SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES

(AUTONOMOUS)

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B.Tech - R23 Regulations

(Applicable for 2023-2024 Regular Students & 2024-2025 Lateral Students)

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

(Effective for the students admitted into I year from the Academic Year 2023-2024 onwards)

1. AWARD OF THE DEGREE

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

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

(ii) Registers for ***160 credits*** *and* ***secures all 160 credits****.*

(b) Award of B.Tech. degree with Honors

A student will be declared eligible for the award of the B.Tech. with Honors if he/she fulfils the following:

(i) Student secures additional 15 credits fulfilling all the requisites of a B.Tech. program i.e., 160 credits.

(ii) Registering for Honors is optional.

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

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

3. ADMISSIONS

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

4. PROGRAM RELATED TERMS

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

Credit definition:

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5 credit
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 working days and an academic year is divided into two semesters.

ii) The summer term is for eight weeks during summer vacation. Internship/ apprenticeship / work-based vocational education and training can be carried out during the summer term, especially by students who wish to exit after two semesters or four semesters of study.

iii) Regular courses may also be completed well in advance through MOOCs satisfying prerequisites.

6. STRUCTURE OF THE UNDERGRADUATE PROGRAMME

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

S.No.	Category	Breakup of Credits (Total 160)	Percentage of total credits	AICTE Recommendation (%)
1.	Humanities and Social Science including Management (HM)	13	8 %	8 – 9%
2.	Basic Sciences (BS)	20	13 %	12 - 16%
3.	Engineering Sciences (ES)	23.5	14%	10 – 18%
4.	Professional Core (PC)	54.5	34 %	30 – 36%
5.	Electives – Professional (PE) & Open (OE); Domain Specific Skill Enhancement Courses (SEC)	33	21 %	19 - 23%
6.	Internships & Project work (PR)	16	10 %	8 – 11%
7.	Mandatory Courses (MC)	Non-credit	Non-credit	-

7. COURSE CLASSIFICATION:

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

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

8. PROGRAMME PATTERN

i. Total duration of the of B. Tech (Regular) Programme is four academic years.
ii. Each academic year of study is divided into two semesters.
iii. Minimum number of instruction days in each semester is 90 days.

iv. There shall be mandatory student induction program for freshers, 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 undergraduate students.

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

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

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

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

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

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

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

xiii. Students shall undergo mandatory summer internships, for a minimum of eight weeks duration at the end of second and third year of the programme. The internship at the end of second year shall be community oriented and industry internship at the end of third year.

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

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

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

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

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

9. EVALUATION PROCESS

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

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

Theory Courses:

Assessment Method	Marks
Continuous Internal Assessment (CIA)	30
Semester End Examination (SEE)	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 weightage of 10 marks. Any fraction shall be rounded off to the next higher mark.
- The objective paper shall be conducted either online or offline by the respective institution on the day of subjective paper test.
- If conducted offline, the midterm examination shall be conducted first by distribution of the Objective paper, simultaneously marking the attendance, after 20 minutes the answered objective paper shall be collected back. The student is not allowed to leave the examination hall. Then the descriptive question paper and the answer booklet shall be distributed. After 90 minutes the answered booklets are collected back.
- 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% weightage given to the better mid exam and 20% to the other.

For Example:

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

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

For Example:

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

b) End Examination Evaluation:
End examination of theory subjects shall have the following pattern:

i) There shall be 6 questions and all questions are compulsory.
ii) Question I shall contain 10 compulsory short answer questions for a total of 20marks such that each question carries 2 marks.
iii) There shall be 2 short answer questions from each unit.
iv) In each of the questions from 2 to 6, there shall be either/or type questions of 10 marks each. Student shall answer any one of them.
v) The 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 and Basic Civil & Mechanical 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 1mark.
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 (CIA)	30
Semester End Examination (SEE)	70
Total	100

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

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

c) 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.

The end examination shall be evaluated 35 marks in each part. Mid semester examination shall be evaluated as above for 30 marks (day-to-day evaluation 15 marks and internal examination 15 marks) in each part and final internal marks shall be arrived by considering the average of marks obtained in two parts.

d) 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 (CIA)	30
Semester End Examination (SEE)	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 consists of 5 questions, either/or type, of 14 marks each. There shall be no objective type questions in the end examination. However, the end examination pattern for other subjects related to design/drawing, multiple branches, etc is mentioned along with the syllabus.

e) 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.

f) 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 University at the beginning of the semester. The principal of the respective 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.

11. MASSIVE OPEN ONLINE COURSES (MOOCS):

A Student has to pursue and complete one course compulsorily through MOOCs approved by the 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 shall allow up to a maximum of 20% of the total courses being offered in a particular programme i.e., maximum of 32 credits through MOOCs platform.

i) The Institution shall offer credit mobility for MOOCs and give the equivalent credit 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 shall ensure no overlap of MOOC exams with that of the university examination schedule. In case of delay in results, the university 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 institutions shall resolve any issues that may arise in the implementation of this policy from time to time and shall review its credit transfer policy in the light of periodic changes brought by UGC, SWAYAM, NPTEL and state government.

Note: Students shall be permitted to register for MOOCs offered through online platforms approved by the Institution from time to time.

13. ACADEMIC BANK OF CREDITS (ABC)

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

i) Provide option of mobility for learners across the universities 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

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

Evaluation of the summer internships shall be through the departmental committee. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the departmental committee comprising of Head of the Department, supervisor of the internship and a senior faculty member of the department.

A certificate of successful completion from industry shall be included in the report. The report and the oral presentation shall carry 50% weight age each. It shall be evaluated for 50 external marks. There shall be no internal marks for Summer Internship. A student shall secure minimum 40% of marks for successful completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the Institutions.

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, Presentation/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 University and is evaluated for 140 marks.

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

15. GUIDELINES FOR OFFERING A MINOR

To promote interdisciplinary knowledge among the students, the students admitted into B.Tech. in a major stream/branch are eligible to obtain degree in Minor in another stream.

i) The Minor program requires the completion of 12 credits in Minor stream chosen.
ii) Two courses for 06 credits related to a Minor are to be pursued compulsorily for the minor degree, but maybe waived for students who have done similar/equivalent courses. If waived for a student, then the student must take an extra elective course in its place. It is recommended that students should complete the compulsory courses (or equivalents) before registering for the electives.

iii) Electives (minimum of 2 courses) to complete a total of 12 credits.

Note: A total of 04 Open Electives are offered in the curriculum. A student can complete the requirement for Minor within the 160 credits by opting for the courses offered through various verticals/tracks under Open Electives.

16. GUIDELINES FOR OFFERING HONORS

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

i) Honors is introduced in the curriculum of all B. Tech. programs offering a major degree and is applicable to all B. Tech (Regular and Lateral Entry) students admitted in Engineering & Technology.
ii) A student shall earn additional 15 credits for award of B.Tech.(Honors) degree from same branch/department/discipline registered for major degree. This is in addition to the credits essential for obtaining the Undergraduate degree in Major Discipline (i.e., 160 credits).
iii) A student is permitted to register for Honors in IV semester after the results of III Semester are declared and students may be allowed to take maximum two subjects per semester pertaining to the Honors from V Semester onwards.
iv) The concerned Principal of the college shall arrange separate class work and timetable of the courses offered under Honors program.
v) Courses that are used to fulfil the student's primary major may not be double counted towards the Honors. Courses with content substantially equivalent to courses in the student's primary Major may not be counted towards the Honors.
vi) Students can complete the courses offered under Honors either in the college or in online platforms like SWAYAM with a minimum duration of 12 weeks for a 3-credit course and 8 weeks duration for a 2-credit course satisfying the criteria for credit mobility. If the courses under Honors are offered in conventional mode, then the teaching and evaluation procedure shall be similar to regular B. Tech courses.
vii) The attendance for the registered courses under Honors and regular courses offered for Major degree in a semester are to be considered separately.
viii) A student shall maintain an attendance of 75% in all registered courses under Honors to be eligible for attending semester end examinations.

ix) A student registered for Honors shall pass in all subjects that constitute the requirement for the Honors degree program. No class/division (i.e., second class, first class and distinction, etc.) shall be awarded for Honors degree programme.
x) If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into open or core electives; they will remain extra. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.
xi) The Honors will be mentioned in the degree certificate as Bachelor of Technology (Honors) in XYZ. For example, B.Tech. (Honors) in Mechanical Engineering

Enrolment into Honors:

i) Students of a Department/Discipline are eligible to opt for Honors program offered by the same Department/Discipline
ii) The enrolment of student into Honors is based on the CGPA obtained in the major degree program. CGPA shall be taken up to III semester in case of regular entry students and only III semester in case of lateral entry students. Students having 7 CGPA without any backlog subjects will be permitted to register for Honors.
iii) If a student is detained due to lack of attendance either in Major or in Honors, registration shall be cancelled.
iv) Transfer of credits from Honors to regular B. Tech degree and vice-versa shall not be permitted.
v) Honors is to be completed simultaneously with a Major degree program.

Registration for Honors:

i) The eligible and interested students shall apply through the HOD of his/her parent department. The whole process should be completed within one week before the start of every semester. Selected students shall be permitted to register the courses under Honors.
ii) The selected students shall submit their willingness to the principal through his/her parent department offering Honors. The parent department shall maintain the record of student pursuing the Honors.
iii) The students enrolled in the Honors courses will be monitored continuously. An advisor/mentor from parent department shall be assigned to a group of students to monitor the progress.
iv) There is no fee for registration of subjects for Honors program offered in offline at the respective institutions.

17. ATTENDANCE REQUIREMENTS:

i) A student shall be eligible to appear for the University 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 (CAC).

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. 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 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.

iv) 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.

v) 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.

19. GRADING:

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

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

(a) Structure of Grading of Academic Performance

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

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

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

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

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

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

where, Ci is the number of credits of the i^{th} subject and Gi is the grade point scored by the student in the i^{th} course.

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

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

where "Si" is the SGPA of the i^{th} semester and Ci is the total numberof 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.

(b) 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 (Without any Supplementary Appearance)
First Class	≥ 6.5 < 7.5
Second Class	≥ 5.5 < 6.5
Pass Class	≥ 5.0 < 5.5

Note: * Students who have written supplementary examinations to fulfil the credit requirement will not be awarded First Class with Distinction. For such students the highest degree that is awarded will be First Class Only.

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

20. WITH–HOLDING OF RESULTS

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

21. MULTIPLE ENTRY / EXIT OPTION

(a) Exit Policy:

The students can choose to exit the four-year programme at the end of first/second/third year.

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

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

iii) **Bachelor of Science (in Field of study/discipline)** i.e., **B.Sc. Engineering in (Field of study/discipline)**- Programme duration: First three years (first six semesters) of the undergraduate programme, 120 credits.

(b) Entry Policy:

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

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

22. GAP YEAR CONCEPT:

Gap year concept for Student Entrepreneur in Residence is introduced and outstanding students who wish to pursue entrepreneurship / become entrepreneur are allowed to take a break of one year at any time after II year to pursue full-time entrepreneurship programme/to establish startups. This period may be extended to two years at the most and these two years would not be counted for the time for the maximum time for graduation. The principal of the respective college shall forward such proposals submitted by the students to the University.

An evaluation committee constituted by the University shall evaluate the proposal submitted by the student and the committee shall decide whether to permit the student(s) to avail the Gap Year or not.

23. TRANSITORY REGULATIONS

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

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

24. MINIMUM INSTRUCTION DAYS FOR A SEMESTER:

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

25. MEDIUM OF INSTRUCTION

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

26. STUDENT TRANSFERS:

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

27. GENERAL INSTRUCTIONS:

a) The academic regulations should be read as a whole for purpose of any interpretation.
b) Malpractices rules-nature and punishments are appended.
c) Where the words “he”, “him”, “his”, occur in the regulations, they also include “she”, “her”, “hers”, respectively.
d) In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Head of the Institution is final.

e) The Institution may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the Universities.
f) In the case of any doubt or ambiguity in the interpretation of the guidelines given, the decision of the Head of the institution is final.

Academic Regulations (R23) for B. Tech (Lateral Entry Scheme)

(Effective for the students getting admitted into II year through Lateral Entry Scheme from the Academic Year 2024-2025 onwards)

1. AWARD OF THE DEGREE

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

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

(ii) Registers for 120 credits and secures all 120 credits.

(b) **Award of B.Tech. degree with Honors**

A student will be declared eligible for the award of the B.Tech. with Honors if he/she fulfils the following:

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

(ii) Registering for Honors is optional.

(iii) Honors 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).

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SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
(Autonomous)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
(DATA SCIENCE)

B.Tech R23 - COURSE STRUCTURE AND SYLLABI

Semester I (First Year)

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	23BSC111	Applied Chemistry	3	0	0	3	30	70	100
2	23BSC113	Engineering Physics	3	0	0	3	30	70	100
3	23BSC114	Linear Algebra and Calculus	2	1	0	3	30	70	100
4	23ESC114	Introduction to Programming	2	1	0	3	30	70	100
5	23ESC111	Basic Civil and Mechanical Engineering	3	0	0	3	30	70	100
6	23BSC115	Applied Chemistry Lab	0	0	2	1	30	70	100
7	23BSC117	Engineering Physics Lab	0	0	2	1	30	70	100
8	23ESC115	Computer Programming Lab	0	0	3	1.5	30	70	100
9	23ESC117	Engineering Workshop	0	0	3	1.5	30	70	100
10	23HSM113	Health and wellness, Yoga and Sports	0	0	1	0.5	-	-	100
Contact Hours per week			13	2	11	-	-	-	-
Total Hours per week			26			-	-	-	-
Total credits						20.5	-	-	-
Total Marks							270	630	1000

Semester II (First Year)

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	23BSC121	Differential Equations and Vector Calculus	2	1	0	3	30	70	100
2	23HSM111	Communicative English	2	0	0	2	30	70	100
3	23ESC112	Basic Electrical and Electronics Engineering	2	1	0	3	30	70	100
4	23ESC113	Engineering Graphics	1	0	4	3	30	70	100
5	23CSE121	Data Structures	2	1	0	3	30	70	100
6	23HSM112	Communicative English Lab	0	0	2	1	30	70	100
7	23ESC116	Electrical and Electronics Engineering Workshop	0	0	3	1.5	30	70	100
8	23ESC118	IT Workshop	0	0	2	1	30	70	100
9	23CSE122	Data Structures Lab	0	0	3	1.5	30	70	100
10	23HSM114	NSS/NCC/Scouts & Guides/Community Service	0	0	1	0.5	-	-	100
Contact Hours per week			9	3	15	-	-	-	-
Total Hours per week			26			-	-	-	-
Total credits						19.5	-	-	-
Total Marks							270	630	1000

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
(Autonomous)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
(Data Science)

B.Tech R23 - COURSE STRUCTURE AND SYLLABI

Semester III (Second Year)

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	23BSC232	Discrete Mathematics and Graph Theory	2	1	-	3	30	70	100
2	23HSM231	Universal Human Values – Understanding Harmony and Ethical Human Conduct	2	1	-	3	30	70	100
3	23CSE231	Advanced Data Structures and Algorithm Analysis	2	1	-	3	30	70	100
4	23CSE232	Object Oriented Programming Through Java	2	1	-	3	30	70	100
5	23CSD231	Introduction to Data Science	2	1	-	3	30	70	100
6	23CSD232	Data Science Lab	-	-	3	1.5	30	70	100
7	23CSE234	Object Oriented Programming Through Java Lab	-	-	3	1.5	30	70	100
8	23CSE235	Python Programming (SOC)	-	1	2	2	30	70	100
9	23MAC231	Environmental Science	2	-	-	-	P	-	-
Contact Hours per week			12	06	10	-	-	-	-
Total Hours per week						-	-	-	-
Total credits						20	-	-	-
Total Marks							270	630	900

Semester IV (Second Year)

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	23BSC241	Optimization Techniques	2	-	-	2	30	70	100
2	23CSE241	Database Management Systems	2	1	-	3	30	70	100
3	23ESC232	Digital Logic and Computer Organization	2	1	-	3	30	70	100
4	23CSD241	Data Engineering	2	1	-	3	30	70	100
5	23CSD242	Statistical methods for Data science	2	1	-	3	30	70	100
6	23CSD243	Data Engineering Lab	-	-	3	1.5	30	70	100
7	23CSE244	Database Management Systems Lab	-	-	3	1.5	30	70	100
8	23CSD244	Exploratory Data Analysis with Python (SOC)	-	1	2	2	30	70	100
9	23ESC241	Design Thinking and Innovation	1	-	2	2	30	70	100
Contact Hours per week			11	5	10	-	-	-	-
Total Hours per week						-	-	-	-
Total credits						21	-	-	-
Total Marks							270	630	900
Mandatory Community Service Project Internship of 06-08 weeks duration during summer Vacation									

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
(AUTONOMOUS)
DEPARTMENT OF SCIENCE & HUMANITIES

I B. Tech I/II sem

23BSC111	**APPLIED CHEMISTRY**	**L**	**T**	**P**	**C**
	(Common to EEE, ECE, CSE, CSE (AI&ML), CSE (AI) and CSE (DS))	**3**	**0**	**0**	**3**

COURSE EDUCATIONAL OBJECTIVES:

1. To train the students about the concept of Quantum Mechanics and Molecular Orbital theory.
2. To familiarize Knowledge and applications of modern engineering materials
3. To understand the concept of Electro Chemistry with its applications such as battery, fuel cells and sensors
4. To develop knowledge on the concept and applications of polymers
5. To introduce instrumental methods such as UV, IR and Chromatography with applications

UNIT-I:STRUCTURE AND BONDING MODELS (9)

Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of Ψ and Ψ2, particle in one dimensional box, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O2 and CO, etc. π-molecular orbitals of butadiene and benzene, calculation of bond order.

