

USHARAMA
COLLEGE OF ENGINEERING AND TECHNOLOGY
AUTONOMOUS

(Approved by A.I.C.T.E & Permanently Affiliated to JNTU, Kakinada)
Accredited by NAAC with "A" Grade
on NH 16, Telaprolu, Krishna Dist – 521109

B.TECH
ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

UR23

(Applicable for the batches admitted from the Academic Year 2023-24)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING



USHARAMA

COLLEGE OF ENGINEERING AND TECHNOLOGY

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AUTONOMOUS

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Vision, Mission and Program Educational Objectives

Vision of The Institution:

To emerge as a centre of excellence in technical education by imparting quality teaching learning practices and research for the transformation of society.

Mission of the Institution:

- M1: Provide an ideal and the best class infrastructure to foster exploration in engineering and research.
- M2: Build dedicated faculty with student centric teaching, incorporating experiential, innovative skills.
- M3: Encourage life-long learning, entrepreneurial thinking, and ethical responsibility in students to address societal challenges.

Vision of the Department:

To be a pioneer in Electronics and Communication Engineering and research, promoting entrepreneurship and delivering innovative solutions to societal needs.

Mission of the Department:

- M1: To provide a strong foundation in Electronics and Communication Engineering, preparing students to tackle emerging technological challenges.
- M2: To drive research in Electronics and Communication Engineering that delivers innovative solutions to societal needs.
- M3: To promote lifelong learning, empowering students to adapt to the evolving technological advancements.

Program Educational Objectives:

- **PEO1** Exhibit continuous growth in technical expertise and leadership within the engineering field, while upholding professional ethics.
- **PEO2** Communicate effectively and manage resources skillfully as members and leaders of the profession.
- **PEO3** Commit to continuous learning and adapt to emerging technologies to meet the evolving needs of society.

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

PROGRAM OUTCOMES (PO's)

Po. No	PROGRAM OUTCOME
PO-1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO-2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO-3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO-4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO-5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO-6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO-7	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO-8	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO-9	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO-10	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO-11	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSO's)

PSO-1	Develop electronics and communication systems in VLSI, embedded systems, signal processing, and RF communications using advanced tools.
PSO-2	Apply ECE knowledge to design, develop, and test systems, considering societal, environmental, ethical, and economic factors.

UR23 CBCS REGULATIONS

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1. PREAMBLE

Usha Rama College of Engineering and Technology (URCET) aims at achieving academic excellence by implementing new initiatives in teaching-learning and evaluation processes. Based on the directions of the University Grants Commission (UGC), New Delhi, All India Council for Technical Education (AICTE), New Delhi and Jawaharlal Nehru Technological University (JNTUK) Kakinada, URCET introduced the Credit Based Semester System (CBSS) in under-graduate programmes offered from the academic year 2019 – 20. Keeping in view of the standardization of the higher education system in India, URCET is going to implement Choice Based Credit System (CBCS).

2. ADMISSION CRITERIA

The eligibility criteria for admission into engineering programmes offered at URCET shall be as prescribed by the Government of Andhra Pradesh. The criteria are given below:

- The candidate shall be an Indian National / NRI.
- The candidate should have completed 18 years of age as on 31st December of the academic year for which the admissions are being conducted.
- The candidate should have passed the qualifying examination (10+2) or equivalent as on the date of admission recognized by BIE, Andhra Pradesh State.
- Seats in each programme in the Institute are classified into three categories i.e., Category – A, Category – B
- Category – Lateral Entry seats as per the GOs.

2.1 Category – A Seats

These seats shall be filled through counseling by convener as per the rank secured by a candidate in the Common Entrance Test (EAMCET) conducted by the Government of Andhra Pradesh and as per other admission criteria laid down in the GOs.

2.2 Category – B Seats

These seats shall be filled by the Institute as per the GOs issued by the Government of Andhra Pradesh from time to time.

2.3 Category – Lateral Entry seats

Direct Admission to Second Year: (Lateral Entry Scheme)

A candidate shall be admitted into the third semester (II year I semester) based on the rank secured by the candidate in the Engineering Common Entrance Test [ECET (For Diploma Holders)] by the Government of Andhra Pradesh and as per other admission criteria laid down in the GOs.

3. UNDER-GRADUATE DEGREE PROGRAMMES OFFERED

The following courses of study are offered at present as specializations for the B. Tech. Courses:

Table 1: Under graduate degree programs offered

S.No	Branch
1	Civil Engineering (CE)
2	Electrical and Electronics Engineering (EEE)
3	Mechanical Engineering (ME)
4	Electronics and Communication Engineering (ECE)
5	Computer Science and Engineering (CSE)
6	Information Technology (IT)

4. AWARD OF B.TECH DEGREE

A student will be declared eligible for the award of B. Tech. Degree if he/she fulfills the following academic requirements:

1. A student shall be declared eligible for the award of the B. Tech Degree, if he pursues a course of study in not less than four and not more than eight academic years
2. The candidate shall register for 160 credits and secure all the 160 credits.

NOTE: Students, who fail to fulfill all the academic requirements for the award of the degree within eight academic years from the year of their admission, shall forfeit their seat in B.Tech. programme.

3. In case of Lateral Entry students, the candidate shall register for 120 credits and secure all the 120 credits.

NOTE: Students, who fail to fulfill all the academic requirements for the award of the degree within six academic years from the year of their admission, shall forfeit their seat in B.Tech. programme.

5. DURATION OF THE ACADEMIC PROGRAMMES

Under CBCS, it is possible for an outstanding student to qualify for the award of degree in a shorter time than that of the duration specified for the concerned programme. However, the B.Tech. degree shall be issued at the end of normal duration of the programme.

Normal Duration:

The duration of the B.Tech. degree programme shall be four (4) years.

The duration of the B.Tech Lateral Entry Scheme (LES) degree programme shall be three (3) years.

Maximum Duration:

The maximum period in which a student can complete a full time B.Tech. degree programme shall be twice the normal duration of the programme, i.e., eight years (16 semesters) for B.Tech. degree and six years (12 semesters) for B.Tech. lateral entry scheme degree (For Diploma Holders).

The maximum period for a programme shall also be dictated by the fact that a student has to demonstrate the prescribed minimum academic performance by registering for the prescribed minimum number of credits in every semester, for continuing in the programme. This period can be equal to or lesser than the maximum period.

6. B.TECH. PROGRAMME COURSE STRUCTURE

6.1 Medium of Instruction And Examination

The medium of instruction shall be English for all the courses including their content delivery and examinations, seminars, presentations and project evaluation as prescribed in the programme curriculum.

6.2 Scheme of Instruction And Examination:

The scheme of instruction and examination of all B. Tech programs are given separately.

6.3 Minimum Instruction Days

Each semester shall consist of 16 weeks of academic work excluding examination and evaluation. The minimum instruction days for each semester shall be 90 working days.

7. COURSES AND CREDIT STRUCTURE

Table 2: Course Code and Definitions

Course Code	Definitions
L	Lecture
T	Tutorial
P	Practical
BSC	Basic Science Courses
ESC	Engineering Science Courses
HMC	Humanities and social sciences including Management Courses
PCC	Professional Core Courses
PEC	Professional Elective Courses
OEC	Open Elective Courses
LC	Laboratory Courses
MC	Mandatory Courses
PROJ	Project

Table 3: Description of Courses

Broad Course Classification	Course Category	Description of Courses
Foundation Courses	Basic Science courses	Includes mathematics, physics, chemistry and biology courses
	Engineering Science courses	Includes fundamental engineering courses
	Humanities and Social Science courses including Management courses	Includes courses related to humanities, social sciences and management
Core courses	Professional Core courses	Includes core courses related to the parent discipline / department / branch of Engineering
	Project Work	B.Tech. project stage-I and stage-II
	Mini- project	Internship / Industry oriented mini-project
Elective courses	Professional Elective courses	Includes elective courses related to the parent discipline / department t/ branch of Engineering
	Open Elective courses	Elective courses which include inter – disciplinary courses or courses in an area outside the parent discipline / department / branch of Engineering
Mandatory courses		Mandatory non-credit courses

Table 4: Category of Courses, their Codes and Distribution of Credits

Type of Courses	Course Category	Code	Range of Credits	
Compulsory Courses	Engineering Science courses	ESC	14-20	
	Foundation courses	Basic Science courses	BSC	17-25
		Humanities & Social Science Incl. Management	HM	09-16
	Core courses	Professional Core courses	PC	70-75
	Project	Project	PROJ	12-13
Elective Courses	Professional Elective	PE	15-20	
	Open Elective	OE	09-12	
Mandatory Courses	Mandatory courses MC		Non- Credit	
Total Credits			160	

Engineering Exploration Project

Engineering Exploration Project is offered to the First year students of all engineering disciplines. The motivation of including this project is to make the students practice creative problem solving method - Design Thinking which fosters collaboration and solve problems in human-centered ways. It enables the students to exercise and identify design opportunities through various phases with the help of hands-on activities. Obtaining a best solution for an identified problem involves a non-linear, iterative process which seeks to understand users, challenge assumptions, redefine problems and create innovative solutions to prototype and test. The students are encouraged to explore real-world problems and expected to take charge of their own learning, work together in teams towards the problem.

The evaluation of the Engineering Exploration Project involves in writing their observations in Activity Cards at the end of each task given in syllabus and submitting a final report along with working prototype.

8. CHOICE BASED CREDIT SYSTEM

Flexibility is extended to the fast learning students to take the courses of higher semesters in advance as per their convenience to concentrate on their placement activity/ project work etc., during the seventh/eighth semesters.

8.1 CBCS Course Registration policy

Fast learning students can register for additional courses from higher semesters by satisfying the pre-requisite course(s) to a maximum of 6 credits in each of the semesters from 3rd semester onwards along with the regular semester courses as prescribed. There is no minimum limit on the credits for taking additional courses.

8.2 Eligibility for choosing CBCS flexibility

Regular Students (4 Year duration), entering the nth semester must pass all the subjects in single attempt as on date and with CGPA ≥ 7.75 up to (n-2)th semester, are only eligible to opt for this flexibility.

Lateral entry students (3 year duration) with 70% Marks in their Diploma are eligible to opt for this flexibility during 3rd and 4th Semesters. Those students entering into V/ VI /VII semester with no backlog courses as on date and with CGPA ≥ 7.75 up to (n-2)th semester, are only eligible to opt for this flexibility

- List of additional courses offered in the even & odd semesters, registration dates will be notified by the respective departments well in advance.
- Withdrawal from the respective course by the student may be permitted within 10 days after the commencement of the course.
- Choice of opting this flexibility is purely optional to the students.
- Minimum number of students required to register for an additional course shall be twenty (20). In case the registered strength for the additional course is less than twenty (20), the course may be

offered on the recommendation of the Head of the Department and subsequent approval of the Principal.

9. EXAMINATIONS AND SCHEME OF EVALUATION

9.1 Description of Evaluation

9.1.1 Internal Evaluation

The performance of the student in each course is evaluated by the faculty/course coordinator all through the semester with mid-term examinations, assignments, Online quiz, project reviews, viva voce, laboratory assessment and other means covering the entire syllabus of the course.

9.1.2 Semester End Evaluation (SEE)

Semester End Examination (SEE) shall be conducted by the Controller of Examinations (COE) by inviting Question Papers from the External Examiners. Question papers may be moderated for the coverage of syllabus, pattern of questions by an examiner appointed by the COE. The appointed examiner shall prepare a detailed answer key and scheme of valuation and submit it to the COE. Laboratory SEE shall be conducted involving internal and external examiners. The controller of examinations must use the panel of examiners for question paper setting/evaluation approved by concerned BOS. At present, Question paper setting and evaluation shall be external (IIT/NIT/Central University/State University/Reputed Autonomous Colleges).

9.2 CONTINUOUS INTERNAL EVALUATION

9.2.1 Theory Courses

Each course is evaluated for 30 marks. For theory subjects, during a semester, there shall be two mid-term examinations. Each mid-term exam consists of one objective paper, one descriptive paper and one assignment. The midterm marks shall be awarded giving a weightage of 75% in the midterm examination in which the student scores more marks and 25% for the midterm examination in which the student scores less marks.

- (a) Two assignment tests each for 5 marks will be conducted for 60 minutes duration. Question bank with minimum six comprehensive questions from the concerned UNIT of the syllabus will be given at least a week in advance before the commencement of Assignment Test.
- (b) Two descriptive type mid-term examinations each for 15 Marks will be conducted for 90 minutes duration.
- (c) Two Online Quizzes (Objective type mid-term exam) for 10 marks will be conducted for 20 minutes duration.
- (d) For the subject having design and/or drawing (such as Engineering Graphics & Drafting, Machine Drawing) and

Estimation, there is no online quiz. The distribution of internal marks shall be as given below.

Day to day performance – 15M

Midterm exam – 15M

- (e) **Mandatory Courses (Non Credit):** Environmental Sciences, Universal Human Values, Ethics, Indian Constitution and Essence of Indian Traditional Knowledge etc are non-credit (zero credits) mandatory courses. Environmental Sciences shall be offered compulsorily as Mandatory Course for all branches. There shall be Semester End Examination for 70 marks and it shall be conducted by the college internally. Two internal examinations shall be conducted for 30 marks. Internal marks can be calculated with 75% weightage for best performance internal exam and 25% weightage for least performance internal exam. Student has to secure 35% of marks in the Semester End Examination and minimum 40% marks in the sum total of the internal marks and Semester End Examination marks putting together for passing the course. There is no online internal exam for mandatory courses. No marks or letter grade shall be printed in the transcripts for all mandatory non-credit courses, but only Completed (Y)/Not-completed (N) will be specified. A student who failed to complete the course can appear for a supplementary examination as per the schedule announced by URCET.

9.2.2 Lab Courses

For Laboratory courses there shall be continuous internal evaluation during the semester for 20 marks (Day to day work 10M + Record 5M + Internal laboratory test 5M) and semester end evaluation for 30 marks.

9.2.3 Engineering Exploration Project / Engineering Project for Community Services /Mini Project

For Engineering Exploration Project /Engineering Project for Community services / Mini Project, there shall be Internal evaluation during the semester for 20 marks and semester end evaluation for 30 marks.

9.2.4 Project: 80 Marks

Project work shall be carried out in two stages. The Project stage 1 during the VII semester and Project stage 2 during the VIII semester. Project stage 1 shall be evaluated for 50 marks and Project stage 2 shall be evaluated for 150 marks.

For Project stage 1, there shall be an internal evaluation during the VII semester for 20 marks and semester end evaluation for 30 marks. The internal evaluation for project stage 1 shall be on the basis of project reviews conducted by the Project Review Committee (PRC). The PRC consists of HOD, Project coordinator, two senior faculty members of the department and project guide. Students have to submit a report containing introduction

to the project work, literature survey and problem definition for the project stage 1 at the end of VII semester.

For Project stage 2, there shall be an internal evaluation during the VIII semester for 60 marks and semester end evaluation for 90 marks. The internal evaluation for Project stage 2 shall be on the basis of project reviews conducted by the Project Review Committee (PRC). Students have to submit a report containing the project work carried out during Project stage 1 and Project stage 2 putting together at the end of VIII semester.

9.3 SEMESTER END EXAMINATIONS

9.3.1 Theory Courses (70M)

The Semester End Examination shall be conducted for 3 hours duration at the end of the semester. The question paper shall be given in the prescribed pattern. Each course shall consist of 5 units of syllabus. The questions shall be framed in line with the Course Outcomes defined and Blooms Taxonomy levels.

9.3.2 Laboratory Courses

The semester end examination for laboratory courses shall be conducted for three hour duration at the end of semester for 30 marks. Each Semester-end Laboratory Examination shall be conducted by an External Examiner along with an Internal Examiner. The average of the marks awarded by Internal and External Examiners shall be taken into consideration in case of difference of opinion.

9.3.3 Engineering Exploration Project/ Engineering Project For Community Services/Mini Project: 30 Marks

The distribution of semester end examination marks for Engineering Exploration Project / Engineering Project for Community services and Mini Project is given below

Report – 20 Marks

Presentation and Viva Voce – 10 Marks

The semester end examination shall be conducted and evaluated by the Committee nominated by the Head of the Department.

9.3.4 Project: 120 Marks

The semester end examination for project stage 1 shall be held for 30 marks and project stage 2 shall be for 90 marks (Evaluation, Presentation and Viva Voce) by a committee consisting of an external examiner, Head of the Department and Project coordinator. The evaluation of project stage 1 shall be conducted at the end of VII semester and project stage 2 at the end of VIII semester. The average of marks awarded by the committee members shall be taken in to consideration. The semester end examination for both project stages shall be completed before the commencement of semester end theory examinations.

9.3.5 Self-Learning Courses:

(Prescribed from the existing open courseware)

Students who have qualified in the examination conducted by the MOOCs providers are exempted from appearing in the internal and semester end evaluations conducted by the institution in that category.

In case a student fails to complete the MOOCs course offered by MOOCs providers, he/she may be allowed to register again for the same with any of the providers from the list approved by the department.

For the courses under this category, those students who have not registered under MOOCs platform and are able to learn by themselves shall appear for internal evaluation for 20 marks and semester end examination for 30 marks in the VIII semester

The distribution of marks for internal evaluation is given below

Home assignment - 5M

Assignment test - 5M Midterm

Examination – 10M

9.3.6 Industry Interaction / Internships: 100M

Students have to register for an Internship in collaboration with an Industry of their specialization during summer.

The candidate shall submit the comprehensive report to the department. The report will be evaluated for 100 marks by the Review Committee consisting of Head of the department, Program Coordinator and Industry Institute Interaction Coordinator.

9.3.7 Induction Program:

Induction program is mandatory for all the first year B.Tech students and shall be conducted as per Semester – 0 course structure.

9.4 MINIMUM ACADEMIC REQUIREMENTS

In addition to the attendance requirements mentioned in these regulations for the award of B.Tech Degree, a student must satisfy the minimum academic requirements as given below:

A student shall be deemed to have satisfied the minimum academic requirements and earn the credits for each theory or practical or design or drawing course in B.Tech programme, if he secures

9.4.1 A minimum of 35% marks for each theory course and Mandatory Course in the semester end examinations and a minimum of 40% marks for each theory course and Mandatory Course considering both IE and SEE taken together.

9.4.2 A minimum of 50% marks for lab courses, internship, industry oriented mini-project and project.

9.4.3 A student shall be treated as failed, if he does not submit a report on internship, industry oriented mini-project, project or does not make a presentation of the same before the evaluation committee as per the schedule, or secures less than 50% marks in evaluation.

9.4.4 In case of a student not meeting any of the above points, student may re-appear for each of the evaluation of internship, industry oriented mini-project, project, design sensitization, design thinking courses, as scheduled by the evaluation committee until he/she meets the requirement.

9.4.5 A student shall register for all the courses covering 160 credits as specified and listed in the course structure of the B.Tech programme, fulfills all the attendance and academic requirements for 160 credits, 'earn all 160 credits' by securing SGPA ≥ 5.0 (in each semester) and CGPA (at the end of each successive semester) ≥ 5.0 to successfully complete the under-graduate programme.

9.4.6 If a student fails to secure a pass grade in a particular course, he shall register and reappear for the supplementary examination in that course. It is mandatory that he should continue to register and reappear for the examination till he secures a pass grade.

9.4.7 A student eligible to appear in SEE of any course, but remains absent from it or gets failed (failing to secure 'D' grade or above) may reappear for that course in the supplementary SEE as and when conducted. In such cases, IE assessed earlier for that course shall be carried over, and added to the marks to be obtained in the supplementary SEE examination for evaluating the performance in that course.

9.4.8 A student detained in a semester due to shortage of attendance, may be re-admitted into the same semester in the next academic year for fulfillment of the academic requirements.

9.4.9 Academic regulations applicable to the semester in which re-admission is sought shall be applicable to the re-admitted student. However, no grade allotments or SGPA/ CGPA calculations shall be done for the entire semester in which the student has been detained.

9.4.10 A student detained due to lack of credits, shall be promoted to the next year only after acquiring the required academic credits. Academic regulations applicable to the semester in which re-admission is sought shall be applicable to the re-admitted student.

9.4.11 The student shall be qualified in two certificate courses not less than 40 hours duration each during his course of study. Out of the two certificate courses, atleast one certificate course shall be pursued through MOOCs platform like SWAYAM-NPTEL online courses, Coursera online courses, BEC certification courses etc.

9.4.12 Students who fail to earn 160 credits(LEs 120 Credits) as indicated in the course structure within eight academic years(LEs 6) counting from the year of their admission shall forfeit their seat in B.Tech programme and their admission stands cancelled.

9.5 REVALUATION AND PERSONAL VERIFICATION

9.5.1 Internal Evaluation

The Internal Evaluation scripts shall be shown to the students before finalizing the marks.

9.5.2 Semester End Evaluation

1. As per the notification issued by the Controller of Examinations, the students can submit the application form along with the requisite fee receipt for revaluation of his/her answer script(s) of theory course(s), if he/she is not satisfied with marks obtained.
2. The Controller of Examinations shall arrange for re-evaluation of those answer script(s).
3. A new examiner, other than the first examiner, shall re-evaluate the answer script(s).
4. Best out of the two will be taken into consideration.

9.5.3 Personal verification

On payment of special fee, the Semester End Examination answer scripts shall be shown to the candidate in front of the Controller of Examinations.

