SESHADRI RAO GUDLAVALLERU ENGINEERING COLLEGE

(An Autonomous Institute with Permanent Affiliation to JNTUK, Kakinada)
Seshadri Rao Knowledge Village, Gudlavalleru – 521356, Krishna District (A.P.)

ACADEMIC REGULATIONS

(Applicable for the students of B.Tech. from the Academic Year 2023-24)

1. UG – B.Tech. Programs

The following B.Tech. Programs are offered at present

i) Civil Engineering (CE)
ii) Electrical and Electronics Engineering (EEE)
iii) Mechanical Engineering (ME)
iv) Electronics and Communication Engineering (ECE)
v) Computer Science and Engineering (CSE)
vi) Information Technology (IT)
vii) Artificial Intelligence and Data Science (AI&DS)
viii) Internet of Things (IoT)
ix) CSE (Artificial Intelligence and Machine Learning)

2. Duration of the Program

The duration of the program is four academic years consisting of eight semesters. However, a student is permitted to complete the course work of B.Tech. program in the stipulated time frame of **EIGHT** years from the date of joining. Students admitted into third semester of B.Tech. program directly,through Lateral Entry (LE), shall have to complete the course work of B.Tech.program in the stipulated time frame of **SIX** years from the date of joining. However, for the students availing Gap year facility, this period shall be extended by two years at the most and these two years would be in addition to the maximum period permitted for graduation (Eight years).

3. Minimum Instruction Days

Each semester consists of a minimum of ninety instruction days.

4. Award of B.Tech. Degree

i) Each discipline of the B.Tech. program is designed to have a total of **160** credits and the student shall have to complete the four year course work and earn all the **160** credits for the award of B.Tech. Degree.
ii) Students, who fail to complete their four years' course of study within eight years from the year of their admission or fail to acquire the **160** credits within this period shall forfeit their seat in B.Tech. course and their admission shall stand cancelled.
iii) Students joining the B.Tech. program into the II year 1st semester directly through Lateral Entry (LE) Scheme shall have to complete the three year course work and earn **120** credits for the award of B.Tech. degree.
iv) Students, who fail to complete their three years course of study within six years from the year of their admission or fail to acquire the **120** credits for the award of degree within this period shall forfeit their seat in B.Tech. course and their admission shall stand cancelled.

5. Award of B. Tech. (Honors) / B. Tech. (Minor)

i) B. Tech. with Honors will be awarded if a student earns 15 additional credits as per the regulations/guidelines.

ii) B. Tech. with a Minor will be awarded if a student earns 12 additional credits as per the regulations/guidelines.

iii) Registering for Honors / Minor degree is optional.

iv) Honors / Minor is to be completed simultaneously with B.Tech. programme.

6. Duration and Pattern of the Program

i) The duration of the program is four academic years consisting of eight semesters for regular students and three academic years consisting of six semesters for lateral entry students. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would be in addition to the maximum period permitted for graduation (Eight years).

ii) Each semester consists of a minimum of ninety instructional days.

iii) Three week induction program is mandatory for all the first year UG students and shall be conducted as per AICTE/UGC/APSCHE guidelines.

iv) A student has to register for all the courses in a semester.

v) Grade points, based on percentage of marks awarded for each course will be the basis for calculation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average).

vi) Award of division shall be based on the CGPA acquired.

vii) A pool of interdisciplinary, skill development courses, summer internships, full semeseter internship and project etc., which are relevant to the industry are integrated into the curriculum of the branch of engineering concerned.

viii) As a mandatory rule, all the students shall register for the mandatory non-credit courses as per AICTE/UGC/APSCHE guidelines.

7. Attendance Regulations

i) A student shall be eligible to appear for the semester end examinations if he/she acquires a minimum of 40% attendance in each subject and 75% of attendance in aggregate of all the subjects. Attendance of mandatory non credit course shall be considered while calculating aggregate attendance .

ii) 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.

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

iv) A stipulated fee shall be payable towards condonation of shortage of attendance to the college.

v) 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.

vi) 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.

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

viii) 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.

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

8. Distribution and Weightage of marks - Evaluation

The distribution of Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) marks for each course is given in the table:

Sl.No.	Components	Internal	External	Total
1	Theory / Integrated Theory and Laboratory/ Project Based Theory	30	70	100
2	Design/ Drawing	30	70	100
3	Practical / Skill Development Courses	30	70	100
4	Summer Internship	-	50	50
5	Full semester Internship & Project Work	60	140	200
6	Mandatory Credit Courses	100	-	100
7	Mandatory Non Credit Courses	30	-	30

9. Mandatory Internships

i) **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.

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

10. Continuous Internal Evaluation

a) Theory Courses:

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) For theory courses having 5 units of syllabus, 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.

iii) For theory courses having 6 units of syllabus with Part A and Part B, First midterm examination shall be conducted for I, II,III units of syllabus with one either or type question from each unit. The second midterm examination shall be conducted for III,IV and V units with one either or type question from each unit.

iv) Objective paper shall contain for 05 short answer questions with 2 marks each or maximum of 20 bits for 10 marks.

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

vi) 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. Any fraction shall be rounded off to the next higher mark.

vii) 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.

viii) For theory courses having 5 units of syllabus , 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: (25 x 0.8) + (20 x 0.2) = 24

If the student is absent for any one midterm examination, the final mid semester marks shall be arrived at by considering 80% 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

ix) For theory courses having 6 units of syllabus (Part A and Part B), mid semester examination shall be evaluated for 30 marks in each part (10 marks for objective paper, 15 marks for subjective paper and 5 marks for assignment) and final mid semester marks shall be arrived by considering the average of marks obtained in two parts.

b) Design and/or Drawing Courses

For the subjects such as Engineering Graphics, Internal Evaluation shall be for 30 marks. 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.

c) Practical Courses

For practical courses, there shall be a continuous evaluation during the semester for 30 sessional marks. Day-to-day work in the laboratory shall be evaluated for 15 marks by the concerned laboratory teacher based on the record/viva and 15 marks for the internal test. In a practical subject consisting of two parts (Eg: Basic Electrical &Electronics Engineering Lab), the internal test shall be conducted for 15 marks as a single laboratory.

d) Skill Oriented Courses

i) Each student shall register for five skill oriented courses offered by the department concerned.

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) 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.

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

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

vi) The recommended courses offered by external agencies, conversions and appropriate grades/marks are to be approved by the institution at the beginning of the semester.

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 college.

e) Mandatory Credit Courses

i) Mandatory credit courses like Health and Wellness, Yoga and Sports / NSS/NCC/Scouts & Guides/ Community Service shall be evaluated for a total of 100 marks.

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

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

iv) There shall be no external examination for these courses.

f) Mandatory Non-Credit Courses

i) Each student shall register for mandatory non-credit courses like Environmental Studies, Constitution of India offered by the respective departments asper the course structure.

ii) For courses like Environmental Studies and Constitution of India, two subjective examinations shall be conducted for 30 marks each along with the mid-term examinations of regular theory courses.

iii) Each subjective examination consists of 3 descriptive questions for 10 marks each with a total of 30 marks for a duration of 90 minutes.

iv) Sum of the 80% marks of better scored subjective examination and 20% marks of less scored subjective examination are considered.

v) There shall be no external examination for these courses.

g) Summer Internships:

There shall be no internal marks for Summer Internship.

h) Full Semester Internship and Project work:

i) The Full Semester Internship and Project work shall be evaluated for 60 internal marks.

ii) The supervisor assesses the student for 30 marks (Report: 15 marks, Seminar: 15 marks).

iii) 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 remaining 30 marks.

11. Semester End Examinations – Evaluation

a) Theory Courses

i) For all Theory Courses, the semester end examination shall be conducted for 70 marks.

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

iii) Question I shall contain 10 compulsory short answer questions for a total of 20 marks such that each question carries 2 marks.

iv) There shall be 2 short answer questions from each unit.

v) 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.

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

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

i) Question paper shall be in two parts viz., Part A and Part B with equal weightage of 35 marks each.

ii) In each part, question 1 shall contain 5 compulsory short answer questions for a total of 5 marks such that each question carries 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.

b) Design and/or Drawing Courses

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 etc. is mentioned along with the syllabus.

c) Practical Courses:

i) The semester end examination shall be evaluated for 70 marks, conducted by the concerned laboratory teacher and a subject expert appointed by controller of examinations. The distribution of marks shall be as follows:

Procedure: 20 marks

Experimental work & Results: 30 marks

Viva voce: 20 marks.

ii) 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.

d) Skill Oriented Courses:

i) The semester end examination shall be conducted for 70 marks

ii) The end examination pattern is similar to practical examination and shall be conducted by the concerned teacher and an expert in the subject nominated by controller of examinations.

e) Summer Internships: Evaluation of the summer internships shall be through the departmental committee. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the departmental committee comprising of Head of the Department, supervisor of the internship and a senior faculty member of the department. A certificate of successful completion from industry shall be included in the report. The report and the oral presentation shall carry 50% weightage each. It shall be evaluated for 50 external marks.

f) Full Semester Internship and Project work:

The project report shall be evaluated for 140 marks with an external examiner. The external evaluation of Project Work is a Viva-Voce Examination conducted in the presence of internal examiner and external examiner appointed by the controller of examinations.

12. Massive Open Online Courses (MOOCs)

i) A student has to pursue and complete one course compulsorily through MOOCs approved by the Committee constituted by Head of the Department. 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.

ii) 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.

iii) 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 institute.

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

13. Promotion Rules

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

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

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

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

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.

14. Credit Transfer Policy

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

ii) The institute shall offer credit mobility for MOOCs and give the equivalent credit weightage to the students for the credits earned through online learning courses.

iii) 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.

iv) Credit transfer policy will be applicable to the Professional & Open Elective courses only.

v) The concerned department shall identify the courses permitted for credit transfer.

vi) The institution shall notify at the beginning of semester the list of the online learning courses eligible for credit transfer.

vii) 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.

viii) The institution shall ensure no overlap of MOOC exams with that of the examination schedule. In case of delay in results, the institution will re-issue the marks sheet for such students.

ix) 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.

x) The Head of the Department shall submit the following to the examination section of the institution:

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.

xi) The universities 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.

15. Criteria for Passing a Course

i) A candidate shall be declared to have passed in individual theory / integratedtheory and laboratory / project based theory / drawing or design course/ practical / Full Semester Internship and Project work, if he/she secures a minimum of 40% aggregate marks (continuous internal evaluation & semester end examination marks put together), subject to securing a minimum of 35% marks in the semester end examination.

ii) A candidate shall be declared to have passed in summer internship if he/she secures a minimum of 40% marks in the semester end examination.

iii) A candidate shall be declared to have passed the mandatory credit course only when he/she secures 40% or more in the internal examinations. In case, the student fails, a reexamination shall be conducted for 30 marks.

iv) For mandatory non-credit courses the student has to secure minimum 40% aggregate marks (continuous internal evaluation) for passing the course. No marks or letter grade shall be printed in the grade cards for all mandatorynon-credit courses, but only Completed (Y)/Not-completed (N) will be specified.A student has to repeat the course whenever it is offered; if he does not getsatisfactory grade or does not fulfill the attendance requirements in each non-credit course for getting the degree awarded.

v) On passing a course of a program, the student shall earn the credits assignedto that course.

16. Award of Grades

i) 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:

ii) 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.

iii) A student shall be considered to have completed a course successfully and earned the credits if he/she secures an acceptable letter grade in the range S to E as given below.

iv) Letter grade 'F' in any course implies failure of the student in that course and no credits earned. Absent is also treated as no credits earned.

v) 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

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

Calculation of Semester Grade Point Average (SGPA) for Semester:

The performance of each student at the end of the each semester is indicated interms of SGPA. 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.