UNIT-II:MODERN ENGINEERING MATERIALS (9)

Semiconductors, band diagram in solids, Semiconductor devices (p-n junction diode as rectifier and transistors)
Super conductors-Introduction basic concept, applications.
Supercapacitors: Introduction, Basic Concept-Classification – Applications.
Nano materials: Introduction, classification, properties and applications of Fullerenes, carbon nano tubes and Graphines nanoparticles.

UNIT-III:ELECTROCHEMISTRY AND APPLICATIONS (9)

Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations).
Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples.
Primary cells – Zinc-air battery, Secondary cells –lithium-ion batteries- working of the batteries including cell reactions; Fuel cells, hydrogen-oxygen fuel cell– working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC).

UNIT-IV:POLYMER CHEMISTRY (9)

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of polymer formation.
Plastics –Thermo and Thermosetting plastics, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibres.
Elastomers–Buna-S, Buna-N–preparation, properties and applications.
Conducting polymers – polyacetylene, polyaniline, – mechanism of conduction and applications. Bio-Degradable polymers - Poly Glycolic Acid (PGA), Polyl Lactic Acid (PLA).

UNIT-V:INSTRUMENAL METHODS AND APPLICATIONS (9)

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.

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
(AUTONOMOUS)
DEPARTMENT OF SCIENCE & HUMANITIES

On successful completion of the course the students will be able to		POs
CO1	Demonstrate knowledge based on quantum mechanics and molecular orbital theory	PO1, PO2
CO2	Demonstrate knowledge on engineering materials with applications	PO1, PO2, PO6
CO3	Demonstrate knowledge on electrochemistry with analytical skills and applications such as battery, fuel cells and sensors	PO1, PO2, PO6
CO4	Demonstrate knowledge on polymers with applications related to society and sustainability	PO1, PO2, PO6,PO7
CO5	Demonstrate knowledge on principles and instrumentations of spectroscopy and chromatography	PO1, PO2

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
2. J.M. Lehn, Supra Molecular Chemistry, VCH Publications

CO/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	2	-	-	-	-	-	-
CO3	3	2	-	-	-	2	-	-	-	-	-	-
CO4	3	2	-	-	-	2	2	-	-	-	-	-
CO5	3	2	-	-	-	-		-	-	-	-	-
CO*	3	2	-	-	-	2	2	-	-	-	-	-

SREENIVASAINSTITUTEOFTECHNOLOGYANDMANAGEMENTSTUDIES
(Autonomous)

I B.Tech I/II sem

23BSC113	**ENGINEERING PHYSICS**	**L**	**T**	**P**	**C**
	(Common to All Engineering Branches)	**3**	**0**	**0**	**3**

COURSE EDUCATIONAL OBJECTIVES:

1. To study the intensity variation of light due to interference, diffraction and polarization
2. To understand the fundamental of crystals and their structures.
3. To recognize various types of polarization of dielectrics and classification of the magneticmaterials.
4. To study the principles of quantum mechanics and implementing it the one-dimensional motion of particles and the band theory of solids.
5. To provide an overview of semiconductor and identification of type of semiconductor using Hall effect.

UNIT-I : Wave Optics

Interference: Introduction **-** Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colors in thin films- Newton's Rings- Determination of wavelength and refractive index.
Diffraction: Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit– Diffraction Grating -Applications
Polarization: Introduction -Types of polarization - Polarization by reflection, refraction andDouble refraction - Nicol's Prism -Half wave and Quarter wave plates. -Applications

UNIT-II :Crystallography and X-ray diffraction

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl) planes.
X-ray diffraction: Bragg's law - X-ray Diffractometer – crystal structure determination by Laue's and powder methods.

UNIT-III:Dielectric and Magnetic Materials

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector – Relation between the electric vectors - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius- Mossotti equation - complex dielectric constant – Frequency dependence of polarization – dielectric loss
Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability – Atomic origin of magnetism - Classification of magnetic materials: Dia, para, Ferro, anti-ferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials.

UNIT-IV:Quantum Mechanics and Free electron theory

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.
Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory – electrical conductivity based on quantum freeelectron theory - Fermi-Dirac distribution - Density of states - Fermi energy.

UNIT-V:Semiconductors

Semiconductors: Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors: density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation - Hall effect and its applications

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**Pos**
CO1	Identify the importance and applications Wave Optics in various Streams of Engineering	**PO1, PO2**
CO2	Explain the fundamental of crystals and their structures	**PO1, PO2**
CO3	Elucidate the importance, properties and applications of Magnetic materials and dielectrics	**PO1, PO2**
CO4	Use ideas with mathematical solutions to Quantum mechanics and its applications in various atomic phenomena	**PO1, PO2**
CO5	Provide knowledge about semiconductor and different type of semiconductor using Hall effect.	**PO1, PO2**

TEXT BOOKS:

1. A Text book of Engineering Physics - M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy,
2. S. Chand Publications, 11th Edition 2019.
3. Engineering Physics - D.K.Bhattacharya and Poonam Tandon, Oxford press (2015).

REFERENCE BOOKS:

1. Solid State Physics, by Kittel, Wiley
2. Engineering Physics by Gaur and Gupta, Dhanpatrai Publications
3. Engineering Physics by K.Thyagarajan, McGraw Hill.

REFERENCE WEBSITE:

https://archive.nptel.ac.in/courses/122/107/122107035/
https://archive.nptel.ac.in/courses/112/106/112106293/
https://www.youtube.com/watch?v=6QUFuZpCgGw
https://archive.nptel.ac.in/courses/122/106/122106034/
https://www.youtube.com/watch?v=k6ZxP9Yr02E

CO\PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO.1	3	3	-	-	-	-	-	-	-	-	-	-
CO.2	3	3	-	-	-	-	-	-	-	-	-	-
CO.3	3	3	-	-	-	-	-	-	-	-	-	-
CO.4	3	3	-	-	-	-	-	-	-	-	-	-
CO.5	3	3	-	-	-	-	-	-	-	-	-	-
CO*	3	3	-	-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
(AUTONOMOUS)
DEPARTMENT OF SCIENCE & HUMANITIES

I B.Tech I sem

		L	T	P	C
23BSC114	**LINEAR ALGEBRA & CALCULUS (Common to All Branches of Engineering)**	**2**	**1**	**-**	**3**

COURSE EDUCATIONAL OBJECTIVES:

1. To familiarize the concepts of matrices and mean value theorems and their applications in engineering.
2. To equip the students to solve various application problems in engineering through evaluation of multiple integrals etc.,
3. To equip the students with standard concepts and tools of mathematics to handle various real-world problems and their applications.

UNIT-I: MATRICES (9)

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.Iterative methods: Jacobi and Gauss Seidel Methods.

UNIT-II: EIGEN VALUES, EIGEN VECTORS AND ORTHOGONAL TRANSFORMATION (9)

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 (9)

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

UNIT-IV:PARTIAL DIFFERENTIATION AND APPLICATIONS (MULTI VARIABLE CALCULUS) (9)

Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, 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(MULTIPLE VARIABLE CALCULUS) (9)

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).

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	To solve a system of homogenous and non-homogeneous linear equations	**PO1, PO2,PO3**
CO2	Develop and use of matrix algebra techniques that are needed by engineers for practical applications	**PO1, PO2,PO3**
CO3	Learn important tools of calculus in higher dimensions. Utilize mean value theorems to real life problems.	**PO1, PO2,PO3**
CO4	Familiarize with functions of several variables which is useful in optimization	**PO1, PO2,PO3**
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.	**PO1, PO2,PO3**

TEXT BOOKS:

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

REFERENCE BOOKS:

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

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/110/105/111105111/
2. https://www.youtube.com/watch?v=8D3WViAyJvc
3. https://www.youtube.com/watch?v=fKzDtjq0ks4
4. https://www.youtube.com/watch?v=wMd4YRyBmjA
5. https://www.youtube.com/watch?v=ArkDa6d5h9I
6. https://www.youtube.com/watch?v=KgItZSst2sU
7. https://www.youtube.com/watch?v=-I3HUeHi1Ys

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	3	2	-	-	-	-	-	-	-	-	-
CO.2	3	3	2	-	-	-	-	-	-	-	-	-
CO.3	3	3	2	-	-	-	-	-	-	-	-	-
CO.4	3	3	2	-	-	-	-	-	-	-	-	-
CO.5	3	3	2	-	-	-	-	-	-	-	-	-
CO*	3	3	2	-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

I B.Tech - I Semester

23ESC114
INTRODUCTION TO PROGRAMMING
(Common to all Branches)

L	T	P	C
2	1	0	3

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To introduce students to the fundamentals of computer programming.
2. To provide logical thinking and problem-solving skills using control structures.
3. To familiarize students with programming concepts such as data types, arrays and strings.
4. To introduce the concepts of pointers and user-define data types.
5. To encourage the students with functions and file handling mechanisms.

UNIT- 1 Introduction to Programming and Problem Solving (10)

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. Introduction to Compilation and Execution, Primitive Data Types, Variables, and Constants, Basic Input and Output, Operators and Expressions, Type Conversion, and Casting.

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

UNIT- 2 Control Structures (8)

Simple sequential programs, Conditional Statements (if, if-else, switch), Loops (for, while, do-while). Break and Continue.

UNIT- 3 Arrays and Strings (9)

Arrays indexing, memory model, programs with array of integers, two dimensional arrays. Strings-Declaring and Initializing String Variables, Reading string from terminal, Writing string to the screen, String Handling Functions.

UNIT-4 Pointers & User Defined Data types (9)

Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers. User-defined data types-Structures and Unions.

UNIT-5 Functions & File Handling (9)

Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scopeand Lifetime of Variables. File Handling- Basic Operations on Files – File Handling Function.

TOTAL HOURS: 45

COURSE OUTCOMES:

On successful completion of the course the student will be able to,		**POs related to COs**
CO1	Understand basics of computers, the concept of algorithm and algorithmic thinking.	**PO1, PO2**
CO2	Analyze a problem and develop an algorithm and program using control structures to solve it.	**PO1, PO2, PO3**
CO3	Implement various programming concepts using arrays and strings.	**PO1,PO2, PO3, PO4**
CO4	Understand and implement more advanced features of pointers and user-defined data types.	**PO1, PO2, PO5**
CO5	Develop problem-solving using functions and file handling concepts.	**PO1, PO3, PO4, PO5**

TEXT BOOKS:

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

REFERENCE BOOKS:

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

REFERENCE WEBSITES:

1. https://onlinecourses.swayam2.ac.in/cec22_cs11
2. https://onlinecourses.nptel.ac.in/noc22_cs40
3. https://www.geeksforgeeks.org

CO-PO MAPPING:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	2	3	-	-	-	-	-	-	-	-
CO4	3	3	-	-	3	-	-	-	-	-	-	-
CO5	3	-	3	3	3	-	-	-	-	-	-	-
CO*	**3**	**3**	**2**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
(Autonomous)

I B.Tech. - I Semester

23ESC111	**BASIC CIVIL AND MECHANICAL ENGINEERING (Part-B) (Common to All Branches)**	**L**	**T**	**P**	**C**
		3	**-**	**-**	**3**

BASIC CIVIL ENGINEERING
(Part-A)

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To study the Overview of civil engineering and basic concepts on construction materials.
2. To study the basic concepts in the field of surveying & Foundation Engineering
3. To study the basic transportation, water resources and environmental engineering.

UNIT –1: INTRODUCTION TO CIVIL ENGINEERING (8)

BASICS OF CIVIL ENGINEERING: Overview of civil engineering — Civil engineering contributions to the welfare of society – Various disciplines of civil engineering – Basic concepts and scope of structural engineering, geo-technical engineering, transportation engineering, hydraulics , water resources engineering, and environmental engineering **CONSTRUCTION TECHNOLOGY:** Fundamental concepts of building planning for residential buildings and Sequences of Work in Building Construction – Introduction to Prefabricated construction Techniques & Green buildings concept **Construction Materials:** Cement – Aggregate – Bricks – Cement – Concrete – Steel – Timber – Modern materials. (Brief discussion only)

UNIT –2: SURVEYING & FOUNDATION ENGINEERING (8)

SURVEYING: Objectives of surveying – Horizontal measurements – Angular measurements – Introduction to bearings levelling instruments used for levelling – Simple problems on levelling and bearings– Contour mapping. (Brief discussion only)
FOUNDATIONS ENGINEERING: Bearing capacity of soil, functions of foundations, types – shallow and deep- Load bearing and framed structures (Brief discussion only)

UNIT –3: TRANSPORTATION AND WATER RESOURCES AND ENVIRONMENTAL ENGINEERING (8)

TRANSPORTATION ENGINEERING: Importance of transportation in Nation's economic development – Types of highway pavements – Flexible pavements and rigid pavements – Simple differences– Basics concepts on harbor, tunnel, airport, and railway engineering. (Brief discussion only)
WATER RESOURCES AND ENVIRONMENTAL ENGINEERING: Introduction on water resources and environmental engineering – Sources of water – Quality of water and Specifications – Introduction to hydrology – Rainwater harvesting – Water storage and conveyance structures – Fundamental concepts on dams and reservoirs.
(Brief discussion only)

Total Hours: 24

(**Note:** The subject covers only the basic principles of Civil Engineering. The evaluation shall be intended to test only the fundamentals of the subject)

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society.	**PO1, PO12**
CO2	Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying and Basics concepts of foundations engineering	**PO1, PO12**
CO3	Realize the importance of Transportation Water Resources and Environmental Engineering.	**PO1, PO12**

TEXT BOOKS:

1. Indian Standard Specifications for Drinking Water is : 10500 – 1983
2. G.Shanmugam and M.S.Palanichamy, "Basic Civil and Mechanical Engineering", Tata McGraw Hill Publishing Co., New Delhi , 1996.
3. Venugopal K,Prahu Raja V, "Basic Mechanical Engineering", Anuradha Publishers, Chennai.

REFERENCE BOOKS:

1. Building Material by S K Duggal New Age International Publishers; Second Edition.
2. Text book of surveying, C.Venkataramaiah, Universities Press.
3. S.K.Khanna & C.E.G.Justo, Highway Engineering Nemchand & Bros., 7th edition (2000).
4. Garg, S.K., Environmental Engineering Vol. II, Khanna Publishers,New Delhi, 2015.
5. P.K.Nag, "Power Plant Engineering", McGraw-Hill Education Pvt. Ltd., New Delhi,4/e, 2014.
6. P.N.Modi,‖ Irrigation and Water Resources & Water Power Engineering‖, Standard Book House.
7. M. S. Shetty, Concrete Technology‖, S. Chand and Company Ltd., New Delhi, 2003
8. K.R.Arora,‖Soil Mechanics and Foundation Engineering‖, Standard Publishers and Distributors, Delhi.,

REFERENCE WEBSITE:

1. https://onlinecourses.nptel.ac.in/noc22_ce42/preview

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	-	-	-	-	-	-	-	-	-	-	1
CO.2	3	-	-	-	-	-	-	-	-	-	-	1
CO.3	3	-	-	-	-	-	-	-	-	-	-	1
CO*	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

SREENIVASAINSTITUTEOFTECHNOLOGYANDMANAGEMENTSTUDIES
(Autonomous)

I B.Tech. - I Semester

23ESC111	**BASIC CIVIL AND MECHANICAL ENGINEERING (Part-B)** **(Common to All Branches)**	**L T P C** **3 - - 3**

BASIC MECHANICAL ENGINEERING
(Part-B)

PRE-REQUISITES: Nil.

COURSE EDUCATIONAL OBJECTIVES:

1. To study the basic concepts materials, machining, and scope of mechanical engineering.
2. To study the basic concepts in the field of thermal engineering.
3. To study the basic principles of power plants, mechanical transmission system and fundamentals of robotics.

UNIT –1: INTRODUCTION TO MATERIALS & MANUFACTURING ENGINEERING (8)
Introduction to Mechanical Engineering: Role of mechanical engineering in industries and society – Technologies and scope in different sectors such as energy, manufacturing, design, automotive, aerospace, and marine. **Engineering Materials**: Introduction on metals-ferrous and non-ferrous, ceramics, composites, smart materials. **Manufacturing Processes:** Basic principles and applications of casting, forming, joining processes, and machining – Introduction to CNC machines, 3D printing, and smart manufacturing.

UNIT –2: INTRODUCTION TO THERMAL ENGINEERING (8)
Thermal Engineering: Working principle of boilers. **Refrigeration:** Refrigeration and air-conditioning cycles – Units of refrigeration – Refrigerants – Vapour-compression and absorption system. **Air Conditioning:** Terminology in air conditioning – Working principle of window, split, and central air conditioning system. **IC Engines:** Basic concepts on Otto cycle and Diesel cycle – Components of IC engines – SI/CI Engines – Working principle of two/four stroke petrol and diesel engines – Differences between petrol and diesel engines – Basic concepts on electric and hybrid vehicles.