9.6 PERFORMANCE AND GRADING SYSTEM

Marks Range (% of marks)	Letter Grade	Level	Grade Points
≥ 90	O	Outstanding	10.00
≥80 to <90	S	Excellent	9.00
≥70 to <80	A	Very Good	8.00
≥60 to <70	B	Good	7.00
≥50 to <60	C	Fair	6.00
≥40 to <50	D	Satisfactory	5.00
<40	F	Fail	0
	AB	Absent	0

9.7 COMPUTATION OF SGPA AND CGPA

Computation of SGPA

The following procedure is to be adopted to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e

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

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

Computation of CGPA

The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semester of a programme, i.e.

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

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

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

$$\text{Equivalent Percentage} = (\text{CGPA} - 0.75) \times 10$$

9.8 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 shall be placed in one of the following four classes:

Class Awarded	CGPA to be secured	
First Class with Distinction	≥ 7.75 with no subject failures	From the CGPA secured from 160 Credits (120 credits incase of LEs)
First Class	≥ 6.75 with subject failures	
Second Class	≥ 5.75 to < 6.75	
Pass Class	≥ 4.75 to < 5.75	

9.9 WITH HOLDING RESULTS

If the student has any dues, to the institute or if any case of indiscipline is pending against him, the result of the student will be withheld. His degree will be withheld in such cases.

9.10 MALPRACTICES:

Institution implements JNTUK guide lines for malpractices and improper conduct in examinations.

Disciplinary Action for Malpractices/Improper Conduct in Examinations

S.No	Nature of Malpractices/Improper conduct	Punishment
	<i>If the candidate:</i>	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm	Expulsion from the examination hall and cancellation of the performance in that subject only.

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	computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the Controller of Examinations.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is

UR23 CBCS Regulations

		subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Controller of Examinations / Additional Controller of Examinations – any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

UR23 CBCS Regulations

	which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the college expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.

UR23 CBCS Regulations

		Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Principal for further action to award suitable punishment.	

10. ATTENDANCE REQUIREMENTS AND DETENTION POLICY

Student has to maintain a minimum of 50% in each subject and 75% of attendance in aggregate to be eligible for appearing the Semester End Examinations. Students who do not meet this requirement shall be detained in that semester.

However, the following are the special cases where the lack of attendance can be condoned.

- (i) Shortage of attendance up to 10% on medical grounds in which case the student must submit the medical certificate from any recognized medical practitioner on the day of reporting back to the class work after recovery from ill health.
- (ii) Up to a maximum of 10% if the student represents the university/state/country in any extra /co-curricular activities.

Shortage of attendance below 65 % shall in no case be condoned.

- A stipulated fee shall be payable towards condonation of shortage of attendance.
- Students, who do not meet the minimum required attendance in a semester, shall be detained in that semester and their registration for that semester shall stand cancelled. They shall not be promoted to the next semester.
- Students detained in a semester shall seek re-admission into that semester as and when offered.
- Academic regulations applicable to the semester in which re-

admission is sought shall be applicable to the re-admitted student. In case if there are any professional electives and/or open electives, the same may also be re- registered if offered. However, if those electives are not offered in the later semesters, then alternate electives may be chosen from the same set of elective courses offered under that category.

- A student fulfilling the attendance requirement in the present semester shall not be eligible for re-admission into the same class.

11. ELIGIBILITY CRITERIA FOR SEMESTER END EXAMINATIONS

- i) Minimum required attendance 75%
- ii) No dues

12. PROMOTION RULES

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.8 for promotion to higher classes

- a. A student shall be promoted from first year to second year if he fulfills the minimum attendance requirement as per norms of the college.
- b. A student will be promoted from II to III year if he fulfills the minimum attendance requirements in II year II semester and also the academic requirement of 40% of credits up to II year II Semester from all the examinations, whether or not the candidate takes the examinations. Due to any reason, if II Year II Semester results are not declared/delayed, student must have secured 40% of total credits up to II Year I semester of the respective programme from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
- c. A student shall be promoted from III year to IV year if he fulfills the minimum attendance requirements in III year II semester as per the norms of the college and also the academic requirements of 40% of the credits up to III year II semester from all the examinations, whether or not the candidate takes the examinations. Due to any reason, if III Year II Semester results are not declared/delayed, student must have secured 40% of total credits up to III Year I semester of the respective programme from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.

13. DISCIPLINE

Students shall conduct themselves within and outside the premises of the Institute in a manner befitting the students of our Institution.

13.1 Ragging:

As per the order of Honorable Supreme Court of India, ragging in any form is considered as criminal offence and is banned. Any form of ragging will be severely dealt with the institute implements anti ragging regulations of UGC.

URCET - ANTI RAGGING REGULATIONS

According to UGC Anti Ragging Regulations 2009

UGC REGULATIONS ON CURBING THE MENACE OF RAGGING IN HIGHER EDUCATIONAL INSTITUTIONS, 2009

In exercise of the powers conferred by clause (g) of Sub-Section (1) of Section 26 of the University Grants Commission Act, 1956, the University Grants Commission, hereby, makes the following Regulations, namely

Title, commencement and applicability:-

1. These regulations shall be called the "UGC Regulations on Curbing the Menace of Ragging in Higher Educational Institutions, 2009".
2. They shall come into force with immediate effect.
3. They shall apply to all the Universities established or incorporated by or under a Central Act, a Provincial Act or a State Act, to all Institutions deemed to be University under Section 3 of UGC Act, 1956, to all other higher Educational Institutions, Including the departments, constituent units and all the premises (academic, residential, sports, canteen, etc.) of such Universities, deemed University and other Higher Educational Institutions, whether located within the campus or outside, and to all means of transportation of students whether public or private.

Objective:

To root out raging in all its forms from Universities, Colleges and other educational institutions in the country by prohibiting it by law, preventing its occurrence by following the provision of these regulations and punishing those who indulge in ragging as provided for in these regulations and the appropriate law in force.

"Ragging" means the following:

Any conduct whether by words spoken or written or by an act which has the effect of teasing, treating or handling with rudeness any other student, indulging in rowdy or undisciplined activities which causes or is likely to cause annoyance, hardship or psychological harm or to raise fear or apprehension thereof in a fresher or a junior student or asking the students to do any act or perform something which such student will not in the ordinary course and which has the effect of causing or generating a

sense of shame or embarrassment so as to adversely affect the physique or psyche of a fresher or a junior student.

Punishable ingredients or Ragging:

- Abetment to ragging;
- Criminal conspiracy to ragging;
- Unlawful assembly and rioting while ragging;
- Public nuisance created during ragging;
- Violation of decency and morals through ragging;
- Injury to body, causing hurt or grievous hurt;
- Wrongful restraint;
- Wrongful confinement;
- Use of criminal force;
- Assault as well as sexual offences or unnatural offences;
- Extortion;
- Criminal trespass;
- Offences against property;
- Criminal intimidation;
- Attempts to commit any or all of the above mentioned offences against the victim(s);
- Physical or psychological humiliation;
- All other offences following from the definition of "Ragging".

Punishments:

At the institution level:

Depending upon the nature and gravity of the offence as established by the Anti-Ragging Committee of the institution, the possible punishments for those found guilty of ragging at the institution level shall be any one or any combination of the following:

- Suspension from attending classes and academic privileges.
- Withholding/Withdrawing scholarship/fellowship and other benefits.
- Debarring from appearing in any test/examination or other evaluation process.
- Withholding results.
- Debarring from representing the institution in any regional, National or International meet, tournament, Youth festival, etc.
- Suspension/ Expulsion from the hostel.
- Cancellation of Admission.
- Rustication from the Institution for period ranging from 1 to 4 semesters.
- Expulsion from the Institution and consequent debarring from admission to any other institution for specified period.
- Fine ranging between Rupees 25,000/- and Rupees 1 Lakh.

Collective punishment: when the persons committing or abetting the crime of ragging are not identified, the institution shall resort to collective punishment.

13.2 Eve Teasing

- i) Definition: "Eve teasing" means any indecent conduct or act by a man which causes or likely to cause intimidation, fear, shame or embarrassment to a woman, including abusing or causing hurt or nuisance to or assault, use of force on a woman.
- ii) Eve teasing at any place is prohibited.
- iii) Whoever commits or participates in or abets Eve teasing in or within the precincts of the institute shall be punished.

14. LATERAL ENTRY SCHEME ACADEMIC REGULATIONS

UR 19 CBCS regulations are applicable for lateral entry students admitted into 2nd year B.Tech from the Academic Year 2020-2021. All the regulations applicable to B.Tech 4-year degree course (Regular) will hold good for B.Tech Lateral Entry Scheme unless otherwise mentioned.

15. TRANSITORY REGULATIONS

1. Discontinued or detained candidates are eligible for readmission as and when next offered.
2. The readmitted students will be governed by the current regulations under which the candidate has been readmitted.
3. Transfer from other universities is permitted with the approval of Academic Council/APSHEC. Equivalent subjects and credits will be calculated with the approval of Board of Studies (BOS) chairman.

16. GENERAL

1. Wherever the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".
2. The academic regulation should be read as a whole for the purpose of any interpretation.
3. In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal is final.
4. The institute may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the institute.

17. AMENDMENTS TO REGULATIONS

The Academic council of Usha Rama College of Engineering and Technology (Autonomous) reserves the right to revise, amend or change the regulations, scheme of examinations and/or syllabi or any other matter pertained suitable to the needs of the students, society, industry without any notice.

COURSE STRUCTURE
ELECTRONICS AND COMMUNICATION ENGINEERING
(Applicable for batches admitted from 2023-2024)

B.Tech. – I Year I Semester								
S.No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs./Wk	C
1	BS&H	23BS101B	Engineering Physics	3	0	0	3	3
2	BS&H	23BS103	Linear Algebra & Calculus	3	0	0	3	3
3	ES	23ES102B	Basic Electrical & Electronics Engineering	3	0	0	3	3
4	ES	23ES105B	Engineering Graphics	1	0	4	5	3
5	PC	23PC104B	Network Analysis	3	0	0	3	3
6	BS&H	23ES113B	IT Workshop	0	0	2	3	1.0
8	BS&H	23BS111B	Engineering Physics Lab	0	0	2	3	1.0
8	ES	23ES112B	Electrical & Electronics Engineering Workshop	0	0	3	3	1.5
9	PC	23PC114B	Network Analysis Lab	0	0	3	3	1.5
10	BS&H	23BS115A	NSS/NCC/Scouts & Guides/Community Service	-	--	1	1	0.5
Total				13	0	17	30	20.5

B.Tech. – I Year II Semester								
S.No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs./Wk	C
1	BS&H	23BS201A	Communicative English	2	0	0	2	2
2	BS&H	23BS202A	Chemistry	3	0	0	3	3
3	ES	23BS203	Differential Equations & Vector Calculus	3	0	0	3	3
4	ES	23ES205A	Basic Civil & Mechanical Engineering	3	0	0	3	3
5	ES	23ES204A	Introduction to Programming	3	0	0	3	3
6	BS&H	23BS211A	Communicative English Lab	0	0	2	2	1
7	BS&H	23BS212A	Chemistry Lab	0	0	2	2	1
8	ES	23ES213A	Engineering Workshop	0	0	3	3	1.5
9	ES	23ES214A	Computer Programming Lab	0	0	3	3	1.5
10	BS&H	23BS215A	Health and wellness, Yoga and Sports	-	--	1	1	0.5
Total				14	0	11	25	19.5

B.Tech. – II Year I Semester								
S.No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs./Wk	C
1	BS&H	23BSC301C	Probability theory and stochastic process	3	0	0	3	3
2	HSMC	23HS302	Universal Human Values– Understanding Harmony and Ethical Human Conduct	2	1	0	3	3
3	ES	23ES303C	Signals and Systems	3	0	0	3	3
4	PC	23PCEC304	Electronic Devices and Circuits	3	0	0	3	3
5	PC	23PCEC305	Switching Theory and Logic Design	3	0	0	3	3
6	PC	23PCEC311	Electronic Devices and Circuits Lab	0	0	3	3	1.5
7	PC	23PCEC312	Switching Theory and Logic Design Lab	0	0	3	3	1.5
8	SEC	23SEC313C	Data Structures using Python	0	1	2	3	2
Total				14	2	8	24	20
Mandatory Course								
9	Audit Courses	23MC300	Environmental Science	2	0	0	2	0

B.Tech. – II Year II Semester								
S.No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs./Wk	C
1	Management Course - I	23HM401A	Managerial Economics and Financial Analysis	2	0	0	2	2
2	ES	23ES402B	Linear Control Systems	3	0	0	3	3
3	PC	23PCEC403	Electromagnetic Waves and Transmission Lines	3	0	0	3	3
4	PC	23PCEC404	Electronic Circuit Analysis	3	0	0	3	3
5	PC	23PCEC405	Analog Communications	3	0	0	3	3
6	PC	23PCEC411	Signals and Systems Lab	0	0	3	3	1.5
7	PC	23PCEC412	Electronic Circuit Analysis lab	0	0	3	3	1.5
8	SEC	23ES413C	Soft Skills	0	1	2	3	2
9	ES	23BS414	Design Thinking & Innovation	1	0	2	3	2
Total				15	1	10	26	21
Mandatory Community Service Project Internship of 08 weeks duration during summer vacation								

V SEMESTER(III Year - I Semester)									
S.No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs./Wk	C	
1	PCC	23PCEC501	Analog and Digital IC Applications	3	0	0	3	3	
2	PCC	23PCEC502	Digital communications	3	0	0	3	3	
3	PCC	23PCEC503	Antennas and Wave Propagation	3	0	0	3	3	
4	PEC	Professional Elective (PE-I)			3	0	0	3	3
		23PEEC501A	Digital System Design through HDL						
		23PEEC501B	Optical Communications						
		23PEEC501C	Electronic Measurements and Instrumentation						
		23PEEC501D	Computer Organizations and Architecture						
		12 week MOOC Swayam/ NPTEL course recommended by the BoS							
5	OEC		OR Entrepreneurship Development & Venture Creation	3	0	0	3	3	
6	PCC		Analog and Digital IC Applications Lab	0	0	3	3	1.5	
7	PCC		Analog and digital communications Lab	0	0	3	3	1.5	
8	SEC		ARM Based/ AURDINO Based Programming	0	1	2	3	2	
9	ES		Design of PCB and Antenna Lab	0	0	2	2	1	
10	PROJ		Evaluation of Community Service Internship	-	-	-	-	2	
Total				15	1	10	26	23	
Minor Course (Student may select from the same specialized minors pool)				3	0	3	6	4.5	
Minor Course through SWAYAM / NPTEL (Minimum 12 Week, 3 credit course)				3	0	0	3	3.0	

VI SEMESTER (III Year - II Semester)									
S.No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs./Wk	C	
1	PCC		VLSI Design	3	0	0	3	3	
2	PCC		Microprocessors and Microcontrollers	3	0	0	3	3	
3	PCC		Digital Signal Processing	3	0	0	3	3	
4	PEC	Professional Elective (PE-II)			3	0	0	3	3
			Analog IC Design						
			Satellite Communications						
			Smart and Wireless Instrumentation						
			Machine Learning						
	12 week MOOC Swayam/ NPTEL course recommended by the BoS								
5	PEC	Professional Elective (PE-III)			3	0	0	3	3
			Bio Medical Instrumentation						
			Microwave Engineering						
			Embedded Systems						
			Artificial Intelligence						
	12 week MOOC Swayam/ NPTEL course recommended by the BoS								
6	OEC	---	Open Elective Course/ Job oriented elective-2	3	0	0	3	3	
7	PCC		VLSI Design Lab	0	0	3	3	1.5	
8	PCC		Microprocessors and Microcontrollers Lab	0	0	3	3	1.5	
9	SEC		Microwave and Optical Communications Lab	0	1	2	3	2	
Total				18	1	8	27	23	
Mandatory Course									
10	MC		Research methodology and IPR	0	0	0	2	0	
Minor Course (Student may select from the same specialized minors pool)				3	0	3	6	4.5	
Minor Course through SWAYAM / NPTEL (Minimum 12 Week, 3 credit course)				3	0	0	3	3.0	
Mandatory Industry Internship of 08 weeks duration during summer vacation									

VII SEMESTER(IV Year - I Semester)									
S.No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs./Wk	C	
1	PCC		Cellular & Mobile Communications	3	0	0	3	3	
2	PCC		Management Science	2	0	0	2	2	
3	PEC	Professional Elective (PE-IV)			3	0	0	3	3
			Low Power VLSI Design						
			Coding Theory and Applications						
			DSP Processors and Architectures						
			Soft Computing Techniques						
		12 week MOOC Swayam/ NPTEL course recommended by the BoS							
4	PEC	Professional Elective (PE-V)			3	0	0	3	3
			Design for Testability						
			Radar Engineering						
			Digital Image Processing						
		Internet of Things							
5	OEC		Open Elective - III	3	0	0	3	3	
6	OEC		Open Elective-IV	3	0	0	3	3	
7	SEC		Digital Signal and Image Processing Lab	0	1	2	3	2	
8	PROJ		Evaluation of Industry Internship	-	-	-	-	2	
Total				15	1	10	26	21	
Mandatory Course									
9	MC		Constitution of India	2	0	0	2	0	
Minor Course -5				3	0	0	3	3	
Minor Course -6				3	0	0	0	3	
Minor Course through SWAYAM / NPTEL (Minimum 12 Week, 3 credit course)				3	0	0	3	3.0	

VIII SEMESTER (IV Year - II Semester)								
S.No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs./Wk	C
1	PROJ		Internship and Project	-	-	24	-	12
Total				-	-	24		12
Minor Course through SWAYAM / NPTEL (Minimum 12 Week, 3 credit course)				3	0	0	3	3.0

List of the OPEN ELECTIVES offered by ECE Department to other Branches:

S.No.	Course Code	Open Elective-I
1		Electronic Devices and Circuits
2		Signals and Systems
3		Probability Theory and Random Variables
4		Consumer Electronics
	Course Code	Open Elective-II
5		Linear and Digital IC Applications
6		Principles of communications
7		Principles of Signal Processing
8		Microprocessors and Microcontrollers
	Course Code	Open Elective-III
9		Fundamentals of VLSI Design
10		Digital Electronics
11		Electronic measurements and Instrumentations
12		Optical communications
	Course Code	Open Elective-IV
13		Principles of Cellular & Mobile communications
14		Fundamentals of Satellite Communications
15		Embedded Systems
16		Transducers and Signal Conditioning
17		Quantum Science and Technology

B. Tech I Year
ENGINEERING PHYSICS

L	T	P	C
3	0	0	3

(Common for all branches of Engineering)

Course Category: BS & H

Internal Marks: 30

External Marks: 70

Course Objectives: To bridge the gap between the Physics in school at 10+2 level and UG level engineering courses by identifying the importance of the optical phenomenon like interference, diffraction etc, enlightening the periodic arrangement of atoms in crystalline solids and concepts of quantum mechanics, introduce novel concepts of dielectric and magnetic materials, physics of 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 (h k l) 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.

Textbooks:

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).

WebResources: <https://www.loc.gov/rr/scitech/selected-internet/physics.html>

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

CO1: Analyze the intensity variation of light due to polarization, interference and diffraction.

CO2: Identify the Engineering applications of lasers and optical fibers in various fields.

CO3: Explain fundamentals of quantum mechanics and apply it to one dimensional motion of particles.

CO4: Summarize various types of polarization of dielectrics and classify the magnetic materials. CO5: Explain the basic concepts of Quantum Mechanics and the band theory of solids.

CO6: Identify the type of semiconductor using Hall effect.

LINEAR ALGEBRA AND CALCULUS
(Common to All Branches of Engineering)

Course Category: BS&H
B.Tech I Year - I Semester

L	T	P	C
3	0	0	3

Internal Marks: 30
External Marks: 70

Course Objectives:

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

UNIT I: Matrices

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

UNIT II: Eigen values, Eigen vectors and Orthogonal transformation

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

UNIT III: Calculus

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

UNIT IV: Partial differentiation and Applications (Multi variable calculus)

Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Taylor’s and Maclaurin’s series expansion of functions of two variables. Jacobians, Functional dependence,

maxima and minima of functions of two variables, method of Lagrange multipliers.

UNIT V: Multiple integrals (Multi variable Calculus)

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

Textbooks:

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

Reference Books:

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

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

CO1: Develop and use of matrix algebra techniques that are needed by engineers for practical applications.

CO2: Understanding mean value theorems in the intervals.

CO3: Familiarize with functions of several variables which is useful in optimization.

CO4: Learn important tools of calculus in higher dimensions.

C05: Familiarize with double and triple integrals of functions of several variables in two dimensions using Cartesian and polar coordinates and in three dimensions using cylindrical and spherical coordinates.

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

B.Tech. I Year

Course Category: ES

L T P C

3 0 0 3

Internal Marks: 30

External Marks: 70

Course Objectives:

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

PART A: BASIC ELECTRICAL ENGINEERING

UNIT I DC & AC Circuits

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

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

UNIT II Machines and Measuring Instruments

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

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

UNIT III Energy Resources, Electricity Bill & Safety Measures

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

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

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

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. Bhattacharya, 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:**

- 1.To teach the fundamentals of semiconductor devices and its applications, principles of digital electronics.

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 INSTRUMENTATION

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.

COURSE OUTCOMES:

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

1. Understand the formation of p-n junction and how it can be used as a p- n junction as diode in different modes of operation.
2. Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons.
3. Develop Combinational Logic Gates and Flip Flops.

