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.

ECE - 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	PH4501	Engineering Physics	3	0	0	3
2	MA4501	Linear Algebra & Calculus	3	0	0	3
3	EE4501	Basic Electrical & Electronics Engineering	3	0	0	3
4	ME4501	Engineering Graphics	1	0	4	3
5	CT4501	Introduction to Programming	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	CT4502	Computer Programming 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**

I Year II 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	CH4501	Chemistry	3	0	0	3
3	MA4502	Differential Equations & Vector Calculus	3	0	0	3
4	CM4501	Basic Civil & Mechanical Engineering	3	0	0	3
5	EE4503	Network Analysis	3	0	0	3
6	EG4502	Communicative English Lab	0	0	2	1
7	CH4502	Chemistry Lab	0	0	2	1
8	EE4504	Network Analysis And Simulation Laboratory	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**

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	BA4501	Managerial Economics and Financial Analysis	2	0	0	2
3	EC4506	Probability Theory and Stochastic Processes	3	0	0	3
4	EC4507	Signals and Systems	3	0	0	3
5	EC4508	Electronic Devices and Circuits	3	0	0	3
6	EC4509	Electronic Devices and Circuits Lab	0	0	3	1.5
7	EC4510	Signals and Systems Lab	0	0	3	1.5
8	CT4508	Data Structures using Python	0	1	2	2
9	EN4501	Environmental Science	2	0	0	0
Total			**15**	**2**	**8**	**19**

II Year II Semester

Sl. No.	Course Code	Name of Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1	EE4512	Linear Control Systems	3	0	0	3
2	EC4515	Switching Theory and Logic Design	3	0	0	3
3	EC4516	Electromagnetic Waves and Transmission Lines	3	0	0	3
4	EC4517	Electronic Circuit Analysis	3	0	0	3
5	EC4518	Analog Communications	3	0	0	3
6	EC4519	Switching Theory and Logic Design Lab	0	0	3	1.5
7	EC4520	Electronic Circuit Analysis Lab	0	0	3	1.5
8	EG4503	Soft Skills	0	1	2	2
9	DT4501	Design Thinking & Innovation	1	0	2	2
Total			**16**	**1**	**10**	**22**
Mandatory Community Service Project Internship of 08 weeks duration during summer vacation						

ENGINEERING PHYSICS

(Common to All Branches)

I Year – I 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

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)

BASIC ELECTRICAL & ELECTRONICS ENGINEERING

(Common to All Branches)

I Year – I 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 electricity tariff, calculation of electricity bill for domestic consumers.

Equipment Safety Measures: Working principle of Fuse and Miniature circuit breaker(MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

Textbooks

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

Reference Books

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

Web Resources:

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

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 of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier.

UNIT II BASIC ELECTRONIC CIRCUITS AND INSTRUMENTTAION

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

UNIT III DIGITAL ELECTRONICS

Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, Gray code, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple combinational circuits–Half and Full 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:

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

End examination pattern:

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

ENGINEERING GRAPHICS

(Common to All Branches)

I Year – I 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 one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes

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

UNIT III

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

UNIT IV

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

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

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.

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.

Course Content

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

ENGINEERING PHYSICS LAB

(Common to All Branches)

I Year – I Semester

Practice :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 – I Semester

Practice :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 thestudents.
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, Third Edition

Note: Minimum Six Experiments to be performed.

PART – B ELECTRONICS ENGINEERING LAB

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

Tools / Equipment Required

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

References

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

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

COMPUTER PROGRAMMING LAB

(Common to All Branches)

I Year – I Semester

Practice :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.
- 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.

Write a C program to swap two numbers using call by reference.

i) Demonstrate Dangling pointer problem using a C program.
ii) Write a C program to copy one string into another using pointer.
iii) Write a C program to find no of lowercase, uppercase, digits and 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.

IT WORKSHOP

(Common to All Branches)

I Year – I Semester

Practice :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 & GUIDES /COMMUNITY SERVICE

(Common to All branches)

I Year – I 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.
- **e**xplore human relationships by analyzing social problems.
- determine to extend their help for the fellow beings and downtrodden people.
- develop leadership skills and civic responsibilities.

Course Content

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.

COMMUNICATIVE ENGLISH

(Common to All Branches)

I Year – II 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

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

- 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 listeningto 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 ofinformation.

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; repositions.

Vocabulary: Homonyms, Homophones, Homographs.

UNIT III
Lesson: BIOGRAPHY: Elon Musk

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

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

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

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

Textbooks:

1. Pathfinder: Communicative English for Undergraduate Students, 1st Edition, 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 aSuperior 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

CHEMISTRY

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

I Year – II Semester

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

C**ourse 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

DIFFERENTIAL EQUATIONS AND 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 CIVIL AND MECHANICAL ENGINEERING

(Common to All Branches)

I Year – II 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

Powerplants -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

NETWORK ANALYSIS

(ECE & IoT)

I Year – II Semester

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

Course Objectives

- To introduce basic laws, mesh & nodal analysis techniques for solving electrical circuits
- To impart knowledge on applying appropriate theorem for electrical circuit analysis
- To explain transient behavior of circuits in time and frequency domains
- To teach concepts of resonance
- To introduce open circuit, short circuit, transmission, hybrid parameters and their interrelationship.

Course Outcomes

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

- compute voltage, current and power in the given electrical circuit using network reduction techniques and network theorems.
- determine the transient response of series RL, RC and RLC circuits using differential equations and Laplace transforms.
- calculate impedance, phase angle, current in series RL, RC and RLC circuits.
- explain the concepts of series resonance, parallel resonance, self-inductance, mutual inductance, coefficient of coupling and dot rule of coupled circuits.
- compute the parameters of a two-port network.

UNIT I

Types of circuit components, Types of Sources and Source Transformations, Mesh analysis and Nodal analysis, problem solving with resistances only including dependent sources also. Principal of Duality with examples.

Network Theorems: Thevenin's, Norton's, Milliman's, Reciprocity, Compensation, Substitution, Superposition, Max Power Transfer, Tellegen's - problem solving using dependent sources also.

UNIT II

Transients: First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, evaluating initial conditions procedure, second order differential equations, homogeneous, non-homogenous, problem-solving using R-L-C elements with DC excitation and AC excitation, Response as related to s-plane rotation of roots.

Laplace transform: introduction, Laplace transformation, basic theorems, problem solving using Laplace transform, partial fraction expansion, Heaviside's expansions, problem solving using Laplace transform.

