV B.Tech II Semester (EEE)	L	T	P	C
	0	0	0	4

23AEE44 INTERNSHIP

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY,
CHITTOOR
(AUTONOMOUS)**

IV B.Tech II Semester (EEE)	L	T	P	C
	0	0	0	8

23AEE45 PROJECT

**HONORS DEGREE IN DEPARTMENT OF ELECTRICAL AND ELECTRONICS
ENGINEERING (SYLLABUS)**

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY,
CHITTOOR**

(AUTONOMOUS)

L	T	P	C
3	0	0	3

23AEE46 E - MOBILITY

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Understanding the Fundamentals of Electric Vehicles and Vehicle Dynamics. Choose suitable motors and analyse different power electronics in EVs. -L2
- CO2. Analyzing Battery Technologies for Electric Vehicles. -L4
- CO3. Understanding and Evaluating Charging Technologies for Electric Vehicles. -L2
- CO4. Exploring Future Trends and Innovations in Electric Vehicles. -L5
- CO5. Understanding E-Mobility, Policy, and Integration with Smart Grids. -L2

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. Iqbal Hussain, “Electric & Hybrid Vehicles – Design Fundamentals”, Second Edition, CRC Press, 2011.
2. James Larminie, “Electric Vehicle Technology Explained”, John Wiley & Sons, 2003.

REFERENCE BOOKS:

1. Mehrdad Ehsani, Yimin Gao, Ali Emadi, “*Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals*”, CRC Press, 2010.
2. Sheldon S. Williamson, *Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles*, Springer, 2013.
3. Sandeep Dhameja, “*Electric Vehicle Battery Systems*”, Newnes, 2000
4. Tariq Muneer and Irene Illescas García, “*The automobile, In Electric Vehicles: Prospects and Challenges*”, Elsevier, 2017.

RESOURCES:

1. <https://nptel.ac.in/courses/108106170>

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23AEE47 BATTERY MANAGEMENT SYSTEMS

L	T	P	C
3	0	0	3

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Understand the role of battery management system -L2
- CO2. Identify the requirements of Battery Management System. L2
- CO3. Interpret the concept associated with battery charging / discharging process.-L3
- CO4. Analyze various parameters of battery and battery pack. L4
- CO5. Design the model of battery pack. 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. Plett, Gregory L. Battery management systems, Volume I: Battery modelling. Artech House, 2015.
2. Plett, Gregory L. Battery management systems, Volume II: Equivalent-circuit methods. Artech House, 2015.

REFERENCE BOOKS:

1. Bergveld, H.J., Kruijt, W.S., Notten, P.H.L. “Battery Management Systems -Design by Modelling” Philips Research Book Series 2002.
2. Davide Andrea,” Battery Management Systems for Large Lithium-ion Battery Packs” Artech House, 2010
3. Pop, Valer, et al. Battery management systems: Accurate state-of-charge indication for battery- powered applications. Vol. 9. Springer Science & Business Media, 2008.

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CHITTOOR
(AUTONOMOUS)**

L	T	P	C
3	0	0	3

23AEE48 SPECIAL MACHINES FOR ELECTRIC VEHICLES

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Understanding the Fundamentals of Permanent Magnet (PM) Brushless Motor Drives. -L2
- CO2. Analyzing Switched Reluctance Motor (SRM) Drives. -L4
- CO3. Evaluating Stator-Permanent Magnet (PM) Motor Drives. -L4
- CO4. Understanding and Designing Magnetic-Gear Motor Drives. -L2
- CO5. Exploring Advanced Magnet less and Multiphase Motor Drives. L5

UNIT I

Permanent Magnet (PM) Brushless Motor Drives:

Structure of PM Brushless Machines, Principle of PM Brushless Machines Modeling of PM Brushless Machines, Inverters for PM Brushless Motors Motor Control, Design Criteria of PM Brushless Motor Drives for EVs, Design Examples of PM Brushless Motor Drives for EVs, Application, Advantages and Limitations for EVs.

UNIT II

Switched Reluctance Motor Drive:

Structure of SR Machines, Principle of SR Machines, SR Converters Topologies, SR Motor Control, Design Criteria of SR Motor Drives for EVs, Examples of SR Motor Drives for EVs, Application, Advantages and Limitations for EVs.

Unit III

Stator-PM Motor Drives:

Doubly-Salient PM Motor Drives, Flux-Reversal PM Motor Drives, Flux-Switching PM Motor Drives, Hybrid-Excited PM Motor Drives Flux-Mnemonic PM Motor Drives, Design Criteria of Stator-PM Motor Drives for EVs, Application, Advantages and Limitations for EVs.

UNIT IV

Magnetic-Geared Motor Drives:

Principle of MG Machines, Modeling of MG Machines, Inverters for MG Motors, MG Motor Control, Design Criteria of MG Motor Drives for EVs, Application, Advantages and Limitations for EVs

UNIT V

Advanced Magnet less Motor Drives and Multiphase Motor Drives:

Introduction of Advanced Magnet less technology, Synchronous Reluctance Motor Drives, Doubly- Salient DC Motor Drives, Flux-Switching DC Motor Drives, Design Criteria of Advanced Magnet less Motor Drives for EVs, Application, Advantages and Limitations for EVs. Multiphase Induction Motor drives – principle, operation and control, Multiphase PMSM machine – principle, operation and control, Fault tolerant operation of multiphase drives

TEXTBOOKS:

1. Mehrdad Ehsani, Yimin Gao, Sebatien Gay and Ali Emadi, “Modern Electric, Hybrid Electric and Fuel cell vehicles: Fundamentals, Theory and Design”, CRC Press, 2004.
2. James Larminie and John Lory, “Electric Vehicle Technology – Explained”, John Wiley & Sons Ltd, 2003.
3. Vladimir S. Bagotsky, Alexander M. Skundin, Yuriy VM. Volfkovich., —Electrochemical power sources : Batteries, fuel cells, and supercapacitors, John Wiley & Sons, Inc.,2015.

REFERENCE BOOKS:

1. Sandeep Dhameja, “Electric Vehicle Battery Systems”, Butterworth – Heinemann, 2002.
2. Ronald K Jurgen, “Electric and Hybrid – Electric Vehicles”, SAE, 2002.
3. Ron Hodgkinson and John Fenton, “Light Weight Electric/Hybrid Vehicle Design”, Butterworth – Heinemann, 2001.
4. Iqbal Husain, “Electric and Hybrid Vehicles- Design Fundamentals” CRC Press, 2011.

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L	T	P	C
3	0	0	3

23AEE49 GRID INTERFACE OF ELECTRIC VEHICLES

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Understanding the Fundamentals of Smart Grid and Electric Vehicle Integration Analyze Impact of EV on smart grid -L2
- CO2. Analyzing the Impact of EVs and V2G on the Smart Grid and Renewable Energy Systems -L3
- CO3. Applying Power Conversion Technologies for Smart Grids and Electric Vehicles- L4
- CO4. Designing Control and Management Strategies for PEV Parking Lots -L5
- CO5. Evaluating the Role of PEVs as Ancillary Services in Smart Grids -L4

UNIT I

Introduction to Smart Grid and PEV:

Introduction to smart grid and microgrid, Impact of PEVs on Distributed Energy Resources in the Smart Grid, V2G Technology and PEVs Charging Infrastructures

UNIT III

Impact of V2G and G2V on the Smart Grid and Renewable Energy Systems:

Types of Electric Vehicles, Motor Vehicle Ownership and EV Migration, Impact of Estimated EVs on Electrical Network, Impact on Drivers and the Smart Grid, Standardization and Plug-and-Play

UNIT III

Power Conversion Technology in the Smart Grid and EV:

Impacts of EV Penetration on Grid Power Profile, Requirements of Its Control and Monitoring, Hybrid EV Power train Architectures, Control, Monitoring and Management Strategies of EV, V2G Communication System, System model of EV, Case study of three phase fault and its impact

UNIT IV

Planning, Control and Management Strategies for Parking Lots for PEVs:

Introduction to PEV Charging Facility, Long-Term Planning for PEV Parking Lots, Control and Management of PEV Parking Lots - stages of implementation

UNIT V

PEV as Ancillary Service in Smart Grid:

Introduction to Ancillary Services, PEV Charger Optimization, PEV as ancillary source, Control Strategies for PEVs to Follow the Individual Operation Values, Systems and Control Algorithm for Smart PEV Chargers, Avoiding the Harmonic Propagation Within the Grid, Case study

TEXTBOOKS:

1. Lu, J. and Hossain, J., Vehicle-to-grid: linking electric vehicles to the smart grid. Institution of Engineering and Technology, 2015.
2. Rajakaruna, S., Shahnia, F. and Ghosh, A. eds., Plug In Electric Vehicles in Smart Grids: Integration Techniques. Springer, 2014.

REFERENCE BOOKS:

1. Rajakaruna, S., Shahnia, F. and Ghosh, A. eds., *Plug in electric vehicles in smart grids: charging strategies*. Springer, 2014.
2. Salman, S.K., *Introduction to the Smart Grid: Concepts, Technologies and Evolution (Vol. 94)*. IET., 2017.

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23AEE50 EV CHARGING TECHNOLOGIES

L	T	P	C
3	0	0	3

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Understanding Battery Basics and Key Parameters-L2
- CO2. Analyzing Battery Modeling Techniques and Capacity Estimation-L3
- CO3. Exploring Charging Infrastructure and Regulatory Frameworks-L4
- CO4. Evaluating Battery Charging Techniques and Performance-L3
- CO5. Understanding Power Electronics in EV Charging Systems-L3

UNIT I

Battery Basics:

Battery parameters- Cell and Battery Voltages, Charge (or Amp hour) Capacity, Energy Stored, Specific Energy, Energy Density, Specific Power, Amp hour (or Charge) Efficiency, Energy Efficiency, Self-discharge Rates, Battery Geometry, Battery Temperature, Heating and Cooling Needs 35 3.2.12 Battery Life and Number of Deep Cycles Types of batteries- lead-acid, nickel based sodium based, lithium batteries, metal-air batteries. Refilled Batteries.

UNIT II

Battery Modeling:

The Purpose of Battery Modeling, Electrochemical model, black box model, equivalent circuit model - Battery Equivalent Circuit, Modeling Battery Capacity, Simulating a Battery at a Set Power, Calculating the Peukert Coefficient, Approximate Battery Sizing, Battery state of charge estimation.

UNIT III

Charging Infrastructure:

EV supply equipment, charging standards, classification of charging infrastructure, connecting EVs to the electricity grid, regulatory framework for EV charging connections, communication protocols for smart charging, Battery Management System.

UNIT IV

Battery Charging Techniques:

Basic Terms for Evaluating Charging Performances, Charging Algorithms for Li-Ion Batteries, Optimal Charging Current Profiles for Lithium-Ion battery, Lithium Titanate Oxide Battery with Extreme Fast Charging Capability. Super Capacitors for battery charging.