SGPA is calculated for a candidate who passed all the courses in that semester.

The SGPA is calculated as given below:

SGPA = Semester Grade Point Average for each semester.

$$\text{SGPA} = \frac{\Sigma \text{CR X GP}}{\Sigma \text{CR}}$$

where CR = Credits of a course

GP = Grade Points awarded for a course

Illustration of SGPA: Let us assume there are 6 subjects in a semester. The grades obtained as follows:

Course	Credits (CR)	Grade Point (GP)	CR x GP
Subject 1	3	8	24
Subject 2	2	9	18
Subject 3	4	7	28
Subject 4	3	6	18
Subject 5	3	9	27
	ΣCR=15		ΣCR X GP =115

$$\text{SGPA} = \frac{\Sigma \text{CR X GP}}{\Sigma \text{CR}} = \frac{115}{15} = 7.67$$

Formula for calculation CGPA for entire program

$$\text{CGPA} = \frac{\Sigma \text{CR X SGPA}}{\Sigma \text{ CR}}$$

17. Award of Class

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

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

CGPA to percentage conversion formula :

Percentage = (CGPA- 0.5) x 10

18. Grade Card and Consolidated Grade Card

i) A grade card shall be issued for each semester separately both for regular and supplementary examinations irrespective of passing the examination.

ii) A grade card consists of a letter grade and credits earned for all courses of that semester along with SGPA and CGPA.

iii) A consolidated grade card consisting of all semesters' courses with the letter grade and credits secured for each course, CGPA and award of division shall be issued if he/she fulfills the academic regulations B.Tech. program.

19. Withholding of Results

If the student has not paid the dues, if any, to the College or if any case of indiscipline is pending against him, the result of such student will be withheld. His degree will also be withheld in such cases.

20. Supplementary Examinations

Supplementary examinations will be conducted twice in a year at the end of odd and even semesters.

21. Revaluation

i) Students can apply for revaluation of his/her answer script(s) of theory course(s) as per the notification issued by the Controller of Examinations.

ii) The Controller of Examinations shall arrange for revaluation of such answer script(s).

iii) An examiner, other than the first examiner, shall revaluate the answer script(s).

iv) If the variation in marks of two evaluations is less than 15% of total marks, the best mark of two evaluations shall be taken into consideration.

v) If the variation in marks of two evaluations is more than 15% of total marks, there shall be third evaluation by an examiner other than the first two examiners. The best marks of two evaluations (which are nearer) shall be taken into consideration.

vi) There is no revaluation for practical/ Skill Development Courses/Community Service Project/ Main Project courses.

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

i) Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfilment of academic regulations.

ii) 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 after duly fulfilling the required norms stipulated by the college with the same or equivalent subjects as and when subjects are offered and they will follow the academic regulations into which they are readmitted.

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

iv) These candidates have to obtain written permission from the Principal for readmission into the same semester after duly fulfilling the required norms stipulated by the college.

24. Student Transfers

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

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. Malpractices and Punishments

i) Every student appearing for the Examinations is liable to be charged with committing malpractice(s), if he/she is observed as committing any one ormore of the acts mentioned in of examination malpractices and punishments.

ii) The Principal shall refer the cases of malpractices in internal assessment tests and semester end examinations to a malpractice enquiry committee constituted by him for the purpose. Such committee shall follow the approved levels of punishment. The Principal shall take necessary action against the erring students based on the recommendations of the committee.

iii) Any action by the candidate trying to get undue advantage in theperformance or trying to help another, or derive the same through unfairmeans is punishable according to the provisions contained.

27. 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 may be waived for students who have done similar/equivalent courses. If waived for a student, then the student must take an extra elective course in its place. It is recommended that students should complete the compulsory courses (or equivalents) before registering for the electives.

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 by opting for the courses offered through various verticals/tracks under Open Electives.

28. Guidelines for offering Honors

i) 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.

ii) 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.

iii) 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).

iv) 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.

v) Separate class work and timetable shall be arranged for the courses offered under Honors program.

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

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

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

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

x) 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.

xi) 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.

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

29. 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

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.

30. 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.

CSE - COURSE STRUCTURE

I Year I Semester

S. No.	Course Code	Name of Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1	EG4501	Communicative English	2	0	0	2
2	MA4501	Linear Algebra & Calculus	3	0	0	3
3	CH4501	Chemistry	3	0	0	3
4	CM4501	Basic Civil & Mechanical Engineering	3	0	0	3
5	CT4501	Introduction to Programming	3	0	0	3
6	EG4502	Communicative English Lab	0	0	2	1
7	CH4502	Chemistry Lab	0	0	2	1
8	CT4502	Computer Programming Lab	0	0	3	1.5
9	ME4502	Engineering Workshop	0	0	3	1.5
10	HW4501	Health and Wellness, Yoga and Sports	-	-	1	0.5
Total			**14**	**0**	**11**	**19.5**

I Year II Semester

S. No.	Course Code	Name of Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1	PH4501	Engineering Physics	3	0	0	3
2	MA4502	Differential Equations & Vector Calculus	3	0	0	3
3	EE4501	Basic Electrical & ElectronicsEngineering	3	0	0	3
4	ME4501	Engineering Graphics	1	0	4	3
5	CT4504	Data Structures	3	0	0	3
6	PH4502	Engineering Physics Lab	0	0	2	1
7	EE4502	Electrical & Electronics Engineering Workshop	0	0	3	1.5
8	CT4505	Data Structures Lab	0	0	3	1.5
9	CT4503	IT Workshop	0	0	2	1
10	NS4501	NSS/NCC/Scouts& Guides & Community Service	-	-	1	0.5
Total			**13**	**0**	**15**	**20.5**

II Year I Semester

Sl. No.	Course Code	Name of Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1	UH4501	Universal human values – understanding harmony and Ethical human conduct	2	1	0	3
2	MA4505	Discrete Mathematics and Graph Theory	3	0	0	3
3	CT4510	Digital Logic and Computer Organization	3	0	0	3
4	CT4511	Advanced Data Structures and Algorithm Analysis	3	0	0	3
5	CT4512	Object Oriented Programming Through Java	3	0	0	3
6	CT4513	Advanced Data Structures and Algorithms Lab	0	0	3	1.5
7	CT4514	Object Oriented Programming Through Java Lab	0	0	3	1.5
8	CT4515	Python Programming	0	1	2	2
Total			**14**	**2**	**8**	**20**

II Year II Semester

Sl. No.	Course Code	Name of Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1	BA4501	Managerial Economics and Financial Analysis	2	0	0	2
2	MA4506	Probability and Statistics	3	0	0	3
3	CT4518	Operating Systems	3	0	0	3
4	CT4517	Database Management Systems	3	0	0	3
5	CT4519	Software Engineering	2	1	0	3
6	CS4501	Operating Systems Lab	0	0	3	1.5
7	CT4520	Database Management Systems Lab	0	0	3	1.5
8	CT4521	Full Stack Development – I	0	1	2	2
9	DT4501	Design Thinking and Innovation	1	0	2	2
10	EN4501	Environmental Science	2	0	0	-
Total			**16**	**2**	**10**	**21**
Mandatory Community Service Project Internship of 08 weeks duration during summer vacation						

COMMUNICATIVE ENGLISH

(Common to All Branches)

I Year – I Semester

Lecture :2	Internal Marks : 30
Credits :2	External Marks : 70

Course Objective

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

Course Outcomes

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

UNIT I

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

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.

Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.

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

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

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

Vocabulary: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

UNIT II

Lesson: NATURE: The Brook by Alfred Tennyson (Poem)

Listening: Answering a series of questions about main ideas and supporting ideas after listening to audio texts.

Speaking: Discussion in pairs/small groups on specific topics followed by short structuretalks.

Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Writing: Structure of a paragraph - Paragraph writing (specific topics) **Grammar:** Cohesive devices - linkers, use of articles and zero article; prepositions.

Vocabulary: Homonyms, Homophones, Homographs.

UNIT III

Lesson: BIOGRAPHY: Elon Musk

Listening: Listening for global comprehension and summarizing what is listened to.

Speaking: Discussing specific topics in pairs or small groups and reporting what isdiscussed

Reading: Readinga text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.

Writing: Summarizing, Note-making, paraphrasing

Grammar: Verbs - tenses; subject-verb agreement; Compound words, Collocations
Vocabulary: Compound words, Collocations

UNIT IV
Lesson: INSPIRATION: The Toys of Peace by Saki

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

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

Listening: Identifying key terms, understanding concepts and answering a series ofrelevant questions that test comprehension.
Speaking: Formal oral presentations on topics from academic contexts
Reading: Reading comprehension.
Writing: Writing structured essays on specific topics.
Grammar: Editing short texts identifying and correcting common errors in grammar andusage (articles, prepositions, tenses, subject verb agreement)
Vocabulary: Technical Jargons

Textbooks

1. Pathfinder: Communicative English for Undergraduate Students, 1st Edition, OrientBlack Swan, 2023
2. **Extensive Reading (for internal assessment only)**

   The following simplified classics, one for each mid-semester, from the series, *Great Stories in Easy English*, published by S. Chand & Company Limited:

   - *Kidnapped* by R L Stevenson
   - *Little Women* by Louisa May Alcott

Reference Books

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

Web Resources
GRAMMAR:

1. www.bbc.co.uk/learningenglish
2. https://dictionary.cambridge.org/grammar/british-grammar/
3. www.eslpod.com/index.html
4. https://www.learngrammar.net/
5. https://english4today.com/english-grammar-online-with-quizzes/
6. https://www.talkenglish.com/grammar/grammar.aspx

VOCABULARY

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

LINEAR ALGEBRA AND CALCULUS

(Common to All Branches)

I Year – I Semester

Lecture :3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

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

Course Outcomes

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

- develop and use of matrix algebra techniques that are needed by engineers for practical applications.
- compute eigen values and eigenvectors of real matrices.
- utilize mean value theorems to real life problems.
- familiarize with functions of several variables, which are useful in optimization.
- measure areas and volumes using double and triple integrals.

Course Content

UNIT I Matrices

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

UNIT II Eigenvalues, Eigenvectors and Orthogonal Transformation

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

UNIT III Calculus

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

UNIT IV Partial differentiation and Applications (Multi variable calculus)

Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobians, Functional dependence, maxima and minima of functions of two variables, method of Lagrange multipliers.

UNIT V Multiple Integrals (Multi variable Calculus)

Double integrals, triple integrals, change of order of integration, change of variables to polar, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

Textbooks

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

Reference Books

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

CHEMISTRY

(Common to EEE, ECE, IOT, CSE, IT, AI&DS & CSE(AI&ML))

I Year – I Semester

Lecture :3	Internal Marks : 30
Credits :3	External Marks : 70

Course Objectives

- To impart the knowledge of bonding in the determination of properties of molecules.
- To impart the knowledge of principles and applications of electrochemistry and engineering materials.

Course Outcomes

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

- analyze the properties of molecules basing on fundamentals of quantum mechanics and bonding models.
- explain the properties and applications of modern materials used in electronic devices.
- solve the numerical problems on emf and identify the electrochemistry involved in sensors and batteries.
- explain the properties and applications of polymers.
- identify the applications of spectrophotometric techniques and chromatographic techniques.

UNIT-I: Structure and Bonding Models:

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

UNIT-II: Modern Engineering materials

Semiconductors - Introduction, basic concept, application
Super conductors - Introduction basic concept, applications.
Supercapacitors: Introduction, Basic Concept-Classification – Applications.
Nano materials: Introduction, classification, properties and applications of Fullerenes, carbon nano tubes and Graphenes nanoparticles.