UNIT III

Steady State Analysis of A.C Circuits: Impedance concept, phase angle, series R-L, R-C, R-L- C circuits problem solving. Complex impedance and phasor notation for R-L, R-C, R-L-C problem solving using mesh and nodal analysis, Star-Delta conversion, problem solving using Laplace transforms also.

UNIT IV

Resonance: Introduction, Definition of Q, Series resonance, Bandwidth of series resonance, Parallel resonance, general case-resistance present in both branches, anti-resonance at all frequencies.

Coupled Circuits: Coupled Circuits: Self-inductance, Mutual inductance, Coefficient of coupling, analysis of coupled circuits, Natural current, Dot rule of coupled circuits, conductively coupled equivalent circuits- problem solving.

UNIT V

Two-port Networks: Relationship of two port networks, Z-parameters, Y-parameters, Transmission line parameters, h- parameters, Relationships Between parameter Sets, Parallel & series connection of two port networks, cascading of two port networks, problem solving using dependent sources also.

Image and iterative impedances. Image and iterative transfer constants. Insertion loss. Attenuators and pads. Lattice network and its parameters. Impedance matching networks.

Textbooks

1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, revised 3rd Edition, 2019.
2. Engineering Circuit Analysis by William H. Hayt, Jack Kemmerly, Jamie Phillips, Steven M. Durbin, 9th Edition 2020.
3. Network lines and Fields by John. D. Ryder 2nd Edition, PHI

Reference Books

1. D. Roy Choudhury, Networks and Systems, New Age International Publications, 2013.
2. Joseph Edminister and Mahmood Nahvi, Electric Circuits, Schaum's Outline Series, 7th Edition, Tata McGraw Hill Publishing Company, New Delhi, 2017
3. Fundamentals of Electric Circuits by Charles K. Alexander and Matthew N. O. Sadiku, McGraw-Hill Education.

COMMUNICATIVE ENGLISH LAB

(Common to All Branches)

I Year – II 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

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

- 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
K- Van

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 – II 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. Siva sankar.

NETWORK ANALYSIS AND SIMULATION LABORATORY

(ECE & IoT)

I Year – II Semester

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

Course Objectives:

- To gain hands on experience in verifying Kirchoff's laws and network theorems
- To analyze transient behavior of circuits
- To study resonance characteristics
- To determine 2-port network parameters

Course Outcomes:

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

- verify Kirchhoff's laws, mesh analysis, nodal analysis and network theorems.
- analyze the behavior of RL, RC and RLC circuits.
- compute quality factor and bandwidth of series / parallel resonant circuit.
- determine the parameters of a two-port network.

The following experiments need to be performed using both Hardware and simulation Software. The experiments need to be simulated using software and the same need to be verified using the hardware.

1. Study of components of a circuit and Verification of KCL and KVL.
2. Verification of mesh and nodal analysis for AC circuits.
3. Verification of Superposition, Thevenin's & Norton theorems for AC circuits.
4. Verification of maximum power transfer theorem for AC circuits.
5. Verification of Tellegen's theorem for two networks of the same topology.
6. Study of DC transients in RL, RC and RLC circuits.
7. Study of frequency response of various 1^{st} order RL & RC networks.
8. Study of the transient and steady state response of a 2^{nd} order circuit by varying its various parameters and studying their effects on responses.
9. Find the Q Factor and Bandwidth of a Series and Parallel Resonance circuit.
10. Determination of open circuit (Z) and short circuit (Y) parameters.
11. Determination of hybrid (H) and transmission (ABCD) parameters.
12. To measure two port parameters of a twin-T network and study its frequency response.

Hardware Requirements:

Regulated Power supplies, Analog/Digital Function Generators, Digital Multimeters, Decade Resistance Boxes/Rheostats, Decade Capacitance Boxes, Ammeters (Analog or Digital), Voltmeters (Analog or Digital), Active & Passive Electronic Components

Software requirements:

- Multisim/ Pspice/Equivalent simulation software tool, Computer Systems with required specifications

References:

1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, revised 3rd Edition, 2019.
2. Engineering Circuit Analysis by William H. Hayt, Jack Kemmerly, Jamie Phillips, Steven M. Durbin, 9^{th} Edition 2020.

ENGINEERING WORKSHOP

(Common to All Branches)

I Year – II 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

SYLLABUS

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)

I Year – II 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, totaling 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

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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

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

(Common to CE, ECE and AI&DS)

II Year – I Semester

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

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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- PayBack Method, Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR)Method (sample problems).

UNIT-V: Financial Accounting and Analysis

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

Textbooks:

1. Varshney & Maheswari, "Managerial Economics" 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, S. Chand, 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", 2nd Edition, Pearson, 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 THEORY AND STOCHASTIC PROCESSES

II Year – I Semester

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

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Course Objectives

- To familiarize with the concepts of probability, random variables and operations that can be performed on them.
- To introduce the spectral and temporal characteristics of random process.
- To impart the basic concepts of linear systems with random inputs and noise sources.

Course Outcomes

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

- understand the concepts of probability, random variables and their functions.
- perform operations on single and multiple random variables.
- determine the temporal characteristics of random signals.
- determine the spectral characteristics of random signals.
- characterize linear systems and understand the concepts of noise.

Course Content

UNIT – I: Probability & Random Variable

Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Joint Probability, Conditional Probability, Total Probability, Baye's Theorem, Independent Events, Random Variable-Definition, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Methods of defining Conditioning Event, Conditional Distribution, Conditional Density and their Properties.

UNIT – II: Operations on Single & Multiple Random Variables – Expectations

Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function. Vector Random Variables: Joint Distribution Function and its Properties, Marginal Distribution Functions, Statistical Independence. Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem (Proof not expected), Unequal Distribution, Equal Distributions. Expected Value of a Function of Random Variables: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, Properties.

UNIT – III: Random Processes – Temporal Characteristics

The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationary and Statistical Independence. First-Order, Second Order, Wide-Sense and Strict-Sense Stationary, Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and Its Properties, Cross-Correlation Function and Its Properties, Covariance Functions.

UNIT – IV: Random Processes – Spectral Characteristics

The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, the Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function.

UNIT – V: Linear Systems with Random Inputs and Noise Sources

Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output. Resistive/Thermal Noise Source, Arbitrary Noise Sources, Effective Noise Temperature, Noise equivalent bandwidth, Average Noise Figures, Average Noise Figure of cascaded networks, Narrow Band noise.

Text Books

1. Peyton Z. Peebles, "Probability, Random Variables & Random Signal Principles", 4th Edition, TMH, 2001.
2. Athanasios Papoulis, S. Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes", 4th Edition, PHI, 2002.