UNIT V

Power Electronics in EV Charging:

Active front end rectifiers - Forward converters, half and full bridge DC-DC converters, power factor correction converters, decreasing impact on the grid and switches, bidirectional battery chargers, wireless charging.

TEXTBOOKS:

1. James Larminie, John Lowry, “Electric Vehicle Technology Explained”, Wiley, 2012.
2. RuiXiong, Weixiang Shen, “Advanced Battery management Technologies for Electric Vehicle”, Wiley, 2018.

REFERENCE BOOKS:

1. *Handbook of Electric Vehicle Charging Infrastructure Implementation*, NITI Aayog, Government of India.
2. Chris Mi, M. AbulMasrur, *Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives*, Wiley, 2017
3. Bruno Scrosati, Jurgen Garche, Werner Tillmetz, *Advances in Battery Technologies for Electric Vehicles*, Wood head Publishing Series in Energy, 2015.
4. Sheldon S. Williamson , *Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles*, Springer, 2013.

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	L	T	P	C
23AEE51 PROJECT ON ELECTRIC VEHICLES	0	0	6	3

MINOR DEGREE IN ENERGY SYSTEMS
(SYLLABUS)

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND
TECHNOLOGY, CHITTOOR
(AUTONOMOUS)**

L	T	P	C
3	0	0	3

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. Understand the basic principle and applications of the electrolytic process.-L1
- CO6. 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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L	T	P	C
3	0	0	3

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. Guinness 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.

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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
Analyzing Indoor Environmental Requirements and Their Impact on Energy Use -L3
- 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, Yuriy 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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L	T	P	C
3	0	0	3

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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L	T	P	C
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 transesterification. 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 & 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 Ptasiński, —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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23AEE57 PROJECT IN ENERGY SYSTEMS

MINORS DEGREE IN MICRO GRID TECHNOLOGY (SYLLABUS)

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23AEE58 FUTURISTIC POWER SYSTEMS

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.

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.

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; Heatsink- 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., Elsevier 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., Elsevier 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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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, Computational methods for Electric Power Systems, CRC Press, NW, 2016, 3rd Edition.
3. Francisco D'íaz-González, 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. Kathires, 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

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

III Year B.Tech. CE-I Semester

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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

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(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.

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III Year B.Tech. CE–II Semester

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(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
(AUTONOMOUS)

IV Year B.Tech. CE– I Semester

L	T	P	C
3	0	0	3

(23ACE71)

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 Proofer.

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-I Semester

L	T	P	C
0	0	3	1.5

(23ACE72)

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]
6. **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.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

III Year B.Tech. CE-II Semester

L	T	P	C
0	0	3	1.5

(23ACE73)

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
9. 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

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)**

Minors in Mechanical Engineering (R23)

L	T	P	C
3	0	0	3

23AME61: MATERIAL SCIENCE & ENGINEERING

Course Outcomes:

CO1: Understand crystal structures, defects, strengthening mechanisms, and phase diagrams including the iron–carbon system

CO2: Classify and evaluate the microstructure, properties, and applications of steels and cast irons.

CO3: Analyze various heat treatment processes and their effects on the microstructure and properties of steels.

CO4: identify the microstructure, properties, and industrial uses of important non-ferrous metals and their alloys.

CO5: Understand the structure, properties, and applications of ceramics, polymers, composites, superalloys, and nanomaterials.

UNIT – I

Structure of Metals & Constitution of Alloys

Structure of Metals: Crystal Structures: Unit cells, Metallic crystal structures, Imperfection in solids: Point, Line, interstitial and volume defects; dislocation strengthening mechanisms and slip systems, critically resolved shear stress.

Constitution of Alloys: Necessity of Alloying, substitutional and interstitial solid solutions- Phase diagrams: Interpretation of binary phase diagrams and microstructure development; eutectic, peritectic, peritectoid and monotectic reactions. Iron-Iron-carbide diagram and microstructural aspects of ferrite, cementite, austenite, ledeburite, and cast iron.

UNIT – II

Steels & Cast irons

Steels: Plain carbon steels, use and limitations of plain carbon steels. AISI& BIS classification of steels. Classification of alloys steels. Microstructure, properties and applications of alloy steels-stainless steels and tool steels.

Cast irons: Microstructure, properties and applications of white cast iron, malleable cast iron, grey cast iron, nodular cast iron and alloy cast irons.

UNIT-III

Heat Treatment of Steels: Annealing, tempering, normalizing and hardening, isothermal transformation diagrams for Fe-Fe₃C alloys and microstructure development. Continuous cooling curves and interpretation of final microstructures and properties- austempering, martempering, case hardening - carburizing, nitriding, cyaniding, carbo-nitriding, flame and induction hardening, and vacuum and plasma hardening.

UNIT-IV

Non-ferrous Metals and Alloys: Microstructure, properties and applications of copper, aluminium, titanium, nickel and their alloys. Study of Al-Cu phase diagram.

UNIT-V

Ceramics, Polymers and Composites: Structure, properties and applications of ceramics, polymers and composites. Introduction to super alloys and nanomaterials.

TEXT BOOKS:

1. V.Raghavan, Material Science and Engineering, 5/e, Prentice Hall of India, 2004.
2. R.Balasubramaniam, Callister's Material Science and Engineering, 2/e, Wiley India, 2014.

REFERENCE BOOKS:

1. Y. Lakhtin, Engineering Physical Metallurgy, University Press of the Pacific, 2000.
2. S.H. Avner, Introduction to Physical Metallurgy, 2/e, Tata McGraw- Hill, 1997

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)**

Minors in Mechanical Engineering (R23)

L	T	P	C
3	0	0	3

23AME62: ADDITIVE MANUFACTURING

Course Outcomes:

CO1: Introduce the fundamentals, evolution, classifications, and data formats associated with Additive Manufacturing (AM) systems.

CO2: Familiarize students with CAD modeling, digitization, data processing, and reverse engineering techniques for AM.

CO3: Explain the principles, processes, materials, and applications of solid and liquid-based AM systems.

CO4: Understand the working principles, processes, advantages, and limitations of powder-based AM systems.

CO5: Explore additional AM techniques like 3DP, BPM, and SDM, along with their operational principles and practical applications.

Unit – I

Introduction to Additive Manufacturing (AM) Systems: History and Development of AM, Need of AM, Difference between AM and CNC, Classification of AM Processes: Based on Layering Techniques, Raw Materials and Energy Sources, AM Process Chain, Benefits and Applications of AM, Representation of 3D model in STL format, RP data formats: SLC, CLI, RPI, LEAF, IGES, CT, STEP, HP/GL.

Unit – II

CAD & Reverse Engineering: Basic Concept, Digitization techniques, Model Reconstruction, Data Processing for Additive Manufacturing Technology: CAD model preparation, Part Orientation and support generation, Model Slicing, Tool path Generation, Software's for Additive Manufacturing Technology: MIMICS, MAGICS. Reverse Engineering (RE) –Meaning, Use, RE – The Generic Process, Phase of RE Scanning, Contact Scanners, Noncontact Scanners, Point Processing, Application Geometric Model, Development.

UNIT-III

Liquid Based AM Systems: Stereolithography (SLA): Principle, Process, Materials, Advantages, Limitations and Applications. Solid Ground Curing (SGC): Principle, Process, Materials, Advantages, Limitations, Applications. Fusion Deposition Modeling (FDM): Principle, Process, Materials, Advantages, Limitations, Applications. Laminated Object Manufacturing (LOM): Principle, Process, Materials, Advantages, Limitations, Applications.

UNIT-IV

Powder Based AM Systems: Principle and Process of Selective Laser Sintering (SLS), Advantages, Limitations and Applications of SLS, Principle and Process of Laser Engineered Net Shaping (LENS), Advantages, Limitations and Applications of LENS, Principle and Process of Electron Beam Melting (EBM), Advantages, Limitations and Applications of EBM.

UNIT-V

Other Additive Manufacturing Systems: Three-Dimensional Printing (3DP): Principle, Process, Advantages, Limitations and Applications. Ballistic Particle Manufacturing (BPM): Principle, Process, Advantages, Limitations, Applications. Shape Deposition Manufacturing (SDM): Principle, Process, Advantages, Limitations, Applications.

TEXT BOOKS:

1. Ian Gibson, David W. Rosen, Brent Stucker, "Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing", 1st edition, Springer, 2010.
2. Chua C.K., Leong K.F. and Lim C.S., "Rapid Prototyping: Principles and Applications", 2nd edition, World Scientific Publishers, 2003.
3. Liou W. Liou, Frank W., Liou, "Rapid Prototyping and Engineering Applications: A Tool Box for Prototype Development", CRC Press, 2007

REFERENCE BOOKS:

1. Pham D.T. and Dimov S.S., "Rapid Manufacturing; The Technologies and Application of RPT and Rapid Tooling", Springer, London 2001.
2. Gebhardt A., "Rapid prototyping", Hanser Gardener Publications, 2003

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)**

Minors in Mechanical Engineering (R23)

L	T	P	C
3	0	0	3

23AM63: MATERIALS CHARACTERIZATION TECHNIQUES

Course Outcomes:

CO1: Understand and apply the principles of X-ray diffraction for structural analysis of polycrystalline materials, including crystallite size estimation using Scherrer and WH methods.

CO2: Gain knowledge of the construction, working, imaging modes, and applications of Scanning Electron Microscopy (SEM).

CO3: Comprehend the operation and applications of Transmission Electron Microscopy (TEM) and distinguish it from SEM.

CO4: Understand the principles, instrumentation, and analytical applications of key spectroscopy techniques such as UV-Vis, Raman, FTIR, and XPS.

CO5: Analyze electrical and magnetic properties of materials using techniques like DC/AC conductivity, Hall Effect, VSM, and SQUID.

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 Scherrer and WH 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 Microscope, 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, Advantages and Limitations of Transmission Electron Microscopy.

UNIT-IV

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

UNIT-V

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

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Fundamentals of Molecular Spectroscopy -IV Ed. -Colin Neville Banwell and Elaine M. McCash, Tata McGraw-Hill, 2008.
2. Elements of X-ray diffraction - Bernard Dennis Cullity & Stuart R Stocks, Prentice Hall, 2001 — Science

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)**

Minors in Mechanical Engineering (R23)

L	T	P	C
3	0	0	3

23AME64: 3D PRINTING MATERIALS & APPLICATIONS

Course Outcomes:

CO1: Understand the fundamentals of 3D printing and differentiate between traditional prototyping and rapid prototyping technologies.

CO2: Gain knowledge of solid and liquid-based RP systems such as FDM, LOM, SLA, DLP, and SGC, including their working principles, materials, and applications.

CO3: Comprehend the working, materials, and applications of powder-based and other RP systems like SLS, DMLS, LENS, EBM, 3DP, BPM, and SDM.

CO4: Understand the principles and processes involved in rapid tooling and reverse engineering, including scanning techniques and tool classification.