End examination pattern:

- i) Question paper shall be in two parts viz., Part A and Part B with equal weightage of 35 marks each.
- ii) In each part, question 1 shall contain 5 compulsory short answer questions for a total 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.

B.Tech. I Year

COURSE CATEGORY: E S

L T P C
1 0 4 3

ENGINEERING GRAPHICS

Internal Marks: 30

External Marks: 70

Course Objectives:

- To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing.
- To impart knowledge on the projection of points, lines and plane surfaces.
- To improve the visualization skills for better understanding of projection of solids.
- To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces.
- To make the students understand the viewing perception of a solid object in Isometric and Perspective projections.

UNIT I

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods. Curves: construction of ellipse, parabola and hyperbola by general, Cycloids, Involute, Normal and tangent to Curves. Scales: Plain scales, diagonal scales and vernier scales.

UNIT II

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

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

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

UNIT III Projections of Solids: Types of solids: Polyhedra and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to

horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane.

UNIT IV

Sections of Solids: Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only. Development of Surfaces: Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

UNIT V

Conversion of Views: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views. Computer graphics: Creating 2D&3D drawings of objects including PCB and Transformations using Auto CAD (Not for end examination).

Textbook:

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

Reference Books:

1. Engineering Drawing, K.L. Narayana and P. Kanniah, Tata McGraw Hill, 2013.
2. Engineering Drawing, M.B.Shah and B.C. Rana, Pearson Education Inc,2009.
3. Engineering Drawing with an Introduction to AutoCAD, Dhananjay Jolhe, Tata McGraw Hill, 2017.

Course Outcomes: On Completion of the course, the student should be able to CO1:

Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections.

CO2: Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views.

CO3: Understand and draw projection of solids in various positions in first quadrant.

CO4: Explain principles behind development of surfaces.

CO5: Prepare isometric and perspective sections of simple solids.

(ECE) B.Tech. I Year

NETWORK ANALYSIS
Course Category: PC

L T P C
3 0 0 3

Internal Marks: 30
External Marks: 70

Course Objectives:

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

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, Tellegens - 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.

E-RESOURCES:

1. <https://nptel.ac.in/courses/108/105/108105159/>
2. https://onlinecourses.nptel.ac.in/noc20_ee46/preview

Course Outcomes:

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

CO1: Understand basic electrical circuits with nodal and mesh analysis.

CO2: Analyse the circuit using network simplification theorems.

CO3: Find Transient response and Steady state response of a network.

CO4: Analyse electrical networks in the Laplace domain.

CO5: Compute the parameters of a two-port network

CO6: know the cascading of two port networks

B.Tech. I Year

L T P C
0 0 2 1

IT WORKSHOP
COURSE CATEGORY: ES
(Common to All Branches)

Internal Marks: 30

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.

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

Task 2: Using La TeX and Word to create a project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects,

Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both La TeX and Word.

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

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

EXCEL

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

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

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

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

POWER POINT

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.

Getting Started with Canva

Task 1 : Create a Canva account and set up your profile. Navigate the Canva workspace and explore the tool's menus. Design a simple social media post using a Canva template. Identify and apply at least three basic design principles in your design.

Task 2: Explore the impact of typography by creating a text-based design. Experiment with color theory by designing a color palette for a project. Enhance an image using Canva's image editing tools. Apply layout and composition principles to create a visually appealing graphic.

Task 3: Customize a Canva template to match a specific project or brand. Incorporate design elements like icons, shapes, or illustrations into a design. Create an infographic or data visualization using Canva. Design a set of social media graphics for a marketing campaign. Design a marketing flyer for a fictional product or service. Design a print-ready poster for an event or cause.

Introduction to Git and GitHub

Task 1: Install Git on your local machine. Create a local Git repository and make initial commits.

Task 2: Create a Git repository for a personal project. Practice branching and merging in Git. Create a GitHub account and set up SSH keys. Clone a GitHub repository, make changes, and create a pull request.

Task 3: Simulate and resolve merge conflicts. Implement a Gitflow workflow in a project. Contribute to an open-source project on GitHub. Create a CI/CD pipeline for a project using Git/GitHub Actions.

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?"

REFERENCES BOOKS:

1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003

2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech, 2013, 3rd edition
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2012, 2nd edition
4. PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft)
5. LaTeX Companion, Leslie Lamport, PHI/Pearson.
6. IT Essentials PC Hardware and Software Companion Guide, David Anfinson and Ken Quamme. – CISCO Press, Pearson Education, 3rd edition
7. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCO Press, Pearson Education, 3rd edition.

Note: Minimum 12 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

COURSE OUTCOMES:

- CO1:** Perform Hardware troubleshooting.
- CO2:** Understand Hardware components and inter dependencies.
- CO3:** Safeguard computer systems from viruses/worms.
- CO4:** Document/ Presentation preparation.
- CO5:** Perform calculations using spreadsheets
- CO6:** Understand the concepts of Canva, GitHub and ChatGPT.

B. Tech I Year
ENGINEERING PHYSICS LAB
(Common for all branches of Engineering)

L	T	P	C
0	0	2	1

Course Category: BS & H

Internal Marks: 30
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.

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 nonuniform 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 of duration two periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for the semester end

exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when 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

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<https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype>

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

CO1: Operate optical instruments like travelling microscope and spectrometer.

CO2: Estimate the wavelengths of different colors using diffraction grating.

CO3: Plot the intensity of the magnetic field of circular coil carrying current with distance.

CO4: Evaluate dielectric constant and magnetic susceptibility for dielectric and magnetic materials respectively.

CO5: Calculate the band gap of a given semiconductor.

CO6: Identify the type of semiconductor using Hall effect.

ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP
(Common to All branches of Engineering)

B.Tech. I Year

Course Category: ES

L T P C

0 0 3 1.5

Internal Marks: 30

External Marks: 70

Course Objectives:

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

Activities:

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

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

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

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

1 Components:

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

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

PART A: ELECTRICAL ENGINEERING LAB

List of experiments:

1. Verification of 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

Course Outcomes:

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

CO1. Measure voltage, current and power in an electrical circuit. (L3)

CO2. Measure of Resistance using Wheat stone bridge (L4)

CO3. Discover critical field resistance and critical speed of DC shunt generators. (L4)

CO4. Investigate the effect of reactive power and power factor in electrical loads. (L5)

PART B: ELECTRONICS ENGINEERING LAB**Course Objectives:**

1. To impart knowledge on the principles of digital electronics and fundamentals of electron devices & its applications.

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.

E-RESOURCES:

1. <https://nptel.ac.in/courses/117/103/117103063/>
2. <https://nptel.ac.in/courses/106/105/106105185/>

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

CO1: Identify & testing of various electronic components.

CO2: Understand the usage of electronic measuring instruments.

CO3: Plot and discuss the characteristics of various electron devices.

CO4: Explain the operation of a digital circuit.

NOTE: Minimum 12 experiments (Part-A: 6 & Part-B: 6) of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

NETWORK ANALYSIS AND SIMULATION LABORATORY
(ECE) B.Tech. I Year Course Category: PC

L T P C
0 0 3 1.5

Internal Marks: 30
External Marks: 70

Course Objectives:

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

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 Reciprocity and Millmann's Theorems
6. Verification of Tellegen's theorem for two networks of the same topology.
7. Study of DC transients in RL, RC and RLC circuits
8. To study frequency response of various 1st order RL & RC networks
9. To study the transient and steady state response of a 2nd order circuit by varying
its various parameters and studying their effects on responses
10. Find the Q Factor and Bandwidth of a Series and Parallel Resonance circuit.
11. Determination of open circuit (Z) and short circuit (Y) parameters
12. Determination of hybrid (H) and transmission (ABCD) parameters
13. 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

Course Outcomes:

CO1: Verify Kirchoff's laws and network theorems.

CO2: Measure time constants of RL & RC circuits.

CO3: Analyze behaviour of RLC circuit for different cases.

CO4: Design resonant circuit for given specifications.

CO5: Characterize and model the network in terms of all network parameters.

CO6: Determination of hybrid (H) and transmission (ABCD) parameters.

NOTE: Minimum 12 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE
(Common to All branches of Engineering)

B.Tech. I Year **Course Category: BS&H**

L T P C
0 0 1 0.5

Course Objectives:

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

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.

COURSE CATEGORY: BS&H B.TECH. I Year

L T P C
2 0 0 2

COMMUNICATIVE ENGLISH
(Common to All Branches of Engineering)

Internal Marks: 30
External Marks: 70

Course Objectives:

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

UNIT I

Lesson: HUMAN VALUES: The Gift of Magi by O. Henry (Short Story)

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

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

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

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

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

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

UNIT II

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

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

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

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

Writing: Structure of a paragraph - Paragraph writing (specific topics)

Grammar: Cohesive devices linkers, use of articles and zero article; prepositions.

Vocabulary: Homonyms, Homophones, Homographs.

UNIT III

Lesson: BIOGRAPHY: Elon Musk

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

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

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

Writing: Summarizing, Note-making, paraphrasing

Grammar: Verbs-tenses; subject-verb agreement;

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

Text Books:

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

Reference Books:

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

Web Resources:

GRAMMAR:

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

VOCABULARY

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

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

CO1: Understand the context, topic, and pieces of specific information from social or Transactional dialogues.

CO2: Apply grammatical structures to formulate sentences and correct word forms.

CO3: Analyze discourse markers to speak clearly on a specific topic in informal discussions.

CO4: Evaluate reading /listening texts and to write summaries based on global comprehension of these texts.

CO5: Create a coherent paragraph, essay and resume

**Course Category: BS&H B. Tech I Year UR23
CHEMISTRY**

L	T	P	C
3	0	0	3

(Common to EEE, ECE, CSE, IT) & allied branches)

Internal marks: 30

Course Objectives:

External marks:70

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

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 Graphines 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-oxygen fuel 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 fibers.

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, 5th Edition, Wiley Publications, Feb.2008
3. Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd Edition.

Course Outcomes:

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

C01: Explain the principles of wave function and Molecular orbital theory.

C02: Apply the principle of Band diagrams in the application of conductors and semiconductors.

C03: Compare the materials of construction for battery and electrochemical sensors.

C04: Explain the preparation, properties, and applications of thermoplastics & thermosetting & elastomers conducting polymers.

C05: Summarize the concepts of Instrumental methods.

DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS
(Common to All Branches of Engineering)

Course Category: BS&H
B.Tech I Year - II Semester

L T P C
3 0 0 3
Internal Marks: 30
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.

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, homogenous and non-homogenous, complimentary function, particular integral, general solution, 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 and Non Homogenous Linear Partial differential equations with constant coefficients.

UNIT IV: Vector differential calculus

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

UNIT V: Vector integral calculus

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 problem

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

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

CO1: Solve the differential equations of first order first degree related to various engineering fields.

CO2: Solve the linear differential equations of higher order related to various engineering fields.

CO3: Identify solution methods for partial differential equations that model physical processes.

CO4: Interpret the physical meaning of different operators such as gradient, curl and divergence.

CO5: Estimate the work done against a field, circulation and flux using vector integral calculus.

B. Tech. I Year

COURSE CATEGORY: E S

L T P C

3 0 0 3

BASIC CIVIL AND MECHANICAL ENGINEERING

Internal Marks: 30

External Marks: 70

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.

PART A: BASIC CIVIL ENGINEERING

UNIT I

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

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

CO1: Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society.

CO2: Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying.

CO3: Realize the importance of Transportation in nation's economy and the engineering measures related to Transportation.

CO4: Understand the importance of Water Storage and Conveyance Structures so that the social responsibilities of water conservation will be appreciated.

CO5: Understand the basic characteristics of Civil Engineering Materials and attain knowledge on prefabricated technology.

PART B: 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 overview of different thermal and mechanical transmission systems and introduce basics of robotics and its applications.

UNIT I

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

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

UNIT II

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

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

UNIT III

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

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

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

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

Textbooks:

1. Internal Combustion Engines by V.Ganesan, By Tata McGraw Hill publications (India) Pvt. Ltd.
2. A text book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd.
3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengage learning India Pvt. Ltd.

Reference Books:

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

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

CO1: Understand the different manufacturing processes.

CO2: Explain the basics of thermal engineering and its applications.

CO3: Describe the working of different mechanical power transmission systems and power plants.

CO4: Describe the basics of robotics and its applications.

Course Category: ES

**B. Tech I Year UR23
INTRODUCTION TO PROGRAMMING
(Common to All Branches)**

L T P C

3 0 0 3

Internal marks: 30

External marks:70

COURSE OBJECTIVES:

- The objectives of this course are to make the student familiar with 'problem solving using computers, development of algorithms, usage of basic flowchart symbols and designing flowcharts.
- The students can also understand programming language basic concepts, reading and displaying the data, earn the programming skills using selection, iterative control structures, functions, arrays, pointers and files.
- After completion of this course the student is expected to analyze the real life problem and write programs in C language to solve the problems.

UNIT – I

INTRODUCTION

Problem Solving: Problem solving aspects, Problem solving techniques, Computer as a Problem solving tool, Algorithms-definition, features, criteria. Flowchart-definition, basic symbols, sample flowcharts. Top down design, Implementation of program verification, The efficiency of algorithms, Analysis of algorithms, computational complexity of algorithm, order(O) notation, Worst case & Average case Analysis.

UNIT – II

Basics of C programming language: Introduction to C, structure of a C program, basic data types and sizes, constants, variables, unary, binary and ternary operators, expressions, type conversions, conditional expressions, precedence and order of evaluation, Input and Output statements, Sample Programs.

Selection-Decision Making Conditional Control Structures: simple-if, if- else, nested if-else, if- else ladder and switch-case.

Iterative: while-loop, do-while loop and for loop control structures, goto, break and continue statements. Sample Programs.

UNIT – III

Functions: Basics, parameter passing, storage classes extern, auto, register, static, scope rules, block structure, user defined functions, standard library functions, recursive functions, Recursive solutions for Fibonacci series, towers of Hanoi, header files, C Preprocessor, example c programs.

ARRAYS -concepts, declaration, definition, accessing elements, storing 'elements, 1-D arrays, 2-D arrays and character arrays, Multidimensional arrays, array applications: Matrix operations, checking the symmetricity of a Matrix, Passing 1-D arrays, 2-D arrays to functions, Strings and String Manipulations

UNIT – IV

Pointers: pointers concepts, initialization of pointer variables, pointers and function arguments, passing by address-dangling memory, address arithmetic, character pointers and functions, pointers to pointers, pointers and -multi-dimensional arrays, dynamic memory management functions, command line arguments

UNIT – V

Enumerated, Structure And Union Types: Derived types- structures- declaration, definition and initialization of structures, accessing 'structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit-fields, program applications

File handling: Concept of a file, text files and binary files, Formatted I/O, File I/O operations

TEXT BOOKS:

1. How to Solve it by Computer, R. G. Dromey, Pearson Education, 2019
2. Programming in C, Ashok N Kamthane, Amit Ashok Kamthane, 3rd Edition, Pearson Education, 2019

REFERENCE BOOKS:

1. The C programming Language by Dennis Richie and Brian Kernighan
2. Programming in C, Reema Thareja, OXFORD
3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, Cengage

COURSE OUTCOMES:

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

CO1: Design efficient algorithm for solving a problem.

CO2: Identify various constructs of C programming language efficiently.

CO3: Apply programs using modular approach such as functions.

CO4: Create programs to perform matrix and mathematical applications.

CO5: Understand dynamic memory management and problems using pointers and solving the problems.

CO6: Develop real life applications using structures and also learn about handling the files for storing the data permanently.

L T P C
0 0 2 1

COMMUNICATIVE ENGLISH LAB
(Common to All Branches of Engineering)

Internal Marks: 30
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.

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 Info tech
- Young India Films

Reference Books:

1. Raman Meenakshi, Sangeeta - Sharma. *Technical Communication*. OxfordPress.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*, (2ndEd), Kindle, 2013Web Resources:

Spoken English:

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

Voice & Accent:

1. <https://www.youtube.com/user/letstalkaccent/videos>
2. <https://www.youtube.com/c/EngLanguageClub/featured>
3. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUglVexc
4. https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA

Note: Minimum 10 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examination. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HoD and complete the required number of experiments and appear for semester end exam as and when conducted.

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

CO1: Understand the different aspects of the English language proficiency with emphasis on LSRW skills.

CO2: Apply communication skills through various language learning activities.

CO3: Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.

CO4: Evaluate and exhibit professionalism in participating in debates and group discussions. CO5: Create effective Course

Course Category: BS&H

**B. Tech I Year UR23
CHEMISTRY LAB**

(Common to EEE, ECE, CSE, IT) & allied branches)

L	T	P	C
0	0	2	1

Internal marks: 30

External marks:70

Course Objectives:

- Verify the fundamental concepts with experiments.

List of Experiments:

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 6th Edition" Pearson Publications by J.Mendham, R.C.Denney, J.D.Barnes and B. Sivasankar

Note: Any 10 of the listed experiments are to be conducted of duration 2 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fail to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for the semester end exam as and when conducted.

Course Outcomes:

At the end of the course, the students will be able to

CO1: Determine the cell constant and conductance of solutions.

CO2: Prepare advanced polymer Bakelite materials.

CO3: Measure the strength of an acid present in secondary batteries.

CO4: Analyze the IR spectra of some organic compounds.

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

B.Tech. I Year

COURSE CATEGORY: E S

L T P C

0 0 3 1.5

ENGINEERING WORKSHOP

Internal Marks: 30

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.

SYLLABUS

1. **Demonstration:** Safety practices and precautions to be observed in workshop.
2. **Wood Working:** Familiarity with different types of woods and tools used in wood working and make following joints. a) Half – Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint
3. **Sheet Metal Working:** Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets. a) Tapered tray b) Conical funnel c) Elbow pipe d) Brazing
4. **Fitting:** Familiarity with different types of tools used in fitting and do the following fitting exercises. a) V-fit b) Dovetail fit c) Semi-circular fit d) Bicycle tire puncture and change of two-wheeler tyre
5. **Electrical Wiring:** Familiarity with different types of basic electrical circuits and make the following connections. a) Parallel and series b) Two- way switch c) Godown 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.

Textbooks:

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

Reference Books:

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

Course Outcomes: At the end of the course student is able to

CO1: Identify workshop tools and their operational capabilities.

CO2: Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding.

CO3: Apply fitting operations in various applications.

CO4: Apply basic electrical engineering knowledge for House Wiring Practice

Note: Minimum 10 experiments of duration 3 periods each must be completed for the eligibility to appear for the semester end examinations.

In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

COURSE CATEGORY: ES

B.Tech. I Year

L T P C
0 0 3 1.5

COMPUTER PROGRAMMING LAB
(Common to All Branches)

Internal Marks: 30

External Marks: 70

COURSE OBJECTIVES:

- Understand the basic concept of C Programming, and its different modules that include conditional and looping expressions, Arrays, Strings, Functions, Pointers, Structures and File programming.
- Acquire knowledge about the basic concept of writing a program.
- Role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language.
- Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.
- Role of Functions involving the idea of modularity.

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 2: Converting algorithms/flow charts into C Source code.

Developing the algorithms/flowcharts for the following sample programs

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

WEEK 3

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

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.

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

WEEK 8:

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

Suggested Experiments/Activities:

Tutorial 8: 2 D arrays, sorting and Strings.

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

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.

WEEK 11:

Objective: Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration.

Suggested Experiments/Activities:

Tutorial 11: Functions, call by value, scope and extent,

Lab 11: Simple functions using call by value, solving differential equations using Eulers theorem.

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

WEEK 12:

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

Suggested Experiments/Activities:

Tutorial 12: Recursion, the structure of recursive calls

Lab 12: Recursive functions

- i) Write a recursive function to generate Fibonacci series.
- ii) Write a recursive function to find the lcm of two numbers.

- iii) Write a recursive function to find the factorial of a number.
- iv) Write a C Program to implement Ackermann function using recursion.
- v) Write a recursive function to find the sum of series.

WEEK 13:

Objective: Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers.

Suggested Experiments/Activities:

Tutorial 13: Call by reference, dangling pointers

Lab 13: Simple functions using Call by reference, Dangling pointers.

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

WEEK14:

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

Suggested Experiments/Activities:

Tutorial 14: File handling

Lab 14: File operations

- i) Write a C program to write and read text into a file.
- ii) Write a C program to write and read text into a binary file using fread() and fwrite()
- iii) Copy the contents of one file to another file.
- iv) Write a C program to merge two files into the third file using command-line arguments.

- v) Find no. of lines, words and characters in a file
- vi) Write a C program to print last n characters of a given file.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

Note: Minimum 12 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

COURSE OUTCOMES:

Upon the completion of the course, the student will be able to:

- CO1:** Apply and practice logical ability to solve the problems.
- CO2:** Identify C programming development environment, compiling, debugging, and linking and executing a program using the development environment.
- CO3:** Analyze the complexity of problems, modularize the problems into small modules and then convert them into programs.
- CO4:** Apply the in-built functions and customized functions for solving the problems.
- CO5:** Create C programs using pointers, memory allocation techniques.
- CO6:** Use files for dealing with variety of problems.

HEALTH AND WELLNESS, YOGA AND SPORTS
(Common to All branches of Engineering)

B.Tech. I Year Course Category: BS&H

L T P C
0 0 1 0.5

Course Objectives:

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

UNIT I

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

Activities:

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

UNIT II

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

Activities:

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

UNIT III

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

Activities:

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

Reference Books:

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

Course Outcomes: After completion of the course the student will be able to
CO1: Understand the importance of yoga and sports for Physical fitness and sound health.