Reference Books

1. Bruce Hajck, "Random Processes for Engineers", Cambridge Unipress, 2015
2. Taub and Schilling, "Principles of Communication systems", TMH, 2008.
3. B.P. Lathi, "Signals, Systems & Communications", B.S. Publications, 2003.
4. S.P Eugene Xavier, "Statistical Theory of Communication", New Age Publications, 2003.

SIGNALS AND SYSTEMS

II Year – I Semester

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

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Course Objectives

- To familiarize with various types of basic signals and systems.
- To impart the spectral characteristics of signal using Fourier series and Fourier transforms.
- To present various characteristics of LTI system.
- To introduce the concept of sampling process and correlation.
- To familiarize with various transform techniques.

Course Outcomes

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

- differentiate the various classifications of signals and systems.
- analyze the frequency domain representation of signals using Fourier concepts.
- classify the systems based on their properties and determine the response of LTI Systems.
- understand the concepts of correlation and sampling.
- apply Laplace transform to analyze signals.

Course Content

UNIT- I: Introduction

Definition of Signals and Systems, Classification of Signals, Classification of Systems, Operations on signals: time-shifting, time- scaling, amplitude-shifting, amplitude-scaling. Problems on classification and characteristics of Signals and Systems. Complex exponential and sinusoidal signals, Singularity functions and related functions: impulse function, step function signum function and ramp function.

UNIT–II: Fourier Series and Fourier Transform

Fourier series representation of continuous time periodic signals, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Relation between Trigonometric and Exponential Fourier series, Complex Fourier spectrum. Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function, Related problems.

UNIT-III: Analysis of Linear Systems

Introduction, Linear system, Linear time invariant (LTI) system, Impulse response, Response of a LTI system, Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Transfer function of a LTI system, Related problems. Filter characteristics of linear systems. Distortion less transmission through a system, Signal band width, system band width, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, relationship between bandwidth and rise time.

UNIT–IV

Correlation: Auto-correlation and cross-correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between Convolution and correlation.

Sampling Theorem: Graphical and analytical proof for Band Limited Signals, impulse sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling –Aliasing, Related problems.

UNIT–V: Laplace Transforms

Introduction, Concept of region of convergence (ROC) for Laplace Transforms, constraints on ROC for various classes of signals, Properties of Unilateral L.T's, Inverse Laplace transform-Partial fractions method, Relation between L.T's, and F.T. of a signal.

Text Books

1. B. P. Lathi, "Signals, Systems & Communications", B S Publications, 2003.
2. A. V. Oppenheim, A. S. Willsky, S. H. Nawab, "Signals and Systems", 2nd Edition, PHI, 1997.
3. Simon Haykin, VanVeen, "Signals & Systems", 2nd Edition, Wiley, 2007.

Reference Books

1. B. P. Lathi, "Principles of Linear Systems and Signals", Oxford University Press, 2015.
2. T. K. Rawat, "Signals and Systems", Oxford University press, 2011.

ELECTRONIC DEVICES AND CIRCUITS

II Year – I Semester

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

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Course Objectives

- To familiarize with the electrical characteristics of different diodes.
- To impart the application of diode as rectifier with their operation and characteristics with filters.
- To acquire the knowledge about the principle of working and operation of Bipolar Junction Transistor and MOS Transistor and their characteristics.
- To familiarize with the purpose of transistor biasing and its small signal equivalent circuit analysis of BJT and MOSFETs.

Course Outcomes

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

- understand the formation of p-n junction and identify the diode for various applications in different modes of operation.
- analyze the construction, working principle of various Semiconductor Devices and Diode Circuits
- identify the need of transistor biasing, various biasing techniques for BJT and MOSFET and stabilization concepts with necessary expressions
- apply small signal low frequency transistor amplifier circuits using BJT and MOSFET.

Course Content

UNIT-I:

Junction Diode Characteristics: Review of semiconductors, Energy band diagram of PN junction Diode, Contact potential, current components in p-n junction Diode, Diode equation, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance.

Special Semiconductor Devices: Breakdown mechanisms, Zener diode applications, Varactor Diode, LED, Photodiode, Tunnel Diode, UJT, PNPN Diode, SCR-Construction, operation and V-I characteristics.

UNIT-II: Diode Circuits

The Diode as a circuit element, The Load-Line concept, The Piece wise Linear Diode model, Clipping (limiting) circuits, Clipping at Two Independent Levels, Peak Detector, Clamping circuits, Comparators, Sampling Gate, Basic Rectifier setup**,** half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, Filters, Inductor filter, Capacitor filter, π-section Filter, comparison of various filter circuits in terms of ripple factors.

UNIT-III:

Transistor Characteristics: Junction transistor, transistor current components, transistor equation in CB and CE configuration, Ebers-Moll model, punch through/reach through, Photo transistor, typical transistor junction voltage values.

Transistor Biasing and Thermal Stabilization: Need for biasing, operating point, load line analysis, BJT biasing-methods, basic stability, fixed bias, collector to base bias, self-bias, Stabilization against variations in V_{BE}, Ic, andβ, Stability factors, (S,S$^{'}$,S$^{''}$), Bias compensation, Thermal run away, Thermal stability.

UNIT-IV: Small Signal Low Frequency Transistor Amplifier Models

BJT Two port network, Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers**.**

UNIT-V:

FET: FET types, JFET operation, characteristics, small signal model of JFET.

MOSFET: MOSFET Structure, Operation of MOSFET: operation in triode region, operation in saturation region, MOSFET as a variable resistor, derivation of V-I characteristics of MOSFET, Channel length modulation, MOS transconductance, MOS device models: MOS small signal model, PMOS Transistor, CMOS Technology, Comparison of Bipolar and MOS devices.

MOS amplifiers: General Considerations, Common Source Stage, Common Gate Stage, Source Follower, comparison of FET amplifiers.

Text Books

1. J. Millman, C. C. Halkias, Satyabratajit, "Electronic Devices and Circuits", 4th Edition, Mc-Graw Hill Education, 2015.
2. J. Millman, C. Halkias, and Ch. D. Parikh, "Integrated Electronics", 2nd Edition, Mc-Graw Hill Education, 2009.
3. Behzad Razavi, "Fundamentals of Micro-electronics", 3rd Edition, Wiley, 2021.