UNIT –3: POWER PLANTS, MECHANICAL TRANSMISSION AND ROBOTICS (8)
Power Plants: Working principle of steam, diesel, hydro, gas turbine, and 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 Mechanical Engineering systems. The evaluation shall be intended to test only the fundamentals of the subject)

Total Hours: 24

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Understand the concepts of engineering materials and basic manufacturing process.	**PO1, PO2, PO3**
CO2	Describe the basic concepts of thermal engineering, refrigeration, air conditioning and IC engines.	**PO1, PO2, PO3**
CO3	Describe the working of different mechanical power transmission systems, power plants, and fundamentals of robotics.	**PO1, PO2, PO3**

TEXT BOOKS:

1. G.Shanmugam and M.S.Palanichamy, "Basic Civil and Mechanical Engineering", Tata McGraw Hill Publishing Co., New Delhi , 1996.
2. Venugopal K,Prahu Raja V, "Basic Mechanical Engineering", Anuradha Publishers, Chennai, 2000.

REFERENCE BOOKS:

1. Materials Science and Engineering: An Introduction, William D. Callister, 9/e, 2014,Wiley India Pvt. Ltd.
2. Serope Kalpakjian and Steven R. Schmid, "Manufacturing Engineering and Technology (SI Edition)", Pearson Education, New Delhi, 7/e, 2018.
3. Ian Gibson, David W.Rosen and Brent Stucker, "Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping and Direct Digital Manufacturing", Springer, 2/e, 2015.
3. V. Ganesan, "Internal Combustion Engines", Tata McGraw-Hill Education Pvt. Ltd., 4/e, 2012.
4. C P Arora, "Refrigeration and Air Conditioning", Tata McGraw-Hill Education Pvt. Ltd., Noida, 3/e, 2008.
5. M.Ehsani, Y.Gao,S.Gayand AliEmadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles" Fundamentals, Theory and Design", CRC Press, 2005
6. P.K.Nag, "Power Plant Engineering", McGraw-Hill Education Pvt. Ltd., New Delhi,4/e, 2014.
7. S.S.Rattan, "Theory of Machines and Mechanisms', Tata McGraw-Hill Education Pvt.Ltd, Noida, 5/e, 2019.
8. Industrial Robotics: Technology, Programming and Applications, Mikell P Groover, Mitchell Weiss, Roger N. Nagel, Nicholas G Odrey and Ashish Dutta 2/e, 2012, Tata McGraw-Hill Education Pvt. Ltd.,

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/112103316
2. https://nptel.ac.in/courses/112106293
3. https://nptel.ac.in/courses/112104290

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	-	-	-	-	-	-	-	-	-	-	1
CO.2	3	-	-	-	-	-	-	-	-	-	-	1
CO.3	3	-	-	-	-	-	-	-	-	-	-	1
CO*	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
(AUTONOMOUS)
DEPARTMENT OF SCIENCE & HUMANITIES

I B.Tech I/II sem

		L	T	P	C
23BSC115	**APPLIED CHEMISTRY LAB**				
	(Common to EEE, ECE, CSE, CSE (AI&ML), CSE (AI) and CSE (DS))	**-**	**-**	**2**	**1**

COURSE EDUCATIONAL OBJECTIVES:

1. Verify the fundamental concepts with experiments.
2. To provide solid foundation in chemistry laboratory to solve engineering problems
3. To apply theoretical principles in preparing polymers and nonmaterial's
4. To apply theoretical principles in estimating strength of acid, ferrous ion
5. To apply theoretical concept and principles in determining cell constant and conductance of solution, strength of acids by conduct metric titrations and PH metric titrations, redox potential,emf and viscosity
6. To experience the importance of theory by utilizing analytical tools such as pb-acid battery, colorimeter,ostwalds viscometer, potentiometer, conductivity meter and PH meter
7. To experience the importance of theory by performing spectroscopic investigations, using modern instrumental tools such as UV-spectrophotometer and IR spectrometer

LIST OF EXPERIMENTS

1. Measurement of 10Dq by spectrophotometric method.
2. Conduct metric titration of strong acid (HCl) vs. strong base (NaOH)
3. Conduct metric titration of weak acid (CH3COOH) vs. strong base (NaOH)
4. Determination of cell constant and conductance of potassium chloride solutions
5. Potentiometry-determination of redox potentials and emfs (emf titration of Fe^{2+} with $cr_2O_7^{2-}$)
6. Determination of Strength of an acid in Pb-Acid battery
7. Preparation of a polymer (Bakelite).
8. Verification Lambert-Beer's law for $KMnO_4$ by colorimetry.
9. Wavelength measurement of sample through UV-Visible Spectroscopy
10. Identification of simple organic compounds by IR
11. Preparation of ZnO nanomaterials by precipitation method
12. Estimation of Ferrous Iron by Dichrometry
13. Determination of molecular weight of a polymer using Ostwald viscometer
14. pH metric titration of strong acid (HCl) vs strong base (NaOH)

Note: Any **TEN** of the listed experiments are to be conducted, out of which any **TWO** experiments may be conducted in virtual mode.

REFERENCE BOOK:

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

COURSE OUTCOMES:

On the successful completion of the course students will be able to		POs
CO1	Demonstrate knowledge on preparation of bakerite and nanomaterial	PO1
CO2	Analyse ferrous iron colorimetry and ferrous iron by dichrometry, analyse acid in lead acid battery	PO2
CO3	Conduct investigations of lead in lead acid battery, wave length determination in spectrophotometer, conductometric titrations of acids and bases	PO4
CO4	Analyse using tools such as UV and IR spectrophotometers	PO5
CO5	Follow the ethical principles in implementing the programmes	PO8

CO6	Conduct experiments effectively as an individual and as a team member in a group	PO9
CO7	Communicate verbally and in written form the understanding about the experiments	PO10
CO8	Continue updating their skill related to nanomaterials and battery and implementing programmes in future	PO12

CO/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	3	-	-	-	-	-	-	-	-
CO4	-	-	-	-	3	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	3	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	-	-	-
CO7	-	-	-	-	-	-	-	-	-	3	-	-
CO8	-	-	-	-	-	-	-	-	-	-	-	3
CO	**3**	**3**	**-**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

SREENIVASAINSTITUTEOFTECHNOLOGYANDMANAGEMENTSTUDIES
(Autonomous)

I B.Tech I/II sem

23BSC117	ENGINEERING PHYSICS LAB (Common to All Engineering Branches)	L -	T -	P 2	C 1

PRE-REQUISITES: Nil.

COURSE EDUCATIONAL OBJECTIVES:

1. **To** Operate optical instruments like travelling microscope and spectrometer.
2. To Estimate the wavelengths of different colors using diffraction grating.
3. To Plot the intensity of the magnetic field of circular coil carrying current with distance.
4. To Calculate the band gap of a given semiconductor.
5. To verify the laws of stretched strings

LIST OF EXPERIMENTS

1. Determination of radius of curvature of a given Plano convex lens by Newton's rings.
2. Determination of thickness of a thin wire using wedge method
3. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
4. Determination of wavelength of Laser light using diffraction grating.
5. Determination of energy gap of a semiconductor using p-n junction diode.
6. Determination of particle size using laser source
7. Magnetic field along the axis of a current carrying circular coil by Stewart Gee'sMethod.
8. Determination of rigidity modulus of the material of the given wire using Torsionalpendulum.
9. Sonometer: Verification of laws of stretched string.
10. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration
11. Determination of temperature coefficients of a thermistor.
12. Determination of Frequency of electrically maintained tuning fork by Melde's experiment.

Note: Any **TEN** of the listed experiments are to be conducted. Out of which any **TWO** experiments may be conducted in virtual mode.

REFERENCE BOOK:

1. A Textbook of Practical Physics - S. Balasubramanian, M.N. Srinivasan, S. ChandPublishers, 2017.

WEB RESOURCE:

1. ***URL***:www.vlab.co.in

SREENIVASAINSTITUTEOFTECHNOLOGYANDMANAGEMENTSTUDIES
(Autonomous)

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**Pos**
CO1	Demonstrate Knowledge on measurement of various physical quantities using optical methods and fundamentals of magnetic fields	**PO1**
CO2	Identify different physical properties of materials like band gap, magnetic field intensity etc, for engineering and technological applications	**PO2**
CO3	Provide valid conclusions on phenomena Interference and Diffraction	**P04**
CO4	Follow the ethical principles in implementing the programs	**PO8**
CO5	Do experiments effectively as an individual and as a team member in a group.	**PO9**
CO6	Communicate verbally and in written form, the understanding about the experiments.	**PO10**
CO7	Continue updating their skill related to loops, pointers and files implementing programs in future.	**PO12**

CO/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	3	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	3	-	-	-	-
CO5	-	-	-	-	-	-	-	-	3	-	-	-
CO6	-	-	-	-	-	-	-	-	-	3	-	-
CO7	-	-	-	-	-	-	-	-	-	-	-	3
CO8	-	-	-	-	-	-	-	-	-	-	-	3
CO	**3**	**3**	**-**	**3**	**-**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

I B.Tech. – I Semester

23ESC115

COMPUTER PROGRAMMING LAB	**L**	**T**	**P**	**C**
(Common to All Branches)	**0**	**0**	**3**	**1.5**

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To provide knowledge on flowchart and algorithm to the given problem
2. To exercise conditional and iterative statements to write C programs
3. To develop the skill of C programs using arrays, strings and functions.
4. To understand C programs using pointers, Structures and union.
5. To familiarize with file handling techniques.

Week 1

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

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

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

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

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

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

1D Array manipulation, linear search

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

Week 8

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

Pointers

i) Write a C program to find the sum of a 1D array using pointers
ii) Enter n students data using Pointers and display failed students list
iii) Demonstrate the arithmetic operations using pointers.
iv) Write a C Program using Pointers to Read in an Array of Integers and Print its Elements in Reverse Order

Week 10

Structures and Unions

i) Demonstrate the differences between structures and unions using a C program.
ii) Write a C program to find the total, average of n students using structures
iii) Write a C program to copy one structure variable to another structure of the same type.
iv) Write a C program to shift/rotate using bit fields.

Week 11

Simple functions using call by value, solving differential equations using Eulerstheorem.

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

Week 12

Recursive functions

i) Write a recursive function to generate Fibonacci series.
ii) Write a recursive function to find the GCD of two numbers.
iii) Write a recursive function to find the factorial of a number.
iv) Write a recursive function to find the sum of series.

Week 13

Simple functions using Call by reference.

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

Week 14

File operations

i) Write a C program to write and read text into a file.
ii) Write a C program to write and read text into a binary file using fread() and fwrite()
iii) Copy the contents of one file to another file.
iv) Write a C program to merge two files into the third
v) Write a C program to print last n characters of a given file.

Total Hours: 45

COURSE OUTCOMES:

After the successful completion of this course, the students able to:		**POs related to COs**
CO1	Read and understand the execution of programs written in C language.	**PO1**
CO2	Analyze the programs on control statements and arrays.	**PO2**
CO3	Design C programs which utilize memory efficiently using programming constructs like pointers.	**PO3**
CO4	Develop the programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C	**PO4**
CO5	Analyze and implement the advanced concepts on functions and File handling techniques.	**PO5**
CO6	Follow the ethical principles in implementing the programs	**PO8**
CO7	Do experiments effectively as an individual and as a team member in a group.	**PO9**
CO8	Communicate verbally and in written form, the understanding about the experiments.	**PO10**
CO9	Continue updating their skill related to loops, pointers and files, implementing programs in future.	**PO12**

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

REFERENCE WEBSITES:

1. https://onlinecourses.swayam2.ac.in/cec22_cs11
2. https://onlinecourses.nptel.ac.in/noc22_cs40
3. https://www.geeksforgeeks.org.

CO-PO MAPPING:

CO-PO	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-
CO7	-	-	-	-	-	-	-	-	3	-	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	
CO9												3
CO*	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**3**	**3**	**3**		**3**

SREENIVASAINSTITUTEOFTECHNOLOGYANDMANAGEMENTSTUDIES
(Autonomous)

I B.Tech. - I Semester

		L	T	P	C
23ESC117	**ENGINEERING WORKSHOP (Common to All Branches)**	**-**	**-**	**3**	**1.5**

PRE-REQUISITES: Nil.

COURSE EDUCATIONAL OBJECTIVES:

1. To provide exposure to the students with hands on experience on various basic engineering practices in civil, mechanical, and electrical engineering.

Trade for Exercises:

1. **Demonstration:** Safety practices and precautions to be observed in workshop.
2. **Carpentry:** Familiarity with different types of woods and tools used in wood working and make following joints.
    a. Middle T lap joint or Half lap joint
    b. Mortise and tenon joint
    c. Dove tail joint or bridle joint
3. **Sheet Metal:** Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets.
    a. Tapered tray
    b. Conical funnel
    c. Elbow pipe
    d. Brazing
4. **Fitting:** Familiarity with different types of tools used in fitting and do the following fitting exercises.
    a. V fit
    b. Dove tail joint
    c. Semi-circular fit / Square fit
    d. Bicycle tire puncture
5. **House Wiring:** Familiarity with different types of basic electrical circuits and make the following connections.
    a. Parallel and series
    b. Two-way switch
    c. Godown lighting
    d. Tube light
    e. Three phase motor
    f. Soldering of wires
6. **Basic Machining:** Familiarity with different types of tools used in metal parts and practicing basic machining operation.
    a. Simple plain turning / simple step turning.
    b. Drilling and tapping
7. **Plumbing:** Familiarity with plumbing tools, Preparation of pipe joints with coupling for same diameter and with reducer for different diameters and make the following tap connections
    a. Single tap connections
    b. Multi tap connections.

Trade for Demonstration:

1. **Foundry Trade:** Demonstration and practice on moulding tools and processes, preparation of green sand moulds for single and split patterns.
2. **Welding:** Demonstration and practice on Arc Welding and Gas welding Preparation of Lap joint and Butt joint.

TEXT BOOKS:

1. Serope Kalpak Jain and Steven R. Schmid, "Manufacturing Processing forEngineering Materials (SI Edition)", Pearson Education, New Delhi, 6/e, 2018.
2. P.N. Rao, "Manufacturing Technology - Foundry, Farming and Welding, Volume-I",Tata McGraw-Hill Education Pvt. Ltd., Noida, 5/e, 2018.

REFERENCE BOOKS:

1. Hajra Choudhury S.K and Nirjhar Roy, "Elements of Workshop Technology, Volume-I", Media Promoters and Publishers Pvt.Ltd, 15/e, 2010.
2. Roy A Lindberg, "Process and Materials of Manufacturing", Pearson Education, New Delhi, 4/e, 2015.
3. R.K. Jain, "Production Technology", Khanna publishers, New Delhi, 17/e, 2011.
4. R.K. Rajput, "A Textbook of Manufacturing Technology: Manufacturing Processes", Laxmi Publications (P) Ltd., New Delhi, 2/e, 2017.
5. "A Text book of Manufacturing Technology-I", P.C.Sharma, S.Chand& Company Pvt. Ltd., New Delhi, 1/e, 2011.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/112/104/112104301/
2. https://nptel.ac.in/courses/112/107/112107219/

OURSE OUTCOMES:

On successful completion of the course, students will be able to		**POs**
CO1	Demonstrate the knowledge on different tools used in carpentry, fitting, sheet metal, house wiring and plumbing sections and also basic machining process	**PO1**
CO2	Analyze the basic pipeline connection using different joints	**PO2**
CO3	Design and develop simple components by using different materials includes wood, GI sheet and MS plates	**PO3**
CO4	Apply basic electrical engineering tools on the house wiring practice	**PO5**
CO5	Follow the ethical principles in while doing the exercises.	**PO8**
CO6	Do the exercises effectively as an individual and as a team member in a group	**PO9**
CO7	Communicate verbally among team members and in written form, the understanding about the trade exercises.	**PO10**
CO8	Continue updating their skill related to trades.	**PO12**

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	3	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	3	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	-	-	-
CO7	-	-	-	-	-	-	-	-	-	3	-	-
CO8	-	-	-	-	-	-	-	-	-	-	-	3
CO	**3**	**3**	**3**	**-**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES (AUTONOMOUS)

DEPARTMENT OF SCIENCE & HUMANITIES

I B.Tech I/II sem

		L	T	P	C
23HSM113	**Health And Wellness, Yoga and Sports (Common to All branches of Engineering)**	**0**	**0**	**1**	**0.5**

COURSE EDUCATIONAL OBJECTIVES:

1. To maintain their mental and physical wellness upright and develop ability in them to cope up with the stress arising in the life.
2. To create space in the curriculum to nurture the potential of the students in sports/games/yoga etc.
3. To introduce a practice oriented introductory course on the subject.

COURSE OUTCOMES:

After completion of the course the student will be able to

1. Be Physical fit to perform daily routine without undue fatigue.
2. Be Mentally alert and Socially Cohesive
3. Consider success and failure equally.
4. Develop Positive Personality
5. Improve Leadership qualities

UNIT-I:

Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index (BMI) of all age groups.

Activities:

1. Organizing health awareness programmes in community
2. Preparation of health profile
3. Preparation of chart for balance diet for all age 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:

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

   Practicing general and specific warm up, aerobics

2. Practicing cardio respiratory 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 GUDIELINES:

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.

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

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
(AUTONOMOUS)

DEPARTMENT OF SCIENCE & HUMANITIES

I B.Tech II sem

		L	T	P	C
23BSC121	**DIFFERENTIAL EQUATIONS AND VECTOR (Common to All Branches of Engineering)**	**2**	**1**	**-**	**3**

COURSE EDUCATIONAL OBJECTI VES:

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

UNIT-I: DIFFERENTIAL EQUATIONS OF FIRST ORDER AND FIRST DEGREE (9)

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

UNIT-II:LINEAR DIFFERENTIAL EQUATIONS OF HIGHER ORDER (CONSTANT COEFFICIENTS) (9)

Definitions,homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskean, Method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems and Simple Harmonic motion.