UNIT-III: Electrochemistry and Applications

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

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

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

UNIT-IV: Polymer Chemistry

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

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

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

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

UNIT-V: Instrumental Methods and Applications

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

Textbooks

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

Reference Books

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

BASIC CIVIL AND MECHANICAL ENGINEERING

(Common to All Branches)

I Year – I Semester

Lecture :3	Internal Marks : 30
Credits :3	External Marks : 70

PART A: BASIC CIVIL ENGINEERING

Course Objectives

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

Course Outcomes

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

- Gain knowledge on various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society
- Apply the concepts of surveying and to determine the distances, angles and levels
- Realize the importance of Water Storage & Conveyance Structures, Transportation and Environmental Engineering in Nation's economy

UNIT I Basics of Civil Engineering:

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

UNIT II Surveying:

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

UNIT III Transportation Engineering

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

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

Textbooks:

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

Reference Books

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

PARTB: BASIC MECHANICAL ENGINEERING

Course Objectives

The students after completing the course are expected to

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

Course Outcomes

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

- Select suitable material for the given application.
- Apply the principles of CNC machining and 3D printing to create simple components.
- Examine the working cycles of engines like Otto, Diesel, and IC engines.
- Apply the knowledge of mechanical power transmission systems to solve real-world engineering problems.
- Evaluate the potential applications of robotics in different industries.

UNIT I

Introduction to Mechanical Engineering: Role of Mechanical Engineering in Industries and Society-Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.

Engineering Materials - Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials.

UNIT II

Manufacturing Processes: Principles of Casting, Forming, joining processes, Machining, Introduction to CNC machines, 3D printing, and smart manufacturing.

Thermal Engineering: Working principle of Boilers, Otto cycle, Diesel cycle, Refrigeration and air-conditioning cycles, IC engines, 2-Stroke and 4-Stroke engines, S I CI Engines, Components of Electric and Hybrid Vehicles.

UNIT III

Power plants - Working principle of Steam, Diesel, Hydro, Nuclear power plants.

Mechanical Power Transmission - Belt Drives, Chain, Rope drives, Gear Drives and their applications.

Introduction to Robotics - Joints & links, configurations, and applications of robotics.

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

Textbooks

1. Internal Combustion Engines by V.Ganesan, By Tata Mc Graw Hill publications (India) Pvt. Ltd.
2. A text book of Theory of Machines by S. S. Rattan, Tata Mc Graw Hill Publications, (India) Pvt. Ltd.

3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengage learning India Pvt. Ltd.

Reference Books:

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

INTRODUCTION TO PROGRAMMING

(Common to All Branches)

I Year – I Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To foster logical thinking and problem – solving skills using programming.
- To familiarize students with programming concepts such as data types, control structures, functions, arrays and files.

Course Outcomes

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

- solve problems using the concepts of algorithm and algorithmic thinking.
- use control structures in programming for solving the problems
- apply the concepts of arrays and strings in problem solving.
- use pointers and user-defined data types in developing the programs
- write functions to increase the reusability of code and use various file handling functions for efficient handling of data.

UNIT I: Introduction to Programming and Problem Solving

History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program Algorithms, flowcharts (Using Dia Tool), pseudo code. Introduction to Compilation and Execution, Primitive Data Types, Variables, and Constants, Basic Input and Output, Operations, Type Conversion, and Casting.

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

UNIT II: Control Structures

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

UNIT III: Arrays and Strings

Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Introduction to Strings.

UNIT IV: Pointers & User Defined Data types

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

UNIT V: Functions & File Handling

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

Textbooks

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

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

COMMUNICATIVE ENGLISH LAB

(Common to All Branches)

I Year – I Semester

Practical :2	Internal Marks : 30
Credits :1	External Marks : 70

Course Objectives

The main objective of introducing this course, Communicative English Laboratory, is to expose the students to a variety of self-instructional, learner friendly modes of language learning. The students will get trained in basic communication skills and also make them ready to face job interviews.

Course Outcomes

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

List of Topics:

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

Suggested Software:

Walden Infotech Young
India Films

Reference Books:

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

CHEMISTRY LAB

(Common to EEE, ECE, IoT, CSE, IT, AI &DS & CSE(AI &ML))

I Year – I Semester

Practical :2	Internal Marks : 30
Credits :1	External Marks : 70

Course Objectives

- To develop the skill on chemical and instrumental methods of analysis.
- To acquire the skill in preparation of synthetic materials.

Course Outcomes

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

- perform quantitative analysis by using chemical and instrumental methods.
- synthesize polymers and nanomaterials
- verify Beer-Lambert's law.
- calculate strength of an acid in Pb-acid battery.

List of Experiments

(Any TEN of the listed experiments are to be conducted)

1. Measurement of 10Dq by spectrophotometric method.
2. Conductometric titration of strong acid vs. strong base.
3. Conductometric titration of weak acid vs. strong base.
4. Determination of cell constant and conductance of solutions.
5. Potentiometry - determination of redox potentials and emfs.
6. Determination of Strength of an acid in Pb-Acid battery.
7. Preparation of a Bakelite.
8. Verify Lambert-Beer's law.
9. Wavelength measurement of sample through UV-Visible Spectroscopy.
10. Identification of simple organic compounds by IR.
11. Preparation of nanomaterials by precipitation method.
12. Estimation of Ferrous Iron by Dichrometry.

Reference

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

COMPUTER PROGRAMMING LAB

(Common to All Branches)

I Year – I Semester

Practical :3	Internal Marks : 15
Credits :1.5	External Marks : 35

Course Objectives

- To give students hands-on experience in problem solving and train them on the concepts of C –programming language.

Course Outcomes

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

- develop and trace the execution of programs written in C language. CO2: select the right control structure for solving the problem.
- develop C programs using structures and unions.
- develop, debug and execute programs to demonstrate the applications of arrays, functions and basic concepts of pointers in C.
- create and access files using file handling functions.

UNIT I WEEK 1

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

Suggested Experiments/Activities:

Tutorial 1: Problem-solving using Computers.

Lab1: Familiarization with programming environment

i) Basic Linux environment and its editors like Vi, Vim & Emacs etc.
ii) Exposure to Turbo C, gcc
iii) Writing simple programs using printf(), scanf()

WEEK 2

Objective: Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.

Suggested Experiments /Activities:

Tutorial 2: Problem-solving using Algorithms and Flow charts.

Lab 1: Converting algorithms/flow charts into C Source code.

Developing the algorithms/flowcharts for the following sample programs

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

WEEK 3

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

Suggested Experiments/Activities:

Tutorial 3: Variable types and type conversions:

Lab 3: Simple computational problems using arithmetic expressions.

i) Finding the square root of a given number
ii) Finding compound interest
iii) Area of a triangle using heron's formulae
iv) Distance travelled by an object

UNIT II WEEK 4

Objective: Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works.

Suggested Experiments/Activities:

Tutorial4: Operators and the precedence and as associativity:

Lab4: Simple computational problems using the operator' precedence and associativity

i) Evaluate the following expressions.
   a. A+B*C+(D*E) + F*G
   b. A/B*C-B+A*D/3
   c. A+++B---A
   d. J= (i++) + (++i)

ii) Find the maximum of three numbers using conditional operator

iii) Take marks of 5 subjects in integers, and find the total, average in float

WEEK 5

Objective: Explore the full scope of different variants of "if construct" namely if-else, nullelse, if-else if*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for "if construct".

Suggested Experiments/Activities:

Tutorial 5: Branching and logical expressions:

Lab 5: Problems involving if-then-else structures.

i) Write a C program to find the max and min of four numbers using if-else.

ii) Write a C program to generate electricity bill.

iii) Find the roots of the quadratic equation.

iv) Write a C program to simulate a calculator using switch case.

v) Write a C program to find the given year is a leap year or not.

WEEK 6

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

Suggested Experiments/Activities:

Tutorial 6: Loops, while and for loops

Lab 6: Iterative problems e.g., the sum of series

i) Find the factorial of given number using any loop.

ii) Find the given number is a prime or not.

iii) Compute sine and cos series

iv) Checking a number palindrome

v) Construct a pyramid of numbers.

UNIT III WEEK 7

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

Suggested Experiments/Activities:

Tutorial 7: 1 D Arrays: searching.

Lab 7:1D Array manipulation, linear search

i) Find the min and max of a 1-D integer array.

ii) Perform linear search on1D array.

iii) The reverse of a 1D integer array

iv) Find 2's complement of the given binary number.

v) Eliminate duplicate elements in an array.

WEEK 8

Objective: Explore the difference between other arrays and character arrays that can be used as Strings

by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.
Suggested Experiments/Activities:
Tutorial 8: 2 D arrays, sorting and Strings.
Lab 8: Matrix problems, String operations, Bubble sort

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

UNIT IV WEEK 9

Objective: Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C Suggested Experiments/Activities:
Tutorial 9: Pointers, structures and dynamic memory allocation
Lab 9: Pointers and structures, memory dereference.

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

WEEK 10

Objective: Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures
Suggested Experiments/Activities:
Tutorial 10: Bitfields, Self-Referential Structures, Linked lists
Lab10 : Bitfields, linked lists Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit- fields

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

UNIT V WEEK 11

Objective: Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration
Suggested Experiments/Activities:
Tutorial 11: Functions, call by value, scope and extent,
Lab 11: Simple functions using call by value, solving differential equations using Eulers theorem.

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

WEEK 12

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

Tutorial 12: Recursion, the structure of recursive calls
Lab 12: Recursive functions

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

WEEK 13

Objective: Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers Suggested Experiments/Activities:
Tutorial 13: Call by reference, dangling pointers
Lab 13: Simple functions using Call by reference, Dangling pointers.

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

WEEK14

Objective: To understand data files and file handling with various file I/O functions. Explore the differences between text and binary files.
Suggested Experiments/Activities:
Tutorial 14: File handling
Lab 14: File operations

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

Textbooks

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

Reference Books

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

ENGINEERING WORKSHOP

(Common to All Branches)

I Year – I Semester

Practical :3	Internal Marks : 30
Credits :1.5	External Marks : 70

Course Objectives

- To familiarize students with wood working, sheet metal operations, fitting, electrical house wiring skills, and basic repairs of two-wheeler vehicle.

Course Outcomes

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

- demonstrate the correct use of safety equipment and procedures
- fabricate the lap joint, dovetail joint with the use of woodworking tools.
- utilize sheet metal tools to create tapered tray, conical funnel, elbow pipe and perform brazing.
- perform fitting exercises such as v-fit, dovetail fit, semicircular fit, and bicycle tire puncture and change.
- create electrical connections, including parallel and series circuits, and tube lights
- create green sand moulds for provided patterns.
- perform arc and gas welding to create lap and butt joints.
- create pipe joints with couplings for the same diameter and reducers for different diameters. perform basic repairs and maintenance on a two-wheeler vehicle

1. **Demonstration**: Safety practices and precautions to be observed in workshop.
2. **Wood Working:** Familiarity with different types of woods and too lsused in wood working and make following joints.
   a) Half Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint
3. **Sheet Metal Working**: Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets.
   a) Tapered tray b) Conical funnel c) Elbow pipe d)Brazing
4. **Fitting:** Familiarity with different types of tools used in fitting and do the following fitting exercises.
   a) V- fit b) Dovetail fit c)Semi-circular fit d) Bicycle tire puncture and change of two-wheeler tyre
5. **Electrical Wiring**: Familiarity with different types of basic electrical circuits and make the following connections.
   a) Parallel and series b)Two-way switch c) Go down lighting
   d) Tube light e) Three phase motor f) Soldering of wires
6. **Foundry Trade:** Demonstration and practice on Moulding tools and processes, Preparation of Green sand Moulds for given Patterns.
7. **Welding Shop**: Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint.
8. **Plumbing:** Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters.
9. **Basic repairs of Two-wheeler vehicle** Demonstration of working of two-wheeler vehicle and its repairs.