Reference Books

1. Chinmoy Saha, Arindam Halder, Debarati Ganguly, "Basic Electronics-Principles and Applications", Cambridge University Press, 2018.
2. Robert L.Boylestad, Loui Nashelsku, "Electronics Devices & Circuit Theory", 11th Edition, Pearson, 2015.
3. A. Bell, David, "Electronic Devices and Circuits", 5th Edition, Oxford University Press, 2008.
4. S. Salivahanan, N.Suresh Kumar, "Electronic Devices and Circuits", 5th Edition, Mc-Graw Hill, 2022.

ELECTRONIC DEVICES AND CIRCUITS LAB

II Year – I Semester

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

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Course Objectives

- To familiarize with the conduct of experiments for obtaining the V-I characteristics of LED, Photo diode, SCR, UJT, BJT and MOSFET devices.
- To impart biasing concepts in CE and CS amplifiers.

Course Outcomes

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

- identify various electronic components and basic electronic measuring instruments and other lab equipment.
- perform experiment, take observations, present the results in proper form, analyze and interpret results, and draw conclusions by correlating with theory.
- verify the I-V characteristics of LED, photodiode, SCR,UJT, BJT, MOSFET and obtain their parameters.
- implement and verify diode clipper and clamper circuits.
- implement and test the biasing circuits for BJT and MOSFET.
- analyze CE,CC and CS amplifier circuits with its frequency response.

List of Experiments

Perform any ten of the following experiments

1. LED and Photo Diode Characteristics
2. SCR Characteristics
3. UJT Characteristics
4. Clipper circuit using diode
5. Clamping circuit using diode
6. BJT Characteristics (CB/CE Configuration)
   Part A: Input Characteristics
   Part B: Output Characteristics
7. Transistor Biasing - BJT
8. BJT- CE Amplifier
9. BJT- CC Amplifier
10. MOSFET Characteristics (CS Configuration)
    Part A: Drain Characteristics
    Part B: Transfer Characteristics
11. Transistor Biasing - MOSFET
12. MOSFET- CS Amplifier

Reference Books:

1. Chinmoy Saha, Arindam Halder, Debarati Ganguly, "Basic Electronics-Principles and Applications", Cambridge University Press, 2018.
2. Robert L.Boylestad, Loui Nashelsku, "Electronics Devices & Circuit Theory", 11th Edition, Pearson, 2015.

3. A. Bell, David, “Electronic Devices and Circuits”, Oxford University Press, 5th Edition, 2008.
4. S. Salivahanan, N.Suresh Kumar, “Electronic Devices and Circuits”, 5th Edition, Mc-Graw Hill, 2022.

SIGNALS AND SYSTEMS LAB

II Year – I Semester

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

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Course Objectives

- To familiarize with various types of basic signals and their operations.
- To introduce various transform techniques on signals.
- To impart the concepts of Correlation and Convolution of signals.

Course Outcomes

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

- generate and characterize various continuous time signals.
- execute the basic operations on the signals.
- analyze the spectral characteristics of signals using Fourier analysis.
- analyze the signals using Laplace transform.

List of Experiments

1. Plot the following continuous time signals:
   a. Unit step
   b. Unit impulse
   c. Unit Ramp
   d. Sinusoidal
   e. Signum
2. Execute the following transformations on independent variable:
   a. Shifting (Delay & Advance)
   b. Reversing
   c. Scaling (Amplitude & Time)
3. Perform the addition, subtraction and multiplication operations on a given signal.
4. (a) Compute the energy and power off given signal.
   (b) Find the even and odd parts of the given signal.
5. Obtain the trigonometric and exponential Fourier series coefficients of a given periodic signal.
6. Analyze the spectrum of the given signal using Fourier transform.
7. Verify the properties of Fourier transform.
8. Perform the Convolution and Deconvolution.
9. Compute correlation of two signals.
10. Perform the Laplace Transforms of the given signal.

Reference Books

1. B. P. Lathi, “Signals, Systems & Communications”, B S Publications, 2003.
2. A. V. Oppenheim, A. S. Willsky, S. H. Nawab, “Signals and Systems”, 2nd Edition, PHI, 1997.
3. Simon Haykin, VanVeen, “Signals & Systems”, 2nd Edition, Wiley, 2007.
4. T. K. Rawat, “Signals and Systems”, Oxford University press, 2011.

DATA STRUCTURES USING PYTHON

(Common to ECE and IoT)

II Year – I Semester

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

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Course Objectives

- To demonstrate the implementation of various searching and sorting techniques in python.
- To develop programs for the implementation of linear and non-linear data structures in python.
- To familiarize with the principles of object-oriented programming and comprehensions in python.

Course Outcomes

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

- implement various searching and sorting algorithms in python.
- develop python programs for implementing stacks, queues, linked lists and binary search trees and perform various operations on them.
- utilize constructors and methods to manipulate and access class data in python.
- develop classes in python that override base class abstract methods to provide specific implementations.
- implement method overloading and method overriding concepts with python.
- write efficient python code using list, dictionary, set, and generator comprehensions.

List of Experiments

Perform any ten of the following experiments

1. Write a python program for Linear Search and Binary search.
2. Write a python program to implement Bubble Sort and Selection Sort.
3. Write a python program to implement Merge sort and Quick sort.
4. Write a python program to implement Stacks and Queues.
5. Write a Python program for class, Flower, that has three instance variables of type str, int and float that respectively represent the name of the flower, its number of petals and its price. Your class must include a constructor method that initializes each variable to an appropriate value, and your class should include methods for setting the value of each type, and retrieving the value of each type.
6. Develop an inheritance hierarchy based upon a Polygon class that has abstract methods area() and perimeter(). Implement classes Triangle, Quadrilateral, Pentagon, that extend this base class, with the obvious meanings for the area( ) and perimeter( ) methods. Write a simple program that allows users to create polygons of the various types and input their geometric dimensions, and the program then outputs their area and perimeter.
7. Write a python program to implement Method Overloading and Method Overriding.
8. Write a Python program to illustrate the following comprehensions:
   a) List Comprehensions
   b) Dictionary Comprehensions
   c) Set Comprehensions
   d) Generator Comprehensions

9. Write a Python program to generate the combinations of n distinct objects taken from the elements of a given list.

   Example: Original list: [1,2,3,4,5,6,7,8,9]

   Combinations of 2 distinct objects: [1,2][1,3][1,4][1,5]….[7,8][7,9][8,9].
10. Write a python program to implement Singly Linked List.
11. Write a python program to implement Doubly Linked list.
12. Write a python program to implement Binary Search Tree.