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

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

CO4: Assess current personal fitness levels.

CO5: Develop Positive Personality

General Guidelines:

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

Evaluation Guidelines:

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

B.Tech. III Semester

COURSE CODE: 23BSC301C

L T P C

3 0 0 3

PROBABILITY THEORY AND STOCHASTIC PROCESS

Internal Marks: 30

External Marks: 70

Course Objectives:

1. This gives basic understanding of random variables and operations that can be performed on them.
2. To know the Spectral and temporal characteristics of Random Process.
3. To Learn the Basic concepts of Information theory Noise sources and its representation for understanding its characteristics

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, Bay'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, Transformations of a Random Variable: Monotonic and Non-monotonic Transformations of Continuous Random Variable, Transformation of a Discrete Random Variable. Vector Random Variables, Joint Distribution Function and its Properties, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Conditional Distribution and Density – Interval conditioning, 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, N Random Variable case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables

UNIT – III: Random Processes – Temporal Characteristics:

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

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. Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output.

UNIT – V: Noise Sources & Information Theory:

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, Quadrature representation of narrow band noise & its properties. Entropy, Information rate, Source coding: Huffman coding, Shannon Fano coding, Mutual information, Channel capacity of discrete channel, Shannon-Hartley law; Trade -off between bandwidth and SNR.

TEXT BOOKS:

1. Peyton Z. Peebles - Probability, Random Variables & Random Signal Principles, 4th Ed, TMH, 2001.
2. Taub and Schilling - Principles of Communication systems, TMH, 2008

REFERENCE BOOKS:

1. Bruce Hajck - Random Processes for Engineers, Cambridge unipress, 2015
2. Athanasios Papoulis and S. Unnikrishna Pillai - Probability, Random Variables and Stochastic Processes, 4th Ed., PHI, 2002.
3. B.P. Lathi - Signals, Systems & Communications, B.S. Publications, 2003.
4. S.P Eugene Xavier -Statistical Theory of Communication, New Age Publications, 2003.

E-RESOURCES:

1. <https://archive.nptel.ac.in/courses/111/102/111102111/>
2. <https://archive.nptel.ac.in/courses/111/102/111102014/>

Course Outcomes:

Upon completion of the Course, the students will be able to:

1. Perform operations on single and multiple Random variables.
2. Determine the temporal characteristics of Random Signals.
3. Determine the Spectral characteristics of Random Signals.
4. Characterize LTI systems driven by stationary random process by using ACFs and PSDs.
5. Understand the concepts of Noise and Information theory in Communication systems.
6. Understand the concepts of Information theory in Communication systems.

B.Tech. III Semester COURSE CODE: 23HS302

L T P C

2 1 0 3

**Universal human values understanding harmony and
Ethical human conduct**

**Internal Marks: 30
External Marks: 70**

Course Objective:

The objective of the course is four fold:

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

Course Topics

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

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

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

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

Lecture 2: Understanding Value Education

Tutorial 1: Practice Session PS1 Sharing about Oneself

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

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

Tutorial 2: Practice Session PS2 Exploring Human Consciousness

Lecture 5: Happiness and Prosperity – Current Scenario

Lecture 6: Method to Fulfill the Basic Human Aspirations

Tutorial 3: Practice Session PS3 Exploring Natural Acceptance

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

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

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

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

Lecture 9: The body as an Instrument of the self

Lecture 10: Understanding Harmony in the self

Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self

Lecture 11: Harmony of the self with the body

Lecture 12: Programme to ensure self-regulation and Health

Tutorial 6: Practice Session PS6 Exploring Harmony of self with the body

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

Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction

Lecture 14: 'Trust' – the Foundational Value in Relationship

Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust

Lecture 15: 'Respect' – as the Right Evaluation

Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect

Lecture 16: Other Feelings, Justice in Human-to-Human Relationship

Lecture 17: Understanding Harmony in the Society

Lecture 18: Vision for the Universal Human Order

Tutorial 9: Practice Session PS9 Exploring Systems to fulfil Human Goal

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

Lecture 19: Understanding Harmony in the Nature

Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature

Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature

Lecture 21: Realizing Existence as Co-existence at All Levels

Lecture 22: The Holistic Perception of Harmony in Existence

Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence.

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

Lecture 23: Natural Acceptance of Human Values

Lecture 24: Definitiveness of (Ethical) Human Conduct

Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct

Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order

Lecture 26: Competence in Professional Ethics

Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education

Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies

Lecture 28: Strategies for Transition towards Value-based Life and Profession

Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

Practice Sessions for UNIT I – Introduction to Value Education

PS1 Sharing about Oneself

PS2 Exploring Human Consciousness

PS3 Exploring Natural Acceptance

Practice Sessions for UNIT II – Harmony in the Human Being

PS4 Exploring the difference of Needs of self and body

PS5 Exploring Sources of Imagination in the self

PS6 Exploring Harmony of self with the body

Practice Sessions for UNIT III – Harmony in the Family and Society

PS7 Exploring the Feeling of Trust

PS8 Exploring the Feeling of Respect

PS9 Exploring Systems to fulfil Human Goal

Practice Sessions for UNIT IV – Harmony in the Nature (Existence)

PS10 Exploring the Four Orders of Nature

PS11 Exploring Co-existence in Existence

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

PS12 Exploring Ethical Human Conduct

PS13 Exploring Humanistic Models in Education

PS14 Exploring Steps of Transition towards Universal Human Order

TEXT BOOKS:

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

ISBN 978-93-87034-47-1

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

REFERENCE BOOKS:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

3. The Story of Stuff (Book).

4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

5. Small is Beautiful - E. F Schumacher.

6. Slow is Beautiful - Cecile Andrews

7. Economy of Permanence - J C Kumarappa

8. Bharat Mein Angreji Raj – Pandit Sunderlal

9. Rediscovering India - by Dharampal

10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi

11. India Wins Freedom - Maulana Abdul Kalam Azad

12. Vivekananda - Romain Rolland (English)

13. Gandhi - Romain Rolland (English)

Mode of Conduct:

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

Tutorial hours are to be used for practice sessions.

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

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

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

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on

basic human values.

It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional

content may be offered in separate, higher courses. This course is to be taught by faculty from every teaching department, not exclusively by any one department.

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

E-RESOURCES:

1. <https://fdp-si.aicte-india.org/UHVII%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf>
2. <https://fdp-si.aicte-india.org/UHVII%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf>
3. <https://fdp-si.aicte-india.org/UHVII%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf>
4. <https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-S2%20Respect%20July%202023.pdf>
5. <https://fdp-si.aicte-india.org/UHVII%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf>

Course Outcomes:

Upon completion of the Course, the students will be able to:

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

SIGNALS AND SYSTEMS**Internal Marks: 30****External Marks: 70****Course Objectives:**

1. To study about signals and systems.
2. To analyze the spectral characteristics of signal using Fourier series and Fourier transforms.
3. To understand the characteristics of systems.
4. To introduce the concept of sampling process
5. To know various transform techniques to analyze the signals and systems.

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. Analogy between vectors and signals, orthogonal signal space, Signal approximation using orthogonal functions, Mean square error, closed or complete set of orthogonal functions, Orthogonality in complex functions. Related problems.

UNIT-II:FOURIER SERIES AND FOURIER TRANSFORM:

Fourier series representation of continuous time periodic signals, properties of Fourier series, 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. Introduction to Hilbert Transform, Related problems.

UNIT-III: ANALYSIS OF LINEAR SYSTEMS: Introduction, Linear system, impulse response, Response of a linear system, Linear time invariant (LTI) system, Linear time variant(LTV) 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 bandwidth, system bandwidth, 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, Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering.

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, Introduction to Band Pass sampling, 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 L.T's, Inverse Laplace transform, Relation between L.T's, and F.T. of a signal. Laplace transform of certain signals using waveform synthesis.

Z-TRANSFORMS: Concept of Z-Transform of a discrete sequence. Region of convergence in Z-Transform, constraints on ROC for various classes of signals, Inverse Z-transform, properties of Z-transforms. Distinction between Laplace, Fourier and Z-transforms.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Principles of Linear Systems and Signals-BP Lathi, Oxford University Press, 2015
2. Signals and Systems-TK Rawat, Oxford University press, 2011

E-RESOURCES:

1. <https://nptel.ac.in/courses/108/104/108104100/>
2. <https://nptel.ac.in/courses/108/106/108106163/>

Course Outcomes

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

1. Differentiate the various classifications of signals and systems
2. Analyze the frequency domain representation of signals using Fourier concepts
3. Classify the systems based on their properties and determine the response of LTI Systems.
4. Know the sampling process and various types of sampling techniques.
5. Apply Laplace and z-transforms to analyze signals and Systems (continuous & discrete).
6. Know the properties of Correlation.

ELECTRONIC DEVICES AND CIRCUITS**Internal Marks: 30****External Marks: 70****Course Objectives:**

1. To learn and understand the basic concepts of semiconductor physics.
2. Study the physical phenomena such as conduction, transport mechanism and electrical characteristics of different diodes.
3. To learn and understand the application of diodes as rectifiers with their operation and characteristics with and without filters are discussed.
4. Acquire knowledge about the principle of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics.
5. To learn and understand the purpose of transistor biasing and its significance.
6. Small signal equivalent circuit analysis of BJT and FET transistor amplifiers and compare different configurations.

UNIT-I: Review of Semiconductor Physics: Mobility and Conductivity, Intrinsic and extrinsic semiconductors, Hall effect, continuity equation, law of junction, Fermi Dirac function, Fermi level in intrinsic and extrinsic Semiconductors.

Junction Diode Characteristics : energy band diagram of PN junction Diode, Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in p-n junction Diode, Diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance.

UNIT-II:

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

Diode Circuits: The Diode as a circuit element, The Load-Line concept, The Piecewise 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 configuration, transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, Ebers-Moll model of a transistor, 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} , I_c , and β , Stability factors, (S,S',S''), Bias compensation, Thermal runaway, 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. **CMOS amplifiers:** General Considerations, Common Source Stage, Common Gate Stage, Source Follower, comparison of FET amplifiers.

TEXT BOOKS:

1. Millman's Electronic Devices and Circuits- J. Millman, C. C. Halkias and Satyabrata Jit, Mc-Graw Hill Education, 4th edition, 2015.
2. Millman's Integrated Electronics-J. Millman, C. Halkias, and Ch. D. Parikh, Mc-Graw Hill Education, 2nd Edition, 2009.
3. Fundamentals of Microelectronics-Behzad Razavi, Wiley, 3rd edition, 2021.

REFERENCE BOOKS:

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

E-RESOURCES:

1. <https://nptel.ac.in/courses/117/103/117103063/>
2. https://onlinecourses.nptel.ac.in/noc21_ee55/preview

Course Outcomes

Upon completing this course, the student will be able to

1. Apply the basic concepts of semiconductor physics.
2. Understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation.
3. Analyze the construction, working principle of Semiconductor Devices and Diode Circuits
4. Know the need of transistor biasing, various biasing techniques for BJT and FET and stabilization concepts with necessary expressions
5. Apply small signal low frequency transistor amplifier circuits using BJT in different configurations
6. Apply small signal low frequency transistor amplifier circuits using FET in different configurations

**SWITCHING THEORY AND LOGIC DESIGN Internal Marks: 30
External Marks: 70****Course Objectives:**

1. To solve a typical number base conversion and analyze new error coding techniques.
2. Theorems and functions of Boolean algebra and behavior of logic gates
3. To optimize logic gates for digital circuits using various techniques.
4. Boolean function simplification using Karnaugh maps and Quine-McCluskey methods
5. To understand concepts of combinational circuits.
6. To develop advanced sequential circuits.

UNIT – I**REVIEW OF NUMBER SYSTEMS & CODES:**

Representation of numbers of different radix, conversion from one radix to another radix, r-1's complements and r's complements of signed members. Gray code, 4 bit codes; BCD, Excess-3, 2421, 84-2-1 code etc. Error detection & correction codes: parity checking, even parity, odd parity, Hamming code.

BOOLEAN THEOREMS AND LOGIC OPERATIONS:

Boolean theorems, principle of complementation & duality, De-morgan theorems. Logic operations ; Basic logic operations -NOT, OR, AND, Universal Logic operations, EX-OR, EX-NOR operations. Standard SOP and POS Forms, NAND-NAND and NOR-NOR realizations, Realization of three level logic circuits.

UNIT – II**MINIMIZATION TECHNIQUES:**

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

COMBINATIONAL LOGIC CIRCUITS DESIGN:

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 – III**COMBINATIONAL LOGIC CIRCUITS DESIGN USING MSI &LSI :**

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 – IV**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, T flip-flop, D flip-flop with reset and clear terminals. Conversion from one flip-flop to another flip-flop. Design of 5 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.

Study the following relevant ICs and their relevant functions

7474, 7475, 7476, 7490, 7493, 74121.

UNIT – V

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)

TEXT BOOKS:

1. Switching and finite automata theory Zvi.KOHAVI, Niraj.K.Jha 3rdEdition, Cambridge UniversityPress,2009
2. Digital Design by M.MorrisMano, Michael D Ciletti,4th editionPHIpublication,2008
3. Switching theory and logic design by Hill and Peterson, Mc-Graw Hill TMH edition, 2012.

REFERENCE BOOKS:

1. Fundamentals of Logic Design by Charles H. Roth Jr,JaicoPublishers,2006
2. Digital electronics by R S Sedha.S.Chand &companylimited,2010
3. Switching Theory and Logic Design by A. AnandKumar,PHI Learningpvtltd,2016.
4. Digital logic applications and design by John M Yarbough, Cengagelearning,2006.
5. TTL 74-Seriesdatabook.

E-RESOURCES:

1. <https://nptel.ac.in/courses/106/105/106105185/>
2. https://onlinecourses.nptel.ac.in/noc19_cs74/preview

Course Outcomes

Upon completing this course, the student will be able to:

1. Classify different number systems and apply to generate various codes.
2. Use the concept of Boolean algebra in minimization of switching functions
3. Design different types of combinational logic circuits.
4. Apply knowledge of flip-flops in designing of Registers and counters
5. The operation and design methodology for synchronous sequential circuits and algorithmic state machines.
6. Produce innovative designs by modifying the traditional design techniques.

B.Tech. III Semester COURSE CODE: 23PCEC311

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ELECTRONIC DEVICES AND CIRCUITS LAB

**Internal Marks: 30
External Marks: 70**

Course Objectives:

1. know the functionality of electronic components.
2. observe the characteristics of circuits designed based on electronic components.

Note: The students are required to perform the experiment to obtain the V-I characteristics and to determine the relevant parameters from the obtained graphs.

List of Experiments (Minimum of Ten Experiments has to be performed)

1. Clipper circuit using diode
2. Clamping circuit using diode
3. Rectifiers (without and with c-filter)
PartA: Half-wave Rectifier
PartB: Full-wave Rectifier
4. BJT Characteristics (CE Configuration)
PartA: Input Characteristics
PartB: Output Characteristics
5. FET Characteristics (CS Configuration)
PartA: Drain Characteristics
PartB: Transfer Characteristics
6. SCR Characteristics.
7. UJT Characteristics
8. Transistor Biasing
9. CRO Operation and its Measurements
10. BJT-CE Amplifier
11. Emitter Follower-CC Amplifier
12. FET-CS Amplifier

Major Equipment required for Laboratories:

1. Regulated Power supplies
2. Analog/ Digital Storage Oscilloscopes
3. Analog/ Digital Function Generators
4. Digital Multi-meters
5. Decade Resistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters(Analog or Digital)
8. Voltmeters(Analog or Digital)
9. Active& Passive Electronic Components.

Note: Minimum 10 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

E-RESOURCES:

1. <https://nptel.ac.in/courses/122/106/122106025/>

Course Outcomes:

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

1. Acquire the knowledge of various semiconductor devices and their use in real life.
2. Design aspects of biasing and keep them in active region of the device for functional circuits
3. Acquire the knowledge about the role of special purpose devices and their applications.
4. understand the Operation Characteristics of FET.
5. CRO Operation and its Measurements
6. Determine the Characteristics of SCR.

SWITCHING THEORY AND LOGIC DESIGN LAB

Internal Marks: 30

External Marks: 70

Course objectives:

1. Acquire the knowledge on numerical information in different forms and Boolean Algebra theorems.
2. Define Postulates of Boolean algebra and to minimize combinational functions, and design the combinational circuits.
3. Design and analyze sequential circuits for various cyclic functions.

List of Experiments (Ten experiments to be done):

1. Verification of truth tables of the following Logic gates
Two input (i) OR (ii) AND (iii) NOR (iv) NAND (v) Exclusive-OR (vi) Exclusive-NOR
2. Design a simple combinational circuit with four variables and obtain minimal SOP expression and verify the truth table using Digital Trainer Kit.
3. Verification of functional table of 3 to 8-line Decoder /De-multiplexer
4. 4 variable logic function verification using 8 to1 multiplexer.
5. Design full adder circuit and verify its functional table.
6. Verification of functional tables of (i) JK Edge triggered Flip-Flop (ii) JK Master Slave Flip-Flop (iii) D Flip-Flop
7. Design a four-bit ring counter using D Flip-Flops/JK Flip Flop and verify output.
8. Design a four-bit Johnson's counter using D Flip-Flops/JK Flip Flops and verify output
9. Verify the operation of 4-bit Universal Shift Register for different Modes of operation.
10. Draw the circuit diagram of MOD-8 ripple counter and construct a circuit using T-Flip-Flops and Test It with a low frequency clock and sketch the output waveforms.
11. Design MOD-8 synchronous counter using T Flip-Flop and verify the result and sketch the output waveforms.
12. (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.
13. Design BCD Adder Circuit and Test the Same using Relevant IC
14. Design Excess-3 to 9- Complement convertor using only four Full Adders and test the Circuit.
15. Design an Experimental model to demonstrate the operation of 74154 De-16. Multiplexer using LEDs for outputs.
16. Design of any combinational circuit using Hardware Description Language
17. Design of any sequential circuit using Hardware Description Language

Major Equipment required for Laboratories:

1. 5 V Fixed Regulated Power Supply/ 0-5V or more Regulated Power Supply.
2. 20 MHz Oscilloscope with Dual Channel.
3. Bread board and components/ Trainer Kit.
4. Multimeter.

Note: Minimum 10 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

E-RESOURCE:

1. <https://nptel.ac.in/courses/106/105/106105185/>

course outcomes:

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

1. Acquire the knowledge on numerical information in different forms and Boolean Algebra theorems.
2. Define Postulates of Boolean algebra and to minimize combinational functions, and Design the combinational circuits.
3. Implement the given Boolean function using given Decoders
4. Design and analyze sequential circuits for various cyclic functions.
5. Characterize logic families and analyze them for the purpose of AC and DC parameters.
6. Realize 2:1 MUX using the given gates and Design 8:1 using 2:1 MUX.

DATA STRUCTURES USING PYTHON**Internal Marks: 30**
External Marks: 70**Course objectives:**

1. Acquire the knowledge on Python program.
2. Develop an inheritance hierarchy based upon a Polygon class

List of Experiments (Ten experiments to be done):

1. 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.
2. 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
3. Write a python program to implement Method Overloading and Method Overriding.
4. Write a Python program to illustrate the following comprehensions: a) List Comprehensions b) Dictionary Comprehensions c) Set Comprehensions d) Generator Comprehensions
5. 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].
6. Write a program for Linear Search and Binary search.
7. Write a program to implement Bubble Sort and Selection Sort.
8. Write a program to implement Merge sort and Quick sort.
9. Write a program to implement Stacks and Queues.
10. Write a program to implement Singly Linked List.
11. Write a program to implement Doubly Linked list.
12. Write a program to implement Binary Search Tree.

Note-1: Minimum 10 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

Note-2: Skill Oriented Course shall carry 100 marks and shall be evaluated through continuous assessments during the semester for 30 sessional marks and end examination shall be for 70 marks. Day-to-day work in the class / laboratory shall be evaluated for 30 marks by the concerned teacher based on the regularity/assignments/viva/mid semester test. The end examination similar to practical examination pattern shall be conducted by the concerned teacher and an expert in the subject nominated by the principal.

E-RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc22_cs26/preview
2. <https://nptel.ac.in/courses/106106145>

Course Outcomes:

Upon completing this course, the students will be able to

1. Examine Python syntax and semantics and apply Python flow control and functions.
2. Create, run and manipulate Python Programs using core data structures like Lists
3. Apply Dictionaries.
4. Use Regular Expressions.
5. Interpret the concepts of Object-Oriented Programming as used in Python.
6. Master object-oriented programming to create an entire python project using objects and classes

B.Tech. III Semester

COURSE CODE: 23MC300

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ENVIRONMENTAL SCIENCE

Internal Marks: 30

External Marks: 0

Semester End Exam: 70

Course Objectives:

1. Understanding the importance of ecological balance for sustainable development.
2. Understanding the impacts of developmental activities and mitigation measures.
3. Understanding the environmental policies and regulations

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-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT - III

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

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

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

UNIT - IV

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

UNIT - V

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

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

TEXT BOOKS:

1. Erach Bharucha, Text book of Environmental Studies for Undergraduate Courses, Universities Press (India) Private Limited, 2019.
2. Palani swamy, Environmental Studies, 2/e, 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, 2/e, 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, 1/e, Prentice Hall of India Private limited, 1991.