Text books

1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published, 2019. Work shop Processes, Practices and Materials; Bruce J. Black, Routl edge publishers, 5th Edn. 2015.
2. A Course in Workshop Technology Vol I. & II, B.S. Raghu wanshi, Dhanpath Rai & Co., 2015 & 2017.

Reference Books

1. Elements of Workshop Technology, Vol. I by S.K. Hajra Choudhary & Others, Media Promoters and Publishers, Mumbai, 2007, 14th Edition.
2. Workshop practice by H.S. Bawa, Tata-McGraw Hill, 2004.
3. Wiring Estimating, Costing and Contracting; Soni P.M. &Upadhyay P.A; Atul Prakasham, 2022.

HEALTH AND WELLNESS, YOGA AND SPORTS

(Common to All Branches of Engineering)

I Year – I Semester

Practice :1 Internal Marks : 100

Credits :0.5

Course Objectives

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

Course Outcomes

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

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

UNIT 1

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

Activities:

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

UNIT II

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

Activities:

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

UNIT III

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

Activities:

i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc. Practicing general and specific warm up, aerobics
ii) Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running.

Reference Books

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

General Guidelines:

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

Evaluation Guidelines

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

ENGINEERING PHYSICS

(Common for all Branches)

I Year – II Semester

Lecture :3	Internal Marks : 30
Credits :3	External Marks : 70

Course Objectives

- To apply principles of wave optics for Engineering Applications
- To Analyze crystal parameters to investigate crystal Structures
- To Impart the knowledge of solid state materials with characteristic utility in various engineering applications

Course Outcomes

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

- Analyze the intensity variation of light due to polarization, interference and diffraction.
- Familiarize with the basics of crystals and their structures.
- Summarize various types of polarization of dielectrics and classify the magnetic materials.
- Explore the basic concepts of Quantum Mechanics and the Free electron theory of solids.
- Identify conductivity mechanism in semiconductors

UNIT I Wave Optics

Interference: Introduction - Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colours in thin films- Newton's Rings, Determination of wavelength and refractive index.

Diffraction: Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit & N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative). Polarization: Introduction -Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

UNIT II Crystallography and X-ray diffraction

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl) planes.

X-ray diffraction: Bragg's law - X-ray Diffractometer – crystal structure determination by Laue's and powder methods

UNIT III Dielectric and Magnetic Materials

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector – Relation between the electric vectors - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation

polarizations (Qualitative) - Lorentz internal field - Clausius- Mossotti equation - complex dielectric constant – Frequency dependence of polarization – dielectric loss

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

UNIT IV Quantum Mechanics and Free electron Theory

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory – electrical conductivity based on quantum free electron theory - Fermi-Dirac distribution - Density of states - Fermi energy

UNIT V Semiconductors

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.

Text Books

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

Reference Books

1. Engineering Physics - B.K. Pandey and S. Chaturvedi, Cengage Learning 2021.
2. Engineering Physics - Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.
3. Engineering Physics" - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press. 2010
4. Engineering Physics - M.R. Srinivasan, New Age international publishers (2009).

Web Resources: https://www.loc.gov/rr/scitech/selected-internet/physics.html

DIFFERENTIAL EQUATIONS & VECTOR CALCULUS

(Common to All Branches)

I Year – II Semester

Lecture :3	Internal Marks : 30
Credits :3	External Marks : 70

Course Objectives

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

Course Outcomes

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

- solve the first order differential equations related to various engineering fields.
- find the solutions of higher order linear differential equations.
- identify solution methods for partial differential equations that model physical processes.
- interpret the physical meaning of different operators such as gradient, curl and divergence.
- estimate the work done against a field, circulation and flux using vector calculus also verify the relation between line, surface and volume integrals using integral theorems.

UNIT I Differential equations of first order and first degree

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

UNIT II Linear differential equations of higher order (Constant Coefficients)

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

UNIT III Partial Differential Equations

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Homogeneous Linear Partial differential equations with constant coefficients.

UNIT IV Vector differentiation

Scalar and vector point functions, vector operator Del, Del applies to scalar point functions- Gradient, Directional derivative, Del applied to vector point functions-Divergence and Curl, vector identities.

UNIT V Vector integration

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

Textbooks

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

Reference Books

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

3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018,5th Edition.
4. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
5. Higher Engineering Mathematics, B. V. Ramana, , McGraw Hill Education, 2017

BASIC ELECTRICAL & ELECTRONICS ENGINEERING

(Common to All Branches)

I Year – II Semester

Lecture :3	Internal Marks : 30
Credits :3	External Marks : 70

PART A: BASIC ELECTRICAL ENGINEERING

Course Objectives

To expose the students to the fundamentals of dc and ac circuits, electrical machines, measuring instruments, operation of various power generation systems, electricity bill and electrical safety measures.

Course Outcomes

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

- apply fundamental laws / concepts to derive various equations related to impedance, voltage, current and power in electrical circuits.
- describe the construction and working principles of electrical machines, measuring instruments and power generation stations.
- calculate the electrical load / electrical bill for domestic premises and explain the electrical safety measures.

UNIT I DC & AC Circuits

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

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

UNIT II Machines and Measuring Instruments

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

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

UNIT III Energy Resources, Electricity Bill & Safety Measures

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

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

Textbooks

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

2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, ThirdEdition

Reference Books

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

Web Resources

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

PART B: BASIC ELECTRONICS ENGINEERING

Course Objectives

To teach the fundamentals of semiconductor devices, basic electronic circuits and instrumentation and principles of digital electronics.

Course Outcomes

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

- expound the operation and characteristics of various diodes, transistors and amplifiers.
- describe the working of rectifiers, regulators, amplifiers with its frequency response, and electronic instrumentation system.
- explicate the various number systems, logic gates, simple combinational circuits and sequential circuits

UNIT I SEMICONDUCTOR DEVICES

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

UNIT II BASIC ELECTRONIC CIRCUITS AND INSTRUMENTTAION

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

UNIT III DIGITAL ELECTRONICS

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

Textbooks:

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

Reference Books:

2. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.
3. Santiram Kal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall,India, 2002.
4. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version,Pearson Education,2009.

End examination 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 of5 marks such that each question carries 1 mark.
iii) In each part, questions from 2 to 4, there shall be either/or type questions of 10 markseach. 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 eachquestion.

ENGINEERING GRAPHICS

(Common to All Branches)

I Year – II Semester

Lecture :1	Practice :4	Internal Marks	: 30
Credits :3		External Marks	: 70

Course Objectives

- To impart basic knowledge and skills required to prepare engineering drawings

Course Outcomes

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

- demonstrate the ability to construct regular polygons and curves.
- develop various scales to accurately represent measurements on engineering drawings.
- prepare orthographic projections for points, lines and planes.
- create projections for solids.
- demonstrate the ability to section and develop surfaces for simple geometric shapes.
- construct orthographic views from isometric views and vice versa
- utilize computer graphics tools to create 2D and 3D drawings of objects.

UNIT I

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.

Curves: construction of ellipse, parabolaand hyperbola by general, Cycloids, Involutes, Normal and tangent to Curves.

Scales: Plain scales, diagonal scales and vernier scales.

UNIT II

Orthographic Projections: Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.

Projections of Straight Lines: Projections of straight lines parallel to both reference planes,perpendicular to one reference plane and parallel to other reference plane, inclined to onereference plane and parallel to the other reference plane. Projections of Straight Line Inclinedtoboth thereferenceplanes

Projections of Planes: regular planes Perpendicular to both reference planes, parallel to onereference plane and inclined to the other reference plane; plane inclined to both the referenceplanes.

UNIT III

Projections of Solids: Types of solids: Poly hedra and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane.

UNIT IV

Sections of Solids: Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only.

Development of Surfaces: Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

UNITV

Conversion of Views: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Computer graphics: Creating 2D & 3D drawings of objects including PCB and Transformations using Auto CAD (Not for end examination).

Textbook:

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

Reference Books:

1. Engineering Drawing, K. L. Narayana and P. Kannaiah,Tata Mc Graw Hill, 2013.
2. Engineering Drawing, M. B. Shahand B.C.Rana, Pearson Education Inc, 2009.
3. Engineering Drawing with an Introduction to Auto CAD, Dhananjay Jolhe, Tata Mc Graw Hill, 2017.

DATA STRUCTURES

(Common to CSE, IT, AI&DS, & CSE(AI&ML))

I Year – II Semester

Lecture : 3	Internal Marks : 30
Credits :3	External Marks : 70

Course Objectives

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

Course Outcomes

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

- explain the role of linear data structures in organizing and accessing data efficiently in algorithms.
- design, implement, and apply linked lists for dynamic data storage.
- develop programs using stacks to handle recursive algorithms, and manage program states, and solve related problems.
- demonstrate implementations of queues and their applications.
- describe binary search trees and design hash-based solutions for specific problems.

UNIT I: Introduction to Linear Data Structures

Definition and importance of linear data structures, Abstract data types (ADTs) and their implementation, Overview of time and space complexity analysis for linear data structures. Searching Techniques: Linear & Binary Search, Sorting Techniques: Bubble sort, Selection sort, InsertionSort

UNIT II: Linked Lists

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

UNIT III: Stacks

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

UNIT IV: Queues and Deques

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

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

UNIT V: Trees and Hashing

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, Applications of hashing in unique identifier generation, caching, etc.

Textbooks

1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2ndEdition.
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

ENGINEERING PHYSICS LAB

(Common to All Branches)

I Year – II Semester

Practical :2	Internal Marks : 30
Credits :1	External Marks : 70

Course Objectives

To study the concepts of optical phenomenon like interference, diffraction etc., recognize the importance of energy gap in the study of conductivity and Hall effect in semiconductors and study the parameters and applications of dielectric and magnetic materials by conducting experiments.

Course Outcomes

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

- Operate optical instruments like travelling microscope and spectrometer.
- Estimate the wavelengths of different colours using diffraction grating.
- Plot the intensity of the magnetic field of circular coil carrying current with distance.
- Evaluate dielectric constant and magnetic susceptibility for dielectric and magnetic materials respectively.
- Calculate the band gap of a given semiconductor, Identify the type of semiconductor using Hall effect.
- Identify unknown frequency and verify laws of vibrations

List of Experiments:

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

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

References:

- A Textbook of Practical Physics - S. Balasubramanian, M.N. Srinivasan, S. Chand Publishers, 2017.

Web Resources

- www.vlab.co.in
- https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype

ELECTRICAL AND ELECTRONICS ENGINEERING WORKSHOP

(Common to All Branches)

I Year – II Semester

Practical :3	Internal Marks : 30
Credits :1.5	External Marks : 70

PART A: ELECTRICAL ENGINEERING LAB

Course Objectives

To impart knowledge on the fundamental laws & theorems of electrical circuits, characteristics of dc generator, measurement of resistance, earth resistance, power and power factor, and energy calculations.

Course Outcomes

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

- measure voltage, current, power and power factor in an electrical circuit.
- verify the superposition theorem.
- measure resistance and earth resistance using wheat stone bridge and megger respectively.
- determine critical field resistance and critical speed of dc shunt generator and compute the electrical energy for domestic premises.

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.
    a. 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.
    a. Provide some exercises so that measuring instruments are learned to be used by the students.
3. Components:
    a. Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, colour coding package, symbol, cost etc.
    b. 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

List of experiments

1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Measurement of Resistance using Wheat stone bridge
4. Magnetization Characteristics of DC shunt Generator
5. Measurement of Power and Power factor using Single-phase wattmeter
6. Measurement of Earth Resistance using Megger
7. Calculation of Electrical Energy for Domestic Premises

Reference Books:

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

Note: Minimum Six Experiments to be performed.