UNIT-III:PARTIAL DIFFERENTIAL EQUATIONS (9)

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 and Non-Linear (Standard forms) equations. Homogeneous Linear Partial differential equations with constant coefficients (Method of Separation of variables).

UNIT-IV: VECTOR DIFFERENTIATION (9)

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 (9)

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.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Solve the first order differential equations related to various engineering fields	**PO1, PO2,PO3**
CO2	Solve the higher order differential equations related to various engineering fields.	**PO1, PO2,PO3**
CO3	Identify solution methods for partial differential equations that model physical processes.	**PO1, PO2,PO3**
CO4	Interpret the physical meaning of different operators such as gradient, curl and divergence.	**PO1, PO2,PO3**
CO5	Estimate the work done against a field, circulation and flux using vector calculus	**PO1, PO2,PO3**

TEXT BOOKS:

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

REFERRENCE BOOKS:

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

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/111/106/111106100/
1. https://www.youtube.com/watch?v=OBhZvyhc8JQ&t=982s
2. https://nptel.ac.in/courses/111/106/111106100/
3. https://www.youtube.com/watch?v=3zCdNO2xp3s
4. https://www.youtube.com/watch?v=GFKggEkKtLM
5. https://www.youtube.com/watch?v=SZCsFS9izfQ
6. https://www.youtube.com/watch?v=ma1QmE1SH3I

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	3	2	-	-	-	-	-	-	-	-	-
CO.2	3	3	2	-	-	-	-	-	-	-	-	-
CO.3	3	3	2	-	-	-	-	-	-	-	-	-
CO.4	3	3	2	-	-	-	-	-	-	-	-	-
CO.5	3	3	2	-	-	-	-	-	-	-	-	-
CO*	3	3	2	-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
(AUTONOMOUS)
DEPARTMENT OF SCIENCE & HUMANITIES

I B.Tech I/II sem

23HSM111	**COMMUNICATIVE ENGLISH**	**L**	**T**	**P**	**C**
	(Common to All Branches of Engineering)	**2**	**0**	**0**	**2**

COURSE EDUCATIONAL 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 intheir comprehending abilities, oral presentations, reporting useful information and providingknowledge of grammatical structures and vocabulary. This course helps the students to makethemeffectiveinspeakingandwritingskills andtomakethemindustry ready.

UNIT-I: 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 to pics 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 ofinformation.
Writing: Mechanics of Writing-Capitalization, Spelling Punctuation – Parts of Sentences.
Grammar: Parts of Speech, Basic Sentence Structures - forming questions
Vocabulary: Synonyms, Antonyms, Affixes(Prefixes/Suffixes),Root words.

UNIT-II: NATURE-The Brook by Alfred Tennyson (Poem)

Listening: Answering a series of questions about main ideas and supporting ideas after listening to audiotexts.
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: Cohesivedevices-linkers, use of articles and zero article; prepositions.
Vocabulary: Homonyms, Homophones,Homographs.

UNIT-III: BIOGRAPHY-Elon Musk

Listening: Listening for global comprehension and summarizing what is listened to.
Speaking: Discussing specific to pics in pairs or small groups and reporting what is discussed
Reading: Reading at extindetailby 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-verbagreement;Compoundwords,Collocations
Vocabulary: Compoundwords,Collocations

UNIT-IV: 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, revealtrends/patterns/relationships, communicate processes or display complicateddata.

Writing: Letter Writing:Official Letters, Resumes

Grammar: Reporting verbs, Direct & Indirect speech, Active & Passive Voice

Vocabulary: Words often confused, Jargons

UNIT-V: MOTIVATION-The Power of Intrapersonal Communication (An Essay)

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.

Speaking: Formal oral presentations on topics from academic contexts

Reading: Reading comprehension.

Writing: Writing structure dessayson specific topics.

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

Vocabulary: Technical Jargons

COURSE OUTCOMES:

On successful completion of the course the student will enable to		**PO**
CO1	Understand the context, topic, and pieces of specific information from social or transactional dialogues.	PO1
CO2	Apply grammatical structures to formulate sentences and correct word forms.	PO5
CO3	Analyzed is course markers to speak clearly on a specific topic in informal discussions	PO2
CO4	Evaluate reading/listening texts and To write summaries based On global comprehension of these texts.	PO6
CO5	Create a coherent paragraph,essay, and resume.	PO4

TEXT BOOKS:

1. Pathfinder:CommunicativeEnglishforUndergraduateStudents,1st Edition, Orient BlackSwan, 2023
2. Empowering with Language byCengagePublications,2023

REFERENCE BOOKS:

1. Dubey,ShamJi&Co. EnglishforEngineers, VikasPublishers,2020
2. Bailey,Stephen.Academicwriting:AHandbookforInternationalStudents.Routledge,2014
3. Murphy,Raymond.EnglishGrammarinUse,FourthEdition,CambridgeUniversityPress,2019.
4. Lewis,Norman.WordPowerMadeEasy-TheCompleteHandbookforBuildingaSuperiorVocabulary.Anchor,2014.

REFERENCE WEBSITES:

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

CO-PO MAPPING

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	3	-	-	-	-	-	-	-
CO3	-	3	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	3	-	-	-	-	-	-
CO5	-	-	-	3	-	-	-	-	-	-	-	-
CO	3	3	-	3	3	3	-	-	-	-	-	-

23ESC112	BASIC ELECTRICAL & ELECTRONICS ENGINEERING (Common to All branches of Engineering)	L	T	P	C
		2	1	0	3

PART A: BASIC ELECTRICAL ENGINEERING

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. Apply fundamental circuit theories to both DC and AC circuits, and analyze the complex circuit configurations.
2. Gain proficiency in understanding, operating, and analyzing electrical machines and their applications in various industries and understanding the concept of measuring instruments
3. Gain knowledge about various energy resources and understand the concept of electrical energy consumption, billing mechanism, and safety measures.

UNIT-1: 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 and 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-2: 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 (v) Alternator, Applications of electrical machines.
Measuring Instruments: Construction and working principle of Moving Coil and Moving Iron Instruments, Dynamometer Wattmeter, Energy meter and Wheat Stone bridge.

UNIT-3: Energy Resources, Electricity Bill & Safety Measures:

Energy Resources: Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Thermal, 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:

On successful completion of the course the student could be		PO
CO1	Demonstrate the ability to analyze and solve complex DC and AC circuits, and analyze the complex circuit configurations.	PO1, PO2, PO3,
CO2	Comprehend the construction, principles, and operation of DC and AC machines, and analyze the working principles of various measuring instruments	PO1, PO2, PO3,
CO3	Evaluate different energy resources and Calculate electricity bills and understand the importance of safety measures.	PO1, PO2, PO3,

TEXTBOOKS:

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

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

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

REFERENCE BOOKS:

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Mc Graw Hill, 2019, Fourth Edition 2. V.K. Mehtha, S.Chand Technical Publishers, "Principles of Power Systems", 2020

3.M.S.Naidu,S.kamakshiah"Basic Electrical Engineering", Mc Graw Hill, 2019, Fourth Edition

4.T.K.Nagsarkar,M.S.Sukilja "Basic Electrical Engineering", Oxford Higher education,

Web Resources: https://nptel.ac.in/courses/108105053

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

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	2
CO2	3	2	2	-	-	-	-	-	-	-	-	2
CO3	3	2	2	-	-	-	-	-	-	-	-	2
CO*	**3**	**2**	**2**									**2**

PART B: BASIC ELECTRONICS ENGINEERING

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. Gain the knowledge on basic semiconductor devices
2. Acquire the knowledge on electronic circuits and instrumentation.
3. Understand the principles of digital electronics, combinational circuits and sequential circuits

UNIT-1: SEMICONDUCTOR DEVICES

Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier.

UNIT-2: BASIC ELECTRONIC CIRCUITS AND INSTRUMENTTAION

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

UNIT-3: DIGITAL ELECTRONICS

Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, gray code, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple combinational circuits–Half and Full Adder, Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only)

Course Outcomes:

On successful completion of the course the student could be		POs
CO1	Understand the concept and working of diodes, transistors, and their applications.	PO1, PO2, PO3, PO12
CO2	Analyze the electronic circuits and instrumentation	PO1, PO2, PO3, PO12
CO3	Familiarize with the number systems, codes, Boolean algebra and logic gates and understand the working of different combinational & sequential circuits.	PO1, PO2, PO3, PO12

TEXTBOOKS:

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. 2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009

REFERENCE BOOKS:

1. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.

2. Santiram Kal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.

3. S. Salivahanan, N. Suresh Kumar, Electronic Devices & Circuits, third edition.

Web Resources:

https://archive.nptel.ac.in/courses/108/101/108101091/

https://archive.nptel.ac.in/courses/117/103/117103063/

https://archive.nptel.ac.in/courses/117/107/117107095/

https://archive.nptel.ac.in/courses/122/106/122106025/

https://archive.nptel.ac.in/courses/122/106/122106026/

CO-PO MAPPING:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	2
CO2	3	2	2	-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	2
CO3	3	2	2	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	2
CO*	**3**	**2**	**2**									**2**

SREENIVASAINSTITUTEOFTECHNOLOGYANDMANAGEMENTSTUDIES
(Autonomous)

I B.Tech. – I / II Semester

23ESC113	**ENGINEERING GRAPHICS**	**L T P C**
	(Common to All Branches)	**1 - 4 3**

PRE-REQUISITES: Nil.

COURSE EDUCATIONAL OBJECTIVES:

1. To expose them to national standards related to technical drawings and develop knowledge of basic engineering curves.
2. To develop drawing skills for communication of concepts, ideas and design of projections of points, lines and planes.
3. To develop geometrical shapes and multiple views of projections of solids.
4. To develop drawing skills for communication of concepts, ideas and design the development of surfaces of section of solids.
5. To develop geometrical shapes and multiple views of orthographic projections of isometric views.

UNIT –1: ENGINEERING CURVES AND SCALES (9)

Introduction: Introduction about lines, lettering and dimensioning – Geometrical constructions and constructing regular polygons by general methods. **Engineering Curves:** Construction of ellipse, parabola and hyperbola by general method – Construction of cycloids – Construction involutes – Drawing of tangents and normal to the above curves. **Scales:** Plain scales, and diagonal.

UNIT –2: PROJECTION OF POINTS, LINES AND PLANE SURFACES (12)

Projection of Points: Principles of orthographic projection – Reference lines and Plane – Projections of points. **Projection of Lines:** Projections of 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 – Determination of true lengths, true inclinations by rotating line and trapezoidal method. **Projection of 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 –3: PROJECTION OF SOLIDS (12)

Projection of Solids: Types of solids – Projection of simple solids (prisms, pyramids, cylinder and cone) – 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 –4: SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES (12)

Section of Solids: Sectioning of right regular solids like prisms, pyramids, cylinder and cone – Solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other plane – Obtaining true shape of section. **Development of Surfaces:** Development of Surfaces: Development of lateral surfaces of simple and sectioned solids like prisms, pyramids, cylinder and cone.

UNIT –5: ISOMETRIC PROJECTIONS AND ORTHOGRAPHIC PROJECTIONS (9)

Isometric Projection: Principles of isometric projection – Isometric scale – Isometric views of simple solids and truncated solids like prisms, pyramids, cylinder, sphere, and cone. **Orthographic Projections:** Visualization principles – Plane of projections – Representation of three-dimensional objects – Sketching of multiple views from pictorial views – Conversion of isometric views to orthographic views – Conversion of orthographic views to isometric views.

COMPUTER GRAPHICS (Not for Examination) (3)

Practicing of simple 2D and 3D drawings of objects using Auto CAD

Total Hours: 60

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**Pos**
CO1	Construct the Engineering curves and generate tangent and normal for those curves.	**PO1, PO2, P03, P10, PO12**
CO2	Draw the projection of points, lines and plane surfaces.	**PO1, PO2, P03, P10, PO12**
CO3	Draw the projection of solids, like prisms, pyramids, cylinder, and cone.	**PO1, PO2, P03, P10, PO12**
CO4	Draw the section of solids and development of surfaces.	**PO1, PO2, P03, P10, PO12**
CO5	Draw the isometric projections and orthographic views.	**PO1, PO2, P03, P10, PO12**

TEXT BOOKS:

1. N.D. Bhatt and V. M. Panchal, "Engineering Drawing", Charotar Publishing House, 50th edition, 2010.
2. M.B.Shah and B.C.Rana , "Engineering Drawing", Pearson Education, 2/e, 2009.

REFERENCE BOOKS:

3. K.L.Narayana and P.Kannaiah, "Engineering Drawing", 2/e, 2012, Scitech Publishers.
4. Luzzader, Warren.J and Duff,John M, "Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production", Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
5. K.Venugopal and V.Prabhu Raja ,"Engineering Graphics", New Age International (P) Limited, 2008.
6. Basant Agarwal and C.M.Agarwal ,"Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, , 2008,
7. K.V.Natrajan , "A Text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai. 2009.
8. Creating 2D&3D drawings of objects including PCB and Transformations using Auto CAD

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/112/102/112102304/
2. https://nptel.ac.in/courses/112/105/112105294/
3. https://nptel.ac.in/courses/112/103/112103019/
4. https://nptel.ac.in/courses/112/104/112104172/

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	2	3	-	-	-	-	-	-	1	-	1
CO.2	3	2	3	-	-	-	-	-	-	1	-	1
CO.3	3	2	3	-	-	-	-	-	-	1	-	1
CO.4	3	2	3	-	-	-	-	-	-	1	-	1
CO.5	3	2	3	-	-	-	-	-	-	1	-	1
CO*	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**1**

I B.Tech. – II Semester

DATA STRUCTURES	**L**	**T**	**P**	**C**
(Common to CSE, CSE (AI&ML), CSE (AI) and CSE (DS))	**2**	**1**	**0**	**3**

PRE-REQUISITES: Computer Programming

COURSE OBJECTIVES:

1. To provide the knowledge of basic data structures and their implementations.
2. To understand importance of data structures in context of linked list concept.
3. To develop skills to apply appropriate data structures in problem solving using stacks.
4. To understand and implement the data structures using queue concept.
5. To provide knowledge about trees and hashing concepts.

UNIT-1 **(9)**

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

UNIT- 2 **(9)**

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

UNIT- 3 **(9)**

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

UNIT- 4 **(9)**

Queues: Introduction to queues: properties and operations, implementing queues using arrays and linked lists, Applications of queues in breadth-first search, scheduling, etc.
Deques: Introduction to deques (double-ended queues), Operations on deques and their applications.

UNIT-5 **(9)**

Trees: Introduction to Trees, Binary Search Tree – Insertion, Deletion & Traversal
Hashing: Brief introduction to hashing and hash functions, Collision resolution techniques: chaining and open addressing, Hash tables: basic implementation and operations, Applicationsof hashing in unique identifier generation, caching, etc.

Total Hours: 45

Course Outcomes

	On the successful completion of this course, the student should be able to,	**POs related to COs**
CO1	Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.	**PO1, PO2**
CO2	Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.	**PO1,PO2**
CO3	Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems	**PO1,PO2,PO3,**

CO4	Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between deques and priority queues, and apply them appropriately to solve data management challenges.	**PO1, PO3,PO4**
CO5	Devise novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees.	**PO1,PO3,PO4,PO5**

Text books:

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

Reference Books:

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

Reference Websites

1. https://nptel.ac.in/courses/106/102/106102064/
2. https://nptel.ac.in/courses/106/106/106106127/

CO-PO Mapping

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-		-	-	-	-	-	-	-
CO4	3	-	3	3	-	-	-	-	-	-	-	-
CO5	3	-	2	2	2	-	-	-	-	-	-	-
CO*	**3**	**3**	**3**	**2**	**2**	-						

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
(AUTONOMOUS)
DEPARTMENT OF SCIENCE & HUMANITIES

I B.Tech I/II sem

		L	T	P	C
23HSM112	**COMMUNICATIVE ENGLISH LAB**				
	(Common to all Branches of Engineering)	**-**	**-**	**2**	**1**

COURSE EDUCATIONAL 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 students will get trained in the basic communication skills and make them ready to face job interviews.

LIST OF TOPICS:

1. Vowels & Consonants
2. Neutralization/Accent Rules
3. Communication Skills & JAM
4. Role Play, Conversational Practice and TED talks
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 SOFTWARES:

1. Walden Info tech
2. Young India Films

REEFERENCE BOOKS:

1. MeenakshiRaman,Sangeeta-Sharma.TechnicalCommunication.OxfordPress.2018.
2. GrantTaylor:EnglishConversationPractice,TataMcGraw-HillEducationIndia,2016
3. Hewing's,Martin.CambridgeAcademicEnglish(B2).CUP,2012.
4. T.BalasubramanyamATextbookofEnglishPhoneticsforIndianStudents,(3 rdEd)TrinityPress.