Reference Books

1. Michael T. Goodrich, "Data structures and algorithms in python", 1st Edition, Wiley.
2. Narasimha Karumanchi, "Data Structures and Algorithmic Thinking with Python", 1st Edition, Career Monk,.
3. William McKinney, "Python for Data Analysis", 2nd Edition, O'Reilly Media Inc.

ENVIRONMENTAL SCIENCE

(Common to CE, EEE, ME, ECE, AI&DS and IOT)

II Year – I Semester

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

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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

LINEAR CONTROL SYSTEMS

II Year – II Semester

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

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Course Objectives

- To introduce the concepts of control systems by developing mathematical models for physical systems and familiarize with the time domain behavior of linear control systems.
- To introduce the concepts of state variable analysis, design and also the concepts of controllability and observability.

Course Outcomes

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

- develop mathematical models for physical systems.
- employ the time domain analysis to quantify the performance of linear control systems and specify suitable controllers.
- analyze the system stability using time domain methods.
- determine the system stability using frequency domain methods.
- apply state variable theory to determine the dynamic behavior of linear control systems.

Course Content

UNIT - I: Introduction

Concepts of System, Control Systems: Open Loop and closed loop control systems and their differences. Different examples of control systems, Feedback Characteristics, Effects of feedback. Mathematical models, Differential equations, Impulse Response and transfer functions. Translational and Rotational mechanical systems

UNIT - II: Transfer Function Representation

Transfer Function of DC Servo motor - AC Servo motor- Synchro-transmitter and Receiver, Block diagram representation of systems considering electrical systems as examples –Block diagram algebra–Representation by Signal flow graph-Reduction using mason's gain formula.

Time Response Analysis : Standard test signals– Time response of first order systems– Characteristic Equation of Feedback control systems, Transient response of second order systems – Time domain specifications – Steady state response -Steady state errors and error constants.

UNIT-III: Stability Analysis in S-Domain

The concept of stability–Routh's stability criterion – qualitative stability and conditional stability – limitations of Routh's stability.

Root Locus Technique: The root locus concept - construction of root loci-effects of adding poles and zeros to G(s) H(s) on the root loci.

UNIT- IV: Frequency Response Analysis:

Introduction, Correlation between time and frequency response, Polar Plots, Bode Plots, Nyquist Stability Criterion.

UNIT-V: Classical Control Design Techniques

Compensation techniques–Lag, Lead, Lead-Lag Controllers design infrequency Domain, PID Controllers. State Space Analysis of Continuous Systems Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization-Solving the Time in variant state Equations - State Transition Matrix and it's Properties–Concepts of Controllability and Observability.

Text Books:

1. B. C. Kuo, "Automatic Control Systems", 8th Edition, John Wiley and Sons, 2003.
2. I.J. Nagrath, M. Gopal, " Control Systems Engineering", 2nd Edition, New Age International (P) Limited, 2007.
3. Katsuhiko Ogata, "Modern Control Engineering", 5th Edition, Pearson Publications, 2015.

Reference Books:

1. A. Nagoorkani, "Control Systems", 3rd Edition, RBA Publications, 2017.
2. A. Anand Kumar, "Control Systems", 2nd Edition, PHI, 2014.

SWITCHING THEORY AND LOGIC DESIGN

II Year – II Semester

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

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Course Objectives

- To impart the optimization of logic gates for digital circuits using various techniques.
- To introduce the simplification of Boolean function using Karnaugh maps and Quine-McCluskey methods.
- To familiarize with the development of combinational and advanced sequential circuits using Verilog.

Course Outcomes

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

- use the concept of Boolean algebra in the minimization of switching functions
- design different types of combinational logic circuits.
- apply knowledge of flip-flops in designing of registers and counters.
- design synchronous sequential circuits using algorithmic state machines.
- develop of combinational and advanced sequential circuits using Verilog.

UNIT–I: Minimization Techniques

Minimization and realization of switching functions using Boolean theorems, K-Map (upto 6 variables) and tabular method (Quine - McCluskey method) with only four variables and single function.

Combinational Logic Circuits Design-I: Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders; 4-bit adder subtractor circuit, BCD adder circuit, Excess 3 adder circuit and carry look ahead adder circuit, Design code converts using Karnaugh method and draw the complete circuit diagrams.

UNIT – II: Combinational Logic Circuits Design-II

Design of encoder, decoder, multiplexer and de-multiplexers, Implementation of higher order circuits using lower order circuits. Realization of Boolean functions using decoders and multiplexers. Design of Priority encoder, 4-bit digital comparator and seven segment decoder.

Introduction of PLD's

PLDs: PROM, PAL, PLA -Basics structures, realization of Boolean functions, Programming table.

UNIT – III: Sequential Circuits-I

Classification of sequential circuits (synchronous and asynchronous) , operation of NAND & NOR Latches and flip-flops; truth tables and excitation tables of RS flip-flop, JK flip- flop, Tflip-flop, D flip-flop with reset and clear terminals. Conversion from one flip-flop to another flip- flop. Design of ripple counters, design of synchronous counters, Johnson counter, ring counter. Design of registers - Buffer register, control buffer register, shift register, bi-directional shift register, universal shift register.

UNIT – IV: Sequential Circuits-II

Finite state machine; state diagrams, state tables, reduction of state tables. Analysis of clocked sequential circuits Mealy to Moore conversion and vice-versa. Realization of sequence generator, Design of Clocked Sequential Circuit to detect the given sequence (with overlapping or without overlapping)

UNIT – V: Introduction to Verilog

Structural specification of logic circuits, behavioral specification of logic circuits, hierarchical Verilog Code, Verilog for combinational circuits - conditional operator, if-else statement, case statement, for loop using storage elements with CAD tools-using Verilog constructs for storage elements, flip-flop with clear capability, using Verilog constructs for registers and counters. Verilog code for Sequential circuits: Registers. Asynchronous Counters, Synchronous Counter, Verilog for combinational circuits – Encoder, Decoder, Multiplexer, Demultiplexer.

Text Books

1. M. Morris Mano, Michael D. Ciletti, "Digital Design", 4th Edition, PHI publication, 2008.
2. Zvi Kohavi, Niraj K. Jha "Switching and Finite Automata Theory", 3rd Edition, Cambridge University Press, 2009.
3. Stephen Brown, Zvonko Vranesic, "Fundamentals of Digital Logic with Verilog Design", 3rd Edition, McGraw-Hill.