PART – B ELECTRONICS ENGINEERING

Course Objectives

- To impart knowledge on the principles of digital electronics and fundamentals of Electronic devices & their applications.

Course Outcomes

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

- Identify and test various electronic components and demonstrate the usage of electronic measuring instruments.
- Analyse the electrical behaviour of various electronic devices and digital logic circuits.
- Design and implementation of various electronic circuits for the given specifications.
- Test and verify the operation of electronic circuits using modern simulation tools.

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
8. using ICs.
9. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs.

Tools / Equipment Required

- DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices.

References:

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009.

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

DATA STRUCTURES LAB

(Common to CSE, IT, AI&DS & CSE (AI&ML))

I Year – II Semester

Practical :3	Internal Marks : 30
Credits :1.5	External Marks : 70

Course Objectives

- To demonstrate the implementation of various sorting and searchingtechniques.
- To develop programs for the implementation of linear and non-linear datastructures.

Course Outcomes

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

- implement various sorting and searching algorithms.
- design and implement linked lists and perform various operations on them.
- develop programs for implementing stacks and queues using arrays and linked lists and perform various operations on them.
- Write code for arithmetic expression evaluation and conversion using a stack.
- develop code for the creation of binary search trees and demonstrateoperations on them.
- create a hash table and perform insert, delete and search operations on it.

List of Experiments

Exercise 1: Array Manipulation

a) Write a program to reverse an array.
b) C Programs to implement the Searching Techniques – Linear & Binary Search
c) C Programs to implement Sorting Techniques – Bubble, Selection and InsertionSort

Exercise 2: Linked List Implementation

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

Exercise 3: Linked List Applications

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

Exercise 4: Double Linked List Implementation

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

Exercise 5: Stack Operations

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

Exercise 6: Queue Operations

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

Exercise 7: Stack and Queue Applications

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

Exercise 8: Binary Search Tree

a) Implementing a BST using Linked List.
b) Traversing of BST.

Exercise 9: Hashing

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

Textbooks

1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2ndEdition.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, SusanAnderson Freed, Silicon Press, 2008

Reference Books

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

IT WORKSHOP

(Common to All Branches)

I Year – II Semester

Practical :2	Internal Marks : 30
Credits :1	External Marks : 70

Course Objectives

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

Course Outcomes

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

- Perform Hardware troubleshooting.
- Safeguard computer systems from viruses/worms.
- Prepare document/ Presentation on a given topic.
- Perform calculations using spreadsheets.
- Apply AI tools/Chat GPT to do search,creative writing and language translation.

PC Hardware & Software Installation

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

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

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

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

Task 5: Every student should install BOSS on the computer. The system should be configured as 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

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

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

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

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

LaTeX and WORD

Task 1 Word Orientation: The mentor needs to give an overview of LaTeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of LaTeX 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 LaTeX and word Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 2: Using LaTeX 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 LaTeX and Word.

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

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

EXCEL

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

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

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

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

POWER POINT

Task 1: Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.
Task 2: Interactive presentations - Hyperlinks, Inserting Images, Clip Art, Audio, Video, Objects, Tables and Charts.

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

AI TOOLS ChatGPT

Task 1: Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them.
Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"

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

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

Task 3: Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.

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

Reference Books:

a. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003
b. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech, 2013, 3rd edition
c. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2012, 2nd edition
d. PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft)
e. LaTeX Companion, Leslie Lamport, PHI/Pearson.
f. IT Essentials PC Hardware and Software Companion Guide, David Anfins on and Ken Quamme. CISCO Press, Pearson Education, 3rd edition
g. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan CISCO Press, Pearson Education, 3rd edition

NSS/NCC/SCOUTS AND GUIDES / COMMUNITY SERVICE

(Common to All branches)

I Year – II Semester

Practical :1 Internal Marks : 100

Credits :0.5

Course Objectives

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

Course Outcomes

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

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

UNIT I Orientation

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

Activities

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

UNIT II Nature & Care

Activities

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

UNIT III Community Service

Activities

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

Reference Books

1. Nirmalya Kumar Sinha & Surajit Majumder, A Text Book of National Service Scheme Vol;.I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6)
2. Red Book - National Cadet Corps – Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defence, New Delhi

3. Davis M. L. and Cornwell D. A., “Introduction to Environmental Engineering”, McGraw Hill, New York 4/e 2008
4. Masters G. M., Joseph K. and Nagendran R. “Introduction to Environmental Engineering and Science”, Pearson Education, New Delhi. 2/e 2007
5. Ram Ahuja. Social Problems in India, Rawat Publications, New Delhi.

General Guidelines

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

Evaluation Guidelines

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

UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT

(Common to EEE,ECE and CSE)

II Year – I Semester

Lecture : 2	Tutorial : 1	Internal Marks	: 30
Credits : 3		External Marks	: 70

==========

Course Objectives

- To help understand the need, basic guidelines, content and process of value education.
- To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
- To understand the harmony in nature and existence.
- To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life.

Course Outcomes:

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

- analyze the essentials of human values and skills, self-exploration, happiness and prosperity.
- evaluate coexistence of the "I" with the body.
- identify and evaluate the role of harmony in family, society and universal order.
- examine the holistic perception of harmony at all levels of existence.
- develop appropriate technologies and management patterns to create harmony in professional and personal lives.

Course Content

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

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

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

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

Lecture 2 : Understanding Value Education

Tutorial 1 : Practice Session PS1 Sharing about Oneself

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

Lecture 4 : Continuous Happiness and Prosperity – the Basic Human Aspirations

Tutorial 2 : Practice Session PS2 Exploring Human Consciousness

Lecture 5 : Happiness and Prosperity – Current Scenario

Lecture 6 : Method to Fulfill the Basic Human Aspirations

Tutorial 3 : Practice Session PS3 Exploring Natural Acceptance

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

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

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

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

Lecture 9 : The body as an Instrument of the self

Lecture 10 : Understanding Harmony in the self

Tutorial 5 : Practice Session PS5 Exploring Sources of Imagination in the self
Lecture 11 : Harmony of the self with the body
Lecture 12 : Programme to ensure self-regulation and Health
Tutorial 6 : Practice Session PS6 Exploring Harmony of self with the body

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

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

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

Lecture 19 : Understanding Harmony in the Nature
Lecture 20 : Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature
Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature
Lecture 21 : Realizing Existence as Co-existence at All Levels
Lecture 22 : The Holistic Perception of Harmony in Existence
Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence.

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

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

Practice Sessions:

UNIT I – Introduction to Value Education

PS1 Sharing about Oneself
PS2 Exploring Human Consciousness
PS3 Exploring Natural Acceptance

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

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

UNIT IV – Harmony in the Nature (Existence)

PS10 Exploring the Four Orders of Nature

PS11 Exploring Co-existence in Existence

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

PS12 Exploring Ethical Human Conduct

PS13 Exploring Humanistic Models in Education

PS14 Exploring Steps of Transition towards Universal Human Order

Readings:

Textbook and Teachers Manual

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

b. The Teacher's Manual: R R Gaur, R Asthana, and 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. A Nagaraj, "JeevanVidya: EkParichaya", JeevanVidya Prakashan, Amarkantak, 1999.
2. A. N. Tripathi, "Human Values", New Age International Publishers, 2004.
3. Annie Leonard, "The Story of Stuff", Free Press Publishers, 2010.
4. Mohandas Karamchand Gandhi, "The Story of My Experiments with Truth", 1st edition, Fingerprint Publishers, 2009.
5. E. F Schumacher, "Small is Beautiful", Vintage Publishers, 2010.
6. Cecile Andrews , "Slow is Beautiful", New Society Publishers, 2006.
7. J C Kumarappa, "Economy of Permanence", Sarva Seva Sangh Prakashan, 2017.
8. Pandit Sunderlal, "Bharat Mein Angreji Raj", Publications Division, M/O Information & Broadcasting, Govt. of India, 2016.
9. Dharampal,"Rediscovering India", Stosius Inc/Advent Books Division, 1983.
10. Mohandas K. Gandhi, "Hind Swaraj or Indian Home Rule", 15th edition, Educa Books, 2011.
11. Maulana Abdul Kalam Azad, "India Wins Freedom", 1st edition, Orient BlackSwan, 1988.
12. Romain Rolland, "Life of Vivekananda", 4th Impression edition, Advaita Ashrama press, 2010.
13. Romain Rolland, "Mahatma Gandhi**",** Maple Press , 2010.

Mode of Conduct:

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

Tutorial hours are to be used for practice sessions.

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

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

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

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials)

would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

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

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

Online Resources:

1. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201Introduction%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/D3S2%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%20FDPSI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-S2A%20Und%20Nature-Existence.pdf
7. https://fdp-si.aicteindia.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%202325%20Ethics%20v1.pdf
8. https://www.studocu.com/in/document/kiet-group-of-institutions/universal-humanvalues/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385
9. https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

DISCRETE MATHEMATICS AND GRAPH THEORY

(Common to CSE and AI&DS)

II Year - I Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

==========

Course Objective

- To impart the knowledge on mathematical and combinatorial reasoning, relations, graphs and recurrence relations.

Course Outcomes

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

- verify the validity of mathematical arguments using propositional logic, predicate logic and truth tables.
- solve various problems related to principle of inclusion and exclusion of sets, relations and functions.
- apply combinatorial principles, techniques to solve counting problems and solve problems on recurrence relations.
- demonstrate various types of graphs with applications and determine the isomorphism of graphs.
- illustrate various types of trees and determine spanning / minimal spanning trees of given graphs.

Course Content

UNIT–I: Mathematical Logic

Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof.

Predicate Calculus: Predicates, Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.

UNIT-II: Set Theory

Sets: Operations on Sets, Principle of Inclusion-Exclusion.

Relations: Properties, Operations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering, Hasse Diagram.

Functions: Bijective, Composition, Inverse, Permutation and Recursive Functions, Lattice and its Properties.

UNIT-III: Combinatorics and Recurrence Relations

Combinatorics: Basics of Counting, Permutations, Permutations with Repetitions, Circular and Restricted Permutations, Combinations, Restricted Combinations, Binomial and Multinomial Coefficients and Theorems.

Recurrence Relations: Generating Functions, Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations.

UNIT-IV: Graph Theory

Basic Concepts, Graph Theory and its Applications, Subgraphs, Graph Representations:

Adjacency and Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs.

UNIT-V: Multi Graphs

Multigraphs, Bipartite and Planar Graphs, Euler's Theorem, Graph Colouring and Covering, Chromatic Number, Spanning Trees, Prim's and Kruskal's Algorithms, BFS and DFS Spanning Trees.

Text Books

1. J. P. Tremblay and R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill.
2. C. L.Liu and D. P. Mohapatra, "Elements of Discrete Mathematics-A Computer Oriented Approach", 3rd Edition, Tata McGraw Hill.
3. Seymour Lipschutz and Marc Lars Lipson, "Theory and Problems of Discrete Mathematics", Schaum's Outline Series, 3rd Edition, Tata McGraw Hill.

Reference Books

1. J. L.Mott, A. Kandel and T. P. Baker, "Discrete Mathematics for Computer Scientists and Mathematicians", 2nd Edition, Prentice Hall of India.
2. Bernand Kolman, Robert C. Busby and Sharon Cutler Ross, "Discrete Mathematical Structures", PHI.
3. S. K. Chakraborthy and B.K. Sarkar, "Discrete Mathematics", Oxford, 2011.
4. K. H. Rosen, "Discrete Mathematics and its Applications with Combinatorics and GraphTheory", 7th Edition, Tata McGraw Hill.