WEB RESOURCES:

1. www.esl-lab.com
2. www.englishmedialab.com
3. www.englishinteractive.net
4. https://www.britishcouncil.in/english/online
5. http://www.letstalkpodcast.com/
6. https://www.youtube.com/c/mmmEnglish_Emma/featured
7. https://www.youtube.com/c/ArnelsEverydayEnglish/featured
8. https://www.youtube.com/c/engvidAdam/featured
9. https://www.youtube.com/c/EnglishClass101/featured
10. https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists
11. https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw

COURSE OUTCOMES:

On successful completion of the course the student will be enable to		PO
CO1	UnderstandthedifferentaspectsoftheEnglishlanguageproficiency withemphasisonLSRWskills.	PO1
CO2	Apply communication skills through various language learning activities.	PO5
CO3	Analyze the English speech sounds, stress, rhythm, into nation and syllable division for better listening and speaking comprehension.	PO6
CO4	Evaluate and exhibit professionalism in participating in debates and group discussions.	PO2
CO5	Create effective resonate and prepare themselves to face interviews in future.	PO10

CO-PO Mapping

CO/ PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO	**3**	**3**	**-**	**-**	**3**	**3**	**-**	**-**	**-**	**3**	**-**	**-**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

23ESC116 ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP **L T P C**
(Common to All branches of Engineering) **0 0 3 1.5**

COURSE EDUCATIONAL OBJECTIVES:

1. Gain the knowledge on basic laws
2. Acquire the knowledge on theorems and Characteristics.
3. Analyze the Power and Power factor measurement
4. Analyze various characteristics of electrical circuits, electrical machines and measuring instruments
5. Measurement of various electrical parameters; Household and commercial wiring

Activities:

1. Familiarization of commonly used Electrical & Electronic Workshop Tools: Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.

• Provide some exercises so that hardware tools and instruments are learned to be used by the students.

2. Familiarization of Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.

• Provide some exercises so that measuring instruments are learned to be used by the students.

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

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

PART A: ELECTRICAL ENGINEERING LAB

List of experiments:

1. Verification of Ohms law, 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

Course Outcomes:

On successful completion of the course the student could be		POs
CO1	Understand the Electrical circuit design concept; measurement of resistance, power, power factor; concept of wiring and operation of Electrical Machines and Transformer.	PO1, PO2, PO3
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.	PO1, PO2, PO3
CO3	Apply the theoretical concepts to obtain calculations for the measurement of resistance, power and power factor.	PO1, PO2, PO3
CO4	Analyze various characteristics of electrical circuits, electrical machines and measuring instruments.	PO1, PO2, PO3, PO12
CO5	Design suitable circuits and methodologies for the measurement of various electrical parameters; Household and commercial wiring.	PO1, PO2, PO3, PO12

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

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	2
CO2	3	3	2	-	-	-	-	-	-	-	-	2
CO3	3	2	2	-	-	-	-	-	-	-	-	2
CO4	3	3	2	-	-	-	-	-	-	-	-	2
CO5	3	3	2	-	-	-	-	-	-	-	-	2
CO*	**3**	**2.6**	**2**									**2**

PART B: ELECTRONICS ENGINEERING LAB

COURSE EDUCATIONAL OBJECTIVES:

1 Identify & testing of various electronic components.

2 Understand the usage of electronic measuring instruments.

3 Evaluate the performance of rectifiers

4 Study the characteristics of various electron devices

5 Obtain the operation of a digital circuit.

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

List of Experiments:

1. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
2. Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
3. Implementation of half wave and full wave rectifiers
4. Plot Input & Output characteristics of BJT in CE and CB configurations
5. Frequency response of CE amplifier.
6. Simulation of RC coupled amplifier with the design supplied
7. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs.
8. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs.

Tools / Equipment Required: DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices.

COURSE OUTCOMES:

On successful completion of the course the student could be		POs
CO1	Identify & testing of various electronic components.	PO1, PO2, PO3,
CO2	Understand the usage of electronic measuring instruments.	PO1, PO2, PO3,
CO3	Evaluate the performance of rectifiers	PO1, PO2, PO3,
CO4	Plot and discuss the characteristics of various electron devices	PO1, PO2, PO3, PO12
CO5	Obtain the operation of a digital circuit.	PO1, PO2, PO3, PO12

REFERENCES:

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.

2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009 3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009.

CO-PO MAPPING:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	2
CO2	3	2	2	-	-	-	-	-	-	-	-	2
CO3	3	2	2	-	-	-	-	-	-	-	-	2
CO4	3	2	2	-	-	-	-	-	-	-	-	2
CO5	3	2	2	-	-	-	-	-	-	-	-	2
CO*	**3**	**2**	**2**	-	-	-	-	-	-	-	-	**2**

I B.Tech. – I /II Semester

23ESC118 IT WORKSHOP LAB **(Common to all branches of Engineering)**	**L**	**T**	**P**	**C**
	0	**0**	**2**	**1**

PRE-REQUISITES: Nil

COURSE OBJECTIVES:

1. To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables.
2. To demonstrate configuring the system as Dual boot both Windows and other Operating Systems Viz. Linux, BOSS
3. To teach basic command line interface commands on Linux.
4. To teach the usage of Internet for productivity and self-paced life-long learning
5. To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spread sheets and Presentation tools.

List of Experiments:

PC Hardware & Software Installation

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

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

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

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

5. Every student should install BOSS on the computer. The system should be configuredas dual boot (VMWare) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva

Internet & World Wide Web

6. 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.

7. 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.

8. Search Engines & Netiquette: Students should know what search engines are and howto 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.

9. 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 customizetheir browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

LaTeX and WORD

10. 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, Usinghelp and resources, rulers, format painter in word.

11. 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 TeXand Word.

12. 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.

13. 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 helpand resources.
14.Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

15. 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

16. Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

POWER POINT

17. 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.

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

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

AI TOOLS – ChatGPT

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

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

21. 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 funway 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."

22. 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 tosee how accurate and fluent the translations are.

- Ex:Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

Total Hours: 45

Course Outcomes:

On the successful completion of this course, the student should be able to,		POs related to COs
CO1	Acquire knowledge on computer system such as system unit, input devices, and output devices connected to the computer.	**PO1**
CO2	Demonstrate the booting process that includes switching on the system, execution of POST routine, then bootstrap loader, and loading of the operating system, and getting it ready for use.	**PO2**
CO3	Demonstrate the working of the internet that include the use of protocols, domains, IP addresses, URLs, web browsers, web servers, mail-servers, etc.	**PO3**
CO4	Familiarize with parts of MS Office, To create and save a document, To set page settings, create headers and footers, To use various formatting features such as bold face, italicize, underline, subscript, superscript, line spacing, etc.	**PO4**
CO5	Prompt the diferent types of questions using CHATBOT	**PO5**
CO6	Follow the ethical principles in implementing the programs	**PO8**
CO7	Do experiments effectively as an individual and as a team member in a group.	**PO9**
CO8	Communicate verbally and in written form, the understanding about the experiments	**PO10**
CO9	Continue updating their skill related to MS Office, Internet and Computer in future.	**PO12**

Text Books:

1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003
2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech,2013, 3rd edition

Reference Books:

1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2012, 2nd edition
2. PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft)
3. LaTeX Companion, Leslie Lamport, PHI/Pearson.
4. IT Essentials PC Hardware and Software Companion Guide, David Anfins on and Ken Quamme. – CISCO Press, Pearson Education, 3rd edition
5. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCOPress, Pearson Education, 3rd edition

CO-PO Mapping

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-
CO7	-	-	-	-	-	-	-	-	3	-	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	-
CO9	-	-	-	-	-	-	-	-	-		-	3
CO*	**3**	**3**	**3**	**3**	**3**	-	**-**	**3**	**3**	**3**	-	**3**

I B.Tech. – II Semester

23CSE121 DATA STRUCTURES LAB	**L**	**T**	**P**	**C**
(Common to CSE, CSE (AI&ML), CSE (AI) and CSE (DS))	**0**	**0**	**3**	**1.5**

PRE-REQUISITES: Computer Programming

COURSE OBJECTIVES:

1. To strengthen the ability of the students to identify the problem.
2. To apply the suitable datastructure for the given real-world problem.
3. To understand the knowledge about linear data structure.
4. To understand and analyze the data structure concepts using non-linear data structures.
5. To gain knowledge in practical applications of data structures.

List of Experiments:

1: Array Manipulation

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

2: Linked List Implementation

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

3: Linked List Applications

i) Create a program to detect and remove duplicates from a linked list.
ii) Implement a linked list to represent polynomials and perform addition.
iii) Implement a double-ended queue (deque) with essential operations.

4: Double Linked List Implementation

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

5: Stack Operations

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

6: Queue Operations

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

7: Stack and Queue Applications

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

8: Binary Search Tree

i) Implementing a BST using Linked List.

ii) Traversing of BST.

9: Hashing

i) Implement a hash table with collision resolution techniques.

ii) Write a program to implement a simple cache using hashing.

Total Hours: 45

COURSE OUTCOMES

On the successful completion of this course, the student should be able to,		POs related to COs
CO1	Explain the role of linear data structures in organizing and accessing data efficiently in algorithms	**PO1**
CO2	Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.	**PO2**
CO3	Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems	**PO3**
CO4	Apply queue-based algorithms for efficient task scheduling and breadth-first traversal ingraphs and distinguish between deques and priority queues and apply them appropriately to solve data management challenges.	**PO4**
CO5	Recognize scenarios where hashing is advantageous, and design hash-based solutions forspecific problems.	**PO5**
CO6	Follow the ethical principles in implementing the programs	**PO8**
CO7	Do experiments effectively as an individual and as a team member in a group.	**PO9**
CO8	Communicate verbally and in written form, the understandingabout the experiments.	**PO10**
CO9	Continue updating their skill related to loops, pointers and files, implementing programs in future.	**PO12**

Textbooks:

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

Reference Books:

1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft
3. Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein

Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching,and Graph Algorithms by Robert Sedgewick.

Reference Websites:

1. https://nptel.ac.in/courses/106/102/106102064/
2. https://nptel.ac.in/courses/106/106/106106127/

CO-PO MAPPING

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-
CO7	-	-	-	-	-	-	-	-	3	-	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**	**3**	**-**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES (AUTONOMOUS)

DEPARTMENT OF SCIENCE & HUMANITIES

I B.Tech I/II sem

23HSM114	**NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE**	**L**	**T**	**P**	**C**
	(Common to All branches of Engineering)	**0**	**0**	**1**	**0.5**

COURSE EDUCATIONAL OBJECTIVES:

1. To impart discipline, character, and fraternity amongst young citizens
2. To train them to work in teams/groups to enhance their team spirit.
3. To enable the students to acquire leadership qualities.
4. To induce social consciousness among students through various activities.
5. To instill self-confidence and the ideals of selfless service
6. To engage students in responsible and challenging actions for the common good.

COURSE OUTCOMES:

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

1. Understand the importance of discipline, character and service motto.
2. Outline the needs and problems of the community
3. Solve some societal issues by applying acquired knowledge, facts, and techniques
4. Explore human relationships by analyzing social problems
5. Determine to extend their help for the fellow beings and downtrodden people
6. Develop leadership skills and civic responsibilities

UNIT-I: ORIENTATION

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

Activities:

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

UNIT-II: NATURE & CARE

Activities:

1. Best out of waste competition.
2. Poster and signs making competition to spread environmental awareness.
3. Recycling and environmental pollution article writing competition.
4. Organising Zero-waste day.
5. Digital Environmental awareness activity via various social media platforms.
6. Virtual demonstration of different eco-friendly approaches for sustainable living.
7. Write a summary on any book related to environmental issues.

UNIT-III:COMMUNITY SERVICE

Activities:

1. Conducting One Day Special Camp in a village contacting village-area leaders-Survey in the village, identification of problems- helping them to solve via media-authorities-experts-etc.
2. Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,
3. Conducting consumer Awareness. Explaining various legal provisions etc.
4. Women Empowerment Programmes - Sexual Abuse, Adolescent Health and Population Education.
5. Any other programmes in collaboration with local charities, NGOs etc.

REFERENCE BOOKS:

1. Nirmalya Kumar Sinha & Surajit Majumder, A Text Book of National Service Scheme Vol;.I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6)
2. Red Book - National Cadet Corps – Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defence, New Delhi
3. Davis M. L. and Cornwell D. A., "Introduction to Environmental Engineering", McGraw Hill, New York 4/e 2008
4. Masters G. M., Joseph K. and Nagendran R. "Introduction to Environmental Engineering and Science", Pearson Education, New Delhi. 2/e 2007
5. Ram Ahuja. Social Problems in India, Rawat Publications, New Delhi.

GENERAL GUIDELINES:

1. Institutes must assign slots in the Timetable for the activities.
2. Institutes are required to provide instructor to mentor the students

EVALUATION GUIDELINES:

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.

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES - Chittoor
AUTONOMOUS
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
(Data Science)

II B. Tech III Semester

23BSC232	**DISCRETE MATHEMATICS & GRAPH THEORY**	**L**	**T**	**P**	**C**
	(Common to All Engineering Branches)	**3**	**0**	**0**	**3**

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES

1. To gain the knowledge on connectives and relate the laws of logic to find the disjunctive normal form and conjunctive normal form of compound proposition.
2. To learn the various concepts related to predicate logic.
3. To understand the concept of groups, Abelian groups and group homomorphism and isomorphism.
4. To study the fundamentals of graphs, sub graphs, planar graphs, Hamiltonian graphs, Euler graphs, Spanning trees and graph traversals

UNIT-I: MATHEMATICAL LOGIC (9)

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

UNIT-II: SET THEORY (9)

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

UNIT-III: ELEMENTARY COMBINATORICS (9)

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

UNIT-IV: RECURRENCE RELATIONS (9)

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

UNIT-V: GRAPHS (9)

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

COURSE OUTCOMES

on successful completion of the course, students able to		Pos
CO1	Apply mathematical logic to solve problems.	**PO1,PO2,PO3**
CO2	Understand the concepts and perform the operations related to sets, relations andfunctions. Gain the conceptual background needed and identify structures of algebraic nature.	**PO1,PO2,PO3**
CO3	Apply basic counting techniques to solve combinatorial problems.	**PO1,PO2,PO3, PO4**
CO4	Formulate problems and solve recurrence relations.	**PO1,PO2,PO3**
CO5	Apply Graph Theory in solving computer science problems	**PO1,PO2,PO3**

TEXT BOOKS:

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

REFERENCE BOOKS:

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

REFERENCE WEBSITE:

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

CO-PO MAPPING

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	--	-	-	-	-	-	-	-	-
CO2	3	3		--	-	-	-	-	-	-	-	-
CO3	3	3	3	2	-	-	-	-	-	-	-	-
CO4	3	3	3	--	-	-	-	-	-	-	-	-
CO5	3	3	3		-	-	-	-	-	-	-	-
CO*	3	3	3	2	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

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(Data Science)
II B.Tech III Semester

		L	T	P	C
23HSM231	**UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT**				
	(Common to All Engineering Branches)	**2**	**1**	**0**	**3**

COURSE EDUCATIONAL OBJECTIVES:

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

COURSE TOPICS

The course has 28 lectures and 14 tutorials in 5 modules. The lectures and tutorials are of 1- hour duration. Tutorial sessions are to be used to explore and practice what has been proposed during the lecture sessions.
The Teacher's Manual provides the outline for lectures as well as practice sessions. The teacher is expected to present the issues to be discussed as propositions and encourage the students to have a dialogue.

UNIT I Introduction to Value Education (6 lectures and 3 tutorials for practice session)
Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)
Lecture 2: Understanding Value Education
Tutorial 1: Practice Session PS1 Sharing about Oneself
Lecture 3: self-exploration as the Process for Value Education
Lecture4: Continuous Happiness and Prosperity – the Basic HumanAspirations
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 thebody.
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 practicesession)
Lecture 13: Harmony in the Family – the Basic Unit of Human InteractionLecture 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 practicesession)
Lecture 19: Understanding Harmony in the Nature
Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment amongthe 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 (6lectures 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 ValuEducation
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

MODE OF CONDUCT

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.
Tutorial hours are to be used for practice sessions.
While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.
In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self- exploration.
Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.
It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses. This course is to be taught by faculty from every teaching department, not exclusively by any one department.
Teacher preparation with a minimum exposure to at least one 8-day Faculty Development Program on Universal Human Values is deemed essential.

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COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Define the terms like Natural Acceptance, Happiness and Prosperity	**PO1, PO2, PO3 PO4, PO5, PO6,PO7**
CO2	Identify one's self, and one's surroundings (family, society nature)	**PO1, PO2, PO3 PO4, PO5, PO6,PO7**
CO3	Apply what they have learnt to their own self in different day-to-daysettings in real life	**PO1, PO2, PO3 PO4, PO5, PO6,PO7**
CO4	Understand human values with human relationship and human society.	**PO1, PO2, PO3 PO4, PO5, PO6,PO7**
CO5	Justify the need for universal human values and harmonious existence	**PO1, PO2, PO3 PO4, PO5, PO6,PO7**

TEXT BOOKS:

The Textbook

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

The Teacher's Manual

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

REFERENCE BOOKS:

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

REFERENCE WEBSITE:

1. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf
2. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf
3. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf
4. https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-S2%20Respect%20July%2023.pdf
5. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf
6. https://fdp-si.aicte-india.org/download/FDPTeachingMaterial/3-days%20FDP-SI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-S2A%20Und%20Nature-Existence.pdf
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
   https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	2	1	2	2	2	3	-	-	-	-	-
CO.2	3	2	1	2	2	2	3	-	-	-	-	-
CO.3	3	2	1	2	2	2	3	-	-	-	-	-
CO.4	3	2	1	2	2	2	3	-	-	-	-	-
CO.5	3	2	1	2	2	2	3	-	-	-	-	-
CO*	**3**	2	1	2	2	2	**3**	**-**	**-**	**-**	**-**	**-**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES - Chittoor
AUTONOMOUS
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
(Data Science)

II B. Tech III Semester

23CSD231	**INTRODUCTION TO DATA SCIENCE**	**L**	**T**	**P**	**C**
	CSE(DS)	**3**	**0**	**0**	**3**

PRE-REQUISITES: A course on Python Programming

COURSE EDUCATIONAL OBJECTIVES:

1. Knowledge and expertise to become a data scientist.
2. Essential concepts of statistics and machine learning that are vital for data science;
3. Significance of exploratory data analysis (EDA) in data science.
4. Critically evaluate data visualizations presented on the dashboards
5. Suitability and limitations of tools and techniques related to data science process

UNIT-I: INTRODUCTION TO DATA SCIENCE (9)

Introduction to Data science, benefits and uses, facets of data, data science process in brief, big data ecosystem and data science

Data Science process: Overview, defining goals and creating project charter, retrieving data, cleansing, integrating and transforming data, exploratory analysis, model building, presenting findings and building applications on top of them.