Reference Books

1. Charles H. Roth Jr. "Fundamentals of Logic Design", Jaico Publishers, 2006.
2. R.S.Sedha, "Digital Electronics", S. Chand and Company Limited, 2010.
3. A. Anand Kumar, "Switching Theory and Logic Design", PHI Learning, 2016.
4. John M Yarbough, "Digital Logic Applications and Design", Cengage Learning, 2006.

ELECTROMAGNETIC WAVES AND TRANSMISSION LINES

II Year – II Semester

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

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Course Objectives

- To impart the fundamental knowledge of electric fields, coulomb's law and gauss law.
- To familiarize with Biot-Savart Law, Ampere's Circuital Law and Maxwell equations.
- To introduce the concept of electromagnetic wave propagation in dielectric and conducting media.
- To acquaint with the equivalent circuit of transmission lines and parameters of the transmission lines.
- To instill with Smith chart and its usage in the calculation of transmission line parameters.

Course Outcomes

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

- determine electric field intensity using coulomb's law and Gauss law.
- determine magnetic field intensity using Biot-Savarts Law and Ampere's Circuital Law.
- analyze the electromagnetic wave propagation in dielectric and conducting media.
- examine the primary and secondary constants of different types of transmission lines.
- derive the expressions for input impedance, reflection coefficient, and VSWR of transmission lines and calculate these parameters using smith chart.

Course Content

UNIT-I:

Review of Co-ordinate Systems, **Electrostatics:** Coulomb's Law, Electric Field Intensity, Electric Flux Density, Gauss Law and Applications, Electric Potential, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Illustrative Problems. Convection and Conduction Currents, Dielectric Constant, Poisson's and Laplace's Equations; Capacitance – Parallel Plate, Coaxial Capacitors, Illustrative Problems.

UNIT-II:

Magnetostatics: Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic FluxDensity,Maxwell'sTwoEquationsforMagnetostaticFields,MagneticScalarandVectorPotentials, Forces due to Magnetic Fields, Ampere's Force Law, Inductances and Magnetic Energy, Illustrative Problems**.**

Maxwell's Equations (Time Varying Fields): Faraday's Law and Transformer EMF, In consistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements, Conditions at a Boundary Surface, Illustrative Problems.

UNIT-III: EM Wave Characteristics

Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations Between E & H, Sinusoidal Variations, Wave Propagation in Lossy dielectrics, lossless dielectrics, free space, wave propagation in good conductors, skindepth, Polarization & Types, Illustrative Problems.

Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector and Poynting Theorem, Illustrative Problems.

UNIT-IV: Transmission Lines-I

Types, Parameters, T & π Equivalent Circuits, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line, Lossless lines, distortionless lines, Illustrative Problems.

UNIT-V: Transmission Lines–II:

Input Impedance Relations, Reflection Coefficient, VSWR, Average Power, Shorted Lines, Open Circuited Lines, and Matched Lines, Low loss radio frequency and UHF Transmission lines, UHF Lines as Circuit Elements, Smith Chart – Configuration. Calculation of Reflection coefficient, VSWR, Input impedance using Smith Chart.

Text Books

1. Matthew N. O. Sadiku, "Elements of Electromagnetic", 7th Edition, Oxford University Press, 2018.
2. E. C. Jordan, K. G. Balmain, "Electromagnetic Waves and Radiating Systems", 2nd Edition, PHI, 2008.

Reference Books

1. William H. Hayt, John A. Buck, Jaleel M. Akhtar, "Engineering Electromagnetics", 9th Edition, TMH, 2020.
2. G. S. N. Raju, "Electromagnetic Field Theory and Transmission Lines", Pearson Education, 2006
3. G. Sasi Bhushana Rao, "Electromagnetic Field Theory and Transmission Lines", Wiley India, 2013.
4. John D. Ryder, "Networks, Lines and Fields", 2nd Edition, Pearson Education, 2015.

ELECTRONIC CIRCUIT ANALYSIS

II Year – II Semester

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

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Course Objectives

- To familiarize with transistor at high frequencies.
- To impart the effect of negative feedback on amplifier characteristics and derive the characteristics.
- To introduce the basic principle of oscillator circuits and perform the analysis of different oscillator circuits.
- To instill different Power amplifiers like Class A, Class B, Class C, Class AB and other types of amplifiers.
- To impart different types of tuned amplifier circuits.

Course Outcomes

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

- analyze the response of CS and CE amplifiers at high frequencies.
- apply the knowledge of Differential and Tuned amplifiers in the design of multistage amplifiers.
- describe the effect of negative feedback on Amplifier characteristics.
- derive the expressions for frequency of oscillation and condition for sustaining oscillations of RC and LC oscillators.
- classify the power amplifiers and analyze their power conversion efficiencies.

Course Content

UNIT-I: Small Signal High Frequency Transistor Amplifier models

The MOSFET internal capacitances, high-frequency MOSFET model, MOSFET unity-gain frequency (f_T), The BJT internal capacitances, High-frequency hybrid-π model, the cut-off frequency, High frequency response - General considerations, high-frequency response of Common Source (CS) amplifier using - Miller's theorem, open-circuit time constants and exact analysis, Adapting the formulas for the case of Common Emitter (CE) amplifier, Analysis of common drain Amplifier circuits at high frequencies.

UNIT - II: Multistage Amplifiers

MOS differential pair – Operation with common mode and differential input, Large-signal operation, small-signal operation of MOS differential pair, BJT differential pair – basic operation, Large-signal and small-signal operation, High input resistance transistor amplifier circuits and their analysis-Darlington pair amplifier, Cascode amplifier.

Tuned Amplifiers: The basic principle, Inductor losses, Use of Transformers, Amplifiers with Multiple Tuned circuits, the Cascode and CC-CB cascade, Synchronous tuning, Stagger tuning.

UNIT - III: Feedback Amplifiers

The general feedback structure, some properties of negative feedback (characteristics/advantages), the four basic feedback topologies, Series-Shunt feedback amplifier, Series-Series feedback amplifier, Shunt-Shunt feedback amplifier, Shunt-Series feedback amplifier (Analysis of gain, input and output impedances for all feedback amplifiers), Method of analysis of feedback amplifiers, Performance comparison of feedback amplifiers.

Unit - IV: Oscillators

The basic principle of sinusoidal oscillators, Condition for oscillations, types of oscillators, The ideal Op-Amp, Inverting and Non-Inverting configurations, Wien bridge and RC Phase shift oscillator – analysis for frequency of oscillation and necessary condition to sustain oscillations, Generalized analysis of LC Oscillators, Hartley and Colpitts oscillators, Frequency and amplitude stability of oscillators.