CO5: Identify common 3D printing errors, understand STL file handling and RP software tools, and explore various applications of RP in design, engineering, and medicine.

UNIT – I

Introduction to 3D Printing: Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Need for time compression in product development, Usage of RP parts, Generic RP process, Distinction between RP and CNC, other related technologies, Classification of RP.

UNIT – II

Solid and Liquid Based RP Systems: Working Principle, Materials, Advantages, Limitations and Applications of Fusion Deposition Modelling (FDM), Laminated Object Manufacturing (LOM), Stereo lithography (SLA), Direct Light Projection System (DLP) and Solid Ground Curing (SGC)..

UNIT-III

Powder Based & Other RP Systems: Powder Based RP Systems: Working Principle, Materials, Advantages, Limitations and Applications of Selective Laser Sintering (SLS), Direct Metal Laser Sintering (DMLS), Laser Engineered Net Shaping (LENS) and Electron Beam Melting (EBM).

Other RP Systems: Working Principle, Materials, Advantages, Limitations and Applications of Three-Dimensional Printing (3DP), Ballistic Particle Manufacturing (BPM) and Shape Deposition Manufacturing (SDM).

UNIT-IV

Rapid Tooling & Reverse Engineering: Rapid Tooling: Conventional Tooling Vs. Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling Methods, Soft and Hard Tooling methods.

Reverse Engineering (RE): Meaning, Use, RE – The Generic Process, Phases of RE Scanning, Contact Scanners and Noncontact Scanners, Point Processing, Application Geometric Model, Development.

UNIT-V

Errors in 3D Printing and Applications: Pre-processing, processing and post-processing errors, Part building errors in SLA, SLS, etc. Software: Need for software, MIMICS, Magics, SurgiGuide, 3-matic, 3D-Doctor, Simplant, Velocity2, VoXim, Solid View, 3DView, etc., software, Preparation of CAD models, Problems with STL files, STL file manipulation, RP data formats: SLC, CLI, RPI, LEAF, IGES, HP/GL, CT, STEP. Applications: Design, Engineering Analysis and planning applications, Rapid Tooling, Reverse Engineering, Medical Applications of RP.

TEXT BOOKS:

1. Chee Kai Chua and Kah Fai Leong, “3D Printing and Additive Manufacturing Principles and Applications” 5/e, World Scientific Publications, 2017.
2. Ian Gibson, David W Rosen, Brent Stucker, “Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing”, Springer, 2/e, 2010.

REFERENCE BOOKS:

1. Frank W. Liou, "Rapid Prototyping & Engineering Applications", CRC Press, Taylor & Francis Group, 2011.
2. Rafiq Noorani, "Rapid Prototyping: Principles and Applications in Manufacturing", John Wiley&Sons, 2006.

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)**

Minors in Mechanical Engineering (R23)

L	T	P	C
3	0	0	3

23AME25: CAD/CAM

Course Outcomes:

CO1: Understand the product cycle and apply CAD/CAM tools and computer graphics concepts for industrial design and manufacturing.

CO2: Apply various geometric modeling techniques including wireframe, surface, and solid modeling for accurate representation of engineering components.

CO3: Comprehend the principles of NC/CNC systems and develop CNC part programs using manual and computer-assisted methods.

CO4: Analyze group technology concepts, flexible manufacturing systems, and computer-aided quality control methods for improving production efficiency and quality.

CO5: Understand computer-aided process planning, production control, and modern trends like lean, sustainable, and reconfigurable manufacturing systems.

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.

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)**

Minors in Mechanical Engineering (R23)

L	T	P	C
0	0	3	1.5

23AME06: COMPUTER AIDED MACHINE DRAWING

Course Outcomes:

CO1: Create 2D drawings of mechanical joints, keys, and couplings using conventional representations in CAD software.

CO2: Develop 3D solid models of machine components and generate accurate sectional views.

CO3: Assemble complex mechanical systems using 3D modeling tools and produce detailed assembly drawings.

CO4: Interpret and apply limits, fits, and geometric tolerances in manufacturing drawings.

CO5: Utilize CAD tools to transition from conceptual design to manufacturing-ready technical documentation.

List of Experiments:

I. The following contents 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.

II. The following contents to be done by any 3D software package

Sectional views

Creating solid models of complex machine parts and create 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, carburettor, piston, connecting rod, eccentric, screw jack, plumber block, axle bearing, pipe vice, clamping device, Geneva cam, universal coupling,

Manufacturing 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.

TEXT BOOKS:

1. K.L. Narayana, P.Kannaiah and K.Venkat Reddy, Production Drawing, New Age International Publishers, 3/e, 2014.
2. Software tools/packages- Auto CAD, Solid works or equivalent.

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.

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)**

Minors in Mechanical Engineering (R23)

L	T	P	C
0	0	3	1.5

23AME38: 3D PRINTING LAB

Course Outcomes:

CO1: Create 2D drawings of mechanical joints, keys, and couplings using conventional representations in CAD software.

CO2: Develop 3D solid models of machine components and generate accurate sectional views.

CO3: Assemble complex mechanical systems using 3D modeling tools and produce detailed assembly drawings.

CO4: Interpret and apply limits, fits, and geometric tolerances in manufacturing drawings.

CO5: Utilize CAD tools to transition from conceptual design to manufacturing-ready technical documentation.

List of Experiments:

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.

REFERENCE BOOKS:

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.

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Minors in Mechanical Engineering (R23)

L	T	P	C
3	0	0	3

23AME65: PRODUCTION PLANNING & CONTROL

Course Outcomes:

CO1: Students can able to prepare production planning and control activities.

CO2: Understand the concepts of Work study.

CO3: Analyze the Pre requisite information needed for process planning.

CO4: Understand the Scheduling techniques.

CO5: Understand the Scheduling techniques.

UNIT – I

Introduction: Objectives and benefits of planning and Control-Functions of production Control-Types of production- job- batch and Continuous-Product development and design-Marketing aspect - Functional aspects- Operational Aspect-Durability and dependability aspect aesthetic aspect. Profit consideration-Standardization, Simplification & specialization- Break even analysis-Economics of a new design.

UNIT – II

Workstudy: Method study, basic procedure-Selection-Recording of process - Critical analysis, Development - Implementation - Micro motion and memo motion study – work measurement - Techniques of work measurement - Time study - Production study - Work sampling - Synthesis from standard data - Predetermined motion time standards.

UNIT-III

Product Planning and Process Planning: Product planning-Extending the original product information-Value Analysis-Problems in lack of product planning-Process planning and routing-Pre requisite information needed for process planning- Steps in process planning-Quantity determination in batch production-Machine capacity, balancing- Analysis of process capabilities in a multi-product system.

UNIT-IV

Production Scheduling: Production Control Systems-Loading and scheduling-Master Scheduling-Scheduling rules-Gantt Charts-Perpetual Loading-Basic scheduling problems - Line of balance – Flow production scheduling- Batch production scheduling-Product sequencing – Production Control systems- Periodic batch control-Material requirement planning kanban – Dispatching-Progress reporting and expediting-Manufacturing lead time-Techniques for aligning completion times and due dates.

UNIT-V

Inventory Control and Recent Trends In PPC: Inventory control-Purpose of holding stock-Effect of demand on inventories-Ordering procedures. Two bin system - Ordering cycle system-Determination of Economic order quantity and economic lot size- ABC analysis - Recorder Procedure-Introduction to computer integrated production planning systems- elements of Just in Time Systems-Fundamentals of MRP II and ERP.

TEXT BOOKS:

1. James. B. Dilworth,” Operations management – Design, Planning and Control for manufacturing and services” McGraw Hill International edition 1992.
2. Mart and Telsang, “Industrial Engineering and Production Management”, First edition, S. Chand and Company, 2000.

REFERENCE BOOKS:

1. Chary. S.N., “Theory and Problems in Production & Operations Management”, Tata McGraw Hill, 1995.
2. Elwood S. Buffa, and Rakesh K. Sarin, “Modern Production / Operations Management”, 8th Edition John Wiley and Sons, 2000.

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Minors in Mechanical Engineering (R23)

L	T	P	C
3	0	0	3

23AMB26: MARKETING MANAGEMENT

Course Outcomes:

- CO1:** Knowledge of analytical skills in solving marketing related problem.
CO2: Awareness of marketing management process.
CO3: Identify the scope and significance of Marketing in Domain Industry.
CO4: Examine marketing concepts and phenomenon to current business events In the Industry.
CO5: illustrate market research skills for designing innovative marketing strategies for business firms.

UNIT – I

Introduction: Marketing – Definitions - Conceptual frame work – Marketing environment: Internal and External - Marketing interface with other functional areas – Production, Finance, Human Relations Management, Information System. Marketing in global environment – Prospects and Challenges.

UNIT – II

Marketing Strategy: Marketing strategy formulations – Key Drivers of Marketing Strategies - Strategies for Industrial Marketing – Consumer Marketing — Services marketing – Competitor analysis - Analysis of consumer and industrial markets – Strategic Marketing Mix components.

UNIT-III

Marketing Mix Decisions: Product planning and development – Product life cycle – New product Development and Management – Market Segmentation – Targeting and Positioning – Channel Management – Advertising and sales promotions – Pricing Objectives, Policies and methods.

UNIT-IV

Production Scheduling: Production Control Systems-Loading and scheduling-Master Scheduling-Scheduling rules-Gantt Charts-Perpetual Loading-Basic scheduling problems - Line of balance – Flow production scheduling- Batch production scheduling-Product sequencing – Production Control systems- Periodic batch control-Material requirement planning kanban – Dispatching-Progress reporting and expediting-Manufacturing lead time-Techniques for aligning completion times and due dates.

UNIT-V

Marketing Research & Trends In Marketing: Marketing Information System – Research Process – Concepts and applications: Product – Advertising – Promotion – Consumer Behaviour – Retail research – Customer driven organizations - Cause related marketing - Ethics in marketing –Online marketing trends.

TEXT BOOKS:

1. Philip Kotler and Kevin Lane Keller, Marketing Management, PHI 14/e, 2012.
2. Paul Baines, Chris Fill and Kelly Page, Marketing, Oxford University Press, 2/e, 2011.
3. Kotler, Philip (2002) Marketing Management, Millennium Edition. Intl ed. US: Prentice Hall, 2002

REFERENCE BOOKS:

1. KS Chandrasekar, “Marketing management-Text and Cases”, Tata McGraw Hill, First edition, 2010.
2. Philip Kotler and Kevin Lane Keller, Marketing Management, PHI 14th Edition, 2012.
3. Lamb, hair, Sharma, Mc Daniel– Marketing – An Innovative approach to learning and teaching-A south Asian perspective, Cengage Learning -2012

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Minors in Mechanical Engineering (R23)

L	T	P	C
3	0	0	3

23AME57: SUPPLY CHAIN MANAGEMENT

Course Outcomes:

CO1: Understand the strategic role of logistic and supply chain management in the cost reduction and offering best service to the customer.