UNIT-II: APPLICATIONS OF MACHINE LEARNING IN DATA SCIENCE (9)

Applications of machine learning in Data science, role of ML in DS, Python tools like sklearn, modelling process for feature engineering, model selection, validation and prediction, types of ML, semi-supervised learning

Handling large data: problems and general techniques for handling large data, programming tips for dealing large data, case studies on DS projects for predicting malicious URLs, for building recommender systems

UNIT-III: NOSQL MOVEMENT FOR HANDLING BIGDATA (9)

NoSQL movement for handling Bigdata: Distributing data storage and processing with Hadoop framework, case study on risk assessment for loan sanctioning, ACID principle of relational databases, CAP theorem, base principle of NoSQL databases, types of NoSQL databases, case study on disease diagnosis and profiling

UNIT-IV: TOOLS AND APPLICATIONS OF DATA SCIENCE (9)

Tools and Applications of Data Science**:** Introducing **Neo4j**for dealing with graph databases, graph query language **Cypher**, Applications graph databases, Python libraries like nltk and SQLite for handling Text mining and analytics, case study on classifying Reddit posts

UNIT-V: (9)

Data Visualization and Prototype Application Development**:** Data Visualization options, Crossfilter, the JavaScript MapReduce library, Creating an interactive dashboard with dc.js, Dashboard development tools. Applying the Data Science process for real world problem solving scenarios as a detailed case study.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Understand significance of Data Science.	PO1,PO2,PO3
CO2	Analyze large data	PO1,PO2, PO3,PO4,PO5
CO3	Apply machine learning in Data Science	PO1,PO2,PO3
CO4	Perform Data reduction and apply visualization techniques.	PO1,PO2,PO3, PO4,PO5
CO5	Perform and Apply real world problems	PO1,PO2,PO3, PO4

TEXT BOOKS:

1. Davy Cielen, Arno D.B.Meysman, and Mohamed Ali, "Introducing to Data Science using Python tools", Manning Publications Co, Dreamtech press, 2016
2. Prateek Gupta, "Data Science with Jupyter" BPB publishers, 2019 for basics

REFERENCE BOOKS:

1. Joel Grus, "Data Science From Scratch", OReilly, 2019
2. Doing Data Science: Straight Talk From The Frontline, 1 st Edition, Cathy O'Neil and Rachel Schutt, O'Reilly, 2013

REFERENCE WEBSITE:

1. https://towardsdatascience.com
2. https://www.datacamp.com
3. https://www.coursera.org
4. https://www.datasciencecentral.com
5. https://www.analyticsvidhya.com
6. **https://www.kdnuggets.com**

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	3	3	-	-	-	-	-	-	-	-	-
CO.2	3	3	3	3	2	-	-	-	-	-	-	-
CO.3	3	3	3	-	-	-	-	-	-	-	-	-
CO.4	3	3	3	-	-	-	-	-	-	-	-	-
CO.5	3	3	3	3	2	-	-	-	-	-	-	-
CO*	3	3	3	3	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

II B.Tech - III Semester

		L	T	P	C
23CSE231	**ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS (Common to CSE, CSM, CAI, CSD)**	**3**	**0**	**0**	**3**

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. Provide knowledge on advance data structures frequently used in Computer Science domain
2. Develop skills in algorithm design techniques popularly used
3. Understand the use of various data structures in the algorithm design

UNIT 1: **(9)**

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 2: **(9)**

Heap Trees (Priority Queues) – Min and Max Heaps, Operations and Applications Graphs – Terminology, Representations, Basic Search and Traversals, Connected Components and Biconnected Components, applicationsDivide and Conquer: The General Method, Quick Sort, Merge Sort, Strassen's matrix multiplication, Convex Hull

UNIT 3: **(9)**

Greedy Method: General Method, Job Sequencing with deadlines, Knapsack Problem, Minimum cost spanning trees, Single Source Shortest PathsDynamic 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 4: **(9)**

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 5: **(9)**

NP Hard and NP Complete Problems: Basic Concepts, Cook's theoremNP Hard Graph Problems: Clique Decision Problem (CDP), Chromatic Number Decision Problem (CNDP), Traveling Salesperson Decision Problem (TSP)NP Hard Scheduling Problems: Scheduling Identical Processors, Job Shop Scheduling

.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course the student will be		POs related to COs
CO1	Illustrate the working of the advanced tree data structures and their applications (L2)	PO1, PO2, PO3
CO2	Understand the Graph data structure, traversals and apply them in various contexts. (L2)	PO1, PO2, PO3
CO3	Use various data structures in the design of algorithms (L3)	PO1, PO2, PO3,PO4
CO4	Recommend appropriate data structures based on the problem being solved (L5)	PO1,PO2
CO5	Analyze algorithms with respect to space and time complexities (L4)	PO1, PO2, PO3,PO4

TEXT BOOKS:

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

REFERENCES:

1. Data Structures and program design in C, Robert Kruse, Pearson Education Asia
2. An introduction to Data Structures with applications, Trembley& Sorenson, McGraw Hill
3. The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth, Addison-Wesley, 1997.
4. Data Structures using C & C++: Langsam, Augenstein&Tanenbaum, Pearson, 1995
5. Algorithms + Data Structures & Programs:, N.Wirth, PHI
6. Fundamentals of Data Structures in C++: Horowitz Sahni& Mehta, Galgottia Pub.
7. Data structures in Java:, Thomas Standish, Pearson Education Asia

REFERENCE WEBSITE:

1. https://www.tutorialspoint.com/advanced_data_structures/index.asp
2. http://peterindia.net/Algorithms.html
3. https://www.youtube.com/playlist?list=PLDN4rrl48XKpZkf03iYFl-O29szjTrs_O

CO-PO MAPPING:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	--	-	-	-	-	-	-	-	-
CO2	3	3	3	--	-	-	-	-	-	-	-	-
CO3	3	3	2	3	-	-	-	-	-	-	-	-
CO4	2	3	--	--	-	-	-	-	-	-	-	-
CO5	3	3	3	3	-	-	-	-	-	-	-	-
CO*	2.8	3	2.75	3	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

II B.TECH - III SEMESTER

23CSE232	**OBJECT ORIENTED PROGRAMMING THROUGH JAVA** **(Common to CSE, CSM, CAI, CSD)**	**L T P C** **3 0 0 3**

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

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

UNIT 1: (9)

Object Oriented Programming: Basic concepts, Principles,

Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.

Data Types, Variables, and Operators :Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final,

Introduction to Operators, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.

Control Statements:Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

UNIT 2: (9)

Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this.

Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

UNIT 3: (9)

Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.

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

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

UNIT 4: **(9)**

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

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

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

UNIT 5: **(9)**

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

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

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

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

Total Hours: 45

COURSE OUTCOMES:

		POs related to Cos
CO1	Analyse problems, design solutions using OOP principles, and implement them efficiently in Java. (L4)	PO1, PO2, PO5
CO2	Design and implement classes to model real-world entities, with a focus on attributes, behaviours, and relationships between objects (L4)	PO1, PO4,PO5
CO3	Demonstrate an understanding of inheritance hierarchies and polymorphic behaviour, including method overriding and dynamic method dispatch. (L3)	PO1,PO3,PO4, PO5

CO4	Apply Competence in handling exceptions and errors to write robust and fault-tolerant code. (L3)	PO1,PO4, PO5
CO5	Perform file input/output operations, including reading from and writing to files using Java I/O classes, graphical user interface (GUI) programming using JavaFX.(L3)	PO1, PO2, PO4, PO5

TEXT BOOKS:

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

REFERENCES:

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

REFERENCE WEBSITE:

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

CO-PO MAPPING:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	2	-	-	-	-	-	-	-
CO2	2	-	-	3	3	-	-	-	-	-	-	-
CO3	3	-	3	3	3	-	-	-	-	-	-	-
CO4	3	-	-	3	3	-	-	-	-	-	-	-
CO5	2	3	-	3	3	-	-	-	-	-	-	-
CO*	**2.6**	**3**	**3**	**3**	**2.8**	**-**	**-**	**-**	**-**	**-**	**-**	-

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II B.Tech III Semester

23CSD232	DATA SCIENCE LAB (CSE(DS))	L	T	P	C
		0	0	3	1.5

PRE-REQUISITES: A course on Python Programming

COURSE EDUCATIONAL OBJECTIVES:

1. The main objective of the course is to inculcate the basic understanding of Data Science and its practical implementation using Python.

LIST OF EXPERIMENTS

1. Creating a NumPy Array
   a. Basic ndarray
   b. Array of zeros
   c. Array of ones
   d. Random numbers in ndarray
   e. An array of your choice
   f. Imatrix in NumPy
   g. Evenly spaced ndarray
2. The Shape and Reshaping of NumPy Array
   a. Dimensions of NumPy array
   b. Shape of NumPy array
   c. Size of NumPy array
   d. Reshaping a NumPy array
   e. Flattening a NumPy array
   f. Transpose of a NumPy array
3. Expanding and Squeezing a NumPy Array
   a. Expanding a NumPy array
   b. Squeezing a NumPy array
   c. Sorting in NumPy Arrays
4. Indexing and Slicing of NumPy Array
   a. Slicing 1-D NumPy arrays
   b. Slicing 2-D NumPy arrays
   c. Slicing 3-D NumPy arrays
   d. Negative slicing of NumPy arrays
5. Stacking and Concatenating Numpy Arrays
   a. Stacking ndarrays
   b. Concatenating ndarrays
   c. Broadcasting in Numpy Arrays
6. Perform following operations using pandas
   a. Creating dataframe
   b. concat()
   c. Setting conditions
   d. Adding a new column
7. Perform following operations using pandas
   a. Filling NaN with string

   b. Sorting based on column values
   c. groupby()
8. Read the following file formats using pandas
   a. Text files
   b. CSV files
   c. Excel files
   d. JSON files
9. Read the following file formats
   a. Pickle files
   b. Image files using PIL
   c. Multiple files using Glob
   d. Importing data from database
10. Demonstrate web scraping using python
11. Perform following preprocessing techniques on loan prediction dataset
   a. Feature Scaling
   b. Feature Standardization
   c. Label Encoding
   d. One Hot Encoding
12. Perform following visualizations using matplotlib
   a. Bar Graph
   b. Pie Chart
   c. Box Plot
   d. Histogram
   e. Line Chart and Subplots
   f. Scatter Plot
13. Getting started with NLTK, install NLTK using PIP
14. Python program to implement with Python Sci Kit-Learn & NLTK
15. Python program to implement with Python NLTK/Spicy/Py NLPI.

TEXT BOOKS:

1. Python for Data Science for Dummies, 2ed, Luca Massaron John Paul Mueller.

REFERENCE BOOKS:

1. Python for Data Analysis Data Wrangling with Pandas, NumPy, and IPython, WesMcKinney
2. Introduction to Parallel Computing, Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar, Pearson; 2 edition (January 26, 2003), ISBN 978-0201648652 3. Big Data: Principles and best practices of scalable real-time data systems, 1st Edition, Nathan Marz, James Warren, ISBN 978-1617290343

REFERENCE WEBSITE:

1. https://realpython.com
2. https://www.datacamp.com
3. https://towardsdatascience.com
4. https://www.kaggle.com
5. https://www.analyticsvidhya.com
6. https://www.coursera.org
7. https://www.edx.org

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Understanding and Applying NumPy Basics	**PO1**
CO2	Implement Advanced Array Manipulations with NumPy	**PO3**
CO3	Understand and implement stacking and concatenating arrays.	**PO5**
CO4	Implement Data Manipulation and Analysis with Pandas	**PO6**
CO5	Implement Read and manipulate various file formats including text files, CSV files, Excel files, and JSON files.	**PO2**
CO6	Follow the ethical principles in implementing the programs	**PO8**
CO7	Do experiments effectively as an individual and as a team member in a group.	**PO9**
CO8	Communicate verbally and in written form, the understanding aboutthe experiments.	**PO10**
CO9	Continue updating their skill related to object oriented concepts and implementing programs in future.	**PO12**

CO-PO MAPPING:

CO/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	3	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	3	-	-	-	-	-	-	-
CO4	-	-	-	-	-	3	-		-	-	-	-
CO5	-	-	-	-	-	-	-	-		-	-	-
CO6	-	-	-	-	-	-	-	3	-		-	-
CO7	-	-	-	-	-	-	-	-	3	-	-	-
CO8	-	3	-	-	-	-	-	-	-	3	-	-
C09												3
CO	**3**	**3**	**-**	**3**	**3**	**3**	**-**	**3**	**3**	**3**	**-**	**3**

II B.TECH - III SEMESTER

23CSE234	**OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB (Common to CSE, CSM, CAI, CSD)**	**L**	**T**	**P**	**C**
		3	**1.5**		**00**

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. Practice object-orientedprogramming in the Java programming language
2. ImplementClasses, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
3. Illustrateinheritance, Exception handling mechanism,JDBC connectivity
4. Construct Threads, Event Handling, implement packages, Java FX GUI

EXPERIMENTS COVERING THE TOPICS:

- Object Oriented Programming fundamentals- data types, control structures
- Classes, methods, objects, Inheritance, polymorphism,
- Exception handling, Threads, Packages, Interfaces
- Files, I/O streams, JavaFX GUI

LIST OF EXPERIMENTS:

EXERCISE – 1:

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

b) Write a java program that display the roots of a quadratic equation $ax^2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.

EXERCISE - 2

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

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

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

EXERCISE - 3

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

b) Write a JAVA program implement method overloading.

c) Write a JAVA program to implement constructor.

d) Write a JAVA program to implement constructor overloading.

EXERCISE - 4

a) Write a JAVA program to implement Single Inheritance

b) Write a JAVA program to implement multi level Inheritance

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

EXERCISE - 5

a) Write a JAVA program give example for "super" keyword.

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

c) Write a JAVA program that implements Runtime polymorphism

EXERCISE - 6

a) Write a JAVA program that describes exception handling mechanism

b) Write a JAVA program Illustrating Multiple catch clauses

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

d) Write a JAVA program for creation of User Defined Exception

EXERCISE - 7

a) Write a JAVA program that creates threads by extending Thread class.First thread display "Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third

display "Welcome" every 3 seconds,(Repeat the same by implementing Runnable)
b) Write a program illustrating **is Alive** and **join ()**
c) Write a Program illustrating Daemon Threads.
d) Write a JAVA program Producer Consumer Problem

EXERCISE – 8

a) Write a JAVA program that import and use the user defined packages
b) Without writing any code, build a GUI that display text in label and image in an ImageView (use JavaFX)
c) Build a Tip Calculator app using several JavaFX components and learn how to respond to user interactions with the GUI

COURSE OUTCOMES:

On successful completion of the course the student will be		POs related to COs
CO1	Demonstrate a solid understanding of Java syntax, including data types, control structures, methods, classes, objects, inheritance, polymorphism, and exception handling. (L2)	PO1, PO2, PO3, PO5
CO2	Apply fundamental OOP principles such as encapsulation, inheritance, polymorphism, and abstraction to solve programming problems effectively. (L3)	PO1, PO2, PO3, PO5, PO11
CO3	Familiar with commonly used Java libraries and APIs, including the Collections Framework, Java I/O, JDBC, and other utility classes. (L2)	PO2, PO3, PO5
CO4	Develop problem-solving skills and algorithmic thinking, applying OOP concepts to design efficient solutions to various programming challenges. (L3)	PO2, PO4, PO5
CO5	Proficiently construct graphical user interface (GUI) applications using JavaFX (L4)	PO1, PO2, PO5

REFERENCE BOOKS:

1. P. J. Deitel, H. M. Deitel, "Java for Programmers", Pearson Education, PHI, 4th Edition, 2007.
2. P. Radha Krishna, "Object Oriented Programming through Java", Universities Press, 2nd Edition, 2007
3. Bruce Eckel, "Thinking in Java", Pearson Education, 4th Edition, 2006.
4. Sachin Malhotra, Saurabh Chaudhary, "Programming in Java", Oxford University Press, 5th Edition, 2010.

REFERENCE WEBSITE:

https://java-iitd.vlabs.ac.in/
http://peterindia.net/JavaFiles.html

CO-PO MAPPING:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-
CO7	-	-	-	-	-	-	-	-	3	-	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES - Chittoor
AUTONOMOUS
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
(Data Science)

II B.TECH - III SEMESTER

23CSE235	**PYTHON PROGRAMMING** **(SKILL ENHANCEMENT COURSE)** **(Common to CSE, CSM, CAI, CSD)**	**L T P C** **0 1 2 2**

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

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

UNTI-I:

History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupyter Notebook.
Parts of Python Programming Language: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the type () Function and Is Operator, Dynamic and Strongly Typed Language.
Control Flow Statements: if statement, if-else statement, if...elif…else, Nested if statement, while Loop, for Loop, continue and break Statements, Catching Exceptions Using try and except Statement.