E-RESOURCE:

1. https://onlinecourses.nptel.ac.in/noc23_hs155/preview
2. https://www.edx.org/learn/environmental-science/rice-university-ap-environmental-science-part-3-pollution-andresources?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%2Fenvironmentalscience
3. <http://ecoursesonline.iasri.res.in/Courses/Environmental%20Science-I/Data%20Files/pdf/lec07.pdf>
4. <https://www.youtube.com/watch?v=5QxxaVfgQ3k>

Course Outcomes

Upon completing this course, the student will be able to

1. know the natural resources, ecology, Biodiversity, and conservation of natural resources
2. Grasp multi disciplinary nature of environmental studies and various renewable and non-renewable resources.
3. Understand flow and bio-geo- chemical cycles and ecological pyramids.
4. Understand various causes of pollution and solid waste management and related preventive measures.
5. Understand the rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation.
6. Illustrate the causes of population explosion, value education and welfare programmes.

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Internal Marks: 30

External Marks: 70

Course Objectives:

1. To inculcate the basic knowledge of microeconomics and financial accounting
2. To make the students learn how demand is estimated for different products, Input output relationship for optimizing production and cost
3. To Know the Various types of market structure and pricing methods and strategy
4. To give an overview on investment appraisal methods to promote the students to Learn how to plan long-term investment decisions.
5. To provide fundamental skills on accounting and to explain the process of preparing financial statements.

UNIT – I: Managerial Economics

Introduction – Nature, meaning, significance, functions, and advantages. Demand-Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting- Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.

UNIT – II: Production and Cost Analysis

Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least- cost combination– Short run and long run Production Function- Isoquants and Is costs, Cost & Break-Even Analysis - Cost concepts and Cost behaviour- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems).

UNIT – III: Business Organizations and Markets

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

UNIT – IV: Capital Budgeting

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

UNIT – V: Financial Accounting and Analysis

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

TEXT BOOK:

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

REFERENCES

1. Ahuja HI Managerial economics Schand.
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New

Age International.

3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.

4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage..

E-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/darkyla/business-organizations-19917607>
4. <https://www.slideshare.net/balarajbl/market-and-classification-of-market>
5. <https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396>
6. <https://www.slideshare.net/ashu1983/financial-accounting>

Course Outcomes:

After undergoing the course, students will be able to

1. Define the concepts related to Managerial Economics, financial accounting and management
2. Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets
3. Apply the Concept of Production cost and revenues for effective Business decision
4. Analyze how to invest their capital and maximize returns
5. Evaluate the capital budgeting techniques.
6. Develop the accounting statements and evaluate the financial performance of business entity

B.Tech. IV Semester

COURSE CODE: 23ES402B

L T P C
3 0 0 3

LINEAR CONTROL SYSTEMS

Internal Marks: 30

External Marks: 70

Course Objectives:

1. To introduce the concepts of open loop and closed loop systems, mathematical models of mechanical and electrical systems, and concepts of feedback
2. To study the characteristics of the given system in terms of the transfer function and introducing various approaches to reduce the overall system for necessary analysis
3. To develop the acquaintance in analyzing the system response in time-domain and frequency domain in terms of various performance indices
4. To analyze the system in terms of absolute stability and relative stability by different approaches
5. To design different control systems for different applications as per given specifications
6. To introduce the concepts of state variable analysis, design and also the concepts of controllability and observability.

UNIT I - INTRODUCTION

Concepts of System, Control Systems: Open Loop and closed loop control systems and their differences. Different examples of control systems, Feed-Back 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 flowgraph-Reduction using mason's gain formula.

TIME RESPONSE ANALYSIS

Standard test signals – Time response of first order systems – Characteristic Equation of Feedback controlsystems, 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 invariant state Equations- State Transition Matrix and it's Properties – Concepts of Controllability and Observability.

TEXT BOOKS:

1. Automatic Control Systems 8th edition– by B.C.Kuo – Johnwiley and son's, 2003.
2. Control Systems Engineering –by I. J.Nagrathand M.Gopal, New Age International

(P) Limited, Publishers, 2nd edition, 2007

3. Modern Control Engineering–by Katsuhiko Ogata–Pearson Publications, 5th edition, 2015.

REFERENCE BOOKS:

1. Control Systems by A.Nagoorkani, RB Apublications, 3 edition, 2017.
2. Control Systems by A.Anandkumar, PHI, 2 Edition, 2014.

E-RESOURCES:

- 1.<https://archive.nptel.ac.in/courses/107/106/107106081/>
2. https://onlinecourses.nptel.ac.in/noc20_ee90/preview

Course Outcomes:

After completing this course, the student will be able to

1. Know the concepts of feedback and its advantages to various control systems
2. Design the control system in time-domain and frequency domain are introduced.
3. Control systems for various applications can be designed using time-domain and frequency domain analysis.
4. Get the knowledge on Stability Analysis, root Locus Technique
5. Understand the time response analysis, stability analysis, frequency response analysis of different ordered systems through their characteristic equation and time-domain specifications.
6. Get the knowledge on state space analysis of Continuous Systems.

B.Tech. IV Semester

COURSE CODE: 23PCEC403

L T P C

3 0 0 3

ELECTROMAGNETIC WAVES AND TRANSMISSION LINES

Internal Marks: 30

External Marks: 70

Course Objectives:

1. Understand the fundamentals of electric fields, coulomb's law and gauss law
2. Familiar with of Biot-Savart Law, Ampere's Circuital Law and Maxwell equations
3. Aware of electromagnetic wave propagation in dielectric and conducting media
4. Study the equivalent circuit of transmission lines and parameters of the transmission lines
5. Learn the working of smith chart and its usage in the calculation of transmission line parameters

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 Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, 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, Inconsistency 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, skin depth, 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, distortion less 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 – Construction and Applications, Quarter wave transformer, Single Stub Matching, Illustrative Problems.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

E-RESOURCES:

1. <https://archive.nptel.ac.in/courses/108/106/108106157/>
2. <https://nptel.ac.in/courses/117101056>

Course Outcomes:

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

1. Determine electric field intensity using coulomb's law and Gauss law.
2. Determine magnetic field intensity using Biot-Savarts Law and Ampere's Circuital Law.
3. Analyze the electromagnetic wave propagation in dielectric and conducting media.
4. Examine the primary and secondary constants of different types of transmission lines.
5. Derive the expressions for input impedance, reflection coefficient, and VSWR of transmission lines and calculate these parameters using smith chart.
6. Calculate input impedance, reflection coefficient, and VSWR parameters using smith chart.

ELECTRONIC CIRCUIT ANALYSIS

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To learn hybrid- π parameters at high frequency and compare with low frequency parameters.
2. Learn and understand the purpose of cascading of single stage amplifiers and derive the overall voltage gain.
3. Analyze the effect of negative feedback on amplifier characteristics and derive the characteristics.
4. Learn and understand the basic principle of oscillator circuits and perform the analysis of different oscillator circuits.
5. Compare and analyze different Power amplifiers like Class A, Class B, Class C, Class AB and other types of amplifiers.
6. Analyze different types of tuned amplifier circuits.

UNIT-I Small Signal High Frequency Transistor Amplifier models:

BJT: Transistor at high frequencies, Hybrid- π common emitter transistor model, Hybrid π conductance, Hybrid π capacitances, validity of hybrid π model, determination of high- frequency parameters in terms of low-frequency parameters, CE short circuit current gain, current gain with resistive load, cut-off frequencies, frequency response and gain bandwidth product.

FET: Analysis of common Source and common drain Amplifier circuits at high frequencies.

UNIT-II

Multistage Amplifiers: Classification of amplifiers, methods of coupling, cascaded transistor amplifier and its analysis, analysis of two stage RC coupled amplifier, high input resistance transistor amplifier circuits and their analysis-Darlington pair amplifier, Cascode amplifier, Boot-strap emitter follower, Differential amplifier using BJT.

UNIT-III

Feedback Amplifiers: Feedback principle and concept, types of feedback, classification of amplifiers, feedback topologies, Characteristics of negative feedback amplifiers, Generalized analysis of feedback amplifiers, Performance comparison of feedback amplifiers, Method of analysis of feedback amplifiers.

Unit-IV

Oscillators: Oscillator principle, condition for oscillations, types of oscillators, RC- phase shift and Wien bridge oscillators with BJT and FET and their analysis, Generalized analysis of LC Oscillators, Hartley and Colpitt's oscillators using BJT, Frequency and amplitude stability of oscillators.

UNIT-V

Power Amplifiers: Classification of amplifiers(A to H), Class A power Amplifiers, Class B Push-pull amplifiers, Complementary symmetry push pull amplifier, Class AB power amplifier, Class-C power amplifier, Thermal stability and Heat sinks.

Tuned Amplifiers: Introduction, Q-Factor, small signal tuned amplifier, capacitance single tuned amplifier, double tuned amplifiers, , staggered tuned amplifiers

TEXT BOOKS:

1. Integrated Electronics- J.Millman and C.C.Halkias, Tata McGraw-Hill, 1972.
2. Electronic Devices and Circuits Theory –Robert L.Boylestad and Louis Nashelsky, Pearson/Prentice Hall, Tenth Edition, 2009.
3. Electronic Devices and Integrated Circuits – B.P. Singh, Rekha, Pearson publications, 2006

REFERENCE BOOKS:

1. Electronic Circuit Analysis and Design –Donald A.Neaman, McGrawHill, 2010.
2. Micro electronic Circuits-Sedra A.S. and K.C. Smith, Oxford University Press, Sixth Edition, 2011.
3. Electronic Circuit Analysis-B.V.Rao, K.R.Rajeswari, P.C.R.Pantulu, K.B.R.Murthy, Pearson Publications.

E-RESOURCES:

1. <https://nptel.ac.in/courses/108/102/108102095/>
2. <https://nptel.ac.in/courses/108/102/108102097/>

Course Outcomes

Upon completing this course, the student will be able to

1. Design and analyze of small signal high frequency transistor amplifier using BJT
2. Design and analyze of small signal high frequency transistor amplifier using FET
3. Design and analyze of multistage amplifiers using BJT and FET
4. Design and analyze of Differential amplifier using BJT.
5. Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators and their amplitude and frequency stability concept.
6. Know the classification of the power and tuned amplifiers and their analysis with performance comparison

ANALOG COMMUNICATIONS

Internal Marks: 30

External Marks: 70

Course Objectives:

Students undergoing this course, are expected to

1. Familiarize with the fundamentals of analog communication systems
2. Familiarize with various techniques for analog modulation and demodulation of signals
3. Distinguish the figure of merits of various analog modulation methods

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 sideband 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 bandwidth 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: Tuned radio 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. Communication Systems, Simon Haykin, Michael Moher, Wiley, 5th Edition, 2009.
2. Principles of Communication Systems, H Taub, D L Schilling, Gautam Sahe, TMH, 4th Edition, 2017.
3. Modern Digital and Analog Communication Systems, B.P.Lathi, Zhi Ding, Hari Mohan Gupta, Oxford University Press, 4th Edition, 2017.

REFERENCES:

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

E-RESOURCES:

1. <http://nptel.ac.in/courses/117102059/> Prof. Surendra Prasad.
2. <https://ict.iitk.ac.in/wp-content/uploads/EE320A-Principles-Of-Communication-CommunicationSystems-4ed-Haykin.pdf>.
3. <https://www.scribd.com/document/266137872/sanjay-sharma-pdf>.
4. <http://bayanbox.ir/view/914409083519889086/Book-Modern-Digital-And-AnalogCommunication-Systems-4th-edition-by-Lathi.pdf>.
5. <https://soaneemrana.org/onewebmedia/ELECTRONICS%20COMMUNICATION%20SYSTEM%20BY%20GEORGE%20KENNEDY.pdf>

Course Outcomes:

After undergoing the course, students will be able to

1. Describe the Modulation and Demodulation techniques of standard AM.
2. Compare different types of Amplitude Modulation and Demodulation techniques.
3. Analyse the concepts of generation and detection of Angle Modulated signals.
4. Outline the Radio Receivers with different sections.
5. Interpret the Radio Transmitters completely.
6. Illustrate the noise performance in Analog Modulation techniques.

B.Tech. IV Semester

COURSE CODE: 23PCEC411

L T P C
0 0 3 1.5

SIGNALS AND SYSTEMS LAB

Internal Marks: 30
External Marks: 70

Course objectives:

1. Acquire the knowledge on Generation of Various Signals and Sequences.
2. Verification of Linearity and Time Invariance Properties of a given Continuous/Discrete System.

Note:

1. All the experiments are to be simulated using MATLAB or equivalent software
2. Minimum of 10 experiment are to be completed

List of Experiments (Ten experiments to be done):

1. Generation of Basic Signals (Analog and Discrete)
 - i. Unit step
 - ii. Unit impulse
 - iii. Unit Ramp
 - iv. Sinusoidal
 - v. Signum
2. Operations on signals
 - i. Addition & Subtraction
 - ii. Multiplication & Division
 - iii. Maximum & minimum
3. Energy and power of signals ,even and odd signals
4. Transformation of the independent variable
 - i. Shifting (Delay & Advance)
 - ii. Reversing
 - iii. Scaling
5. Convolution & Deconvolution.
6. Correlation
7. Fourier Series Representation
8. Fourier Transform and Analysis of Fourier Spectrum
9. Laplace Transforms
10. Z-Transforms
11. Waveform Synthesis using Laplace Transform.
12. Verification of Sampling Theorem.

Major Equipment required for Laboratories:

1. Computer System with latest specifications connected
2. Window XP- or equivalent
3. Simulation software-MAT Lab or any equivalent simulation software

Note: Minimum 10 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end

exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

E-RESOURCES:

1. <https://nptel.ac.in/courses/108/104/108104100/>
2. <https://nptel.ac.in/courses/108/106/108106163/>

Course Outcomes:

Upon completing this course, the students will be able to

1. Generate, analyze and perform various operations on Signals/Sequences in time domain
2. Generate, analyze and perform various operations on Signals/Sequences in frequency domain
3. Analyze and Characterize Continuous and Discrete Time Systems in Time domain along with the concept of Sampling
4. Analyze and Characterize Continuous and Discrete Time Systems in Frequency domain along with the concept of Sampling
5. Generate different Random Signals and capable to analyze their Characteristics
6. Apply the Concepts of Deterministic and Random Signals for Noise removal Applications and on other Real Time Signals

ELECTRONIC CIRCUIT ANALYSIS LAB**Internal Marks: 30****External Marks: 70****Course objectives:**

1. To illustrate the students different analog electronic circuit and their application in practice.
2. To impart knowledge on assessing performance of analog electronic circuit through monitoring of sensitive parameters.

Note: The students are required to design the circuit and perform the simulation using Multisim/Equivalent Industrial Standard Licensed simulation software tool. Further they are required to verify the result using necessary hardware equipment.

List of Experiments (Ten experiments to be done):

1. Determination of F_t of a given transistor.
2. Voltage-Series Feedback Amplifier
3. Current-Shunt Feedback Amplifier
4. RC Phase Shift/Wien Bridge Oscillator
5. Hartley/Colpitt's Oscillator
6. Two Stage RC Coupled Amplifier
7. Darlington Pair Amplifier
8. Bootstrap Emitter Follower
9. Class A Series-fed Power Amplifier
10. Transformer-coupled Class A Power Amplifier
11. Class B Push-Pull Power Amplifier
12. Complementary Symmetry Class B Push-Pull Power Amplifier
13. Single Tuned Voltage Amplifier
14. Double Tuned Voltage Amplifier

Major Equipment required for Laboratories:**Software:**

- i. Multisim/Equivalent Industrial Standard Licensed simulation software tool.
- ii. Computer Systems with required specifications

Hardware Required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multimeters
5. Decade Resistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components

Note: Minimum 10 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end

exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

E-RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc20_ee45/preview
2. <https://nptel.ac.in/courses/108106084>

Course Outcomes:

Upon completing this course the students will be able to

1. Identify relevant information to supplement to the Analog Electronic Circuit
2. Set up testing strategies and select proper instruments to evaluate performance characteristics of analog electronic circuit.
3. Design amplifiers with required Q point and analyse amplifier characteristics
4. Examine the effect multistage amplification on frequency response
5. Investigate feedback concept in amplifiers and oscillator
6. Design a Tuned Voltage Amplifier.

**B.Tech. IV
Semester**

COURSE CODE: 23ES413C

SOFT SKILLS

Internal Marks: 30

External Marks: 70

Course Objectives:

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

UNIT – 1: 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.

Note: Skill Oriented Course shall carry 100 marks and shall be evaluated through continuous assessments during the semester for 30 sessional marks and end examination shall be for 70 marks. Day-to-day work in the class / laboratory shall be evaluated for 30 marks by the concerned teacher based on the regularity/assignments/viva/mid semester test. The end examination similar to practical examination pattern shall be conducted by the concerned teacher and an expert in the subject nominated by the principal.

TEXT BOOKS:

1. Sherfield, M. Robert at al, Cornerstone Developing Soft Skills, 4/e, Pearson Publication, New Delhi, 2014.
2. Alka Wadkar, Life Skills for Success, 1/e, Sage Publications India Private Limited, 2016.

REFERENCE BOOKS:

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

E-RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc20_hs60/preview
2. <http://www.youtube.com/@softskillsdevelopment6210>
3. https://youtube.com/playlist?list=PLLy_2iUCG87CQhELCyvXh0E_ybOO1_q&si=Fs05Xh8ZrOPsR8F4
4. <https://www.coursera.org/learn/people-soft-skills-assessment?language=English>
5. <https://www.edx.org/learn/soft-skills>

Course Outcomes:

Upon completing this course the students will be able to

1. Assimilate and understood the meaning and importance of soft skills
2. learn how to develop soft skills.
3. Understand the significance of soft skills in the working environment for professional excellence.
4. Prepare to undergo the placement process with confidence and clarity.
5. Ready to face any situation in life and equip themselves to handle them effectively.
6. Understand and learn the importance of etiquette in both professional and personal life

B.Tech. IV Semester

COURSE CODE: 23BS414

L T P C

1 0 2 2

DESIGN THINKING & INNOVATION

Internal Marks: 30

External Marks: 70

Course Objectives:

The objectives of the course are to

1. Bring awareness on innovative design and new product development.
2. Explain the basics of design thinking.
3. Familiarize the role of reverse engineering in product development.
4. Train how to identify the needs of society and convert into demand.
5. Introduce product planning and product development process.

UNIT – I Introduction to Design Thinking

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

UNIT - II Design Thinking Process

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

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

UNIT - III Innovation

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

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

UNIT - IV Product Design

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

Activity: Importance of 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.

Textbooks:

1. Tim Brown, Change by design, 1/e, Harper Bollins, 2009.
2. Idris Mootee, Design Thinking for Strategic Innovation, 1/e, Adams Media, 2014.

Reference Books:

1. David Lee, Design Thinking in the Classroom, Ulysses press, 2018.
2. Shrrutin N Shetty, Design the Future, 1/e, Norton Press, 2018.
3. William Lidwell, Kritin Holden, & Jill Butter, Universal principles of design, 2/e, Rockport Publishers, 2010.
4. Chesbrough, H., The era of open innovation, 2003.

E-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/noc22_de16/preview
- 5.

Course Outcomes:

At the end of the course, a student will be able to:

1. Define the concepts related to design thinking.
2. Explain the fundamentals of Design Thinking and innovation.
3. Apply the design thinking techniques for solving problems in various sectors.
4. Analyse to work in a multidisciplinary environment.
5. Evaluate the value of creativity.
6. Know How to market our own product.

B.Tech. V Semester

COURSE CODE:

L T P C
3 0 0 3

ANALOG AND DIGITAL IC APPLICATIONS

Internal Marks: 30

External Marks: 70

Course Objectives:

The main objectives of the course are:

1. To introduce the basic building blocks of linear integrated circuits.
2. To introduce the concepts of waveform generation and introduce some special function ICs.
3. To understand and implement the working of basic digital circuits.

UNIT-1

Operational Amplifier: Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, features of 741 Op-Amp, Modes of Operation-Inverting, Non-Inverting, Differential, Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger, Introduction to Voltage Regulators, Features of 723 Regulator, Three Terminal Voltage Regulators.

UNIT-2

Op-Amp, IC-555 and IC565 Applications: Introduction to Active Filters, Characteristics of Bandpass, Band reject and All Pass Filters, Analysis of 1st order LPF and HPF Butterworth Filters, Waveform Generators – Triangular, Sawtooth, Square Wave, IC555 Timer-Functional Diagram, Monostable and Astable Operations, Applications, IC565 PLL- Block Schematic, principle and Applications.

UNIT-3

Data Converters: Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, Different Types of ADCs – Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

UNIT-4

Combinational Logic ICs: Specifications and Applications of TTL-74XX and CMOS 40XX Series ICs - Code Converters, Decoders, LED and LCD Decoders with Drivers, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Priority Generators/Checkers, Parallel Binary Adder/Subtractor, Magnitude Comparators.

UNIT-5

Sequential Logic IC's and Memories: Familiarity with commonly available 74XX and CMOS40XX Series ICs - All Types of Flip-flops, Synchronous Counters, Decade Counters, Shift Registers.

Memories - ROM Architecture, Types of ROMs and Applications, RAM Architecture, Static and Dynamic RAMs.

TEXT BOOKS:

1. Ramakanth A.Gayakwad-Op-Amps and Linear ICs, PHI,2003.
2. Floyd and Jain-Digital Fundamentals, 8th Ed., Pearson Education,2005.