CO2: Understand Advantages of SCM in business.

CO3: Apply the knowledge of supply chain Analysis

CO4: Analyze reengineered business processes for successful SCM implementation.

CO5: Evaluate Recent trend in supply chain management.

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 modelling 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.
3. Wisner, Keong Leong and Keah-Choon Tan, “Principles of Supply Chain Management A Balanced Approach”, Cengage Learning, 1/e.

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(AUTONOMOUS)**

Minors in Mechanical Engineering (R23)

L	T	P	C
3	0	0	3

23AMB27: STRATEGIC MANAGEMENT FOR COMPETITIVE ADVANTAGE

Course Outcomes:

CO1: Understand new forms of Strategic Management concepts and their use in business.

CO2: Summarize strategic formulation process.

CO3: Develop analytical skills to solve cases and to provide strategic solutions.

CO4: Understand Strategic Evaluation, Monitoring and Control.

CO5: Create awareness on corporate Governance and Ethical Issues.

UNIT – I

Basic concepts: Basic Concepts of Strategic Management, Strategic Management Process, Vision, Mission and Goals, Benefits and Risks of Strategic Management, Levels of Strategies Concepts of corporate strategy, Corporate, Business and Operational Level Strategy, Functional Strategies: Human Resource Strategy, Marketing Strategy, Financial Strategy, Operational Strategy Business Environment: Components of Environment Micro and Macro and Environmental Scanning. Competitive Analysis - Competition and Competitor Analysis, Porter Five Forces Model Internal Corporate analysis, Sustainability, Value Chain Analysis.

UNIT – II

Strategic Formulation: Strategic Choices and Importance, Formulation of Alternative Strategies: Generic Strategies, Grand Strategy, Diversification Mergers, Acquisitions, Takeovers, Joint Ventures, Diversification, Turnaround, Divestment and Liquidation. Strategic Analysis and Choice: Issues and Structures, Corporate Portfolio Analysis-SWOT Analysis, BCG Matrix, GE Nine Cell Matrix, Hofer's Matrix, ETOP-Environmental Threat and Opportunity Profile, Strategic Choice-Factors and Importance.

UNIT-III

Strategic Implementation:

Strategy Implementation - Strategy and Structure Steps, Importance and Problems, Resource Allocation-Importance & Challenges Strategic 7S Framework; Management of Change Strategy Implementation - Organizational culture and Leadership; Functional Strategies.

UNIT-IV

Strategic Evaluation, Monitoring and Control - Strategic Controls; Balanced Scorecard; Strategy map Evaluation and Control: Importance, Limitations and Techniques Budgetary Control: Advantages, Limitations. Corporate Restructuring Strategies: Concept, Need and Forms, Corporate Renewal Strategies: Concept, Internal and External factors and Causes.

UNIT-V

Corporate Governance and Ethical Issues, Corporate Social Responsibility and sustainability, Strategic Enablers: Innovation and Entrepreneurship, Knowledge Management, Technology Management. Public Private Participation: Importance, Problems and Governing Strategies of PPP Model. Information technology Driven Strategies: Importance, Limitations and contribution of IT sector in Indian Business. Start-up Business Strategies and Make in India Model: Process of business startups and its Challenges, Growth Prospects and government initiatives in Make in India Model with reference to National manufacturing, Contribution of Make in India Policy in overcoming industrial sickness.

TEXT BOOKS:

1. Strategic Management, A Dynamic Perspective-Concepts and Cases– Mason A. Carpenter, Wm. Gerard Sanders, Prashant Salwan, Published by Dorling Kindersley (India) Pvt Ltd, Licensees of Pearson Education in south Asia.
2. Strategic Management and Competitive Advantage-Concepts, Jay B. Barney, William S. Hesterly, Published by PHI Learning Private Limited, New Delhi.
3. Strategic Management Formulation, Implementation and Control, Pearce & Robinson, McGraw-Hill Publications

REFERENCE BOOKS:

1. Crafting and Executing Strategy – The Quest for Competitive Advantage, Thomson & Strickland, McGraw-Hill Publications, 21st edition.
2. Exploring Strategy – Text and Cases, Gerry Johnson, Richard Whittington, Kevan Scholes, Duncan Angwin, and Patrick Regner, Pearson, 10th edition.

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Minors in Mechanical Engineering (R23)

L	T	P	C
3	0	0	3

23AME66: SIX SIGMA & LEAN MANUFACTURING

Course Outcomes:

CO1: Summarize various techniques that are related to the six-sigma and lean manufacturing.

CO2: Outline the concepts of cellular manufacturing, JIT and TPM.

CO3: Illustrate the principles and implementation of 5S techniques.

CO4: Discuss procedure and principles of value stream mapping.

CO5: Determine the reliability function using six-sigma.

UNIT – I

Introduction to Six-Sigma: Probabilistic models-Six Sigma measures-Yield-DPMO-Quality Level-Reliability function using Six- Sigma- MTTF using Six Sigma-Maintenance free operating period- Availability using Six-Sigma -Point availability-Achieved availability-Operational Availability-Examples.

UNIT – II

The Elements of Six Sigma and their Determination: The Quality Measurement Techniques: SQC, Six Sigma, Cp and Cpk- The Statistical quality control (SQC) methods-The relationship of control charts and six sigma-The process capability index (Cp)-Six sigma approach-Six sigma and the 1.5 a shift-The Cpk Approach Versus Six Sigma-Cpk and process average shift- Negative Cpk-Choosing six sigma or Cpk-Setting the process capability index-Examples.

UNIT-III

Introduction to Lean Manufacturing: Conventional Manufacturing versus Lean Manufacturing — Principles of Lean Manufacturing —Basic elements of lean manufacturing — Introduction to LM Tools.

UNIT-IV

Cellular Manufacturing, JIT, TPM: Cellular Manufacturing — Types of Layout, Principles of Cell layout, Implementation. JIT —Principles of JIT and Implementation of Kanban. TPM — Pillars of TPM, Principles and implementation of TPM.

UNIT-V

Set Up Time Reduction, TQM, 5S, VSM 10: Set up time reduction — Definition, philosophies and reduction approaches. TQM Principles and implementation. 5S Principles and implementation - Value stream mapping procedure and principles.

TEXT BOOKS:

1. U Dinesh Kumar, Crocker, Chitra and Harithe Saranga, Reliability and Six Sigma, Springer Publishers.
2. Sung H. Park, Six Sigma for Quality and Productivity Promotion, Asian Productivity Organization.

REFERENCE BOOKS:

1. Sammy G. Shina, Six Sigma for Electronics Design and Manufacturing, McGraw-Hill.
2. Design and Analysis of Lean Production Systems, Ronald G. Askin & Jeffrey B. Goldberg, John Wiley & Sons, 2003.
3. Mikell P. Groover (2002) Automation, Production Systems and CIM

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(AUTONOMOUS)**

B. Tech (ME)– Minors(R23)

L	T	P	C
0	0	6	3

23AME67: APPLIED PROJECT WORK IN INDUSTRIAL ENGINEERING

**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" Pearson Publication, 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,2ndEdition,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 Sensor network, Sensor 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: RESTful 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. Waltenegus Dargie , Christian Poellabauer, "Fundamentals Of Wireless Sensor Networks Theory And Practice", By John Wiley & Sons Publications, 2011
2. Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks-Technology, Protocols, and Applications", John Wiley, 2007.
3. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003

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 IoT 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 Madiseti, “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 - Schering 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", 9th Edition, 2010.
2. David A. Bell, "Electronic Instrumentation & Measurements", PHI, 2nd Edition, 2006.

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)**

III B. Tech - I Semester (Common to ECE & EBM)

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 Gautam Sahe, “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. Rappoport, “Wireless Communications”, Pearson Education, 2nd Edition, 2002.

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)**

III B. Tech - I Semester

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)**

III B. Tech - II Semester (Common to ECE, EBM)

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 R_s 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 Douglas, 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)**

III B. Tech - II Semester (Common to ECE, EBM)

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 transistor using 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 designs for analysis.

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.

MINOR IN COMPUTER SCIENCE AND ENGINEERING

S. No	Year & Sem	Course Code	CourseName	Hours/week			Credits	Scheme of Examination MaximumMarks		
				L	T	P		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	23ACS44	Computer Organization	3	0	0	3	30	70	100
5.	IV-I	23ACS45	Web Technologies	3	0	0	3	30	70	100
6.	IV-I	23ACS46	Web Technologies Lab			3	1.5	30	70	100
7	III -II	23ACS07	Advanced Data Structures and Algorithm Analysis Lab			3	1.5	30	70	100
Total				15	0	6	18	210	490	700

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

	L	T	P	C
III B.Tech-I Semester CE, E,EEE,ECE(MINOR)	3	0	0	3

23ACS24 CLOUD COMPUTING.

COURSE OUTCOMES:

After the completion of the course students 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 per need.

UNIT I :I Basics of Cloud computing

Lecture 8Hrs

Introduction to cloud computing: Introduction, Characteristics of cloud computing, Cloud Models, Cloud Services Examples, Cloud Based services and applications

Cloud concepts and Technologies: Virtualization, Load balancing, Scalability and Elasticity, Deployment, Replication, Monitoring, Software defined, Network function virtualization, Map Reduce, Identity and Access Management, services level Agreements, Billing.

Cloud Services and Platforms: Compute Services, Storage Services, Database Services, Application services, Content delivery services Analytics Services, Deployment and Management Services, Identity and Access Management services, Open Source Private Cloud software.

UNIT II: Hadoop and Python

Lecture 9Hrs

Hadoop Map Reduce: Apache Hadoop, Hadoop Map Reduce Job Execution, Hadoop Schedulers, Hadoop Cluster set up. Cloud Application Design: Reference Architecture for Cloud Applications, Cloud Application Design Methodologies, Data Storage Approaches.

Python Basics: Introduction, Installing Python, Python data Types & Data Structures, Control flow, Function, Modules, Packages, File handling, Date/Time Operations, Classes.

UNIT III : Python for Cloud computing

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 Framework, Designing a RESTful web API.

Cloud Application Development in Python: Design Approaches, Image Processing APP, Document Storage App, Map Reduce App, Social Media Analytics App.

UNIT IV: Big data, multimedia and Tuning**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.

TEXTBOOKS:

1. Cloud computing Ahands - on Approach ||By Arshdeep Bahga, Vijay Madiseti, 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 Madiseti.
3. Cloud Computing: A Practical Approach, Anthony T.Velte, To by J.Velte, Robert Elsenpeter, Tata Mc Graw Hill,rp 2011.
4. Enterprise Cloud Computing, Gautam Shroff, Cambridge University Press, 2010.

5. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, George Reese, O'Reilly, SPD, rp 2011.
6. Essentials of Cloud Computing by K.Chandrasekaran. CRC Press.