DIGITAL LOGIC AND COMPUTER ORGANIZATION

(Common to CSE and IT)

II Year - I Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

==========

Course Objectives

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

Course Outcomes

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

- represent data in Binary form, minimize logical expressions and design logic circuits using logic gates.
- design combinational and sequential logic circuits.
- demonstrate basic structure and functional units of a computer.
- perform arithmetic operations on signed and unsigned numbers.
- explain input/output (I/O) systems and their interaction with the CPU, memory, and peripheral devices.

Course Content

UNIT – I:

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

Digital Logic Circuits-I: Basic Logic Functions, Logic gates, universal logic gates, Minimization of Logic expressions. K-Map Simplifications (upto 4 variables), Combinational Circuits: Decoders, Multiplexers

UNIT – II:

Digital Logic Circuits-II: Sequential Circuits, Flip-Flops, Registers, Shift Registers: Uni-directional, Bi-directional, Universal, Binary counters, Ripple counters

UNIT – III:

Basic Structure of Computers: Functional units, Basic operational concepts, Bus structures, Multi processors, Multi computers, Von- Neumann Architecture.

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

UNIT – IV:

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

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

UNIT – V:

Input / Output Organization: Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, Buses- synchronous bus, asynchronous bus.

Text Books

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

Reference Books

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

Online Learning Resources

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

ADVANCED DATA STRUCTURES AND ALGORITHM ANALYSIS

(Common to CSE, IT, CSE(AI&ML) and AI&DS)

II Year - I Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

==========

Course Objectives

- To provide knowledge on advance data structures frequently used in Computer Science domain.
- To develop skills in algorithm design techniques popularly used.
- To understand the use of various data structures in the algorithm design.

Course Outcomes

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

- analyze the space and time complexity of algorithms and implement operations on AVL trees.
- implement graph traversal algorithms and perform operations on heap trees.
- apply divide and conquer and greedy methods to design solutions in practical applications.
- find optimal solution to the problems using dynamic programming.
- construct solutions to the problems using backtracking or branch and bound &explain the foundational concepts of NP-hard and NP-complete problems**.**

Course Content

UNIT – I:

Introduction: Algorithm Analysis, Space and Time Complexity analysis, Asymptotic Notations.
AVL Trees : Creation, Insertion, Deletion operations and applications

UNIT – II:

Heap Trees (Priority Queues): Min and Max Heaps, Operations and Applications
Graphs: Terminology, Representations, Basic Search and Traversals.

UNIT – III:

Divide and Conquer: The General Method, Quick Sort, Merge Sort, Strassen's matrix multiplication.
Greedy Method: General Method, Job Sequencing with deadlines, Knapsack Problem, Minimum cost spanning trees, Single Source Shortest Paths

UNIT – IV:

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

UNIT – V:

Backtracking: General Method, 8-Queens Problem, Sum of Subsets problem, Graph Coloring.
Branch and Bound: The General Method, 0/1 Knapsack Problem, Travelling Salesperson problem.
NP Hard and NP Complete Problems: Basic Concepts, Cook's theorem

Text Books

1. Ellis Horowitz, Sartaj Sahni, Dinesh Mehta, , "Fundamentals of Data Structures in C++", 2nd Edition, Universities Press.
2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Computer Algorithms/C++" 2nd Edition, University Press.

Reference Books

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

Online Learning Resources:

1. https://www.tutorialspoint.com/advanced_data_structures/index.asp
2. http://peterindia.net/Algorithms.html
3. Abdul Bari, Introduction to Algorithms (youtube.com)

OBJECT ORIENTED PROGRAMMING THROUGH JAVA

(Common to CSE, IT, CSE(AI&ML) and AI&DS)

II Year - I Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks: 70

==========

Course Objectives

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

Course Outcomes

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

- design, write, and debug Java programs using various data types, control statements, and operators
- apply object oriented concepts to build standard java application.
- utilize arrays, implement various inheritance techniques, and work with interfaces in Java to create object-oriented programs.
- build applications using packages, exception handling, Java I/O.
- develop dynamic applications with strings, multi-threading, JDBC and JFX.

Course Content

UNIT - I: Object Oriented Programming

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

Data Types, Variables, and Operators: Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, **Introduction to Operators**, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.

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

UNIT - II: Classes and Objects

Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Keyword this.

Methods: Introduction, Defining Methods, Overloaded Methods, Passing Arguments by Value and by Reference, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Attributes Final and Static.

UNIT - III: Arrays

Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays.

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, Final class and Methods.

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

UNIT - IV: Packages and Java Library

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

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

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

UNIT - V: String Handling in Java

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

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

Java Database Connectivity: Introduction, JDBC Architecture, Establishing JDBC Database Connections, ResultSet Interface

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

Text Books

1. Anitha Seth, B.L.Juneja,"JAVA one step ahead",Oxford.
2. Debasis Samanta, Monalisa Sarma, "Joy with JAVA: Fundamentals of Object Oriented Programming",Cambridge, 2023.
3. Paul Deitel, Harvey Deitel, "JAVA9 for Programmers",4th Edition,Pearson.

References Books

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

Online Resources

1. https://nptel.ac.in/courses/106/105/106105191/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01288046454761881634 7_shared/overview

ADVANCED DATA STRUCTURES AND ALGORITHMS LAB

(Common to CSE, IT, CSE(AI&ML) and AI&DS)
II Year - I Semester

Practical : 3 Internal Marks : 30

Credits : 3 External Marks : 70

==========

Course Objectives

- To acquire practical skills in constructing and managing Data structures.
- To apply the popular algorithm design methods in problem-solving scenarios.

Course Outcomes

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

- perform operations on AVL trees, Heap Trees and Graphs.
- apply divide and conquer technique to sort the elements using Quick sort and Merge sort.
- design and analyze the time complexity of Greedy method to solve single source shortest path problem and job sequencing with deadlines.
- solve problems using dynamic programming, back tracking, branch and bound techniques.

Experiments Covering the Topics:

- Operations on AVL trees, Heap Trees
- Graph Traversals
- Sorting techniques
- Shortest path algorithms
- 0/1 Knapsack Problem
- Travelling Salesperson problem
- N-Queens Problem
- Job Sequencing

List of Experiments

Perform any 10 of the following Experiments

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

12. Implement Travelling Sales Person problem using Branch and Bound approach.

Reference Books

1. Ellis Horowitz, Sartaj Sahni, Dinesh Mehta, "Fundamentals of Data Structures in C++", 2nd Edition, Universities Press
2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Computer Algorithms/C++", 2nd Edition, University Press
3. Robert Kruse, "Data Structures and program design in C", Pearson Education Asia.
4. Trembley & Sorenson, "An Introduction to Data Structures with Applications", McGraw Hill .

Online Learning Resources

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

OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

(Common to CSE,IT, CSE(AI&ML) and AI&DS)

II Year - I Semester

Practical : 3 Internal Marks: 30

Credits : 1.5 External Marks:70

==========

Course Objectives

- To practice object oriented programming in the Java programming language
- To implement Classes, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
- To illustrate inheritance, Exception handling mechanism, JDBC connectivity
- To construct Threads, Event Handling, implement packages, JavaFX GUI

Course Outcomes

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

- apply object oriented concepts in java programs.
- demonstrate inheritance and polymorphism concepts.
- implement user defined exceptions and multi-tasking applications.
- develop GUI,JDBC and event based applications.

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 $ax^2+bx+c=0$.
c) 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 String Buffer 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 multilevel 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 isAlive and join()

Exercise–8

a) Write a JAVA Program to illustrate Daemon Threads.
b) Write a JAVA program to implement Producer Consumer Problem

Exercise– 9

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 Image View (use JavaFX)
c) Build a Tip Calculator apposing several JavaFX components and learn how to respond to user interactions with the GUI

Exercise– 10

a) Write a JAVA program that connects to a database using JDBC
b) Write a JAVA program to connect to a database using JDBC and insert values into it.
c) Write a JAVA program to connect to a database using JDBC and delete values from it

References Books:

1. Herbert Schildt, "The complete Reference Java",11th Edition,TMH
2. Anitha Seth,B.L.Juneja, "JAVA one step ahead",Oxford.

PYTHON PROGRAMMING

(Common to CSE,IT, CSE(AI&ML) and AI&DS)

II Year – I Semester

Tutorial : 1	Practical : 2	Internal Marks	: 30
Credits : 2		External Marks	: 70

==========

Course Objectives

- To introduce core programming concepts of python programming language.
- To demonstrate about python data structures like lists, tuples, sets and dictionaries.
- To impart knowledge of implementing functions, modules, and file handling methods in python programming and analyzing data sets using python libraries.

Course Outcomes

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

- demonstrate the fundamental concepts of python and use of control flow statements to write effective and readable code.
- develop python programs including functions, strings and lists for efficient problem solving.
- make use of python data structures for efficient data handling, and apply relevant methods to manipulate and retrieve data in python programs.
- apply object-oriented concepts to develop reusable code.
- apply NumPy for numerical computations and evaluate pandas for data analysis in python.

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 Operators iv) Logical Operators v) Bit wise Operators vi) Ternary Operator vii) Membership Operators viii) Identity Operators
5. Write a program to add and multiply complex numbers
6. Write a program to print multiplication table of a given number.

UNIT-II:

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

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

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

Sample Experiments:

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

UNIT - III:

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

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

Sample Experiments:

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

UNIT - IV:

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

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

Sample Experiments:

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

UNIT - V:

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

Sample Experiments:

1. Python program to check whether a JSON string contains complex object or not.
2. Python Program to demonstrate NumPy arrays creation using array() function.
3. Python program to demonstrate use of ndim, shape, size, dtype.
4. Python program to demonstrate basic slicing, integer and Boolean indexing.

5. Python program to find min, max, sum, cumulative sum of array
6. Create a dictionary with atleast five keys and each key represent value as a list where this list contains atleast ten values and convert this dictionary as a pandas data frame and explore the data through the data frame as follows:
   a) Apply head () function to the pandas data frame
   b) Perform various data selection operations on Data Frame
7. Select any two columns from the above data frame, and observe the change in one attribute with respect to other attribute with scatter and plot operations in matplotlib

Reference Books

1. Gowri Shankar S and Veena A., "Introduction to Python Programming", CRC Press, 2018.
2. S Sridhar, J Indumathi and V M Hariharan, "Python Programming", 2nd Edition, Pearson, 2024.
3. Y. Daniel Liang, "Introduction to Programming Using Python", Pearson, 2017.

Online Learning Resources/Virtual Labs

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

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

(Common to EEE, CSE, IT, and IOT)

II Year - II Semester

Lecture : 2	Internal Marks : 30
Credits : 2	External Marks : 70

==========

Course Objectives

- To expose the importance of managerial economics and its role in achieving business objectives.
- To present fundamental skills on accounting and to explain the process of preparing financial statements.

Course Outcomes

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

- classify the concepts of Managerial Economics, Financial Accounting and Management.
- interpret the Concept of Product cost and revenues for effective Business decision.
- establish suitable business organization and analyse markets to understand their impact on pricing & output decisions.
- analyze how to invest their capital and maximize returns using capital Budgeting techniques.
- develop the accounting statements and evaluate the financial performance of business entity.

Course Content

UNIT - I: Managerial Economics

Introduction — Nature, meaning, significance, functions, and advantages. Demand-Concept, Function, Law of Demand - Demand Elasticity - Types - Measurement. Demand Forecasting- Factors governing Forecasting, Methods.

UNIT - II: Product and Cost Analysis

Introduction – Segmentation - Product Life cycle-Channels of Distribution- Cost & Break-Even Analysis - Cost concepts and Cost behavior - Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems).