REFERENCE BOOKS:

1. D.Roy Chowdhury–Linear Integrated Circuits, New Age International(p) Ltd, 2ndEd., 2003
2. John.F.Wakerly–Digital Design Principles and Practices,3rdEd.,Pearson,,2009.
3. Salivahana-Linear Integrated Circuits and Applications, TMH,2008.
4. William D.Stanley-Operational Amplifiers with Linear Integrated Circuits ,4th Ed., Pearson Education India, 2009
5. Operational Amplifiers & Linear ICs by David A Bell, Oxford University Press; Third edition, 2011.

E-RESOURCES:

1. <https://archive.nptel.ac.in/courses/117/106/117106030>
2. https://onlinecourses.nptel.ac.in/noc22_ee37/preview

Course Outcomes:

Upon completion of the Course, the students will be able to:

1. Apply the operational principles and characteristics of op-amps to design and analyze analog circuits such as amplifiers and active filters.(K3: Apply)
2. Design waveform generators and comparator circuits using op-amps for signal processing applications.(K4: Analyze)
3. Implement and troubleshoot combinational and sequential logic circuits using digital ICs.(K4: Analyze)
4. Compare different data conversion techniques (DAC and ADC) and implement digital-to-analog and analog-to-digital conversion circuits in real-time applications.
5. Design and interface digital systems using programmable logic devices like PLDs and FPGAs.(K4: Analyze)
6. Design Successive Approximation ADC

B.Tech. V Semester

COURSE CODE:

L T P C
3 0 0 3

DIGITAL COMMUNICATIONS

Internal Marks: 30

External Marks: 70

Course Objective:

1. To Understand different pulse digital modulation techniques and their comparison.
2. To Understand the concept of entropy and different source coding techniques.
3. To Familiarize with block codes, cyclic codes and convolution codes

UNIT-1

PULSE DIGITAL MODULATION: Elements of digital communication systems, advantages of digital communication systems, Elements of PCM: Sampling, Quantization and Coding, Quantization error, Companding in PCM systems. Differential PCM systems (DPCM). Delta modulation, its draw backs, adaptive delta modulation, comparison of PCM and DM systems, noise in PCM and DM systems, Time division multiplexing, Frequency division multiplexing.

UNIT-2

DIGITAL MODULATION TECHNIQUES: Introduction, ASK, FSK, PSK, DPSK, DEPSK, QPSK, M-ary PSK, ASK, FSK, similarity of BFSK and BPSK.

UNIT-3

DATA TRANSMISSION: Base band signal receiver, probability of error, the optimum filter, matched filter, probability of error using matched filter, coherent reception, non-coherent detection of FSK, calculation of error probability of ASK, BPSK, BFSK, QPSK.

UNIT-4

LINEAR BLOCK CODES: Introduction, Matrix description of Linear Block codes, Error detection and error correction capabilities of Linear block codes, Hamming codes, Binary cyclic codes, Algebraic structure, encoding, syndrome calculation, BCH codes

UNIT-5

CONVOLUTION CODES: Introduction, encoding of convolution codes, time domain approach, transform domain approach. Graphical approach: state, tree and trellis diagram decoding using Viterbi algorithm, Turbo Codes.

TEXT BOOKS:

1. Digital communications - Simon Haykin, John Wiley, 2005
2. Principles of Communication Systems – H. Taub and D. Schilling, TMH, 2003
3. Digital Communications- J.Das, S.K.Mullick, P.K.Chatterjee, John willy and sons, 1986.

REFERENCE BOOKS:

1. Digital and Analog Communication Systems - Sam Shanmugam, John Wiley, 2005.
2. Digital Communications – John Proakis, TMH, 1983. Communication Systems Analog and Digital – Singh and Sapre, TMH, 2004.
3. Modern Analog and Digital Communication – B.P.Lathi, Oxford reprint, 3rd edition, 2004.

E-RESOURCES:

1. <https://nptel.ac.in/courses/117101051>
2. <https://archive.nptel.ac.in/courses/108/102/108102096/>

Course Outcomes:

Upon completion of the Course, the students will be able to:

1. Describe basic components of Digital Communication Systems and to determine the performance of different pulse digital modulation techniques
2. Determine the performance of digital modulation techniques for the generation and digital representation of the signals.
3. Design optimum receiver for Digital Modulation techniques and to determine the probability of error for various digital modulation schemes
4. Compute and analyze error detecting and error correction codes block codes, cyclic codes.
5. Compute and analyze convolution codes and Turbo codes.
6. Determine probability of error using matched filter.

B.Tech. V Semester

COURSE CODE:

L T P C
3 0 0 3

ANTENNAS AND WAVE PROPAGATION

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To understand the concept of radiation, antenna definitions and significance of antenna parameters, to derive and analyze the radiation characteristics of thin wire dipole antennas and solve numerical problems.
2. To analyze the characteristics and design relations of UHF, VHF and Microwave Antennas.
3. To understand the concepts and set-up requirements for microwave measurements, and familiarize with the procedure to enable antenna measurements.

UNIT-1

ANTENNA FUNDAMENTALS: Introduction, Radiation Mechanism – Single Wire, 2-Wire, dipoles, Current Distribution on a thin wire antenna. Antenna Parameters - Radiation Patterns, Patterns in Principal Planes, Field Regions, Main Lobe and Side Lobes, Beamwidth, Radiation Intensity, Directivity, Antenna Efficiency, Gain, Beam Efficiency, Bandwidth, Polarization, Input Impedance, Beam Area and Resolution, Antenna Apertures, Aperture Efficiency, Effective Height, illustrated Problems.

UNIT-2

THIN LINEAR WIRE ANTENNAS: Retarded Potentials, Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole – Current Distributions, Evaluation of Field Components, Power Radiated, Radiation Resistance, Radiation Efficiency, Beamwidth, Directivity, Effective Area and Effective Height. Natural current distributions, fields and patterns of Thin Linear Center-fed Antennas of different lengths, Radiation Resistance at a point which is not current maximum. Antenna Theorems – Applicability and Proofs for equivalence of directional characteristics, Loop Antennas: Small Loops - Field Components, Comparison of far fields of small loop and short dipole, Concept of short magnetic dipole, D and R_r relations for small loops

UNIT-3

NON-RESONANT RADIATORS: Introduction, Traveling wave radiators – basic concepts, long wire antennas – field strength calculations and patterns. Performance comparison with resonant radiators,

ANTENNA ARRAYS: 2 element arrays – different cases, Principle of Pattern Multiplication, N element Uniform Linear Arrays – Broadside, End-fire Arrays, EFA with Increased Directivity, Derivation of their characteristics and comparison; Concept of Scanning Arrays. Directivity Relations (no derivations), Related Problems. Binomial Arrays, Effects of Uniform and Non-uniform Amplitude Distributions, Design Relations, **Arrays with Parasitic Elements:** Yagi-Uda Arrays, Folded Dipoles and their characteristics

UNIT-4

BROADBAND ANTENNAS: Log periodic antenna, Basic principle, Helical Antennas – Significance, Geometry, basic properties; Design considerations for monofilar helical antennas in Axial Mode and Normal Modes (Qualitative Treatment).

UHF AND MICROWAVE ANTENNAS:

Introduction to Horn Antennas – Types, Optimum Horns, Design Characteristics of Pyramidal Horns; **Paraboloidal Reflectors:** – Geometry, characteristics, types of feeds, F/D Ratio, Spill Over, Back Lobes, Aperture Blocking, Off-set Feeds, Case grain Feeds. **Microstrip Antennas**-Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas –Geometry and Parameters, Impact of different parameters on characteristics, illustrated Problems.

UNIT-5

ANTENNA MEASUREMENTS: Friis Transmission Equation, Patterns Required, Set Up, Distance Criterion, Directivity and Gain Measurements (Comparison, Absolute and 3-Antenna Methods).

WAVE PROPAGATION: types of propagations. Sky Wave Propagation – Formation of Ionospheric Layers and their Characteristics, Mechanism of Reflection and Refraction, Critical Frequency, MUF and Skip Distance; Space Wave Propagation – Mechanism, LOS and Radio Horizon, Field strength equation, illustrated Problems.

TEXT BOOKS:

1. Antenna Theory: Analysis And Design- Constantine A. Balanis, 3rd Edition, A John Wiley and Sons, Inc., Publication
2. Antennas for All Applications – John D. Kraus and Ronald J. Marhefka, 3rd Edition, TMH, 2003.
3. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd Edition, 2000.

REFERENCE BOOKS:

1. Antennas and Wave Propagation-G.S.N. Raju, Pearson publications, 2006.
2. Transmission and Propagation – E.V.D. Glazier and H.R.L. Lamont, The Services Text Book of Radio, vol. 5, Standard Publishers Distributors, Delhi.
3. Antennas – John D. Kraus, McGraw-Hill, 2nd Edition, 1988.

E-RESOURCES:

1. <https://archive.nptel.ac.in/courses/108/101/108101092/>
2. https://onlinecourses.nptel.ac.in/noc20_ee20/preview

Course Outcomes:

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

1. Identify basic antenna parameters.
2. Quantify the fields radiated by various types of antennas
3. Design and analyze antenna arrays
4. Design and analyze wire antennas, loop antennas, reflector antennas, lens antennas, horn antennas and micro-strip antennas
5. Analyze antenna measurements to assess antenna's performance
6. Analyse Folded Dipoles and their characteristics.

B.Tech. V Semester

COURSE CODE:

L T P C
3 0 0 3

**DIGITAL SYSTEM DESIGN THROUGH HDL
(PE-I)**

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To Understand HDL fundamentals
2. To Design digital systems
3. To Implement designs in hardware

UNIT-1

Introduction to Verilog HDL and Gate Level Modelling:

Verilog as HDL, Levels of Design Description Basics of Concepts of Verilog, Data Types, System Task, Compiler directives, modules and ports. AND Gate Primitive, Module Structure, Other Gate Primitives, Illustrative Examples, Tri-State Gates, Array of Instances of Primitives, Additional Examples, Design of Flipflops with Gate Primitives, Delay.

UNIT-2

Behavioural Modelling:

Introduction, structured processors, procedural assignments, timing controls, conditional statements, multi-way branching, loops, sequential and parallel blocks, generate blocks, Design of Decoders, Multiplexers, Flip-flops, Registers and Counters in Behavioural model.

UNIT-3

Modelling at Data flow Level:

Introduction, Continuous Assignment Structures, Delays and Continuous Assignments, Assignment to Vectors, Operators, Design of Decoders, Multiplexers, Flip-flops, Registers and Counters in dataflow model, Switch Level Modelling: Introduction, Basic Transistor Switches, CMOS Switch, Bi-directional Gates, Time Delays with Switch Primitive delays.

UNIT-4

FSM Design:

Functions, Tasks, User-defined, Primitives: Introduction, Function, Tasks, User-Defined Primitives (UDP), FSM Design (Moore and Mealy Machines), Encoding Style: From Binary to One Hot. Introduction to Synthesis, Synthesis of combinational logic, Synthesis of sequential logic with latches and flip-flops, Synthesis of Explicit and Implicit State Machines

UNIT-5

Components Test and Verification:

Test Bench – Combinational Circuits Testing, Sequential Circuits Testing, Test Bench Techniques, Design Verification, Assertion Verification

TEXT BOOKS:

1. Samir Palnitkar, "Verilog HDL A Guide to Digital and Synthesis" ,2nd Edition, Pearson Education,2006.
2. Michael, D. Ciletti, "Advanced digital design with the Verilog HDL", Pearson Education India,2005.

REFERENCE BOOKS:

1. Padmanabhan, Tripura Sundari -Design through Verilog HDL, Wiley, 2016
2. S. Brown, Zvonko – Vranesic, Fundamentals of Digital Logic with Verilog Design, TMH, 3rdEdision 2014.
3. J. Bhasker, A Verilog HDL Primer 2nd edition, BS Publications, 2001.

E-RESOURCES:

- 1 . https://onlinecourses.nptel.ac.in/noc21_ee39/preview
2. https://onlinecourses.nptel.ac.in/noc24_cs61/preview

Course Outcomes:

Upon completing this course, the student will be able to

1. Understand the language constructs and programming fundamentals of Verilog HDL.
2. Choose the suitable abstraction level for a particular digital design
3. Construct Combinational and sequential circuits in different modelling styles using Verilog HDL
4. Design and synthesize combinational and sequential logic circuits
5. Analyze and Verify the functionality of digital circuits/systems using test benches.
6. Design Bi-directional Gates.

B.Tech. V Semester

COURSE CODE:

L T P C
3 0 0 3

**OPTICAL COMMUNICATIONS
(PE-I)**

**Internal Marks: 30
External Marks: 70**

Course Objectives:

1. To learn the basic elements of optical fiber transmission link, fiber modes, configurations and structures.
2. To understand the different kind of losses, signal distortion, SM fibers.
3. To learn the various optical sources, materials and optical fiber splicing.

UNIT-1

Overview of optical fiber communication - Historical development, The general system, advantages of optical fiber communications. Optical fiber waveguides- Introduction, Ray theory transmission, Total Internal Reflection, Acceptance angle, Numerical Aperture, Skew rays, Cylindrical fibers- Modes, V-number, Mode coupling, Step Index fibers, Graded Index fibers, Single mode fibers-Cutoff wave length, Mode Field Diameter, Effective Refractive Index, Related problems.

UNIT-2

Fiber materials:- Glass, Halide, Active glass, Chalcogenide glass, Plastic optical fibers. **Signal distortion in optical fibers-** Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses, Information capacity determination, Group delay, Types of Dispersion:- Material dispersion, Wave-guide dispersion, Polarization-Mode dispersion, Intermodal dispersion, Pulse broadening in Graded index fiber, Related problems.

UNIT-3

Optical fiber Connectors- Connector types, Single mode fiber connectors, Connector return loss, Fiber Splicing-Splicing techniques, Splicing single mode fibers, Fiber alignment and joint loss- Multimode fiber joints, single mode fiber joints.

UNIT-4

Optical sources- LEDs, Structures, Materials, Quantum efficiency, Power, Modulation, Power bandwidth product. Injection Laser Diodes- Modes, Threshold conditions, External quantum efficiency, Laser diode rate equations, Resonant frequencies, Reliability of LED and ILD, **Optical detectors-** Physical principles of PIN and APD, Detector response time, Comparison of Photo detectors, Related problems.

UNIT-5

Source to fiber power launching - Output patterns, Power coupling, Power launching, Equilibrium Numerical Aperture, Laser diode to fiber coupling, **Optical receiver operation-** Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Probability of Error, Quantum limit, Analog receivers. **Optical system design** - Point-to-point links- Component choice and considerations, Link power budget, Rise time budget with examples, Line coding in Optical links, WDM, Necessity, Principles, Measurement of Attenuation and Dispersion, Eye pattern.

TEXT BOOKS:

1. Optical Fiber Communications–Gerd Keiser, McGraw- Hill International edition, 3rd Edition, 2000.
2. Fiber Optic Communications– Joseph C. Palais, 4th Edition, Pearson Education, 2004.

REFERENCE BOOKS:

1. Fiber Optic Communications–D.K.Mynbaev, S.C.Gupta and Lowell L.Scheiner, Pearson Education,2005.
2. Optical Fiber Communication and its Applications–S.C. Gupta, PHI, 2005.
3. Fiber Optic Communication Systems–Govind P. Agarwal ,John Wiley, 3rd Edition, 2004.

E-RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_ee42/preview
2. <https://archive.nptel.ac.in/courses/108/106/108106167/>

Course Outcomes:

Upon completing this course, the student will be able to

1. Choose necessary components required in modern optical communications systems.
2. Design and build optical fiber experiments in the laboratory, and learn how to calculate electromagnetic modes in waveguides, the amount of light lost going through an optical system, dispersion of optical fibers.
3. Use different types of photo detectors and optical test equipment to analyze optical fiber and light wave systems.
4. Choose the optical cables for better communication with minimum losses
5. Design, build, and demonstrate optical fiber experiments in the laboratory.
6. Analyse Connector return loss.

B.Tech. V Semester

COURSE CODE:

L T P C
3 0 0 3

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION
(PE-I)

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To Understand measurement principles.
2. To Apply measurement instruments.
3. To Design measurement systems.

UNIT-1

Measuring Instruments: Introduction, Errors in Measurement, Accuracy, Precision, Resolution and Significant figures. Basic PMMC Meter- construction and working, DC and AC Voltmeters- Multirange, Range extension, DC Ammeter, Multimeter for Voltage, Current and resistance measurements.

Digital Instruments: Digital Voltmeters – Introduction, DVM's based on V-T, V-F and Successive approximation principles, Resolution and sensitivity, General specifications, Digital Multimeters, Digital frequency meters, Digital measurement of time.

UNIT-2

Oscilloscopes: Introduction, Block diagram of CRO, Basic principle of CRT, CRT Construction and features, vertical amplifiers, horizontal deflection system- sweep, trigger pulse, delay line, sync selector circuits. Dual beam and dual trace CROs, Sampling and Digital storage oscilloscopes.

UNIT-3

Bridges: DC Bridges for Measurement of resistance - Wheat stone bridge, Kelvin's Bridge, AC Bridges for Measurement of inductance- Maxwell's bridge, Hay's Bridge, Anderson bridge, Measurement of capacitance - Schearing Bridge, Wien Bridge, Errors and precautions in using bridges.

UNIT-4

Signal Generators: Introduction, Fixed and variable AF oscillator, Standard signal generator, Laboratory type signal generator, AF sine and Square wave generator, Function generator, Square and Pulse generator, Sweep frequency generator.

UNIT-5

Transducers: Introduction, Types of Transducers, Electrical transducers, Selecting a transducer, Resistive transducer, Strain gauges, Piezoelectric transducer,

Photoelectric transducer, Photovoltaic transducer, Temperature transducers-RTD, LVDT.

Intelligent Sensors: definition of intelligent instrumentation, types of instruments, Classification, Smart sensors, Cogent Sensors, Soft or Virtual sensors, Self-Adaptive Sensors, Self-Validating Sensors, Temperature Compensating Intelligent Sensors, Pressure Sensor, Indirect Sensing. (**Text Book 3**)

TEXT BOOKS:

1. H. S. Kalsi, "Electronic Instrumentation", Third edition, Tata McGraw Hill, 2010.
2. A. D. Helfrick and W.D. Cooper, "Modern Electronic Instrumentation and Measurement Techniques", PHI, 6th Edition, 2010.
3. Manabendra Bhuyan, –Intelligent Instrumentation: Principles and Applications CRC Press, 2011.

REFERENCE BOOKS:

1. A.K. Sawhney, DhanpatRai and Co., "A course in Electrical and Electronic Measurements and Instrumentation", 9th Edition, 2010.
2. David A. Bell, "Electronic Instrumentation and Measurements", PHI, 2nd Edition, 2006.

E-RESOURCES:

1. <https://archive.nptel.ac.in/courses/108/105/108105153/>
2. https://onlinecourses.nptel.ac.in/noc19_ee44/preview

Course Outcomes:

Upon completing this course, the student will be able to

1. Understand the various Analog and Digital measuring Instruments
2. Aware of the principles and operations of various oscilloscopes
3. Learn measurements using various bridges
4. Familiarize different Signal Generators and function generators
5. Learn various transducers and Intelligent sensors
6. Design Wheat stone bridge

B.Tech. V Semester

COURSE CODE:

L T P C
3 0 0 3

COMPUTER ARCHITECTURE AND ORGANIZATION
(PE-I)

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To understand the structure, function and characteristics of computer systems.
2. To understand the design of the various functional units and components of computers.
3. To identify the elements of modern instructions sets and their impact on processor design.

UNIT-1

Introduction: Digital Computers, Von Neumann computers, Basic organization of a computer, Data Representation: Data types, Complements, Fixed-point representation, Conversion of fractions, Floating-point representation.

Register Transfer and Microoperations: Register transfer language, Register transfer, Bus and Memory transfers, Arithmetic Microoperations, Logic Microoperations, Shift Microoperations, Arithmetic Logic Shift Unit.

UNIT-2

Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory- Reference instructions, Input-Output and Interrupt, Complete Computer Description, Design of Basic computer

Programming the Basic Computer: Introduction, Machine Language, Assembly language, The Assembler, Program Loops, Programming Arithmetic and Logic Operations

Microprogrammed Control: Control Memory, Address Sequencing, Microprogram Example, Design of Control Unit (Preferably from Reference Book 2)

UNIT-3

Central Processing Unit: Introduction, General Register Organization, Stack organization, Instruction Formats, Addressing Modes, Data transfer and Manipulation, Program Control, Reduced Instruction Set Computer.

Computer Arithmetic: Introduction, Addition and Subtraction, Multiplication Algorithms, Division Algorithms, Floating-Point Arithmetic Operations, Decimal Arithmetic Unit, Decimal Arithmetic Operations.

UNIT - 4

Input-Output organization :Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA), Input-Output Processor (IOP), Serial Communication.

UNIT- 5

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware.

TEXT BOOKS:

1. M.Morris Mano," Computer System Architecture," Pearson Publishers, Revised Third Edition

REFERENCE BOOKS:

1. John P Hayes, "Computer Architecture and Organization," Mc-Graw Hill Publishers, Third Edition
2. Carl Hamacher, "Computer Organization," Tata Mc-Graw Hill Publishers, Fifth Edition.