Online Learning Resources:

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

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

	L	T	P	C
IIB.Tech II Semester(Common to CSE, CSD, CSM,CSC,CAI,CSO,IT,CSBS))				
IIIB.Tech I SemesterCE,ME,EEE,ECE(Minor)	3	0	0	3

23AIT02: SOFTWARE ENGINEERING.

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Perform various lifecycle 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.

UNITIV:

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.

UNITV:

Computer-Aided Software Engineering (Case): CASE and its scope, CASE environment, CASE support in the software lifecycle, 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.

TEXTBOOKS:

3. Fundamentals of Software Engineering, Rajib Mall, 5th Edition, PHI.
4. Software Engineering A practitioner's Approach, Roger S. Pressman, 9th Edition, Mc-Graw Hill International Edition.

REFERENCE BOOKS:

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

Online Learning Resources:

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

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

	L	T	P	C
IIB.TechI Semester(Common to CSE,CSD,CSM,CSC,CAI,CSO,IT,CSBS))	3	0	0	3
IIIB.TechII Semester(CE,ME,EEE,ECE(Minor))				

23ACS05: ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS.

COURSE OUTCOMES:

After the 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 Bi connected 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:

NPHard 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)

NPHardSchedulingProblems:SchedulingIdenticalProcessors,JobShopScheduling

TEXTBOOKS:

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

REFERENCE BOOKS:

1. Data Structures and program design in C, Robert Kruse, Pearson Education Asia
2. An introduction to Data Structures with applications, Trembley & Sorenson, Mc Graw 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. Cloud computing – Course (nptel.ac.in)
2. <http://peterindia.net/Algorithms.html>
3. Abdul Bari, 1. Introduction to Algorithms (youtube.com)

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

	L	T	P	C
IIIB.Tech II SemesterCE.ME,EEE,ECE(Minor)	3	0	0	3

23ACS44: COMPUTER ORGANIZATION.

COURSE OUTCOMES:

After the 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, Zvonko Vranesic, Safwat Zaky, "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. Smruti Ranjan Sarangi, "Computer Organization and Architecture", McGraw Hill Education.
4. John P. Hayes, "Computer Architecture and Organization", McGraw Hill Education

Online Learning Resources:

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

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR
(AUTONOMOUS)

	L	T	P	C
IIIB.Tech II SemesterCE.ME,EEE,ECE(Minor	3	0	0	3

23ACS45: WEB TECHNOLOGIES.

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Understand the Web essentials. Identify the hardware requirements for cache memory and virtual memory
- 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, CHITTOOR
(AUTONOMOUS)

	L	T	P	C
IIB.TechI Semester(Common to CSE,CSM,CSC,CAI,CSO,IT,CSBS))				
IIB.TechI SemesterCE.ME,EEE,ECE(Minor)	3	0	0	3

23ACS07: ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS LAB.

COURSE OUTCOMES:

After the 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 costs panning trees
- Shortest path algorithms
- 0/1KnapsackProblem
- Travelling Sales person 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, Sahni Sartaj, Mehta, Dinesh, 2nd Edition, Universities Press
2. Computer Algorithms/C++ Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 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, CHITTOOR

(AUTONOMOUS)

IV B.Tech I Semester CE,ME,EEE,ECE(Minor)

L T P C

3 0 0 3

23ACS46: WEB TECHNOLOGIES LAB.

COURSE OUTCOMES:

After the completion of the course students will be able to

- CO1. Construct web sites with valid HTML, CSS, JavaScript
- CO2. Create responsive Web designs that work on phones, tablets, or traditional laptops and widescreen monitors.
- CO3. Develop websites using jQuery to provide interactivity and engaging user experiences.
- CO4. Embed Google chart tools in a website for better visualization of data.
- CO5. Design and develop web applications using Content Management Systems like Word Press

Sample Programs:

1. Create a Basic HTML document
2. Create your Profile Page
3. Create a Class Timetable (to merge rows/columns, use row span/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-5 still 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)

REFERENCE BOOKS:

1. Deitel and Deitel and Nieto, —Internet and World Wide Web - How to Program, Prentice Hall, 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:

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, —Cybercrimel, 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

L	T	P	C
3	0	0	3

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 Law¹, **2nd Ed Rap 2023**, Pagan Dug gal, Universal Law Publishing.
2. Text book on —Indian Cyber law on Cybercrimes¹, Pagan Dug gal,

REFERENCE BOOKS:

1. Debby Russell and Sr. G.T Gingili, "Computer Security Basics (Paperback)¹, 2nd Edition, O'Reilly Media, 2006.
2. Thomas R. Pettier, —Information Security policies and procedures: A Practitioner's Reference¹, 2nd Edition Prentice Hall, 2004.
3. Kenneth J. Knapp, —Cyber Security and Global Information Assurance: Threat Analysis and Response Solutions¹, IGI Global, 2009.
4. Thomas R Pettier, Justin Pettier and John Blackley,¹ Information Security Fundamentals¹, 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
3	0	0	3

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

L	T	P	C
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 Ethereum Block chain Implementation

Lecture 8Hrs

Ethereum Block chain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereum

Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Gouache, Unit Testing, Ethereum Accounts, My Ether Wallet, Ethereum Networks/Environments, Inure, Ether scan, Ethereum 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 Developersl, Wiley, 2020
2. Andreas M. Antonopoulos, —Mastering Bit coin: Programming the Open Block chainl, 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 of 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 attacks on 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, Threats 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, Diffie Hellman Key Exchange, Elliptic Curve Cryptography.

UNIT-III:

Lecture 9Hrs

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

UNIT-IV:

Lecture 9Hrs

User Authentication: Remote User Authentication Principles, Kerberos. Electronic Mail Security: Pretty Good Privacy (PGP) and MIME. IP Security: IP 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, Secure Shell (SSH) Firewalls: Firewall Characteristics and Access Policy, Types of Firewalls, Firewall Configuration 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

L	T	P	C
0	0	3	3

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 worldl` 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: Analyze various M2M and IoT architectures
- CO4: Evaluate design 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. Caesar cipher b. Substitution cipher c. Hill Cipher encryption 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 Madiseti 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 Madiseti-Internet of Things: A Hands-On Approach, Universities Press,2014.
- 3.The Internet of Things, Enabling technologies and use cases – Pethuru Raj, Anupama C. Raman, CRC Press.
- 4.Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting 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 requirementsfor WSN - Challenges for WSNs – WSN vs Adhoc Networks -Sensor node architecture – Commercially available sensor nodes –Imote, IRIS, MicaMote, EYES nodes, BTnodes, TelosB, Sunspot -Physicallayerandtransceiverdesign 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 cycleprotocols andwakeup concepts - Contention- basedprotocols-Schedule-basedprotocols-SMAC -BMAC -Traffic-adaptivemediumaccess 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-NanoscopeSensorApplications –CaseStudy: IEEE802.15.4 LR-WPANs Standard - Target detection and tracking - Contour/edge detection - Field sampling.

TEXT BOOKS

1. Kazem Sohraby, Daniel Minoli and TaiebZnati, “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.AkkayaandM.Younis,“Asurveyofroutingprotocolsinwirelessensornetworks”, 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

Course Objectives:

L	T	P	C
3	0	0	3

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 & 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 Approachl By ArshdeepBahga, Vijay Madiseti, 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 RajkumarBuyya, Christian Vecchiola, SThamaraiSelvi, TMH
2. Cloud computing A Hands-On Approach by ArshdeepBahga and Vijay Madiseti.
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 analyze IoT 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

Experiment 1: 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

Experiment 2: 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

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. 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)

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](https://www.coursera.org/professional-certificates/ibm-data-science)
- **Introduction to Data Science in Python (University of Michigan)**
Link: [coursera.org](https://www.coursera.org/learn/introduction-to-data-science-in-python)

**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)

Unit 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. **Coursera AI 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 (TensorFlow Lite, 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

1. 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, Language modeling: 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

	L	T	P	C
23ACM37 - INTRODUCTION TO COMPUTER VISION	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

23ACM38-ESSENTIALS OF AI & ML LAB

L	T	P	C
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
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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
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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	<u>Introduction to Data Analytics – IBM</u>

**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	<u>Advanced Predictive Modeling</u> – 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	<u>Big Data Specialization</u> – 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 NussbaumerKnaflie, Storytelling with Data, Wiley.

Online Courses:

Platform	Course Title & Link
Coursera	<u>Data Visualization with Tableau – UC Davis</u>

**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
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IV B. Tech. - I Semester

23ACD48	BIG DATA & NOSQL LAB	L	T	P	C
		0	0	3	1.5

Course Objectives:

- To process big datasets using distributed systems.
- To implement NoSQL solutions.

Course Outcomes:

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

- Handle large datasets using Hadoop/Spark.
- Perform CRUD operations in NoSQL.

Experiments:

1. Introduction to HDFS and Hadoop
2. MapReduce word count example
3. Spark RDD operations
4. DataFrames and Spark SQL
5. PySpark ML basics
6. Connecting MongoDB to Python
7. CRUD operations in MongoDB
8. Indexing and Aggregation
9. Replication and Sharding demo
10. Case study: Big Data pipeline
11. Real-time analytics using Spark Streaming

**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](https://www.coursera.org/professional-certificates/ibm-data-science)
- **Introduction to Data Science in Python (University of Michigan)**
Link: [coursera.org](https://www.coursera.org/learn/introduction-to-data-science-in-python)

**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)

Unit 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	<u>Big Data Specialization by University of California San Diego</u>

**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, Lior Rokach, Bracha Shapira, 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. **Guibing Guo, Jie Zhang, Neil Yorke-Smith**, Deep Learning Based Recommender System, Springer, 2020.

Online Courses:

Platform	Course Title & Link
Coursera	<u>Recommender Systems Specialization by University of Minnesota</u>

**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

23ACA40

QUANTUM COMPUTING FOR AI

L	T	P	C
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. Vlatko Vedral, *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

23ACA41	EDGE AI & IOT	L	T	P	C
		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, IoT vs 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: TensorFlow Lite, 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"** – Rajkumar Buyya, Amir Vahid Dastjerdi, Elsevier, 2016.
3. **"TinyML: Machine Learning with TensorFlow Lite 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"** – Arvind Ravulavaru, Packt Publishing.
3. Research papers from **IEEE IoT Journal, ACM Transactions on IoT, Nature Electronics (Edge AI)**.

Online Courses

Platform	Course Title & Link
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Coursera	AI for Edge Computing – IBM
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SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

III B. Tech - II Semester

23ACA38	PYTHON FOR AI & DATA SCIENCE	L	T	P	C
		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

23ACA39	DATA STRUCTURES & ALGORITHMS FOR AI	L	T	P	C
		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

23AAD03	REINFORCEMENT LEARNING	L	T	P	C
		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 Research Trends

Textbooks

1. **Richard S. Sutton and Andrew G. Barto**, *Reinforcement Learning: An Introduction*, 2nd Edition, MIT Press, 2018.
2. **Csaba Szepesvári**, *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).