UNIT - III: Business Organizations and Markets

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

UNIT - IV: Capital Budgeting

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

UNIT - V Financial Accounting and Analysis

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

Textbooks:

1. Varshney & Maheswari "Managerial Economics" 22nd Edition, Sultan Chand, 2014.
2. Aryasri "Business Economics and Financial Analysis" 4th Edition, MGH, 2019.
3. Philip kotler "Marketing Management" 15th Edition, pearson, 2016.

Reference Books:

1. Ahuja Hl "Managerial economics" 3rd Edition, Schand, 2013.
2. S.A. Siddiqui and A.S. Siddiqui "Managerial Economics and Financial Analysis" New Age International, 2013.
3. Joseph G. Nellis and David Parker "Principles of Business Economics" Pearson, 2nd Edition, New Delhi.

Online Learning Resources

1. https://www.slideshare.net/123ps/managerial-economics-ppt
2. https://www.slideshare.net/rossanz/production-and-cost-45827016
3. https://www.slideshare.net/darky1a/business-organizations-19917607
4. https://www.slideshare.net/ba1arajbl/market-and-classification-of-market
5. https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
6. https://www.slideshare.net/ashu1983/financial-accounting

PROBABILITY AND STATISTICS

(CSE)

II Year - II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

==========

Course Objectives

- To familiarize the students with the foundations of probability and statistical methods
- To impart probability concepts and statistical methods in various applications of engineering

Course Outcomes

Upon successful completion of this course, the student should be able to

- classify the concepts of data science and its importance
- interpret the association of characteristics through correlation and regression tools
- apply discrete and continuous probability distributions
- construct sampling distributions, confidence intervals and to find maximum error of estimates for population parameters.
- apply the inference tests when the sample data is large and/or small.

Course Content

Unit – I: Descriptive statistics and methods for data science:

Data science – Statistics Introduction – Population vs Sample –Collection of data – primary and secondary data – Type of variable: dependent and independent Categorical and Continuous variables – Data visualization – Measures of Central tendency – Measures of Variability – Skewness – Kurtosis.

UNIT – II: Correlation and Regression:

Correlation – Correlation coefficient – Rank correlation.

Linear Regression: Straight line – Multiple Linear Regression - Regression coefficients and properties – Curvilinear Regression: Parabola – Exponential – Power curves.

UNIT – III: Probability and Distributions:

Probability– Conditional probability and Baye's theorem – Random variables – Discrete and Continuous random variables – Distribution functions – Probability mass function, Probability density function and Cumulative distribution functions – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions.

UNIT – IV: Sampling Theory:

Introduction – Population and Samples – Sampling distribution of Means and Variance (definition only) – Point and Interval estimations – Maximum error of estimate – Central limit theorem (without proof) – Estimation using t, χ^2 and F-distributions.

UNIT – V: Tests of Hypothesis:

Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One tail and two-tail tests – Test of significance for large samples and Small Samples: Single and difference of means – Single and two proportions – Student's t- test, F-test and χ^2-test.

Text Books:

1. Miller and Freund's, " Probability and Statistics for Engineers", 7th Edition, Pearson, 2008.
2. S. C. Gupta and V.K. Kapoor, " Fundamentals of Mathematical Statistics", 11th Edition, Sultan Chand & Sons Publications, 2012.

Reference Books:

1. Shron L. Myers, Keying Ye, Ronald E Walpole, "Probability and Statistics Engineers and Scientists", 8th Edition, Pearson 2007.
2. Jay l. Devore, " Probability and Statistics for Engineering and the Sciences", 8th Edition, Cengage.
3. Sheldon M. Ross, " Introduction to probability and statistics Engineers and the Scientists", 4th Edition, Academic Foundation, 2011.

OPERATING SYSTEMS

(Common to CSE and IT)

II Year - II Semester

Lecture 3	Internal Marks : 30
Credits : 3	External Marks : 70

==========

Course Objectives

- To understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection
- To make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
- To illustrate different conditions for deadlock and their possible solutions.

Course Outcomes

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

- describe the role, functions and structures of operating systems.
- demonstrate the concept of process, thread and analyze the performance of CPU scheduling algorithms.
- develop software/hardware based solutions for critical section problems and apply deadlock handling techniques to prevent deadlocks.
- compare different memory management schemes and analyze the performance of different disk scheduling algorithms.
- outline files, directory structures and illustrate need for file protection .

Course Content

UNIT - I:

Operating Systems Overview: Introduction, Operating system functions, Operating systems operations, Free and Open-Source Operating Systems.

System Structures: Operating System Services, User and Operating-System Interface, system calls, Types of System Calls, Operating system structure.

UNIT - II:

Processes: Process Concept, Process scheduling, Operations on processes, Inter-process communication.

Threads and Concurrency: Multithreading models, Threading issues.

CPU Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms.

UNIT – III:

Synchronization Tools: The Critical Section Problem, Peterson’s Solution, Mutex Locks, Semaphores, Monitors, Classic problems of Synchronization.

Deadlocks: system Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from Deadlock.

UNIT - IV:

Memory-Management Strategies: Introduction, Contiguous memory allocation, Paging, Structure of the Page Table, Swapping.

Virtual Memory Management: Introduction, Demand paging, Copy-on-write, Page replacement, Allocation of frames, Thrashing

Storage Management: Overview of Mass Storage Structure, HDD Scheduling.

UNIT - V:

File System: File System Interface: File concept, Access methods, Directory Structure;

File system Implementation: File-system structure, File-system Operations, Directory implementation, Allocation method, Free space management; Protection: Goals of protection, Principles of protection, Access matrix.

Text Books

1. Silberschatz A, Galvin P B, Gagne G, "Operating System Concepts", 10th Edition, Wiley, 2018.
2. Tanenbaum A S, "Modern Operating Systems", 4th Edition, Pearson , 2016

Reference Books

1. Stallings W, "Operating Systems -Internals and Design Principles", 9th Edition, Pearson, 2018
2. D.M Dhamdhere, "Operating Systems: A Concept Based Approach", 3rd Edition, McGraw-Hill, 2013

Online Learning Resources

1. https://nptel.ac.in/courses/106/106/106106144/
   http://peterindia.net/OperatingSystems.html

DATABASE MANAGEMENT SYSTEMS

(Common to CSE, IT and CSE (AI&ML))

II Year - II Semester

Lecture : 3 Internal Marks : 30

Credits : 3 External Marks: 70

==========

Course Objectives

- To introduce database management systems and to give a good formal foundation on the relational model of data and Relational Algebra
- To introduce the concepts of SQL for storage, retrieval and manipulation of data in a relational database.
- To demonstrate the conceptual design and logical database design through normalization
- To provide an overview of transaction management, concurrency control and indexing.

Course Outcomes

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

- describe the importance of DBMS and derive a model in the form of ER diagram
- develop simple queries using SQL to manipulate the data in a relational model
- develop complex queries using SQL to manipulate the data.
- apply principles of normalization for designing a good relational database.
- demonstrate different techniques used in transaction management,concurrency control, crash recovery and indexing.

Course Content

UNIT - I

Introduction: Database system, Characteristics (Database Vs File System), Database Users, Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance; Three tier schema architecture for data independence; Database system structure.

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

UNIT - II

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

UNIT - III

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

UNIT - IV:

Schema Refinement (Normalization): Purpose of Normalization or 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).

UNIT - V:

Transaction Concept: Transaction States, ACID properties, Concurrent Executions, Serializability, Recoverability, Testing for Serializability.
Concurrency Controls: Lock based protocols, timestamp-based protocols, Deadlocks.

Crash Recovery and Indexing: Failure Classification, Recovery Algorithms- differed update and immediate update, checkpoints, Indexing Techniques –B Trees, B+ Trees.

Text Books

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

Reference Books

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

Online Learning Resources

1. https://nptel.ac.in/courses/106/105/106105175/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01275806667282022456_shared/overview

SOFTWARE ENGINEERING

(Common to CSE and IT)

II Year - II Semester

Lecture : 3 Internal Marks : 30

Credits : 3 External Marks: 70

==========

Course Objectives

- To explore the evolution of software development, including various life cycle models.
- To analyze the complexities of software project management.
- To examine coding and testing practices and methodologies.

Course Outcomes

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

- explain software engineering evolution, compare methodologies, and apply life cycle models effectively.
- develop software projects by navigating complexities using proper estimation and risk analysis techniques.
- design robust software systems with modular, cohesive, focusing on object-oriented analysis and design.
- demonstrate coding proficiency, conduct effective testing, ensure software reliability, and implement quality management systems.
- utilize CASE tools across software life cycle models for productivity and quality enhancement.

Course Content

UNIT - I:

Introduction: Evolution, Software development projects, Exploratory style of software developments. **Software Life Cycle Models:** Basic concepts, Waterfall model and its extensions, prototyping model, Agile development model, Spiral model.

UNIT - II:

Software Project Management: Software project management complexities, Responsibilities of a software project manager, Metrics for project size estimation, Project estimation techniques, COCOMO, risk management.

Requirements Analysis And Specification: Requirements gathering and analysis, Software Requirements Specification (SRS).

UNIT - III:

Software Design: Overview of the design process, How to characterize a good software design? Layered arrangement of modules, Cohesion and Coupling, approaches to software design.

Function- Oriented Software Design: Structure Charts and Structure design methodology

Object Oriented Design: Basic object orientation Concepts, Unified Modeling Language, Use case Model , Class diagram, Interaction diagram, Activity Diagram, State chart Diagram, Component and Deployment diagrams.

UNIT - IV:

Coding and Testing: Coding, Testing black box testing, white box testing, integration testing, smoke testing.

Software Reliability And Quality Management: Software reliability, ISO 9000, SEI Capability maturity model.

UNIT - V:

Computer-Aided Software Engineering (CASE): CASE and its scope, CASE environment, CASE support in the software life cycle.

Software Maintenance: Characteristics of software maintenance, Software reverse engineering, Software maintenance process models and Estimation of maintenance cost.

Text Books

1. Rajib Mall, "Fundamentals of Software Engineering", 5th Edition, PHI.
2. Roger S. Pressman, "Software Engineering A practitioner's Approach", 9th Edition, McGraw Hill International Edition.

Reference Books

1. Ian Sommerville, "Software Engineering", 10th Edition, Pearson.
2. Deepak Jain, "Software Engineering, Principles and Practices", Oxford University Press.

e-Resources

1. https://nptel.ac.in/courses/106/105/106105182/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01260589506387148827_shared/overview
3. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01338269041100390473 5_shared/overview

OPERATING SYSTEMS LAB

II Year - II Semester

Practical : 3	Internal Marks : 30
Credits : 1.5	External Marks : 70

==========

Course Objectives

- To provide insights into system calls, file systems and semaphores.
- To develop and debug CPU Scheduling algorithms, page replacement algorithms, thread implementation.
- To implement Bankers Algorithms to avoid the Dead Lock.

Course Outcomes

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

- make use of system call in Unix shell programs.
- evaluate the CPU scheduling, page replacement algorithms.
- analyze memory and file allocation strategies.
- demonstrate concurrent thread execution using the thread library.
- solve the producer-consumer problem with semaphore-based synchronization.
- implement the banker's algorithm to prevent and avoid deadlocks.
- install and explore the nachos operating system to gain practical OS experience.

Experiments covering the Topics:

- UNIX fundamentals, commands & system calls.
- CPU Scheduling algorithms, thread processing.
- IPC, semaphores, monitors, deadlocks.
- Page replacement algorithms, file allocation strategies.
- Memory allocation strategies.