E-RESOURCES:

1. <https://archive.nptel.ac.in/courses/106/105/106105163/>
2. https://onlinecourses.nptel.ac.in/noc21_cs61/preview

Course Outcomes:

Upon completing this course, the student will be able to

1. Understand the representation of data, the register transfer language and Microoperations.
2. Know the basic computer organization and design, programming the basic computer and design the microprogrammer control unit.
3. Know the development of central processing unit and explain various algorithms for computer arithmetic operations.
4. Interface various Peripheral devices and various data transfer operations.
5. Study the memory Hierarchy and different types of memories.
6. Analyse Floating-Point Arithmetic Operations

B.Tech. V Semester

COURSE CODE: ---

L	T	P	C
3	0	0	3

OPEN ELECTIVE-1

Internal Marks: 30

External Marks: 70

The student can choose any one OE-1 subject offered by other Branches. The list of OEs are available in Course Structure.

ANALOG AND DIGITAL IC APPLICATIONS LAB

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To Gain the practical hands-on experience on 741 Op-Amp applications.
2. To Gain the practical hands-on experience on 555 Timer applications.
3. To Gain the practical hands-on experience on IC 565 – PLL Applications.

PART-A: (Minimum **SIX** Experiments to be conducted):

1. OP AMP Applications – Adder, Subtractor, Comparator Circuits.
2. Integrator and Differentiator Circuits using IC 741.
3. Active Filter Applications – LPF, HPF (first order)
4. Active Filter Applications – BPF, Band Reject (Wideband) and Notch Filters.
5. IC 741 Oscillator Circuits – Phase Shift and Wien Bridge Oscillators.
6. Function Generator using OP AMPs.
7. IC 555 Timer – Astable and Mono-stable Operation Circuit.
8. Schmitt Trigger Circuits – using IC 741 and IC 555.
9. IC 565 – PLL Applications.
10. IC 566 – VCO Applications.
11. 4 bit DAC using OP AMP.

Equipment required for Laboratories:

1. RPS
2. CRO
3. Function Generator
4. Multi Meters
5. IC Trainer Kits (Optional)
6. Bread Boards
7. Components:- IC741, IC555, IC565, IC1496, IC723, 7805, 7809, 7912 etc.
8. Analog IC Tester

PART-B: (Minimum **SIX** Experiments to be conducted):

The students are required to design and draw the internal structure of the following Digital Integrated Circuits and to develop HDL(VHDL, Verilog HDL) source code, perform simulation using relevant simulator and analyze the obtained simulation results using appropriate synthesizer. Further, it is required to verify the logic with necessary hardware.

List of Experiments:

1. Realization of Logic Gates
2. 3 to 8 Decoder- 74138
3. 8*1 Multiplexer-74151 and 2*1 De-multiplexer-74155
4. 4-Bit Comparator-7485.
5. D Flip-Flop- 7474
6. Decade Counter- 7490
7. Universal shift register-74194/195
8. RAM (16*4)-74189 (read and write operations)

Equipment Required:

1. Xilinx Vivado/Equivalent Standard IDE
2. Personal computer with necessary peripherals
3. Hardware kits- Various FPGA families.

Note: Minimum 12 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

E-RESOURCES:

1. <https://archive.nptel.ac.in/courses/117/106/117106030>
2. https://onlinecourses.nptel.ac.in/noc22_ee37/preview

Course Outcomes:

Upon completing this course, the student will be able to

1. Understand the basics of Op-Amp and to Design, Analyze Amplifiers, Active filters and Hysteresis voltage of Schmitt trigger using 741 IC.
2. Design the Multivibrator circuits using IC555 and determines the frequency of oscillation and time delay.
3. Explain the functionality of IC723 and determine the load and line regulations.
4. Discuss the characteristics of PLL & design the various applications of PLL.
5. Know IC 566 for VCO Applications.
6. Design 4 bit DAC using OP AMP

ANALOG AND DIGITAL COMMUNICATIONS LAB

Internal Marks: 30

External Marks: 70

Course objectives:

1. Study the basics of analog and digital modulation techniques and get practical exposure to communication systems with detailed analysis of analog and digital communication techniques
2. Design basic digital modulation techniques using electronic hardware
3. Analyze the fundamental concepts of analog and digital communication systems

List of Experiments:

(Fourteen experiments to be done-The students have to calculate the relevant parameters)-

(a. Hardware, b. MATLAB Simulink c. MATLAB Communication toolbox)

Part-A

1. Amplitude Modulation-Modulation and Demodulation
2. AM-DSBSC-Modulation and Demodulation
3. Diode Detector
4. Pre-emphasis and De-emphasis
5. Frequency Modulation-Modulation and Demodulation
6. Verification of Sampling Theorem
7. Pulse Amplitude Modulation and Demodulation
8. PWM, PPM-Modulation and Demodulation

Part-B

1. Time division multiplexing.
2. Frequency Division Multiplexing
3. Pulse code modulation.
4. Differential pulse code modulation.
5. Delta modulation.
6. Frequency shift keying.
7. Phase shift keying.
8. Differential phase shift keying.
9. Companding
10. Source Encoder and Decoder
11. Linear Block Code-Encoder and Decoder and Binary Cyclic Code-Encoder and Decoder
12. Convolution Code-Encoder and Decoder

Note: All the above experiments are to be executed/completed using hardware boards and also to be simulated on Mat lab.

Equipment and Software required:

- i) Computer Systems with latest specifications
- ii) Connected in LAN(Optional)
- iii) Operating system (Windows/Linux software)
- iv) Simulations software (Simulink and MATLAB)

Equipment:

1. RPS -0 -30V
2. CRO -0-20MHz.
3. Function Generators -0-1MHz
4. Components and Breadboards
5. Multi meters and other meters

Note: Minimum 14 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

E-RESOURCE:

1. <https://archive.nptel.ac.in/courses/117/105/117105143/>
2. https://onlinecourses.nptel.ac.in/noc21_ee74/preview

Course outcomes:

Upon completing this course, the student will be able to

1. Understand the fundamental concepts of digital communication systems, including signal flow, time division multiplexing (TDM), pulse modulations, digital modulation techniques, sampling, and reconstruction
2. Analyze the performance of digital designs in communication systems
3. Design and implement different modulation and demodulation techniques
4. Analyze digital modulation techniques using MATLAB tools
5. Identify and describe different techniques in modern digital communications, particularly in source coding using MATLAB tools
6. Design Convolution Code-Encoder and Decoder

B.Tech. V Semester

COURSE CODE:

L T P C
1 0 2 2

ARM BASED/ ARDUINO BASED PROGRAMMING

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. The arduino is an open – source computer hardware/software platform for building devices and interactive objects that can sense and control the physical world around them.
2. In this course students will learn how the Arduino platform works in terms of the physical board and libraries and IDE (Integrated development environment).
3. The course will also cover programming the Arduino using C code and accessing the pins on the board via the software to control external devices.

List of Experiments:

(Minimum 12 Experiments to be conducted)

1. Introduction to Raspberry Pi Board/ Arduino/Node MCU.
2. Familiarization with ARM keil MDK for programming and debugging an application on the PSoC 4 BLE chip and perform necessary software installation.
3. Measure Analog signal from Temperature Sensor.
4. Generate PWM output.
5. Drive single character generation on Hyper Terminal.
6. Drive a given string on Hyper Terminal.
7. Full duplex Link establishment using Hyper terminal.
8. Drive a given value on a 8 bit DAC consisting of SPI.
9. Drive Stepper motor using Analog GPIOs.
10. Drive Accelerometer and Display the readings on Hyper Terminal.
11. Automatic street light control to control the street light (Turn on and off based on the light) using Arduino.
12. Detecting obstacle with IR Sensor and Arduino.
13. Write an Arduino program for interfacing Arduino board with the Ultrasonic sound sensor.
14. To interface DC motor using Arduino.

Note-1: Minimum 12 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

Note-2: Skill Oriented Course shall carry 100 marks and shall be evaluated through continuous assessments during the semester for 30 sessional marks and end

examination shall be for 70 marks. Day-to-day work in the class / laboratory shall be evaluated for 30 marks by the concerned teacher based on the regularity/assignments/viva/mid semester test. The end examination similar to practical examination pattern shall be conducted by the concerned teacher and an expert in the subject nominated by the principal.

E – RESOURCE:

1. <https://archive.nptel.ac.in/courses/106/105/106105193/>
2. <https://archive.nptel.ac.in/courses/117/106/117106111/>

Course Outcomes:

Upon completing this course, the student will be able to

1. Comprehend Microcontroller-Transducers Interface techniques.
2. Establish Serial Communication link with Arduino.
3. Analyze basics of SPI interface.
4. Interface Stepper Motor with Arduino.
5. Analyze Accelerometer interface techniques.
6. Generate different signals using Arduino.

B.Tech. V Semester

COURSE CODE:

L T P C
0 1 2 2

DESIGN OF PCB AND ANTENNA LAB

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To Understand PCB design fundamentals
2. To Design PCBs using software tools.
3. To Measurement of radiation pattern of Antenna.

Part-A: DESIGN OF PCB

List of experiments (Minimum 10 Experiments to be conducted):

1. Study on types of PCB layers, through Hole and SMD Components.
2. Schematic Creation and simulation of an electronic circuit
3. Mapping Components of an electronic circuit
4. Set Parameters for PCB Design.
5. Laying Tracks on PCB.
6. Create PCB Layout of an Electronic Circuit.
7. Create Device Model and simulation.
8. Create PCB layout of an amplifier design.
9. Create PCB layout of an Astable Multivibrator using IC's.
10. Create PCB layout of a Voltage Regulator using IC's.
11. Create PCB layout of a Galvanic isolation circuit.
12. Printing on PCB.
13. Etching and Drilling of PCB.
14. Soldering PCB.
15. Testing of an electronic Circuit-1 on PCB.
16. Testing of an electronic Circuit-2 on PCB.

Part-B: ANTENNAS LAB

List of experiments: (Any Ten experiments using any simulation software):

1. Generation of EM-Wave
2. Impedance Matching using Smith Chart
3. Calculation of phase and group velocity calculation
4. Plot of Radiation pattern of dipole antenna
5. Plot of Radiation pattern of monopole antenna
6. Plot of Radiation pattern of Uniform Linear Array
7. Measurement of radiation pattern of all wired and aperture antennas
8. Measurement of radiation pattern of planar antennas
9. Measurement of radiation pattern of reflector antennas
10. Measurement of radiation pattern of array antennas
11. Analysis of co-polarization and cross polarization
12. Performance analysis of Yagi -Uda antenna
13. Performance analysis of Helix antenna
14. Radio wave propagation path loss calculations

Note: Minimum 20 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

E – RESOURCE:

1. <https://archive.nptel.ac.in/courses/108/101/108101092/>
2. <https://nptel.ac.in/courses/108102481>

Course Outcomes:

Upon completing this course, the student will be able to

1. Design and layout PCBs using software tools.
2. Prototype and test PCBs.
3. Measure the radiation pattern of antenna.
4. Calculate propagation path loss of Radio waves.
5. Plot of Radiation pattern of dipole antenna.
6. Design Folded Dipole Antenna

B.Tech. V Semester

COURSE CODE:

L	T	P	C
0	0	0	2

EVALUATION OF COMMUNITY SERVICE INTERNSHIP

Internal Marks: 0

External Marks: 50

OBJECTIVES

Community Service Project should be an integral part of the curriculum.

- To sensitize the students to the living conditions of the people who are around them,
- To help students to realize the stark realities of the society.
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
- To make students aware of their inner strength and help them to find new /out of box solutions to the social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

IMPLEMENTATION OF COMMUNITY SERVICE PROJECT

Every student should put in a minimum of 180 hours for the Community Service Project during the summer vacation. Each class/section should be assigned with a mentor. The mentor should be a faculty member.

- 2 Credits to be allocated for Community Service Project within the Choice Based Credit System (CBCS).
- The 180 hours of Community Service Project could be done in different areas.
- Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, house-wives, etc.
- A log book has to be maintained by each of the student, where the activities undertaken/involved to be recorded.
- The log book has to be countersigned by the concerned mentor/faculty in charge.

- The final evaluation to be reflected in the grade memo of the student.
- The Community Service Project should be different from the regular programmes of NSS/NCC/Green Corps/Red Ribbon Club, etc.
- Minor project report should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.
- Attendance requirements are as per the norms of the college/ JNTUK University.

EVALUATION METHODOLOGY:

- The faculty member will act as a faculty-mentor for the group and is in-charge for the learning activities of the students and also for the comprehensive and continuous assessment of the students.
- The assessment is to be conducted for 50 marks.
- The number of credits assigned is 2.
- Later as per the present practice the marks are converted into grades and grade points to include finally in the SGPA and CGPA.

The weightings shall be:

Project Log 20%

Project Implementation 30%

Project report 25%,

Presentation 25%

- Each student is required to maintain an individual logbook, where he/she is supposed to record day to day activities.
- The project log is assessed on an individual basis, thus allowing for individual members within groups to be assessed this way.
- The assessment will take into consideration the individual student's involvement in the assigned work.

While assessing the student's performance, using the student's project log, the following should be taken into account -

- a. The individual student's effort and commitment.
- b. The originality and quality of the work produced by the individual student.
- c. The student's integration and co-operation with the work assigned.
- d. The completeness of the logbook.

The assessment for the Community Service Project implementation shall include the following components and based on the entries of Project Log and Project Report:

- a. Orientation to the community development
- b. Conducting a baseline assessment of development needs
- c. Number and Quality of Awareness Programmes organized on beneficiary programmes and improvement in quality of life, environment and social consciousness, motivation and leadership, personality development, etc.
- d. Number and Quality of Intervention Programmes (Prevention or promotion programs that aim to promote behavioural change in defined community contexts to address social problems) organised.
- e. Follow-up Programmes suggested (Referral Services, Bringing Community Participation)

f. Developing short and mid-term action plans in consultation with local leadership and local government officers.

The **Project Report** shall be prepared as per the guidelines given in the Model Project Report.

The **Project Presentation** is to be made by the student after he/she reports back to the College. The components for assessment are –

- a. assessing the involvement in the project
- b. presentation skills
- c. final outcome of the project as evinced by the student.

There shall be no internal marks for Community service Project. A student shall secure minimum 40% of marks for successful completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the College. The guidelines for community service project are given separately.

The candidate shall submit the comprehensive report to the department. The report will be evaluated for 50 marks by the Review Committee consisting of Head of the department, community service project coordinator/mentor and one senior faculty member of the department.

B.Tech. V Semester

COURSE CODE:

L T P C
3 0 0 3

ELECTRONIC DEVICES AND CIRCUITS
(OE-1)

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To inculcate the basic knowledge of microeconomics and financial accounting
2. To make the students learn how demand is estimated for different products, Input output relationship for optimizing production and cost
3. To Know the Various types of market structure and pricing methods and strategy

UNIT-1:

Review of Semi Conductor Physics: Hall effect, continuity equation, law of junction, Fermi Dirac function, Fermi level in intrinsic and extrinsic Semiconductors

Junction Diode Characteristics :energy band diagram of PN junction Diode, Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in PN junction Diode, diode equation, V-I Characteristics, temperature dependence on V- I characteristics, Diode resistance, Diode capacitance.

UNIT-2:

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

Rectifiers and Filters: Basic Rectifier setup, half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, input and output waveforms, Filters, Inductor filter (Series inductor), Capacitor filter (Stunt inductor), π -Filter, comparison of various filter circuits in terms of ripple factors.

UNIT-3: Transistor Characteristics:

BJT: Junction transistor, transistor current components, transistor equation, transistor configurations, transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, Ebers-Moll model of a transistor, punch through/ reach through, Photo transistor, typical transistor junction voltage values.

FET: FET types, construction, operation, characteristics μ , g_m , r_d parameters, MOSFET- types, construction, operation, characteristics, comparison between JFET and MOSFET.

UNIT-4 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} , I_c , and β , Stability factors, (S,S',S''), Bias compensation, Thermal runaway, Thermal stability Biasing- methods and stabilization.

UNIT-5: 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.

TEXT BOOKS:

1. Electronic Devices and Circuits- J. Millman, C. Halkias, Tata Mc-Graw Hill, Second Edition, 2007
2. Electronic Devices and Circuits by David A. Bell, Oxford University Press
3. Electronics devices and circuit theory- Robert L. Boylestad and Loui Nashelsky, Pearson/Prentice hall, tenth edition, 2009

REFERENCE BOOKS:

1. Integrated Electronics-J. Millman, C. Halkias, Tata Mc-Graw Hill, Second Edition, 2009
2. Electronic Devices and Circuits-K. Lal Kishore, BS Publications, Fourth Edition, 2016.

E-RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_ee80/preview
2. <https://archive.nptel.ac.in/courses/108/108/108108112/>

Course Outcomes:

Upon completing this course, the student will be able to

1. Apply the basic concepts of semiconductor physics.
2. Understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation.
3. Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons.
4. Understand the construction, principle of operation of transistors, BJT and FET with their V-I characteristics in different configurations.
5. Know the need of transistor biasing, various biasing techniques for BJT and FET and stabilization concepts with necessary expressions.
6. Understand the construction, principle of operation of MOSFET

B.Tech. V Semester

COURSE CODE:

L T P C
3 0 0 3

SIGNALS AND SYSTEMS
(OE-1)

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To study about signals and systems.
2. To analyze the spectral characteristics of signal using Fourier series and Fourier transforms.
3. To understand the characteristics of systems.

UNIT-1

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-2

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 standard signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function. Related problems.

UNIT-3

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, Detection of periodic signals in the presence of noise by correlation.

SAMPLING THEOREM: Graphical and analytical proof or Band Limited Signals, impulse sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, Aliasing, Related problems.

UNIT-4

LAPLACE TRANSFORMS: Introduction, Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of

L.T's, Inverse Laplace transform, Relation between L.T's, and F.T. of a signal. Laplace transform of certain signals using waveform synthesis.

UNIT-5

Z-TRANSFORMS: Concept of Z-Transform of a discrete sequence. Region of convergence in Z- Transform, constraints on ROC for various classes of signals, Inverse Z-transform, properties of Z-transforms. Distinction between Laplace, Fourier and Z transforms.

TEXT BOOKS:

1. Signals, Systems and Communications-B.P.Lathi, BSPublications,2003.
2. Signals and Systems-A.V. Oppenheim, A.S. Willsky and S.H. Nawab,PHI,2ndEdn,1997
3. Signals and Systems-SimonHaykinandVanVeen,Wiley,2ndEdition,2007

REFERENCE BOOKS:

1. PrinciplesofLinearSystemsandSignals–BPLathi,OxfordUniversityPress,2015
2. Signals and Systems–TK Rawat, Oxford University press,2011.

E-RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_ee28/preview
2. <https://archive.nptel.ac.in/courses/108/104/108104100>

Course Outcomes:

Upon completing this course, the student will be able to

1. Differentiate the various classifications of signals and systems
2. Analyze the frequency domain representation of signals using Fourier concepts
3. Classify the systems based on their properties and determine the response of LTI Systems.
4. Know the sampling process and various types of sampling techniques.
5. Apply Laplace and z-transforms to analyze signals and Systems(continuous and discrete).
6. Analyse Parseval's theorem.

B.Tech. V Semester

COURSE CODE:

L T P C

3 0 0 3

**PROBABILITY THEORY AND RANDOM VARIABLES
(OE-1)**

Internal Marks: 30

External Marks: 70

Course Objectives:

1. This gives basic understanding of random variables and operations that can be performed on them.
2. To know the Spectral and temporal characteristics of Random Process.
3. To Learn the Basic concepts of Information theory Noise sources and its representation for understanding its characteristics

UNIT-1

THE RANDOM VARIABLE: Introduction, Review of Probability Theory, Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variables, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Conditional Distribution, Conditional Density, Properties.

UNIT-2

OPERATION ON ONE RANDOM VARIABLE - EXPECTATIONS: Introduction, 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, Transformations of a Random Variable: Monotonic Transformations for a Continuous Random Variable, Non-monotonic Transformations of Continuous Random Variable.

UNIT-3

MULTIPLE RANDOM VARIABLES: Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem: Unequal Distribution, Equal Distributions.

OPERATIONS ON MULTIPLE RANDOM VARIABLES: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variables case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

UNIT-4

RANDOM PROCESSES – TEMPORAL CHARACTERISTICS: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, Concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second-order and Wide-Sense Stationarity, N^{th} -order and Strict -Sense Stationarity, Time Averages and Ergodicity,

Autocorrelation Function and its Properties, Cross-Correlation Function and its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process.

UNIT-5

RANDOM PROCESSES - SPECTRAL CHARACTERISTICS: The Power Density Spectrum: Properties, Relationship between Power Density Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Density Spectrum and Cross-Correlation Function. **LINEAR SYSTEMS WITH RANDOM INPUTS:** 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 Spectra of Input and Output, Band pass, Band-Limited and Narrowband Processes, Properties.

TEXT BOOKS:

1. Probability, Random Variables and Random Signal Principles, Peyton Z. Peebles, TMH, 4th Edition, 2001.
2. Probability, Random Variables and Stochastic Processes, Athanasios Papoulis and S.Unnikrishna, PHI, 4th Edition, 2002.
3. Probability Theory and Stochastic Processes – B. Prabhakara Rao, BS Publications.

REFERENCE BOOKS:

1. Probability and Random Processes with Applications to Signal Processing, Henry Stark and John W. Woods, Pearson Education, 3rd Edition.
2. Schaum's Outline of Probability, Random Variables, and Random Processes.
3. An Introduction to Random Signals and Communication Theory, B.P. Lathi, International Text REbook, 1968.
4. Probability Theory and Random Processes, P. Ramesh Babu, McGrawHill, 2015.