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

23ACA42	PYTHON & DS LAB	L	T	P	C
		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*)

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

IV B. Tech - I Semester

23ACA43	RL & QUANTUM AI LAB	L	T	P	C
		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

23AAI15	INTRODUCTION TO AI IN CYBER SECURITY	L	T	P	C
		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)

CO No	Course Outcome	Bloom's Level
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
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Coursera	<u>AI For Cybersecurity</u>
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SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

III B. Tech - I Semester

23ACA28	HEALTHCARE AI	L	T	P	C
		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. Bertalan Meskó – The Guide to the Future of Medicine: Technology and The Human Touch.
3. Peter Szolovits – Artificial Intelligence in Medicine (Morgan Kaufmann).

Online Learning Resources:

- 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>

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

III B. Tech - II Semester

23AAI16	AI IN FINANCE & BUSINESS ANALYTICS	L	T	P	C
		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

CO No	Course Outcome	Bloom's Level
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
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Coursera	<u>AI in Finance by NYIF</u>
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edX	Artificial Intelligence in Business
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SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

III B. Tech - II Semester

23AAI17	ETHICAL AI & RESPONSIBLE AI	L	T	P	C
		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

CO No	Course Outcome	Bloom's Level
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
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Coursera	<u>AI For Everyone by Andrew Ng</u>
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SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

IV B. Tech - I Semester

23AAI18	GENERATIVE AI & PROMPT ENGINEERING	L	T	P	C
		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

CO No	Course Outcome	Bloom's Level
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	<u>Prompt Engineering for ChatGPT</u>

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)**

III B. Tech - II Semester

23AAI19	AI APPLICATIONS LAB	L	T	P	C
		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

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

IV B. Tech - I Semester

23AAI20	GENERATIVE AI LAB	L	T	P	C
		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
(AUTONOMOUS)**

IIIB.Tech- I Semester

23AAI15	INTRODUCTION TO AI IN CYBERSECURITY	L	T	P	C
		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)

CO No	Course Outcome	Bloom's
CO1	Explain the fundamentals of AI and its applications in cybersecurity	Understand (L2)
CO2	Apply machine learning models for intrusion and anomaly detection	Analyze (L3)
CO3	Apply AI techniques to detect malware and phishing threats	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 Work flow 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

UNIT4: 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.

UNIT5: 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”** – Rashmi Agrawal, Vishal Jain

Reference Books

1. **“Hands-On Machine Learning for Cybersecurity”** – Soma Halder, Sinan Ozdemir
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
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Coursera	<u>AI For Cybersecurity</u>
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**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)**

IIIB.Tech- I Semester

23ACA28	HEALTHCAREAI	L	T	P	C
		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. Bertalan Meskó – The Guide to the Future of Medicine: Technology and The Human Touch.
3. Peter Szolovits – Artificial Intelligence in Medicine (Morgan Kaufmann).

Online Learning Resources:

- Coursera: AI for Medicine Specialization (offered by Deep Learning.AI)
<https://www.coursera.org/specializations/ai-for-medicine>
- HarvardX: Data Science in Healthcare (edX)
<https://online-learning.harvard.edu/course/data-science-healthcare>

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)**

IIIB.Tech-II Semester

23AAI16	AI IN FINANCE & BUSINESS ANALYTICS	L	T	P	C
		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

CO No	Course Outcome	Course Bloom's
Level CO1	Understand financial systems and analytics tools for business insights	Understand (L2) CO2
	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
	intelligent business systems using ethical AI techniques	Design (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 (MLOps 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)**

IIIB.Tech-II Semester

23AAI17	ETHICAL AI & RESPONSIBLE AI	L	T	P	C
		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: Data sheets 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

UNIT5:EmergingTopics&GlobalPerspective

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)**

IVB.Tech-ISemester

23AAI18	GENERATIVE AI & PROMPT ENGINEERING	L	T	P	C
		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

UNIT4:UseCases&ApplicationDevelopment

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,AIWritingAssistants(e.g.,Jasper,Writer.ai),Prompt-BasedAppDevelopmentwith LangChain, Evaluating Output Quality: Human-AI Feedback Loop

UNIT5:EthicalAI&FutureTrends

AIHallucinationsandMisinformation,Bias,Fairness,andToxicityinGenerativeAI,Copyright,Plagiarism, and Data Usage Issues, Red Teaming & Safety Testing for LLMs, OpenAI Usage Guidelines and Safety Layers,Explainability&InterpretabilityinGenerativeModels,TheFuture:AGI,MultimodalAI,an dPrompt Agents, Capstone Project: Design & Deploy a Prompt-Driven Application

Textbooks

1. **“YouLookLikeaThingandILoveYou”**–JanelleShane
2. **“DeepLearningwithPython”** –FrançoisChollet
3. **“PromptEngineeringGuide”**–DAIR.AI(OpenSource)
4. **“GenerativeDeepLearning”**–DavidFoster

ReferenceBooks

1. **“Hands-OnGenerativeAdversarialNetworks”**–JoshKalin
2. **“TransformersforNaturalLanguageProcessing”**–DenisRothman
3. **“NaturalLanguageProcessingwithTransformers”**–LewisTunstall et al.
4. OpenAICookbook(GitHub)
5. HuggingFaceTransformersDocumentation

OnlineCourses

Platform	CourseTitle
Coursera	<u>PromptEngineeringforChatGPT</u>

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)**

IIIB.Tech-II Semester

23AAI19	AIAPPLICATIONSLAB	L	T	P	C
		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 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

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)**

IVB.Tech-ISemester

23AAI20	GENERATIVEAILAB	L	T	P	C
		0	0	3	1.5

CourseObjectives:

- ToexploregenerativeAltoolsandtechniques.

CourseOutcomes:

- Usetextandimagegenerationmodels.
- Developsimpleprompt-basedapplications.

Experiments:

1. IntrotoLLMsand Generative AI
2. Text generationwithGPTmodels
3. PromptengineeringforQ&Asystems
4. Imagegenerationusing DALL-E/StableDiffusion
5. Textsummarization
6. ChatbotcreationusingLLM API
7. Fine-tuningLLMs
8. Sentiment andemotion generation
9. Storyorpoemgenerationtask
10. Promptoptimizationandtesting
11. Mid-journey/RunwayMLtools(demo)
12. MiniprojectusingGenerativeAI

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: 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	<u>IBM Qiskit Textbook</u>	Hands-on, beginner-friendly curriculum for quantum programming
Coursera	<i>Quantum Mechanics for Scientists and Engineers</i> by Stanford (Leonard Susskind)	<u>Link</u>

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

23ACS48: MATHEMATICAL FOUNDATIONS FOR QUANTUM COMPUTING

Course Outcomes (COs)

CO Code	Description	Bloom's Level
CO1	Understand complex numbers & linear algebra	Understand
CO2		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	<i>Linear Algebra (Gilbert Strang)</i>	Link
edX	<i>Mathematics for Quantum Computing</i> by TUDelft	Link
Khan Academy	<i>Linear Algebra, Probability & Statistics</i>	Link
Quantum Country	<i>Spaced Repetition & Essays on Quantum Math</i>	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 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)	<i>Quantum Algorithms for Cybersecurity</i>	Link
Coursera	<i>Quantum Computing</i> by University of London	Link
Qiskit Textbook	<i>Algorithms & Quantum Machine Learning Modules</i>	Link
Braket (AWS)	<i>Quantum Computing Developer Tools & Tutorials</i>	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

23ACS50: 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	<i>Quantum Cryptography</i> by University of Geneva	Coursera Link
edX	<i>Quantum Information Science I</i> (Harvard/MIT)	edX Course
Qiskit	<i>Quantum Information Applications in Qiskit Textbook</i>	Qiskit Info
QuTech	<i>Quantum Internet Tutorials & Tools</i>	QuTech

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)**

IV B.Tech I Semester CE,ME,EEE,ECE(Minor)

L	T	P	C
3	0	0	3

23ACS10: 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. Vojtěch Havlíček – *Supervised Learning with Quantum-Enhanced Feature Spaces*, Nature, 2019

Online Courses & Resources

Platform	Course Name	Link
edX	<i>Quantum Machine Learning</i> by UTS	edX Course
Qiskit	<i>Qiskit Machine Learning Module</i>	Qiskit ML
Xanadu	<i>QML with PennyLane (Free online textbook)</i>	PennyLane QML Book
Coursera	<i>Quantum Machine Learning</i> 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

23ACS52: 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
(AUTONOMOUS)

IV B.Tech I Semester CE,ME,EEE,ECE(Minor)

L	T	P	C
0	0	3	1.5

23ACS53: 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 (MoS₂, 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)

MINORS - MACHINE LEARNING AND GENERATIVE AI

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

III B. Tech - I Semester CSE(AI&ML) MINORS

23ACM47: Python -Foundation to Mastering

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
Course objectives	3	0	0	3

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
Course Objectives	3	0	0	3

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

- **AI Fairness 360 Toolkit** – IBM (open-source)
- **Explainable AI (XAI)** – DARPA project
- Google's Responsible AI practices: <https://ai.google/responsibility/>
- 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. **Analyze** the ethical, social, and regulatory implications of Generative AI technologies.

Course Outcomes (COs)

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

CO Code	Course Outcome Description	Blooms Level
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
(AUTONOMOUS)

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**

**Learning
Level**

- CO1. Understand key concepts in text processing and representation
- CO2. Apply RNNs and LSTMs to NLP tasks
- CO3. Leverage transformers and attention for sequence modeling
- CO4. Fine-tune pre-trained language models
- CO5. Build and evaluate end-to-end NLP applications

Un
Ap
Ap
An
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

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
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IV B. Tech - I Semester CSE(AI&ML) MINORS

23ACM52 - CAPSTONE PROJECT

L	T	P	C
0	0	6	3

1. MINOR DEGREE IN AI & DS

SNo	Offered in	Course Code	Name of the Subject and Lab	L	T	P	C	Scheme of Examination (Maximum Marks)		
								CIA	SEE	Total
1	III – I	23ACD57	Predictive Data Analytics using R	3	0	0	3	30	70	100
2	III – I	23AAD19	Fundamentals of Generative AI	3	0	0	3	30	70	100
3	III – II	23AAD20	Mastering Data Handling - SQL & No-SQL	3	0	0	3	30	70	100
4	III – II	23AAD21	Generative AI: Advanced methods & Applications	3	0	0	3	30	70	100
5	IV - I	23AAD22	Natural Language Processing with Neural Networks	3	0	0	3	30	70	100
6	IV - II	23AAD23	Capstone Project and Portfolio Development	0	0	6	3	60	140	200
	Total Credits						18	210	490	700

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)**

III B.Tech. I SEM, CSE(DS)

23ACD57

Predictive Data Analytics using R

L	T	P	C
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. Understand (L2)
- Apply data preprocessing, cleaning, and transformation techniques using R for predictive modeling. Apply(L3)
- Develop and implement regression, classification, and clustering models in R for solving real-world problems. Apply(L3)
- Evaluate predictive models using performance metrics such as accuracy, precision, recall, ROC curves, and error measures. Evaluate(L5)
- Interpret and visualize predictive analytics results using R libraries (e.g., ggplot2, caret, randomForest) to support business or research decisions. Evaluate(L5)
- Design and execute end-to-end predictive analytics projects using R, integrating data preparation, model building, validation, and reporting. Design (L6)

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"

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)**

III B.Tech. I SEM, CSE(DS)

23AAD19

Fundamentals Of Generative AI

L	T	P	C
3	0	0	3

COURSE OBJECTIVES: The objective of the course is,

1. Understand the fundamental concepts and techniques of Generative AI.
2. Explore popular generative models such as GANs, VAEs, Diffusion Models, and Transformers.
3. Gain hands-on experience in training and fine-tuning generative models using frameworks like Hugging Face.
4. Learn about the ethical implications and challenges of Generative AI.
5. Apply Generative AI techniques to solve real-world problems in various domains.