List of Experiments

Perform any 10 of the following Experiments

1. Practicing of Basic UNIX Commands.
2. Write programs using the following UNIX operating system calls fork, exec, getpid, exit, wait, close, stat, opendir and readdir
3. Simulate UNIX commands like cp, ls, grep, etc.,
4. Simulate the following CPU scheduling algorithms
   a) FCFS b) SJF c) Priority d) Round Robin
5. Control the number of ports opened by the operating system with
   a) Semaphore b) Monitors.
6. Write a program to illustrate concurrent execution of threads using pthreads library.
7. Write a program to solve producer-consumer problem using Semaphores.
8. Implement the following memory allocation methods for fixed partition
   a) First fit b) Worst fit c) Best fit
9. Simulate the following page replacement algorithms
   a) FIFO b) LRU c) LFU
10. Simulate Paging Technique of memory management.
11. Implement Bankers Algorithm for Dead Lock avoidance and prevention.
12. Simulate the following file allocation strategies
    a) Sequential b) Indexed c) Linked
13. Download and install nachos operating system and experiment with it.

Reference Books

1. Silberschatz A, Galvin P B, Gagne G, "Operating System Concepts", 10th Edition, Wiley, 2018.
2. Tanenbaum A S, "Modern Operating Systems", 4th Edition, Pearson, 2016.
3. Stallings W, "Operating Systems -Internals and Design Principles", 9th Edition, Pearson, 2018.
4. D.M Dhamdhere, "Operating Systems: A Concept Based Approach", 3rd Edition, McGraw-Hill, 2013

Online Learning Resources

1. https://www.cse.iitb.ac.in/~mythili/os/
2. http://peterindia.net/OperatingSystems.html
3. www.cs.washington.edu/~tom/nachos

DATABASE MANAGEMENT SYSTEMS LAB

(Common to CSE, IT and CSE(AI&ML))

II Year - II Semester

Practical : 3 Internal Marks : 30

Credits : 1.5 External Marks: 70

==========

Course Objectives

- To populate and query a database using SQL (DDL,DML) Commands.
- To enforce integrity constraints on a database and to write queries using the concepts of SQL and PL/SQL.

Course Outcomes

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

- develop simple and complex queries using SQL.
- write PL/SQL programs including procedures, functions, cursors and triggers.

Experiments covering the topics

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

List of Experiments

Perform any 10 experiments in the following

1. Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using Select command.
2. Queries (along with sub Queries) using Any, All, In, Exists, Not Exists, Union, Intersection, Constraints. (Ex: 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 and Having.
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, truncate, 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 were found)
   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 expression. The program can be extended using the Null-IF and Coalesce functions.
7. Program development using While Loops, numeric For Loops, nested loops using Error Handling, Built-In Exceptions, User defined Exceptions, Raise- Application Error.
8. Programs development using creation of procedures, passing parameters IN and OUT of

Procedures.

9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
10. Develop programs using features parameters in a Cursor, For Update Cursor, Where Current of clause and Cursor variables.
11. Develop Programs using Before and After Triggers, Row and Statement Triggers and Instead of Triggers.
12. Create a table and perform the search operation on table using indexing and non- indexing techniques.

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", 4th Edition, Pearson Education,2007

FULL STACK DEVELOPMENT – 1

(Common to CSE, CSE(AI&ML) and AI&DS)

II Year - II Semester

Tutorial : 1	Practical : 2	Internal Marks	: 30
Credits : 2		External Marks	: 70

==========

Course Objectives

The main objectives of the course is

- To make use of HTML elements and their attributes for designing static web pages
- To build a web page by applying appropriate CSS styles to HTML elements
- To experiment with JavaScript to develop dynamic web pages and validate forms

Course Outcomes

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

- design web pages using HTML and CSS
- develop dynamic web pages and perform form validations using javascript.

Course Content

Experiments covering the Topics:

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

Sample Experiments

1. Lists, Links and Images

a. Write a HTML program, to explain the working of lists.
   Note: It should have an ordered list, unordered list, nested lists and ordered list in an unordered list and definition lists.

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

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

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

2. HTML Tables, Forms and Frames

a. Write a HTML program, to explain the working of tables. (use tags: <table>, <tr>, <th>,<td> and attributes: border, rowspan, colspan)

b. Write a HTML program, to explain the working of tables by preparing a timetable. (Note: Use <caption> tag to set the caption to the table & also use cell spacing, cell padding, border, rowspan, colspan etc.).

c. Write a HTML program, to explain the working of forms by designing Registration form.

(Note: Include text field, password field, number field, date of birth field, checkboxes, radio buttons, list boxes using <select>&<option> tags, <text area> and two buttons ie: submit and reset. Use tables to provide a better view).

d. Write a HTML program, to explain the working of frames, such that page is to be divided into 3 parts on either direction. (Note: first frame image, second frame paragraph, third frame hyperlink. And also make sure of using "no frame" attribute such that frames to be fixed).

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

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

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

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

4. Selector forms

a. Write a program to apply different types of selector forms.
b. Simple selector (element, id, class, group, universal).
c. Combinator selector (descendant, child, adjacent sibling, general sibling)
d. Pseudo-class selector
e. Pseudo-element selector
f. Attribute selector

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

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

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

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

i. font-size ii. font-weight iii. font-style
iv. text-decoration v. text-transformation vi. text-alignment

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

i. Content ii. Border iii. Margin iv. padding

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

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

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

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

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

7. JavaScript Pre-defined and User-defined Objects

a. Write a program using document object properties and methods.
b. Write a program using window object properties and methods.
c. Write a program using array object properties and methods.
d. Write a program using math object properties and methods.
e. Write a program using string object properties and methods.
f. Write a program using regex object properties and methods.
g. Write a program using date object properties and methods.
h. Write a program to explain user-defined object by using properties, methods, accessors, constructors and display.

8. JavaScript Conditional Statements and Loops

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

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

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

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

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

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

9. Javascript Functions and Events

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

b. Design a HTML having a text box and four buttons named Factorial, Fibonacci, Prime, and Palindrome. When a button is pressed an appropriate function should be called to display
- Factorial of that number
- Fibonacci series up to that number
- Prime numbers up to that number
- Is it palindrome or not

c. Write a program to validate the following fields in a registration page
- Name (start with alphabet and followed by alphanumeric and the length should not be less than 6 characters)
- Mobile (only numbers and length 10 digits)
- E-mail (should contain format like xxxxxxx@xxxxxx.xxx)

Reference Books

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

Online Learning Resources

1. https://www.w3schools.com/html
2. https://www.w3schools.com/css
3. https://www.w3schools.com/js/
4. https://www.w3schools.com/nodejs
5. https://www.w3schools.com/typescript

DESIGN THINKING & INNOVATION

(Common to EEE, ECE, CSE and AI&DS)

II Year – II Semester

Lecture : 1	Practical : 2	Internal Marks	: 30
Credits : 3		External Marks	: 70

==========

Course Objectives

- To develop a comprehensive understanding of design thinking, its history, principles, and application in various contexts, including product development and business innovation.
- To apply the design thinking process and tools to foster creativity, drive innovation, and address real-world challenges in both social and business settings.

Course Outcomes

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

- analyse the elements and principles of design.
- implement the design thinking process (empathize, analyze, ideate, and prototype) to drive inventions and social innovations.
- analyse the difference between innovation and creativity, to foster innovation within organization.
- create a comprehensive product design by forming and solving problems, setting product strategies, values, planning, and specifications, and evaluating case studies for practical insights.
- apply design thinking principles to redefine business strategies and address business challenges.

Course Content

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, brain storming, 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 modeling, how to set specifications, explaining their own product design.

UNIT V: Design Thinking in Business Processes

Design thinking applied in business & strategic Innovation, design thinking principles that redefine business – Business challenges: growth, predictability, change, maintaining relevance, extreme competition, standardization. Design thinking to meet corporate needs. Design thinking for startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes.

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

Text Books

1. Tim Brown, "Change by Design", 1st Edition, Harper Bollins, 2009.
2. Idris Mootee, "Design Thinking for Strategic Innovation", 1st Edition, Adams Media, 2014.

Reference Books

1. David Lee, "Design Thinking in the Classroom", Ulysses press, 2018.
2. Shrrutin N Shetty, "Design the Future", 1st Edition, Norton Press, 2018.
3. William lidwell, Kritina holden, Jill butter, "Universal principles of design", 2nd Edition, Rockport Publishers, 2010.
4. Henry W. Chesbrough, "The Era of Open Innovation", MIT Sloan Management Review, 2003.
5. Anuja Agarwal, "Design Thinking: A Framework for Applying Design Thinking in Problem Solving", 1st Edition, Cengage learning India Pvt. Ltd., 2023

Online Learning Resources

1. https://nptel.ac.in/courses/110/106/110106124/
2. https://nptel.ac.in/courses/109/104/109104109/
3. https://swayam.gov.in/nd1_noc19_mg60/preview
4. https://onlinecourses.nptel.ac.in/noc2

ENVIRONMENTAL SCIENCE

(Common to CSE, IT and CSE(AI&ML))

II Year – II Semester

Lecture : 2	Internal Marks : 30
Credits : -	External Marks : 70

==========

Course Objectives

- To impart basic knowledge about the environment and natural resources.
- To develop an attitude of concern for biodiversity conservation and ecosystems.
- To acquire knowledge and skills on environmental pollution control.

Course Outcomes

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

- create awareness among the people in protection of environment and natural resources.
- analyze structure and functional attributes of an ecosystem and biodiversity conservation.
- identify the sources of environmental pollution, assess their effects and suggest suitable control measures.
- adopt sustainable management practices for various environmental issues.
- recognize the relationship between population growth and health.

Course Content

UNIT - I

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

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

UNIT - II

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

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

Biodiversity And Its Conservation: Introduction and 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, causes, effects and control measures of:

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

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

UNIT - IV

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

UNIT - V

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

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

Text Books

1. Erach Bharucha, "Text book of Environmental Studies for Undergraduate Courses", Universities Press (India) Private Limited, 2019.
2. Palaniswamy, "Environmental Studies", 2nd Edition, Pearson Education, 2014.
3. S.Azeem Unnisa, "Environmental Studies", Academic Publishing Company, 2021.
4. K.Raghavan Nambiar, "Text book of Environmental Studies for Undergraduate Courses (as per UGC model syllabus)", Scitech Publications (India) Pvt. Ltd, 2010.

Reference Books

1. Deeksha Dave and E. Sai Baba Reddy, "Textbook of Environmental Science", 2nd Edition, Cengage Publications, 2012.
2. M. Anji Reddy, "Textbook of Environmental Sciences and Technology", BS Publication, 2014.
3. J. P. Sharma, "Comprehensive Environmental Studies", Laxmi Publications, 2006.
4. J. Glynn Henry and Gary W. Heinke, "Environmental Sciences and Engineering", Prentice Hall of India Private Limited, 1988.
5. G. R. Chatwal, "A Text Book of Environmental Studies", Himalaya Publishing House, 2018.

6. Gilbert M. Masters and Wendell P. Ela, “Introduction to Environmental Engineering and Science”, 1st Edition, Prentice Hall of India Private Limited, 1991.

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc23_hs155/preview
2. https://www.edx.org/learn/environmental-science/rice-university-ap-r-environmental-science-part-3-pollution-and-resources?index=product&objectID=course-3a6da9f2-d84c-4773-8388-1b2f8f6a75f2&webview=false&campaign=AP%C2%AE+Environmental+Science++Part+3%3A+Pollution+and+Resources&source=edX&product_category=course&placement_url=https%3A%2F%2Fwww.edx.org%2Flearn%2Fenvironmental-science.
3. http://ecoursesonline.iasri.res.in/Courses/Environmental%20Science-I/Data%20Files/pdf/lec07.pdf
4. https://www.youtube.com/watch?v=5QxxaVfgQ3k