SAMPLE EXPERIMENTS:

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

i) Arithmetic Operators ii) Relational Operators iii) Assignment Operatorsiv) Logical Operators v) Bit wise Operators vi) Ternary Operator vii) Membership Operatorsviii) 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. additionii. insertioniii. slicing
12. Write a program to perform any 5 built-in functions by taking any list.

UNIT-III:

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

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

Sample Experiments:

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

UNIT-IV:

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

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

SAMPLE EXPERIMENTS:

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

UNIT-V:

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

SAMPLE EXPERIMENTS:

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

COURSE OUTCOMES:

On successful completion of the course the student will be		POs related to COs
CO1	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)	PO1
CO2	Apply Python programming concepts to solve a variety of computational problems (L3)	PO2
CO3	Understand the principles of object-oriented programming (OOP) in Python, including classes, objects, inheritance, polymorphism, and encapsulation, and apply them to design and implement Python programs (L3)	PO3
CO4	Become proficient in using commonly used Python libraries and frameworks such as JSON, XML, NumPy, pandas (L2)	PO4
CO5	Exhibit competence in implementing and manipulating fundamental data structures such as lists, tuples, sets, dictionaries (L3)	PO5

REFERENCE BOOKS:

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

REFERENCE WEBSITE:

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

CO-PO MAPPING:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-
CO7	-	-	-	-	-	-	-	-	3	-	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

II B. Tech III Semester

23MAC231	**ENVIRONMENTAL SCIENCE**	**L**	**T**	**P**	**C**
	(Common to All Engineering Branches)	**2**	**0**	**0**	**0**

COURSE EDUCATIONAL OBJECTIVES:

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

UNIT-I:

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

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

UNIT- II:

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

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

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

UNIT-III:

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

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

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

UNIT IV

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

UNIT V

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

Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**POs mapped with COs**
CO1	Grasp multidisciplinary nature of environmental studies andvarious renewable and nonrenewable resources.	**PO1, PO2, PO3 PO4, PO5, PO6,PO7**
CO2	Understand flow and bio-geo- chemical cycles and ecologicalpyramids.	**PO1, PO2, PO3 PO4, PO5, PO6,PO7**
CO3	Understand various causes of pollution and solid waste management and related preventive measures.	**PO1, PO2, PO3 PO4, PO5, PO6,PO7**
CO4	Understand concept of rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation.	**PO1, PO2, PO3 PO4, PO5, PO6,PO7**
CO5	Causes of population explosion, value education and welfareprogrammes.	**PO1, PO2, PO3 PO4, PO5, PO6,PO7**

TEXTBOOKS:

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

REFERENCE BOOKS:

1. Deeksha Dave and E.Sai Baba Reddy, "Textbook of Environmental Science", Cengage Publications.
2. M.Anji Reddy, "Text book of Environmental Sciences and Technology", BS Publication.
3. J.P.Sharma, Comprehensive Environmental studies, Laxmi publications.
4. J. Glynn Henry and Gary W. Heinke, "Environmental Sciences and Engineering", Prenticehall 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.

REFERENCE WEBSITE:

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

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	2	1	2	2	2	3	-	-	-	-	-
CO.2	3	2	1	2	2	2	3	-	-	-	-	-
CO.3	3	2	1	2	2	2	3	-	-	-	-	-
CO.4	3	2	1	2	2	2	3	-	-	-	-	-
CO.5	3	2	1	2	2	2	3	-	-	-	-	-
CO*	**3**	2	1	2	2	2	**3**	**-**	**-**	**-**	**-**	**-**

II B. Tech IV Semester

23BSC241	**OPTIMIZATION TECHNIQUES**	**L**	**T**	**P**	**C**
	(Common to CSE, CSM, CAI, CSD)	**2**	**0**	**0**	**2**

COURSE EDUCATIONAL OBJECTIVES:

1. To provide the basic knowledge about Optimization, importance, application areas of in the industry, Linear Programming.
2. To impart different optimization models under typical situations in the business organization like transportation, assignment.
3. To understand the process of sequencing in a typical industry.
4. To describe different game strategies under cut-throat competitive business environment
5. To develop networks of activities of projects and to find out optimal modes of completing projects using network modelling evaluation techniques

UNIT - I

Introduction: Meaning, Nature, Scope & Significance of Optimization - Typical applications. The Linear Programming Problem – Introduction, Formulation of Linear Programming problem, Limitations of L.P.P, Graphical method, Simplex method: Maximization and Minimization model(exclude Duality problems), Big-M method and Two Phase method.

UNIT - II

Transportation Problem: Introduction, Transportation Model, Finding initial basic feasible solutions, Moving towards optimality, Unbalanced Transportation problems, Transportation problems with maximization, Degeneracy.
Assignment Problem – Introduction, Mathematical formulation of the problem, Solution of an Assignment problem, Hungarian Algorithm, Multiple Solution, Unbalanced Assignment problems, Maximization in Assignment Model.

UNIT - III

Sequencing – Job sequencing, Johnsons Algorithm for n Jobs and Two machines, n Jobs and Three Machines, n jobs through m machines, Two jobs and m Machines Problems.

UNIT - IV

Game Theory: Concepts, Definitions and Terminology, Two Person Zero Sum Games, Pure Strategy Games (with Saddle Point), Principal of Dominance, Mixed Strategy Games (Game without Saddle Point), Significance of Game Theory in Managerial Application.

UNIT - V

Project Management: Network Analysis – Definition –objectives -Rules for constructing network diagram- Determining Critical Path – Earliest & Latest Times – Floats - Application of CPM and PERT techniques in Project Planning and Control – PERT Vs CPM. (exclude Project Crashing).

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Understanding Optimization and Formulation of Linear Programing	**PO1,PO2,PO3**
CO2	Formulate and Solve Transportation & Assignment Models	**PO1,PO2,PO3**
CO3	Formulate and Solve Transportation & Assignment Models	**PO1,PO2,PO3, PO4**
CO4	Sequencing of operations and optimizing	**P01,PO2,PO3**
CO5	Discuss the game theory and strategies	**PO1,PO2,PO3, PO4**

TEXTBOOKS:

1. Operations Research / R.Pannerselvam, PHI Publications.
2. Operations Research / S.D.Sharma-Kedarnath
3. Operations Research /A.M.Natarajan,P.Balasubramani,A. Tamilarasi/Pearson Education.
4. Engineering Optimization: Theory and practice / S.S.Rao, New Age International (P) Limited

REFERENCE BOOKS:

1. Quantitative Techniques in Management / ND Vohra, Tata McGraw Hill, 4th Edition, 2011.
2. Introduction to O.R/Hiller & Libermann (TMH).
3. Operations Research: Methods & Problems / Maurice Saseini, ArhurYaspan& Lawrence Friedman. Pearson
4. Quantitative Analysis For Management/ Barry Render, Ralph M. Stair, Jr and Michael E. Hanna/
5. Operations Research / Wagner/ PHI Publications.

REFERENCE WEBSITE:

1. https://onlinecourses.swayam2.ac.in/cec20_ma10/preview
2. https://onlinecourses.nptel.ac.in/noc20_ma23/preview
3. https://onlinecourses.nptel.ac.in/noc19_ma29/preview

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	3	3	-	-	-	-	-	-	-	-	-
CO.2	3	3	3	-	-	-	-	-	-	-	-	-
CO.3	3	3	3	2	-	-	-	-	-	-	-	-
CO.4	3	3	3	-	-	-	-	-	-	-	-	-
CO.5	3	3	3	2	-	-	-	-	-	-	-	-
CO*	3	3	3	2		**-**	**-**	**-**	**-**	**-**	**-**	**-**

II B.Tech. - IV Semester

23CSE241	**DATABASE MANGEMENT SYSTEM**	**L T P C**
	(Common to CSE, CSM, CAI, CSD)	**3 0 0 3**

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. Discuss the basic Database concepts and the applications, data models and ER Model.
2. Understand the Relational database design principles
3. Master the basics of SQL and construct queries using SQL.
4. Understand the Normalization process in Database Management System.
5. Familiar with the basic issues of transaction processing and concurrency control.

UNIT –1: INTRODUCTION TO DATABASE MANAGEMENT SYSTEM AND ENTITY RELATIONSHIP MODEL (9)

Database system - Characteristics (Database Vs File System) - Database Users - Advantages of Database systems - Database applications - Brief introduction of different Data Models - Conceptsof Schema - Instance and data independence -Three tier schema architecture for data independence - Database system structure environment - Centralized and Client Server architecture for the database - Introduction to Entity Relationship Model - Representation of entities - Attributes - Entity set – Relationship - Relationship set – Constraints - Sub classes - super class - Inheritance- Specialization -Generalization using ER Diagrams.

UNIT –2: RELATIONAL MODEL (9)

Introduction to Relational model - Concepts of domain – Attribute – Tuple - Relation importance ofnull values - Constraints (Domain, Key constraints, integrity constraints) and their importance - Relational Algebra, Relational Calculus - BASIC SQL: Simple Database schema - Data Base Language - types- Table definitions (create, alter), different DML operations (insert, delete, update).

UNIT –3: INTRODUCTION TO STRUCTURED QUERY LANGUAGE (9)

Basic SQL querying (select and project) using where clause arithmetic & logical operations - SQL functions(Date and Time, Numeric, String conversion) - Creating tables with relationship, Implementation of key and integrity constraints - Nested queries, sub queries, grouping, aggregation, ordering - Implementation of different types of Joins, view (updatable and non-updatable) - Relational set operations.

UNIT –4: NORMALIZATION (9)

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

UNIT –5: TRANSACTION CONCEPT AND INDEXING CONCEPTS (9)

Transaction State - ACID properties - Concurrent Executions – Serializability - Recoverability, Implementation of Isolation - Testing for Serializability - Lock based - Time stamp based optimistic - Concurrency protocols – Deadlocks - Failure Classification - Storage, Recovery and Atomicity - Recovery algorithm - Introduction to Indexing Techniques **-** B+ Trees, operations on B+Trees - Hash Based Indexing

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Demonstrate knowledge on Data models and Database Languages and Design Entity Relationship model for a database	PO1, PO3
CO2	Analyze the relational database theory, and be able to write relational algebra and relational calculus expressions for queries	PO1, PO2
CO3	Analyze and evaluate the database using SQL DML/DDL	PO1, PO2, PO3, PO5
CO4	Analyze databases using normal forms to provide solutions for real time applications	PO1, PO2
CO5	Understand the properties of transactions in a database system, analyze serializability and indexing techniques.	PO1, PO3,PO4

TEXT BOOKS:

1. Database Management Systems, 3rd edition, Raghurama Krishnan, Johannes Gehrke, TMH (For Chapters 2, 3, 4)
2. Database System Concepts,5th edition, Silberschatz, Korth, Sudarsan,TMH (For Chapter 1 and Chapter 5)

REFERENCE BOOKS:

1. Introduction to Database Systems, 8thedition, C J Date, Pearson.
2. Database Management System, 6th edition, RamezElmasri, Shamkant B. Navathe, Pearson
3. Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

REFERENCE WEBSITE:

1. https://www.w3schools.in/sql/database-concepts
2. https://www.javatpoint.com/dbms-tutorial
3. https://www.geeksforgeeks.org/introduction-of-dbms-database-management-system-set-1/
4. https://nptel.ac.in/courses/106/105/106105175/
5. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012758066672820224 56_shared/overview

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	-	3	-	-	-	-	-	-	-	-	-
CO.2	3	3	-	-	-	-	-	-	-	-	-	-
CO.3	3	3	3	-	3	-	-	-	-	-	-	-
CO.4	3	3	-	-	-	-	-	-	-	-	-	-
CO.5	3	-	2	3	-	-	-	-	-	-	-	-
CO*	**3**	**3**	**2.6**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

II B.Tech. - IV Semester

23ESC232	**DIGITAL LOGIC & COMPUTER ORGANIZATION**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

PRE-REQUISITES:Nil

COURSE EDUCATIONAL OBJECTIVES:

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

UNIT I: **(9)**

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

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

UNIT 2: **(9)**

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

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

UNIT 3: **(9)**

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

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

UNIT 4: **(9)**

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

UNIT 5: **(9)**

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

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Differentiate between combinational and sequential circuits based on theircharacteristics and functionalities	**PO1, PO2**
CO2	Demonstrate an understanding of computer functional units.	**PO1,PO2**
CO3	Analyze the design and operation of processors, including instruction execution, pipelining, and control unit mechanisms, to comprehend their role in computer systems.	**PO1,PO2,PO3**
CO4	Describe memory hierarchy concepts, including cache memory, virtual memory, and secondary storage, and evaluate their impact on system performance and scalability	**PO1,PO2,PO3**
CO5	Explain input/output (I/O) systems and their interaction with the CPU, memory, and peripheral devices, including interrupts, DMA, and I/O mapping techniques	**PO1,PO2,PO3, PO4**

TEXTBOOKS:

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

REFERENCE BOOKS:

1. Computer Systems Architecture, M.Moris Mano, 3rdEdition, Pearson, 2017.
2. Computer Organization and Design, David A. Paterson, John L. Hennessy, Elsevier, 2004.
3. Fundamentals of Logic Design, Roth, 5thEdition, Thomson, 2003.

RESOURCE WEBSITE:

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

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	2	3	2	-	-	-	-	-	-	-	-
CO*	**3**	**2.6**	**2.3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
(Data Science)
II B. Tech IV Semester

23CSD241	DATA ENGINEERING	L	T	P	C
	(CSD)	3	0	0	3

PRE-REQUISITES: Nil

COURSE OBJECTIVES:

- Explain basic concepts of Data Engineering
- Discuss bout Data Engineering Life Cycle
- How to design Good Data Architecture

UNIT-I **(9)**

Introduction to Data Engineering: Definition, Data Engineering Life Cycle, Evolution of Data Engineer, Data Engineering Versus Data Science, Data Engineering Skills and Activities,
Data Maturity, Data Maturity Model, Skills of a Data Engineer, Business Responsibilities, Technical Responsibilities, Data Engineers and Other Technical Roles.

UNIT-II **(9)**

Data Engineering Life Cycle: Data Life Cycle Versus Data Engineering Life Cycle, Generation: Source System, Storage, Ingestion, Transformation, Serving Data.
Major undercurrents across the Data Engineering Life Cycle: Security, Data Management, DataOps, Data Architecture, Orchestration, Software Engineering.

UNIT-III **(9)**

Designing Good Data Architecture: Enterprise Architecture,Data Architecture**,** Principles of Good Data Architecture, Major Architecture Concepts.
Data Generation in Source Systems: Sources of Data, Files and Unstructured Data, APIs, Application Databases (OLTP), OLAP, Change Data Capture, Logs, Database Logs, CRUD, Source System Practical Details.

UNIT-IV **(9)**

Storage: Raw Ingredients of Data Storage, Data Storage Systems, Data Engineering Storage Abstractions, Data warehouse, Data Lake, Data Lakehouse.
Ingestion: Data Ingestion, Key Engineering considerations for the Ingestion Phase, Batch Ingestion Considerations, Message and Stream Ingestion Considerations, Ways to Ingest Data

UNIT-V **(9)**

Queries, Modeling and Transformation: Queries, Life of a Query, Query Optimizer, Queries on Streaming Data, Data Modelling, Modeling Streaming Data, Transformations, Streaming Transformations and Processing.
Serving Data for Analytics, Machine Learning and Reverse ETL: General Considerations for serving Data, Business Analytics, Operational Analytics, Embedded Analytics, Ways to serve data for analytics and ML, Reverse ETL.

TOTAL HOURS:45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Understand Data Engineering Life cycle	**PO1, PO2, P03, PO4**
CO2	Apply appropriate data modeling techniques for different types of data. (L3)	**PO1, PO2, P03, PO4**
CO3	Evaluate and select appropriate technologies and frameworks for specific dataengineering tasks. (L5)	**PO1, PO2, P03, PO4**
CO4	Implement data quality checks and governance processes to ensure data reliability andcompliance	**PO1, PO2, P03, PO4**
CO5	Understand Data Engineering Life cycle	**PO1, PO2, P03, PO4**

Textbooks:

1. Joe Reis, Matt Housley, Fundamentals of Data Engineering, O'Reilly Media, Inc.,June 2022,ISBN: 9781098108304

Reference Books:

2. Paul Crickard , Data Engineering with Python,Packt Publishing, October 2020.
3. Ralph Kimball, Margy Ross, The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling, Wiley, 3rd Edition, 2013
4. James Densmore, Data Pipelines Pocket Reference: Moving and Processing Data for Analytics, O'Reilly Media, 1st Edition, 2021

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	2	2	2	-	-	-	-	-	-	-	-
CO.2	3	2	2	2	-	-	-	-	-	-	-	-
CO.3	3	2	2	2	-	-	-	-	-	-	-	-
CO.4	3	2	2	2	-	-	-	-	-	-	-	-
CO.5	3	2	2	2	-	-	-	-	-	-	-	-
CO*	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

II B.Tech. - IV Semester

23CSD242	**STATISTICAL METHODS FOR DATA SCIENCE (CSD)**	**L T P C 3 0 0 3**

PRE-REQUISITES:NIL

COURSE EDUCATIONAL OBJECTIVES:

1. Understand and distinguish between discrete and continuous random variables, and their probability density functions.
2. Explore properties and applications of Binomial, Poisson, and Normal distributions.
3. Define population, sample, parameter, and statistic, and understand characteristics of a good estimator.
4. Grasp the concepts of consistency, unbiasedness, and sufficiency in estimators.
5. Explain the importance of these concepts in statistical inference.