UNIT - V: Power Amplifiers

Output stages and Power Amplifiers: Classification of power amplifiers (A to H), Class A output stage, Class B output stage (Push-pull amplifiers, Complementary symmetry push pull amplifier), Class AB output stage, Biasing the Class AB circuit, Class-C power amplifier, Power BJTs – Junction temperature, Thermal resistance, Power Dissipation versus Temperature, Transistor Case and Heat sink, Parameter values of Power Transistors.

Text Books

1. Adel. S. Sedra and Kenneth. C. Smith, “Microelectronic Circuits”, 5th Edition, Oxford University Press, 2015.
2. Jacob Millman, Christos Halkias, Chetan D Parikh, "Integrated Electronics: Analog and Digital Circuits and Systems", 2nd Edition, Mc Graw Hill Higher Education Publishers, 2017.
3. B.V.Rao, K.R.Rajeswari, P.C.R.Pantulu, K.B.R. Murthy, “Electronic Circuit Analysis”, Pearson Publications.

Reference Books

1. Donald A. Neaman, “Electronic Circuit Analysis and Design”, 3rd Edition, McGraw Hill, 2010.
2. B.P. Singh, Rekha, “Electronic Devices and Integrated Circuits”, Pearson publications, 2006.

Video Lectures:

https://archive.nptel.ac.in/courses/108/105/108105158/

ANALOG COMMUNICATIONS

II Year – II Semester

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

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Course Objectives

- To familiarize the students with the fundamentals of analog communication systems and various Techniques for modulation and demodulation of signals.
- To describe the effect of noise on analog modulated signals.

Course Outcomes

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

- disseminate the fundamentals of amplitude modulation schemes and different multiplexing Techniques.
- analyze DSB-SC, SSB, VSB, FM and PM.
- understand various blocks in AM and FM transmitters and receivers.
- distinguish different pulse analog modulation systems and analyze the effect of noise in AM and FM waves.

Course Content

Unit – I: Amplitude Modulation

Introduction to Fourier transform, Introduction to communication system, Need for modulation, Frequency Division Multiplexing, Amplitude Modulation, Time domain and Frequency domain descriptions, Single tone modulation, Power relations in AM waves, Generation of AM waves: Square law Modulator, Switching modulator, Detection of AM Waves: Square law detector, Envelope detector, Related problems.

Unit–II: DSB & SSB Modulation

Double Sideband Suppressed Carrier Modulator: Time domain and frequency domain description, Generation of DSBSC Waves: Balanced Modulator, Ring Modulator, Detection of DSBSC Waves: Coherent detection, Quadrature Null Effect, COSTAS Loop, Squaring Loop.

Single Side Band Suppressed Carrier Modulator: Time domain and Frequency domain description, Generation of SSBSC Waves: Frequency discrimination method, Phase discrimination method, Demodulation of SSB Waves: Coherent Detection.

Vestigial Sideband Modulation: Time domain description, Frequency domain description, Generation of VSB Modulated wave, Envelope detection of a VSB Wave pulse Carrier, Comparison of different AM Techniques, Applications of different AM Systems, Related problems.

Unit–III: Angle Modulation

Introduction, Basic concept of phase modulation, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Constant Average Power, Transmission band width of FM Wave, Generation of FM Waves: Direct Method, Indirect Method, Detection of FM Waves: Balanced Frequency discriminator, Zero crossing detector, Phase locked loop, Comparison of FM & AM, Related problems.

Unit – IV:

Radio Transmitters: Classification of Transmitters, AM Transmitter, Effect of feedback on performance of AM Transmitter, FM Transmitter: Variable reactance type and Phase modulated FM Transmitter, Frequency stability in FM Transmitter.

Radio Receivers: Receiver Types: Tune dradio frequency receiver, Super heterodyne receiver, RF section and Characteristics, Frequency changing and tracking, Intermediate frequency, AGC, FM Receiver, Amplitude limiting, Comparison of FM & AM Receivers, Communication Receivers, Extension of super heterodyne principle and additional circuits.

Unit – V:

Noise: Review of noise and noise sources, Noise figure, Noise in Analog communication Systems: Noise in DSB & SSB Systems, Noise in AM System and Noise in Angle Modulation Systems, Threshold effect in Angle Modulation System, Pre-emphasis & De-emphasis.

Pulse Analog Modulation: Types of Pulse modulation, PAM (Single polarity, double polarity), PWM: Generation & Detection of PWM, PPM: Generation and Detection of PPM, Time Division Multiplexing, TDM Vs FDM.

Text Books

1. Simon Haykin, Michael Moher, "Communication Systems", 5th Edition, Wiley, 2009.
2. HTaub, D L Schilling, Gautam Sahe, "Principles of Communication Systems", 4th Edition, TMH, 2017.
3. B. P. Lathi, ZhiDing, Hari Mohan Gupta, "Modern Digital and Analog Communication Systems", 4th Edition, Oxford University Press, 2017.

Reference Books

1. George Kennedy, Bernard Davis, S R M Prasanna, "Electronics & Communication Systems", 6th Edition, TMH, 2017.
2. R P Singh, S D Sapre, "Communication Systems", 3rd Edition, TMH, 2017.
3. Dr. Sanjay Sharma, "Communication Systems (Analog and Digital)", 7th Reprint Edition, Katson Books, 2018.

Web Links:

- http://nptel.ac.in/courses/117102059/Prof.SurendraPrasad.
- https://ict.iitk.ac.in/wp-content/uploads/EE320A-Principles-Of-Communication-CommunicationSystems-4ed-Haykin.pdf.
- https://www.scribd.com/document/266137872/sanjay-sharma-pdf.
- http://bayanbox.ir/view/91440908351988908 6/Book-Modern-Digital-And-AnalogCommunication-Systems-4th-edition-by-Lathi.pdf.
- https://soaneemrana.org/onewebmedia/ELECTRONICS%20COMMUNICATION%20SYSTEM%20BY%20GEORGE%20KENNEDY.pdf

SWITCHING THEORY AND LOGIC DESIGN LAB

II Year – II Semester

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

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Course Objectives

- To get acquainted with the concepts of various combinational and sequential circuits
- To familiarize with the CAD Tools.

Course Outcomes

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

- verify the functionality of various combinational and sequential circuits.
- design registers, counters using flip-flops.
- design logic circuits using verilog.