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

UNIT-I: Introduction to Generative AI and Transformers

8 Hrs

Topics:

- **Overview of Generative AI**
 - What is Generative AI?
 - Applications in Art, Healthcare, Gaming, and more
- **Introduction to Probabilistic Models**
 - Probability Distributions and Maximum Likelihood Estimation
- **Transformers Architecture**
 - Attention Mechanism: Self-Attention and Multi-Head Attention
 - Encoder-Decoder Models and Positional Encoding
 - Applications in Generative AI (e.g., GPT, BERT)
- **Hugging Face Transformers Ecosystem**
 - Overview of the Hugging Face Library
 - Pretrained Models and Tokenizers
- Exploring probability distributions using Python (e.g., Normal, Bernoulli)
- Sampling data and visualizing latent spaces
- Loading and fine-tuning Hugging Face Transformer model

UNIT-II: Generative Adversarial Networks (GANs)

8 Hrs

Topics:

- **Fundamentals of GANs**
 - Architecture: Generator and Discriminator
 - Adversarial Loss and Training Challenges

- **Variants of GANs**
 - Conditional GANs (cGANs)
 - StyleGANs and CycleGANs

Hands-on Topics:

- Implementing a basic GAN in TensorFlow or PyTorch
- Training a GAN on MNIST or CIFAR-10 dataset
- Experimenting with StyleGAN for image generation

UNIT-III: Variational Autoencoders (VAEs), Diffusion Models, and Transformers in Generative AI

12 Hrs

Topics:

- **Variational Autoencoders (VAEs)**
 - Encoder-Decoder Architecture
 - KL Divergence and Evidence Lower Bound (ELBO)
 - Applications of VAEs: Image Reconstruction and Latent Space Exploration
- **Diffusion Models**
 - Fundamentals of Noise and Denoising
 - Applications in Image and Text Generation
- **Transformers for Generative AI**
 - GPT Models: Text Generation and Fine-Tuning
 - Exploring Domain-Specific Transformers
 - Implementing a VAE for image reconstruction
- **Hands-on Topics:**
 - Implementing a VAE for image reconstruction
 - Experimenting with pretrained diffusion models for image generation
 - Fine-tuning GPT models using Hugging Face for domain-specific tasks

UNIT-IV: Fine-Tuning, Deployment, and Ethical Considerations

12 Hrs

Topics:

- **Transfer Learning and Fine-Tuning for Generative AI**
 - Working with Hugging Face Transformers
 - OpenAI GPT and DALL-E Integration
- **Responsible AI Practices**
 - Bias, Fairness, and Privacy in Generative AI
 - Misuse and Deepfake Concerns
- **Deployment of Generative Models**
 - Deployment Challenges and Optimization
 - Using Cloud Services (e.g., AWS, Google Cloud, Azure)
- **Hands-on Topics:**
 - Fine-tuning GPT models for text generation with Hugging Face
 - Deploying DALL-E and Transformer models for custom use cases
 - Hosting a generative model on AWS Lambda or SageMaker

UNIT V: Project Work and Emerging Trends in Generative AI

5 Hrs

Project Objective: Build and Deploy a Generative AI Model

Topics:

- **Project Work:**
 - Select a Domain (e.g., Image Generation, Text Synthesis, Music Creation)
 - Preprocess Data and Train a Model
 - Fine-tune and Deploy the Model
- **Emerging Trends in Generative AI**
 - Zero-Shot and Few-Shot Learning with Transformers
 - Advances in Large Language Models
- **Hands-on Topics:**
 - End-to-end implementation of a generative AI project using GANs, VAEs, or Transformers
 - Comparing performance across generative models

TEXT BOOKS:

1. Generative Deep Learning by David Foster (2020, 2nd Edition)
2. Transformers for Natural Language Processing by Denis Rothman (2021)

REFERENCE BOOKS:

1. Hands-On Image Generation with TensorFlow by Soon Yau Cheong (2021, 1st Edition)

E-resources

1. TensorFlow and PyTorch Documentation
2. Hugging Face Tutorials and Guides
3. AWS and Google Cloud AI Whitepapers

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
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III B.Tech. II SEM, CSE(DS)

23AAD20 Mastering Data Handling - SQL & No-SQL

L	T	P	C
3	0	0	3

COURSE OBJECTIVES: The objective of the course is,

- Understand relational and non-relational data models.
- Write SQL queries for data extraction, transformation, and reporting.
- Apply NoSQL concepts using databases like MongoDB.
- Perform CRUD operations and data manipulation across structured and unstructured data.
- Integrate SQL/NoSQL operations for data analytics tasks

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

UNIT-I: Introduction to Databases and Data Models

9Hrs

Types of databases: RDBMS vs NoSQL

- Relational model: tables, rows, columns, schema
- Primary keys, foreign keys, normalization concepts
- Introduction to MongoDB and JSON structure
- Hands-on: Understanding database schemas and JSON documents

UNIT-II: SQL Fundamentals and Data Retrieval

8 Hrs

SELECT statements, filtering data (WHERE, BETWEEN, LIKE)

- Sorting and limiting results (ORDER BY, LIMIT)
- Aggregation (COUNT, SUM, AVG, GROUP BY, HAVING)
- Joins (INNER, LEFT, RIGHT, FULL OUTER)
- Hands-on: Queries to analyze structured business data

UNIT-III: Advanced SQL and Subqueries

10 Hrs

Nested queries and subqueries

- CASE, COALESCE, NULL handling
- Temporary tables, views, and indexes
- Stored procedures and transactions
- Hands-on: Complex querying using subqueries and joins

UNIT-IV: NoSQL Concepts and MongoDB

9 Hrs

Document-based storage model in MongoDB

- CRUD operations in MongoDB
- Indexing and aggregation pipelines
- Comparison of SQL vs NoSQL queries
- Hands-on: Real-time operations with MongoDB shell or Compass

UNIT V: Data Integration and Use Cases

8 Hrs

Connecting databases with Python (using SQLAlchemy or PyMongo)

- Data extraction for visualization/reporting
- Use cases: Customer segmentation, product catalog, transaction logs

- Hands-on: Building a data handler that reads from SQL and NoSQL sources

TEXT BOOKS:

1. Learning SQL by Alan Beaulieu

REFERENCE BOOKS:

1. MongoDB: The Definitive Guide by Kristina Chodorow
2. SQL for Data Analytics by Upmani Sharma et al.

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III B.Tech. II SEM, CSE(DS)

23AAD21

**Generative AI: Advanced methods &
Applications**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES: The objective of the course is,

- Explore advanced concepts and techniques in Generative AI.
- Understand embedding models, vector databases, and their applications.
- Learn Retrieval-Augmented Generation (RAG) techniques and build AI agents using LangChain.
- Dive into multimodal generative AI models and their real-world applications.
- Apply advanced generative AI techniques to solve complex problems in various domains

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

UNIT-I: Foundations of Generative AI and Prompt Engineering

8 Hrs

Topics:

- **Generative AI Refresher**
 - Recap: Generative AI Concepts, Applications, and State-of-the-Art Models (GPT, DALL-E, Stable Diffusion)
- **Prompt Engineering**
 - Role of Few-Shot, Zero-Shot, and Chain-of-Thought Prompting
 - Optimizing Prompts for Text, Image, and Multimodal Models
- **Hands-on Topics:**
 - Experimenting with Prompt Engineering using OpenAI and Hugging Face Models
 - Fine-tuning prompts for complex tasks like summarization, creative generation, and code completion.

UNIT-II: Embedding Models and Vector Databases

10 Hrs

Topics:

- **Understanding Embedding Models**
 - Sentence Embeddings, Text Embeddings, and Image Embeddings
 - Popular Models: BERT, Sentence Transformers, and OpenAI Embeddings
- **Vector Databases**
 - Storing and Searching High-Dimensional Data
 - Tools: Pinecone, Weaviate, FAISS, and Milvus
 - Applications in Semantic Search and Personalized Recommendations
- **Hands-on Topics:**
 - Creating embeddings with Sentence Transformers
 - Implementing vector search with Pinecone or FAISS

- Building a semantic search application

UNIT-III: Retrieval-Augmented Generation (RAG) and AI Agents with Lang Chain

12 Hrs

Topics:

- **Retrieval-Augmented Generation (RAG)**
 - Overview of RAG Framework
 - Combining Knowledge Retrieval with Generative AI Models
 - Applications in Q&A Systems and Conversational AI
- **LangChain Framework**
 - Introduction to LangChain for Building AI Pipelines
 - Integrating Large Language Models (LLMs) with APIs, Memory, and Tools
 - Automating Tasks with AI Agents
- **Hands-on Topics:**
 - Building a RAG pipeline using Hugging Face Transformers and Vector Databases
 - Creating an AI Agent with LangChain for Task Automation
 - Developing a custom chatbot with RAG and LangChain

UNIT-IV: Multimodal Generative AI and Practical Applications

10 Hrs

Topics:

- **Multimodal Models**
 - Overview of Multimodal Generative AI (e.g., CLIP, Flamingo)
 - Cross-Modal Applications: Text-to-Image, Image-to-Text, and Beyond
 - Pretrained Multimodal Models: CLIP, BLIP, and DALL-E
- **Real-World Applications**
 - Generative AI in Healthcare, Content Creation, Gaming, and Marketing
 - Advanced Use Cases: Data Augmentation, Digital Twins, and AR/VR Integration
- **Hands-on Topics:**
 - Implementing a Text-to-Image Model with Stable Diffusion or DALL-E
 - Using CLIP for cross-modal search
 - Developing a multimodal application for a chosen domain

UNIT V: Project Work and Emerging Trends in Generative AI

5 Hrs

Project Objective: Build and Deploy an Advanced Generative AI System

Topics:

- **Project Work:**
 - Choose a Domain (e.g., Conversational AI, Creative Applications, Personalized Recommendations)
 - Integrate Techniques from Previous Units (Embeddings, RAG, LangChain, Multimodal Models)
 - Fine-Tune, Test, and Deploy the System

- **Emerging Trends:**
 - Advanced Foundation Models and Their Capabilities
 - Responsible AI Practices in Multimodal and Retrieval-Based Systems
 - Exploring Open-Source Advancements and Community Contributions
- **Hands-on Topics:**
 - End-to-end project implementation integrating RAG and LangChain
 - Comparing the performance of different embeddings and vector database systems

TEXT BOOKS:

1. Transformers for Natural Language Processing by Denis Rothman (2021)

REFERENCE BOOKS:

1. Generative Deep Learning by David Foster (2020, 2nd Edition)
2. Practical Natural Language Processing by Sowmya Vajjala et al. (2020)

E-resources

1. Hugging Face Documentation and Tutorials
2. LangChain Official Documentation
3. Pinecone, FAISS, and Weaviate Tutorials
4. OpenAI API Documentation

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)**

IV B.Tech. I SEM, CSE(DS)

23AAD22

**Natural Language Processing with Neural
Networks**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES: The objective of the course is,

- Understand core concepts of text processing and representation.
- Build NLP pipelines using traditional and deep learning methods.
- Implement word embeddings and language models.
- Apply RNNs, LSTMs, and transformers for NLP tasks.
- Solve problems like sentiment analysis, translation, and chatbots.