UNIT I: BASIC CONCEPTS (9)

Random variables (discrete and continuous), probability density functions, properties, mathematical expectation. Probability distributions: Binomial, Poisson and Normal-their properties. Population, sample, parameter and statistic; characteristics of a good estimator; Consistency – Invariance property of Consistent estimator, Sufficient condition for consistency; Unbiasedness; Sufficiency.

UNIT 2: POINT ESTIMATION (9)

Point Estimation- Estimator, Estimate, Methods of point estimation – Maximum likelihood method (the asymptotic properties of ML estimators are not included), Large sample properties of ML estimator (without proof)- applications, Method of moments, method of least squares, method of minimum chi-square and modified minimum chi-square-Asymptotic Maximum Likelihood Estimation and applications

UNIT 3: INTERVAL ESTIMATION (9)

Confidence limits and confidence coefficient; Duality between acceptance region of a test and a confidence interval; Construction of confidence intervals for population proportion (small and large samples) and between two population proportions(large samples); Confidence intervals for mean and variance of a normal population; Difference between the mean and ratio of two normal populations.

UNIT 4: TESTING OF HYPOTHESES (9)

Types of errors, power of a test, most powerful tests; Neyman-Pearson Fundamental Lemma and its applications; Notion of Uniformly most powerful tests; Likelihood Ratio tests: Description and property of LR tests - Application to standard distributions.

UNIT 5: SMALL SAMPLE TESTS (9)

Student's t-test, test for a population mean, equality of two population means, paired t-test, F- test for equality of two population variances, Chi-square test for goodness of fit and test for independence of attributes, $\chi 2$ test for testing variance of a normal distribution.

.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Understand the basic concepts of Statistics.	**PO1, PO2, P03,**
CO2	Analyze the data and draw conclusion about collection of data under study using Point estimation	**PO1, PO2, P03,**
CO3	Analyze data and draw conclusion about collection of data under study using Interval estimation.	**PO1, PO2, P03, PO4**
CO4	Analyze to test various hypotheses included in theory and types of errors for large samples.	**PO1, PO2, P03, PO4**
CO5	Apply the different testing tools like t-test, F-test, chi-square test to analyze the relevant real life problems.	**PO1, PO2, P03, PO4**

TEXTBOOKS:

1. Miller and Freunds, Probability and Statistics for Engineers,7/e, Pearson, 2008.
2. Manoj Kumar Srivastava and Namita Srivastava, Statistical Inference – Testing of Hypotheses, Prentice Hall of India, 2014

REFERENCE BOOKS:

1. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.
2. S. Ross, a First Course in Probability, Pearson Education India, 2002.
3. W. Feller, an Introduction to Probability Theory and its Applications, 1/e, Wiley, 1968.
4. Robert V Hogg, Elliot A Tannis and Dale L.Zimmerman, Probability and Statistical Inference, 9th edition, Pearson publishers,2013.

RESOURCE WEBSITE

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

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	3	3		-	-	-	-	-	-	-	-
CO.2	3	3	3		-	-	-	-	-	-	-	-
CO.3	3	3	3	2	-	-	-	-	-	-	-	-
CO.4	3	3	3	2	-	-	-	-	-	-	-	-
CO.5	3	3	3	2	-	-	-	-	-	-	-	-
CO*	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

23CSD343 **II B.Tech– IV Semester**

	L	T	P	C
DATA ENGINEERING LAB (CSD)	**0**	**0**	**3**	**1.5**

PRE-REQUISITES: NIL

COURSE OBJECTIVE:

- The main objective of this course is to teach how build data engineering infrastructureand data pipelines.

EXPERIMENTS:

1. Installing and configuring Apache NiFi, Apache Airflow
2. Installing and configuring Elasticsearch, Kibana, PostgreSQL, pgAdmin 4
3. Reading and Writing files
    a. Reading and writing files in Python
    b. Processing files in Airflow
    c. NiFi processors for handling files
    d. Reading and writing data to databases in Python
    e. Databases in Airflow
    f. Database processors in NiFi
4. Working with Databases
    a. Inserting and extracting relational data in Python
    b. Inserting and extracting NoSQL database data in Python
    c. Building database pipelines in Airflow
    d. Building database pipelines in NiFi
5. Cleaning, Transforming and Enriching Data
    a. Performing exploratory data analysis in Python
    b. Handling common data issues using pandas
    c. Cleaning data using Airflow
6. Building the Data Pipeline
7. Building a Kibana Dash Board
8. Perform the following operations
    a. Staging and validating data
    b. Building idempotent data pipelines
    c. Building atomic data pipelines
9. Version Control with the NiFi Registry
    a. Installing and configuring the NiFi Registry
    b. Using the Registry in NiFi
    c. Versioning your data pipelines
    d. Using git-persistence with the NiFi Registry
10. Monitoring Data Pipelines
    a. Monitoring NiFi in the GUI
    b. Monitoring NiFi using processors
    c. Monitoring NiFi with Python and the REST API
11. Deploying Data Pipelines
    a. Finalizing your data pipelines for production
    b. Using the NiFi variable registry
    c. Deploying your data pipelines
12. Building a Production Data Pipeline
    a. Creating a test and production environment
    b. Building a production data pipeline
    c. Deploying a data pipeline in pr8oduction

COURSE OUTCOMES:

On the successful completion of this course, the student should be able to,		POs related to COs
CO1	Design and implement end-to-end data pipelines using technologies such as Apache Spark, Kafka, or similar frameworks.	**PO1**
CO2	Create and manage relational and NoSQL databases (e.g., MySQL, PostgreSQL, MongoDB) for storing and querying structured and unstructured data.	**PO2**
CO3	Develop Extract, Transform, Load (ETL) processes to integrate data from multiple sources into a unified format suitable for analysis and reporting.	**PO3**
CO4	Implement data quality checks and validation mechanisms to ensure accuracy, completeness, and consistency of data within pipelines and databases.	**PO4**
CO5	Deploy and manage data engineering solutions on cloud platforms (e.g., AWS, Azure, Google Cloud) for scalability and reliability.	**PO5**
CO6	Identify performance bottlenecks in data pipelines and databases, and apply optimization techniques to enhance throughput and efficiency.	**PO6**
CO7	Do experiments effectively as an individual and as a teammember in a group.	**PO7**
CO8	Communicate verbally and in written form, the understandingabout the experiments.	**PO8**
CO9	Continue updating their skill related to lists, tuples anddictionaries implementing programs in future.	**P09**

REFERENCE BOOKS:

1. Paul Crickard , Data Engineering with Python,Packt Publishing, October

CO-PO MAPPING

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-
CO7	-	-	-	-	-	-	-	-	3	-	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**	**3**	**-**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

II B.Tech. – IV Semester

23CSE244	**DATABASE MANAGEMENT SYSTEMS LAB**	**L**	**T**	**P**	**C**
	(Common to CSE, CSM, CAI, CSD)	**3**	**0**	**0**	**3**

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

This Course will enable students to

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

EXPERIMENTS COVERING THE TOPICS:

1. DDL, DML, DCL commands
2. Queries, nested queries, built-in functions,
3. PL/SQL programming- control structures
4. Procedures, Functions, Cursors, Triggers,
5. Database connectivity- ODBC/JDBC

EXPERIMENTS :

1. Creation, altering and droping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.

2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.

3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVINGand Creation and dropping of Views.

4. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc,round, to_char, to_date)

5. i. Create a simple PL/SQL program which includes declaration section, executable section

and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records werefound)

ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.

6. Develop a program that includes the features NESTED IF, CASE and CASE expression. Theprogram can be extended using the NULLIF and COALESCE functions.

7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE1APPLICATION ERROR.

8. Programs development using creation of procedures, passing parameters IN and OUT ofPROCEDURES.

9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.

10. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.

11. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers andINSTEAD OF Triggers

12. Create a table and perform the search operation on table using indexing and non1indexingtechniques.

13. Write a Java program that connects to a database using JDBC

14. Write a Java program to connect to a database using JDBC and insert values into it

15. Write a Java program to connect to a database using JDBC and delete values from it

REFERENCE BOOKS:

1. Oracle: The Complete Reference by Oracle Press
2. Nilesh Shah, "Database Systems Using Oracle", PHI, 2007
3. Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007
4. Ramez Elmasri, Shamkant, B. Navathe," Database Systems,", Pearson Education, 6th Edition,2013.
5. Database Principles Fundamentals of Design Implementation and Management,10th edition, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning,2022

REFERENCE WEBSITE:

1. https://www.scoopworld.in
2. https://vlabs.iitb.ac.in/vlabs-dev/labs/dblab/index.php

COURSE OUTCOMES:

On successful completion of the course the student will be		POs
CO1	Demonstrate practical knowledge on creation and alteration of tables, insertion and Querying of data.	PO1
CO2	Analyze the database schemas for the different types of database	PO2
CO3	Design the databases using SQL DML/DDL Commands	PO3
CO4	Design the complex PL/SQL programs for different problems	PO4
CO5	Use the procedure, function, trigger and cursor concepts in PL/SQL	PO5
CO6	Follow the ethical principles in implementing the programs	PO8
CO7	Do experiments effectively as an individual and as a team member in a group.	PO9
CO8	Communicate verbally and in written form, the understanding about the experiments.	PO10
CO9	Continue updating their skill related to SQL Commands and Queries and implementing programs in future.	PO12

CO PO MAPPING:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-
CO7	-	-	-	-	-	-	-	-	3	-	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
(Autonomous)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
(Data Science)

II B.Tech. - IV Semester

23CSD344	EXPLORATORY DATA ANALYSIS WITH PYTHON (CSD)	L T P C 0 1 2 2

PRE-REQUISITES: A course on C and Data Structures

COURSE EDUCATIONAL OBJECTIVES:

1. This course introduces the fundamentals of Exploratory Data Analysis
2. It covers essential exploratory techniques for understanding multivariate data by summarizing it through statistical methods and graphical methods

UNIT I:

Exploratory Data Analysis Fundamentals: Understanding data science, The significance of EDA, Steps in EDA, Making sense of data, Numerical data, Categorical data, Measurement scales, Comparing EDA with classical and Bayesian analysis, Software tools available for EDA, Getting started with EDA.

Sample Experiments:

1. a) Download Dataset from Kaggle using the following link : https://www.kaggle.com/datasets/sukhmanibedi/cars4u
   b) Install python libraries required for Exploratory Data Analysis (numpy, pandas, matplotlib,seaborn)
2. Perform Numpy Array basic operations and Explore Numpy Built-in functions.
3. Loading Dataset into pandas dataframe
4. Selecting rows and columns in the dataframe

UNIT 2:

Visual Aids for EDA: Technical requirements, Line chart, Bar charts, Scatter plot using seaborn, Polar chart, Histogram, Choosing the best chart

Case Study:EDA with Personal Email, Technical requirements, Loading the dataset, Data transformation, Data cleansing, Applying descriptive statistics, Data refactoring, Data analysis.

Sample Experiments:

5. Apply different visualization techniques using sample dataset
   a) Line Chart b) Bar Chart c) Scatter Plots d)Bubble Plot
6. Generate Scatter Plot using seaborn library for iris dataset
7. Apply following visualization Techniques for a sample dataset
   a) Area Plot b) Stacked Plot c) Pie chart d) Table Chart
8. Generate the following charts for a dataset.
   a) Polar Chart b)Histogram c)Lollipop chart
9. Case Study: Perform Exploratory Data Analysis with Personal Email Data

UNIT 3:

Data Transformation: Merging database-style dataframes, Concatenating along with an axis, Merging on index, Reshaping and pivoting, Transformation techniques, Handling missing data, Mathematical operations with NaN, Filling missing values, Discretization and binning, Outlier detection and filtering, Permutation and random sampling, Benefits of data transformation, Challenges.

Sample Experiments:

10. Perform the following operations
    a) Merging Dataframes
    b) Reshaping with Hierarchical Indexing
    c) Data Deduplication
    d) Replacing Values
11. Apply different Missing Data handling techniques
    a) NaN values in mathematical Operations
    b) Filling in missing data
    c) Forward and Backward filling of missing values

d) Filling with index values
e) Interpolation of missing values

12. Apply different data transformation techniques
a) Renaming axis indexes
b)Discretization and Binning
c) Permutation and Random Sampling
d) Dummy variables

UNIT 4:

Descriptive Statistics: Distribution function, Measures of central tendency, Measures of dispersion, Types of kurtosis, Calculating percentiles, Quartiles, Grouping Datasets, Correlation, Understanding univariate, bivariate, multivariate analysis, Time Series Analysis

Sample Experiments:

13. Study the following Distribution Techniques on a sample data
a) Uniform Distribution
b) Normal Distribution
c) Gamma Distribution
d) Exponential Distribution
e) Poisson Distribution
f) Binomial Distribution
14. Perform Data Cleaning on a sample dataset.
15. Compute measure of Central Tendency on a sample dataset
a) Mean b)Median c)Mode
16. Explore Measures of Dispersion on a sample dataset
a) Variance b) Standard Deviation c) Skewness d) Kurtosis
17. a) Calculating percentiles on sample dataset
b) Calculate Inter Quartile Range(IQR) and Visualize using Box Plots
18. Perform the following analysis on automobile dataset.
a) Bivariate analysis b)Multivariate analysis
19. Perform Time Series Analysis on Open Power systems dataset

UNIT 5:

Model Development and Evaluation: Unified machine learning workflow, Data preprocessing, Data preparation, Training sets and corpus creation, Model creation and training, Model evaluation, Best model selection and evaluation, Model deployment

Case Study: EDA on Wine Quality Data Analysis

Sample Experiments:

20. Perform hypothesis testing using statsmodels library
a) Z-Test b)T-Test
21. Develop model and Perform Model Evaluation using different metrics such as prediction score, R2 Score, MAE Score, MSE Score.
22. Case Study: Perform Exploratory Data Analysis with Wine Quality Dataset

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**Pos**
CO1	Define the concepts related to design thinking. (L1, L2)	**PO1**
CO2	Explain the fundamentals of Design Thinking and innovation (L1, L2)	**PO3**
CO3	Apply the design thinking techniques for solving problems in various sectors. (L3)	**PO5**
CO4	Analyse to work in a multidisciplinary environment (L4)	**PO6**

CO5	Evaluate the value of creativity (L5)	**PO2**
CO6	Formulate specific problem statements of real time issues (L3, L6)	**PO8**
CO7	Do experiments effectively as an individual and as a team member in a group.	**PO9**
CO8	Communicate verbally and in written form, the understanding aboutthe experiments.	**PO10**
CO9	Continue updating their skill related to object oriented concepts andimplementing programs in future.	**PO12**

TEXTBOOK:

1. Suresh Kumar Mukhiya, Usman Ahmed, Hands-On Exploratory Data Analysis with Python, Packt Publishing, 2020.

REFERENCES:

1. Ronald K. Pearson, Exploratory Data Analysis Using R, CRC Press, 2020
2. RadhikaDatar,HarishGarg, Hands-On Exploratory Data Analysis with R: Become an expert in exploratory data analysis using R packages, Ist Edition, Packt Publishing, 2019

REFERENCE WEBSITE

1. https://github.com/PacktPublishing/Hands-on-Exploratory-Data-Analysis-with-Python
2. https://www.analyticsvidhya.com/blog/2022/07/step-by-step-exploratory-data-analysis-eda-using-python/#h-conclusion
3. https://github.com/PacktPublishing/Exploratory-Data-Analysis-with-Python-Cookbook

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	3	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	3	-	-	-	-	-	-	-
CO4	-	-	-	-	-	3	-		-	-	-	-
CO5	-	-	-	-	-	-	-	-		-	-	-
CO6	-	-	-	-	-	-	-	3	-		-	-
C07	-	-	-	-	-	-	-	-	3	-	-	-
C08	-	3	-	-	-	-	-	-	-	3	-	-
CO9												3
CO*	3	3	-	3	3	3	-	3	3	3	-	3

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
(Autonomous)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
(Data Science)

II B. Tech IV Semester

23MECxxx	**DESIGN THINKING & INNOVATION**	**L**	**T**	**C**
	(Common to all Engineering Branches)	**2**	**0**	**2**

COURSE EDUCATIONAL OBJECTIVES:

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

UNIT – I INTRODUCTION TO DESIGN THINKING

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

UNIT – II DESIGN THINKING PROCESS

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

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

UNIT – III INNOVATION

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

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

UNIT – IV PRODUCT DESIGN

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

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

UNIT – V DESIGN THINKING IN BUSINESS PROCESSES

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining

Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs- Design thinking for Startups- Defining and testing Business Models and Business Cases- Developing & testing prototypes.

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

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Define the concepts related to design thinking. (L1, L2)	**PO1,PO2,PO3**
CO2	Explain the fundamentals of Design Thinking and innovation (L1, L2)	**PO1,PO2,PO3**
CO3	Apply the design thinking techniques for solving problems in various sectors. (L3)	**PO1,PO2,PO3**
CO4	Analyse to work in a multidisciplinary environment (L4)	**PO1,PO2,PO3**
CO5	Evaluate the value of creativity (L5)	**PO1,PO2,PO3**

TEXTBOOKS:

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

REFERENCE BOOKS:

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

REFERENCE WEBSITE:

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

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	2	3	-	-	-	-	-	-	-	-	-
CO.2	3	2	3	-	-	-	-	-	-	-	-	-
CO.3	3	2	3		-	-	-	-	-	-	-	-
CO.4	3	2	3		-	-	-	-	-	-	-	-
CO.5	3	2	3		-	-	-	-	-	-	-	-
CO*	3	2	3			**-**	**-**	**-**	**-**	**-**	**-**	**-**