List of Experiments

Perform any ten of the following experiments

1. Design a simple combinational circuit with four variables and obtain minimal SOP expression and verify the truth table.
2. Verification of functional table of 3 to 8 line Decoder / De-multiplexer.
3. Verification of 4-variable logic function using 8 to 1 multiplexer.
4. (a) Draw the circuit diagram of a single bit comparator and test the output
   (b) Construct 7 Segment Display Circuit Using Decoder and 7 Segment LED and test it.
5. Design carry look-ahead adder circuit and verify its functional table.
6. Verification of functional tables of (i) J K Edge triggered Flip–Flop (ii) J K Master Slave Flip–Flop (iii) D Flip-Flop.
7. Verify the operation of 4-bit Universal Shift Register for different Modes of operation.
8. Design MOD-n ripple counter using T-Flip-Flops and test with a low frequency clock and sketch the output wave forms.
9. Design MOD–n synchronous counter using T Flip-Flop and verify the result and sketch the output wave forms.
10. Design a four-bit ring counter using D Flip–Flops / J K Flip-Flops and verify output.
11. Design a four-bit Johnson's counter using D Flip-Flops / J K Flip-Flops and verify output.
12. Design of an ALU using Hardware Description Language.
13. Open ended experiment (Mandatory).

References Books

1. M.Morris Mano, Michael D Ciletti, "Digital Design", 4th Edition, PHI publication, 2008.
2. Hill, Peterson, "Switching Theory and Logic Design", TMH Edition, 2012.
3. Stephen Brown, Zvonko Vranesic, "Fundamentals of Digital Logic with Verilog Design", 3rd Edition, McGraw-Hill.

ELECTRONIC CIRCUIT ANALYSIS LAB

II Year – II Semester

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

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Course Objectives

- To familiarize with the design, simulation, and conduct of experiments to obtain the frequency response/ performance characteristics of single-stage, multistage, feedback, power amplifiers, and tuned amplifiers.
- To inculcate the design of RC and LC oscillators.

Course Outcomes

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

- perform experiment, take observations, present the results in proper form, analyze and interpret results, draw conclusions by correlating with theory.
- use modern tools for simulation.
- determine the unity gain frequency f_t of a given transistor.
- design, simulate, hardware implement, test, and obtain performance characteristics of – various amplifiers and oscillators.

List of Experiments:

Perform any ten of the following experiments

1. Determination of f_t of a given transistor
2. BJT Differential Amplifier
3. Darlington Amplifier
4. Single Tuned Voltage Amplifier
5. Double Tuned Voltage Amplifier
6. Voltage-Shunt Feedback Amplifier
7. Current-Series Feedback Amplifier
8. Op-Amp operation in Inverting and Non-Inverting configurations
9. RC Phase Shift / Wien Bridge Oscillator
10. Hartley / Colpitts Oscillator
11. Class A Series-fed Power Amplifier
12. Complementary Symmetry Class B Power Amplifier
13. Class B Push-Pull Power Amplifier
14. Transformer-coupled Class A Power Amplifier

References Books

1. Donald A. Neaman, “Electronic Circuit Analysis and Design”, McGraw Hill, 2010.
2. A. S. Sedra, K. C. Smith, “Microelectronic Circuits”, 6th Edition, Oxford University Press, 2011.
3. B. V. Rao, K. R. Rajeswari, P. C. R. Pantulu, K. B. R. Murthy, “Electronic Circuit Analysis”, Pearson Publications, 2011.

SOFT SKILLS

(Common to ME and ECE)

II Year – II Semester

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

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Course Objectives

- To prepare to face global competition for employment and excellence in profession.
- To help the students understand and build interpersonal skills that will enable them to lead meaningful professional life.

Course Outcomes

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

- assimilate and understood the meaning and importance of soft skills and learn how to develop them.
- understand the significance of soft skills in the working environment for professional excellence.
- prepare to undergo the placement process with confidence and clarity.
- ready to face any situation in life and equip themselves to handle them effectively.
- understand and learn the importance of etiquette in both professional and personal life.

Course Content

UNIT–I: Introduction

Introduction- Emergence of life skills, Definition & Meaning, Importance & need, reasons for skill gap, Analysis--Soft Skills vs. Hard skills, Linkage between industry and soft skills, Challenges, Personality Developments. Soft Skills, Soft Skills vs. English, Improving Techniques.

UNIT–II: Intra-Personal

Definition-Meaning – Importance-SWOT analysis, Johari windows - Goal Setting- quotient skills - Emotional Intelligence- Attitudinal skills - Right thinking- Problem Solving-Time management, stress management.

UNIT–III: Inter-Personal

Definition–Meaning–Importance-Communications skills-Team Work, managerial skills -Negotiation skills - Leadership skills, corporate etiquettes.

UNIT–IV: Verbal Skills

Definition and Meaning - Listening skills, need-types, advantages, Importance -Improving Tips for Listening, Speaking, need-types, advantages, Importance - Improving Tips, Reading - Writing Skills, Report, Resume, statement of purpose, need- types, advantages, Importance - Improving Tips.

UNIT–V: Non-Verbal Skills & Interview Skills

Definition and Meaning – Importance - Facial Expressions - Eye Contact - Proxemics - Haptics - Posture, cross cultural body language, body language in interview room, appearance and dress code - Kinetics - Para Language - tone, pitch, pause, neutralization of accent, use of appropriate language, Interview skills, interview methods and questions.

Text Books:

1. Sherfield, M. Robert et. al, "Cornerstone Developing Soft Skills", 4th Edition, Pearson Publication, 2014.
2. Alka Wadkar, "Life Skills for Success", 1st Edition, Sage Publications India Private Limited, 2016.

Reference Books:

1. M. Sambaiah, “Technical English”, Wiley publishers India, New Delhi. 2014.
2. Gangadhar Joshi, “From Campus to Corporate,” 1st Edition, Sage Texts.
3. K. Alex, “Soft Skills”, 3rd Edition, S. Chand Publication, 2014.
4. Meenakshi Raman, Sangita Sharma, “Technical Communication: Principle and Practice”, Oxford University Press, 2009.
5. Shalini Varma, “Body Language for Your Success Mantra”, 4th Edition, S. Chand Publication, 2014.
6. Stephen Covey, “Seven Habits of Highly Effective People”, JMD Book, 2013.

Online Learning Resources:

- https://onlinecourses.nptel.ac.in/noc20_hs60/preview
- http://www.youtube.com/@softskillsdevelopment6210
- https://youtube.com/playlist?list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q&si=Fs05Xh8ZrOPsR8F4
- https://www.coursera.org/learn/people-soft-skills-assessment?language=English
- https://www.edx.org/learn/soft-skills

DESIGN THINKING AND 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

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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