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

UNIT-I: Introduction to NLP and Text Processing

9 Hrs

NLP tasks and applications

- Tokenization, stemming, lemmatization
- Stopword removal, POS tagging
- Hands-on: Building a simple text cleaner pipeline

UNIT-II: Text Representation Techniques

9 Hrs

Bag of Words, TF-IDF

- Word embeddings: Word2Vec, GloVe, FastText
- Vector similarity and distance metrics
- Hands-on: Document similarity and keyword extraction

UNIT-III: Sequence Models and LSTM-based Architectures

10 Hrs

RNNs, LSTMs and GRUs in NLP

- Sequence labeling, tagging problems
- Sentiment classification with LSTM
- Hands-on: Sequence modeling for tweets/reviews

UNIT-IV: Transformers and Advanced NLP

8 Hrs

Introduction to Attention and Transformer

- Using BERT and HuggingFace models
- Fine-tuning transformers for downstream tasks
- Hands-on: Text classification using BERT

UNIT V: NLP Applications and Mini Project

8 Hrs

Chatbot building

- Text summarization and Q&A systems
- Machine translation basics
- Hands-on: Complete NLP pipeline project

TEXT BOOKS:

Deep Learning for NLP by Palash Goyal et al

REFERENCE BOOKS:

Transformers for NLP by Denis Rothman

NLP with Python by Bird, Klein, Loper

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III B.Tech. I SEM, CSE(DS)

23ACD56	Foundations Of Cloud Concepts	L	T	P	C
		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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III B.Tech. I SEM, CSE(DS)

23ACD57	Predictive Data Analytics using R	L	T	P	C
		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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III B.Tech. II SEM, CSE(DS)

23ACD58	Data Engineering With AWS	L	T	P	C
		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 Egar (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

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
(AUTONOMOUS)
III B.Tech. II SEM, CSE(DS)

23ACD59	Cloud-Native Machine Learning	L	T	P	C
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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

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
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IV B.Tech. I SEM, CSE(DS)

23ACD60	Deep Learning: The Modern Approach	L	T	P	C
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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 SageMaker

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

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

III B. Tech-I Semester

23ACS60: WEB FUNDAMENTALS, ADVANCED JAVASCRIPT & GITHUB

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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-

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III B. Tech-I Semester

23ACS61: BACKEND DEVELOPMENT WITH NODE.JS & EXPRESS

L	T	P	C
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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

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

23ACS62: BUILDING USER INTERFACES WITH REACT.JS

L	T	P	C
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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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III B. Tech-II Semester

23ACS63: DEVOPS FUNDAMENTALS & CI/CD PIPELINES

L	T	P	C
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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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III B. Tech-II Semester

23ACS64: ADVANCED BACKEND & MICROSERVICES

L	T	P	C
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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

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(AUTONOMOUS)

III B. Tech-II Semester

23ACS65: PROJECT ON FULL STACK MERN AND DEVOPS

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SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

III B. Tech-I Semester

23ACS54: FUNDAMENTALS OF CLOUD COMPUTING

L	T	P	C
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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

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(AUTONOMOUS)

III B. Tech-I Semester

L	T	P	C
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23ACS55: 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

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(AUTONOMOUS)

III B. Tech-II Semester

L	T	P	C
3	0	0	3

23ACS56: 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
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23ACS57: 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

23ACS58: 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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IV B. Tech-I Semester

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23ACS59: CAPSTONE PROJECT

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(AUTONOMOUS)

III B.Tech-I Semester

L	T	P	C
3	0	3	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
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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 Examples Application and Evaluation.

Text books:

3. D. A. Norman, The Design of Everyday Things, Revised and Expanded Edition, New York, NY, USA: Basic Books, 2013.
4. 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

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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.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

III B.Tech-II Semester

L	T	P	C
3	0	3	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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(AUTONOMOUS)

IV B.Tech-I Semester

L	T	P	C
3	0	3	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.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

IV B.Tech-II Semester

L	T	P	C
0	0	6	3

**23AIT42: CAPSTONE PROJECT AND PORTFOLIO
DEVELOPMENT**

**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 nanotechnology 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 Bacteriorhodopsin, 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 - Michaelis-Menten kinetics - oxygen uptake rates -limits of diffusion - Principles 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 – decellularized 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. Ketul Popat “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 OPHTHALMOLOGY 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
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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
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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 SEM, CSBS**

23ACB15	Fundamentals of Computer Systems & Business Environment	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: The objective of the course is,

- **Understand the fundamentals** of data, information, knowledge, and systems in a business context.
- **Familiarize students** with the various types of business information systems (BIS) and their strategic roles.
- **Explore the components** of computer hardware and software and their relevance in BIS.
- **Introduce database concepts** and the application of business intelligence for decision-making.
- **Describe networks, telecommunications,** and how the Internet enables business connectivity and e-commerce.
- **Analyze enterprise and functional systems** used across different business departments.

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

- Distinguish between data, information, knowledge, and wisdom in a business setting.
- Explain the role of BIS in supporting managerial decisions and gaining competitive advantage.
- Identify the major components of computer hardware and software and assess their applications in business.
- Describe various types of databases and apply BI tools to improve organizational decision-making.
- Illustrate the role of networks and the Internet in enabling business communication and e-commerce.
- 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>.

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
III B.Tech. I SEM, CSBS**

23ACB16	Database Management & Enterprise Systems	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: The objective of the course is,

- **Introduce fundamental concepts** of database systems, including their architecture, models, and advantages.
- **Develop skills in the relational model**, relational algebra, SQL, and database normalization.
- **Understand transaction management**, concurrency control, and recovery in database systems.
- **Familiarize students with enterprise systems**, their components, architecture, and implementation lifecycle.
- **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

- Describe the characteristics, components, and architecture of a DBMS and its advantages over file systems.
- Apply relational algebra and SQL commands to model and manipulate data in relational databases.
- Demonstrate the process of database normalization and construct ER models with appropriate keys.
- Explain transaction processing concepts, concurrency control mechanisms, and database recovery techniques.
- Identify the structure and modules of enterprise systems like ERP, SCM, and CRM, and their business roles.
- 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, McGraw-Hill
2. **“Enterprise Resource Planning: Concepts and Practice”** by Mahadeo Jaiswal and Ganesh Vanapalli, 2nd Edition, Pearson
- **“Modern ERP: Select, Implement, and Use Today's Advanced Business Systems”** by Marianne Bradford, 3rd Edition, Lulu Press
- **“ERP Demystified”** by Alexis Leon, 2nd Edition, Tata McGraw-Hill

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
III B.Tech. II SEM, CSBS**

23ACB17	Software Engineering for Business Applications	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- **The objective of the course is, Understand the fundamentals** of software engineering and various software process models.
- **Analyze and model requirements** using structured and object-oriented approaches.
- **Gain insight into Agile methodologies** and apply them to modern software development projects.
- **Explore the principles of software project management**, including planning, risk analysis, and evaluation.
- **Comprehend software quality concepts** and apply estimation techniques for project planning.

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

- Describe the nature of software and various software engineering practices and myths.
- Compare different software process models and select an appropriate model for a given software project.
- Apply requirements engineering techniques including elicitation, modeling, and validation.
- Illustrate various modeling strategies such as scenario-based, class-based, flow-oriented, and behavioral.
- Explain the principles of Agile development and various agile methodologies like XP, Scrum, etc.
- Demonstrate knowledge of software project management practices and tools.
- 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:

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

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
III B.Tech. II SEM, CSBS**

23ACB18	Business Intelligence and Analytics	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: The objective of the course is,

- Introduce the role and structure of **business intelligence (BI)** and **decision support systems (DSS)** in organizational decision-making.
- Provide a comprehensive understanding of the **decision-making process** and how it is supported by DSS.
- Familiarize students with **neural networks, sentiment analysis**, and other intelligent systems used in modern analytics.
- Equip students with knowledge of **model-based decision-making techniques**, including mathematical and spreadsheet-based models.
- 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

- Describe the evolution and components of Business Intelligence and its role in decision-making.
- Explain the phases and structure of the decision-making process and the capabilities of Decision Support Systems.
- Apply basic concepts of neural networks, SVM, and sentiment analysis in real-world decision-making scenarios.
- Construct and evaluate decision models using mathematical programming, spreadsheets, and decision trees.
- 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 2017 by Edward Mize.

Web links and Video Lectures (e-Resources):

- <https://www.youtube.com/watch?v=zbcCdoHeS4w>

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
IV B.Tech. I SEM, CSBS

		L	T	P	C
23ACB19	Digital Transformation & Business Strategy	3	0	0	3

COURSE OBJECTIVES: The objective of the course is,

- Provide an in-depth understanding of the concept and evolution of digital transformation across industries.
- Explore the strategic alignment between digital initiatives and corporate strategy.
- Examine emerging digital technologies that drive transformation, such as AI, IoT, cloud computing, and blockchain.
- Develop knowledge of implementation frameworks including change management, agile practices, and performance measurement.
- 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

- Explain the scope, drivers, and impact of digital transformation on traditional and modern businesses.
- Evaluate how digital strategies align with business goals and describe digital business models and value chains.
- Identify and describe key enabling technologies such as cloud, AI, IoT, blockchain, and cybersecurity.
- Develop a roadmap for digital transformation, considering organizational readiness, change management, and risk.
- Analyze digital transformation practices across sectors and explore emerging trends like digital workplaces, ethics, and sustainability.

UNIT-I: Introduction to Digital Transformation

9Hrs

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

Cloud 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. I SEM, CSBS

23ACB20	Capstone Project and Portfolio Development	L	T	P	C
		0	0	6	3