E-RESOURCES:

1. <https://archive.nptel.ac.in/courses/111/102/111102111/>
2. <https://archive.nptel.ac.in/courses/111/102/111102014/>

Course Outcomes:

Upon completing this course, the student will be able to

1. Mathematically model the random phenomena and solve simple probabilistic problems
2. Identify different types of random variables and compute statistical averages of these random variables.
3. Determine the Spectral characteristics of Random Signals.
4. Characterize the random processes in the time and frequency domains.
5. Analyze the LTI systems with random inputs
6. Analyse Linear Transformations of Gaussian Random Variables.

B.Tech. V Semester

COURSE CODE:

L T P C
3 0 0 3

CONSUMER ELECTRONICS
(OE-1)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. The student will learn about troubleshoot different types of microphones and speakers.
2. To study the troubleshoot colour TV receivers.
3. To maintain the various consumer electronics appliances.

UNIT - 1:

AUDIO SYSTEMS: Microphones and Loudspeakers: Carbon, moving coil, cordless microphone, Direct radiating and horn loudspeaker, Multi-speaker system, Hi-Fi stereo and dolby system. Concept to fidelity, Noise and different types of distortion in audio system

UNIT - 2:

DIGITAL AUDIO FUNDAMENTALS: Audio as Data and Signal, Digital Audio Processes Outlined, Time Compression and Expansion.

UNIT - 3:

TELEVISION: Basics of Television: Elements of TV communication system, Scanning and its need, Need of synchronizing and blanking pulses, VSB, Composite Video Signal, Colour Television: Primary, secondary colours, Concept of Mixing, Colour Triangle, Camera tube, PAL TV Receiver, NTSC, PAL, SECAM

UNIT - 4:

DIGITAL TRANSMISSION AND RECEPTION: Digital satellite television, Direct-To-Home(DTH) satellite television, Introduction to :Video on demand, CCTV, High Definition(HD)-TV. Introduction to Liquid Crystal and LED Screen Televisions Basic block diagram of LCD and LED Television and their comparison

UNIT- 5:

INTRODUCTION TO DIFFERENT TYPE OF DOMESTIC/COMMERCIAL APPLIANCES: Operation of Micro-wave oven, Food Processors, Digital Electronic Lock, Vacuum cleaner, Xerox Machine, Scanner.

TEXT BOOKS:

1. Modern Television Practice by R. R. Gulai; New Age International Publishers.
2. Audio Video Systems by R. G. Gupta; McGraw Hill Education System.
3. Audio Video Systems Principles Practices and Troubleshooting by Bali & Bali; Khanna Publishing Company.
4. Consumer Electronics by S. P. Bali; Pearson Education, New Delhi

REFERENCE BOOKS:

1. Modern Television practices by Gulati R.R., New Age International Publication (P) Ltd. New Delhi Year 2011, latest edition.
2. Audio video systems by Gupta R.G., Tata Mcgraw Hill, New Delhi, India 2010, , latest edition.
3. Mastering Digital Television by Whitaker Jerry & Benson Blair, McGraw-Hill Professional, 2010, latest edition.

E – RESOURCES:

1. <https://archive.nptel.ac.in/courses/117/105/117105144/>
2. <https://nptel.ac.in/courses/117105149>

COURSE OUTCOMES:

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

1. Understand the various type of microphones and loud speakers.
2. To identify the various digital and analog signal.
3. Describe the basis of television and composite video signal.
4. Describe the various kind of colour TV standards and system.
5. Compare the various types of digital TV system.
6. Understand PAL TV Receiver.

VLSI DESIGN

Internal Marks: 30

External Marks: 70

Course Objectives:

1. Give exposure to different steps involved in the fabrication of ICs.
2. Explain electrical properties of MOS and BiCMOS devices to analyze the behavior of inverters with various loads.
3. Give exposure to the design rules to be followed to draw the layout of any logic circuit.

UNIT-1

INTRODUCTION AND BASIC ELECTRICAL PROPERTIES OF MOS CIRCUITS: VLSI Design Flow, Introduction to IC technology, Fabrication process: nMOS, pMOS and CMOS. I_{ds} versus V_{ds} Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit. nMOS Inverter, Pull-up to Pull-down Ratio for nMOS inverter driven by another nMOS inverter, and through one or more pass transistors. Alternative forms of pull-up, The CMOS Inverter, Latch-up in CMOS circuits, Bi-CMOS Inverter, Comparison between CMOS and BiCMOS technology, MOS Layers, Stick Diagrams, Design Rules and Layout, Layout Diagrams for MOS circuits

UNIT-2

BASIC CIRCUIT CONCEPTS: Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, some area Capacitance Calculations, The Delay Unit, Inverter Delays, driving large capacitive loads, Propagation Delays, Wiring Capacitances, Choice of layers.

SCALING OF MOS CIRCUITS: Scaling models and scaling factors, Scaling factors for device parameters, Limitations of scaling, Limits due to sub threshold currents, Limits on logic levels and supply voltage due to noise and current density.

UNIT-3

BASIC BUILDING BLOCKS OF ANALOG IC DESIGN: Regions of operation of MOSFET, Modelling of transistor, body bias effect, biasing styles, single stage amplifier with resistive load, single stage amplifier with diode connected load, Common Source amplifier, Common Drain amplifier, Common Gate amplifier, current sources and sinks.

UNIT-4

CMOS COMBINATIONAL AND SEQUENTIAL LOGIC CIRCUIT DESIGN:

Static CMOS Design: Complementary CMOS, Rationed Logic, Pass-Transistor Logic, design of Half adder, full adder, multiplexer, decoder. **Dynamic CMOS Design:** Dynamic Logic-Basic Principles, Speed and Power Dissipation of Dynamic Logic, Issues in Dynamic Design, Cascading Dynamic Gates, Design examples of sequential circuits: Cross coupled NAND and NOR flipflops, D flipflop, SR JK flip flop, SR Master Slave flip flop.

UNIT-5

FPGA DESIGN: FPGA design flow, Basic FPGA architecture, FPGA Technologies, Introduction to FPGA Families.

INTRODUCTION TO ADVANCED TECHNOLOGIES: Giga-scale dilemma, Short channel effects, High-k, Metal Gate Technology, FinFET, TFET.

TEXT BOOKS:

1. Essentials of VLSI Circuits and Systems - Kamran Eshraghian, Douglas and A. Pucknell and Sholeh Eshraghian, Prentice-Hall of India Private Limited, 2005 Edition.
2. Design of Analog CMOS Integrated Circuits by Behzad Razavi, McGraw Hill, 2003
3. Digital Integrated Circuits, Jan M. Rabaey, Anantha Chandrakasan and Borivoje Nikolic, 2nd edition, 2016.

REFERENCE BOOKS:

1. "Introduction to VLSI Circuits and Systems", John P. Uyemura, John Wiley and Sons, reprint 2009.
2. Integrated Nanoelectronics: Nanoscale CMOS, Post-CMOS and Allied Nanotechnologies Vinod Kumar Khanna, Springer India, 1st edition, 2016.
3. FinFETs and other multi-gate transistors, ColingeJP, Editor New York, Springer, 2008.

E-RESOURCES:

1. <https://nptel.ac.in/courses/117106092>
2. https://nptel.ac.in/domains/discipline/112?course=112_0

Course Outcomes:

Upon completing this course, the student will be able to

1. Demonstrate a clear understanding of CMOS fabrication flow and technology scaling.
2. Design MOSFET based logic circuit.
3. Design basic building blocks in Analog IC design.
4. Design various CMOS logic circuits for design of Combinational logic circuits.
5. Analyze the behaviour of static and dynamic logic circuits.
6. Analyse current sources and sinks.

B.Tech. VI Semester

COURSE CODE:

L T P C
3 0 0 3

MICROPROCESSOR AND MICROCONTROLLERS

Internal Marks: 30

External Marks: 70

Course Objectives:

1. To acquire knowledge on microprocessors and microcontrollers.
2. To select processors based on requirements.
3. To develop programs efficiently on ARM Cortex processors and debug.

UNIT-1

Introduction: Basic Microprocessor architecture, Harvard and Von Neumann architectures with examples, Microprocessor Unit versus Microcontroller Unit, History and classifications of Microprocessor and Microcontroller.

8086 Architecture: register organization, internal architecture of 8086, pin description of 8086, minimum mode and maximum mode of 8086 operation and timing diagrams.

UNIT-2

8086 Programming: instruction set, addressing modes, assembler directives, programming with an assembler, writing simple programs with an assembler, stack and stack structure, interrupts and interrupt service routines 8086 system,

UNIT-3

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

UNIT-4

Intel 8051 MICROCONTROLLER and Interfacing

Architecture, Hardware concepts, Input/output ports and circuits, external memory, counters/timers, serial data input/output, interrupts. Assembly language programming: Instructions, addressing modes, simple programs. Interfacing to 8051: A/D and D/A Convertors, Stepper motor interface, keyboard, LCD Interfacing, Traffic light control.

UNIT-5

ARM Architectures and Processors:

Introduction to CISC and RISC architectures, ARM Architecture, ARM Processors Families, ARM Cortex-M Series Family, ARM Cortex-M3 Processor Functional Description, Instruction set summary, System address map, write buffer, bit-banding.

Programmers Model – Modes of operation and execution, stack pointer, exceptions and interrupt handling.

ARM Cortex-M3 programming – Software delay, Programming techniques, Loops, Stack and Stack pointer, subroutines and parameter passing, parallel I/O, Nested Vectored Interrupt Controller– functional description and NVIC programmers 'model.

TEXT BOOKS:

1. Advanced microprocessors and peripherals by K. M. Bhurchandi, A. K. Ray 3e
2. The 8051 Microcontrollers and Embedded systems Using Assembly and C, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D.McKinlay; Pearson 2nd-Edition,2011.
3. TheDefinitiveGuidetoARMCortex-M3andCortex-M4ProcessorsbyJosephYiu.,Newnes Third edition.

REFERENCE BOOKS:

1. Embedded Systems Fundamentals with Arm Cortex-M based Microcontrollers: A Practical Approach in English, by Dr. Alexander G. Dean, Published by Arm EducationMedia,2017.
2. Cortex-M3TechnicalReference Manual.

E-RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc22_ee12/preview
2. <https://archive.nptel.ac.in/courses/108/105/108105102>

Course Outcomes:

Upon completing this course, the student will be able to

1. Understand the architecture of 8086 and its operation.
2. Develop the students to compose the assembly language program for 8086.
3. Applying 8086 processor to interface with necessary peripherals.
4. Understand the architecture of 8051 and interfacing with necessary peripherals.
5. Understand the introductory concepts of advanced processors, viz., ARM processors.
6. Generate Square wave using 8086 Microprocessor.

B.Tech. VI Semester

COURSE CODE:

L T P C
3 0 0 3

DIGITAL SIGNAL PROCESSING

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To provide background and fundamental concepts for the analysis and processing of digital signals.
2. To design digital filters and their realization structures.
3. To acquaint in Multi-rate signal processing techniques and finite word length effects.

UNIT-1

Introduction: Signals, Systems, and Signal Processing, Classification of Signals, The Concept of Frequency in Continuous Time and Discrete Time Signals

Discrete Time Signals and Systems: Discrete Time Signals, Discrete Time Systems, Analysis of Discrete Time Linear Time Invariant Systems, Discrete Time Systems Described by Difference Equations, Implementation of Discrete Time Systems, Correlation of Discrete Time Signals.

Frequency Analysis of Signals: Frequency Analysis of Continuous Time Signals, Frequency Analysis of Discrete Time Signals, Frequency Domain and Time Domain Signal Properties, Properties of the Fourier Transform for Discrete Time Signals.

Frequency Domain Analysis of LTI Systems: Frequency domain characteristics of LTI systems, Frequency response of LTI systems.

UNIT-2

The z-Transform and Its Applications to the Analysis of LTI Systems: The z-Transform, Properties, Rational z Transforms, Inversion of the z-Transform, Analysis of Linear Time Invariant Systems in the z-Domain, The One sided z-Transform. (**Review only for entire z – Transform topic**).

The Discrete Fourier Transform: Its Properties and Applications: Frequency Domain Sampling: The Discrete Fourier Transform, Properties of the DFT, Linear Filtering Methods Based on the DFT, Frequency Analysis of Signals Using DFT

UNIT-3

Efficient Computation of the DFT: Fast Fourier Transform Algorithms: Direct Computation of the DFT, Radix-2 FFT Algorithms.

Implementation of Discrete Time Systems: Structures for the Realization of Discrete Time Systems, Structures for FIR Systems: Direct Form Structure, Cascade Form Structures, Frequency Sampling Structures.

Structures for IIR Systems: Discrete Form Structures, Signal Flow Graphs and Transposed Structures, Cascade Form Structures, Parallel Form Structures.

UNIT-4

Design of Digital Filters: General Considerations: Causality and Its Implications, Characteristics of Practical Frequency Selective Filters.

Design of FIR Filters: Symmetric and Antisymmetric FIR Filters, Design of Linear Phase FIR Filters Using Windows, Design of Linear Phase FIR Filters by the Frequency Sampling Method.

Design of IIR Filters From Analog Filters: IIR Filter Design by Approximation of Derivatives, IIR Filter Design by Impulse Invariance, IIR Filter Design by the Bilinear Transformation.

Frequency Transformations: Frequency Transformations in the Analog Domain, Frequency Transformations in the Digital Domain.

UNIT-5

Introduction to programmable DSPs: Multiplier and Multiplier Accumulator, Modified bus structures and memory access schemes in P-DSPs, Multiple Access Memory, Multiport memory, VLIW architecture, Pipelining, Special addressing modes, On-Chip Peripherals.

Architecture of TMS320C5X: Introduction, Bus Structure, Central Arithmetic Logic Unit, Auxiliary Register ALU, Index Register, Auxiliary Register Compare Register, Block Move Address Register, Block Repeat Registers, Parallel Logic Unit, Memory mapped registers, program controller, some flags in the status registers, On-chip memory, On-chip peripherals. TMS320C5X Assembly Language Instructions.

TEXT BOOKS:

1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis, 4th Edition, Pearson Education, 2007.
2. Digital Signal Processors – Architecture, Programming and Applications,,B.Venkataramani, M.Bhaskar, TATA McGraw Hill, 2002.

REFERENCE BOOKS:

1. Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer, 3rd Edition, Pearson, 2014.
2. Digital Signal Processing-P. Ramesh Babu, 5th Edition, SCITECH Publishers.

E-RESOURCES:

1. <https://archive.nptel.ac.in/courses/108/101/108101174/>
2. <https://nptel.ac.in/courses/117102060>

Course Outcomes:

Upon completing this course, the student will be able to

1. Understand the concepts of discrete signals and discrete systems with its characteristics
2. Calculate z-Transform, Fourier Transform, Discrete Fourier Transform of discrete signals.
3. Understand the algorithms for the efficient computation of DFT coefficients of signals
4. Design the FIR and IIR filters.
5. Know the architectures of various DSP processors and its addressing modes, assembly language instructions.
6. Analyse Cascade Form Structures.

B.Tech. VI Semester

COURSE CODE:

L T P C
3 0 0 3

**ANALOG IC DESIGN
(PE-II)**

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To Design analog ICs.
2. To Apply circuit analysis techniques.
3. To Design and optimize analog circuits.

UNIT-1

MOS Devices and Modelling: The MOS Transistor, Passive Components- Capacitor and Resistor, Integrated circuit Layout, CMOS Device Modelling - Simple MOS Large-Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor, Computer Simulation Models, Sub-threshold MOS Model.

UNIT-2

Analog CMOS Sub-Circuits:

MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors-Current mirror with Beta Helper, Degeneration, Cascode current Mirror and Wilson Current Mirror, Current and Voltage References, Band gap Reference.

UNIT-3

CMOS Amplifiers:

Inverters, Differential Amplifiers, Cascode Amplifiers, Current Amplifiers, Output Amplifiers, High Gain Amplifiers Architectures. CMOS Operational Amplifiers: Design of CMOS Op Amps, Compensation of Op Amps, Design of Two-Stage Op Amps, Power-Supply Rejection Ratio of Two-Stage Op Amps, Cascode Op Amps, Measurement Techniques of OP Amp.

UNIT-4

Comparators: Characterization of Comparator, Two-Stage, Open-Loop Comparators, Other Open-Loop Comparators, Improving the Performance of Open- Loop Comparators, Discrete- Time Comparators.

UNIT-5

Oscillators and Phase-Locked Loops: General Considerations, Ring Oscillators, LC Oscillators, Voltage Controlled Oscillators. Simple PLL, Charge Pump PLLs, Non- Ideal Effects in PLLs, Delay Locked Loops, Applications.

TEXT BOOKS:

1. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition, Second Edition.
2. CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition,2010.

REFERENCE BOOKS:

1. Analysis and Design of Analog Integrated Circuits- Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, Wiley India, Fifth Edition,2010.
2. Analog Integrated Circuit Design- David A.Johns, Ken Martin, Wiley Student Edn,2013.

E-RESOURCES:

1. <https://archive.nptel.ac.in/courses/108/101/108101174/>
2. <https://nptel.ac.in/courses/117102060>

Course Outcomes:

Upon completing this course, the student will be able to

1. Understand the concepts of MOS Devices and Modelling.
2. Design and analyze any Analog Circuits in real time applications.
3. Extend the Analog Circuit Design to Different Applications in Real Time.
4. Understand of Open-Loop Comparators and Different Types of Oscillators
5. Design and implement oscillators for specific applications.
6. Analyse Measurement Techniques of OP Amp.

B.Tech. VI Semester

COURSE CODE:

L T P C
3 0 0 3

SATELLITE COMMUNICATIONS
(PE-II)

Internal Marks: 30

External Marks: 70

Course Objectives:

1. To enable the student to become familiar with satellite and satellite services.
2. To Study of satellite orbits and launching.
3. To Study of earth segment and space segment components.

UNIT-1

INTRODUCTION: Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency allocations for Satellite Services, Applications, Future Trends of Satellite Communications. **ORBITAL MECHANICS AND LAUNCHERS:** Orbital Mechanics, Look Angle determination, Orbital perturbations, Orbit determination, launches and launch vehicles, Orbital effects in communication systems performance.

UNIT-2

SATELLITE SUBSYSTEMS: Attitude and orbit control system, telemetry, tracking, Command and monitoring system, power systems, communication subsystems, Satellite antennas, Equipment reliability and Space qualification.

UNIT-3

SATELLITE LINK DESIGN: Basic transmission theory, link equation, C/N ratio, system noise temperature and G/T ratio, Design of down links, up link design, Design of satellite links for specified C/N, System design example.

UNIT-4

MULTIPLE ACCESS: Frequency division multiple access (FDMA): Intermodulation, Calculation of C/N. Time division Multiple Access (TDMA); Frame structure, Examples. Code Division Multiple access (CDMA): Spread spectrum transmission and reception.

EARTH STATION TECHNOLOGY: Introduction, basic architecture, Transmitters, Receivers, Antennas, Tracking systems, Terrestrial interface, Primary power test methods.

UNIT-5

LOW EARTH ORBIT AND GEO-STATIONARY SATELLITE SYSTEMS: Orbit consideration, coverage and frequency considerations, Delay and Throughput considerations, System considerations, Operational NGSO constellation Designs.

GLOBAL NAVIGATION SATELLITE SYSTEM(GNSS):

Introduction, various GNSS: GPS, GLONASS, GALILEO, BeiDou, QZSS, IRNSS. GPS-location principle, GPS navigation message, GPS receiver operation, differential GPS; IRNSS-introduction, IRNSS satellites, IRNSS constellation, IRNSS configuration, IRNSS services, navigation data, applications of IRNSS; multi GNSS, **NavIC**.

TEXT BOOKS:

1. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 3RD Edition, 2020.
2. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G.Suyderhoud, 2nd Edition, Pearson Publications, 2003.

REFERENCE BOOKS:

1. Satellite Communications: Design Principles – M. Richharia, BS Publications, 2nd Edition, 2003.
2. Satellite Communication - D.C Agarwal, Khanna Publications, 5th Ed.
3. Fundamentals of Satellite Communications – K.N. Raja Rao, PHI, 2004

E-RESOURCES:

1. <https://archive.nptel.ac.in/courses/117/105/117105131/>
2. <https://archive.nptel.ac.in/noc/courses/noc16/SEM2/noc16-ec10/>

Course Outcomes:

Upon completing this course, the student will be able to

1. Understand the concepts, applications and subsystems of Satellite communications.
2. Understand the Satellite Subsystems
3. Derive the expression for G/T ratio and to solve some analytical problems on satellite link design.
4. Understand the various types of multiple access techniques and architecture of earth station design
5. Understand the concepts of GPS and its architecture.
6. Design of satellite links for specified C/N

B.Tech. VI Semester

COURSE CODE:

L T P C
3 0 0 3

**SMART AND WIRELESS INSTRUMENTATION
(PE-II)**

Internal Marks: 30

External Marks: 70

Course Objectives:

1. To Understand smart instrumentation principles
2. To Design smart instrumentation systems
3. To Apply wireless communication protocols

UNIT-1

Introduction:

Smart Instrumentation (Materials, automation systems, design and Sensors, Sensor Classifications, Wireless Sensor Networks, History of Wireless Sensor networks (WSN), Communication in a WSN, important design constraints of a WSN like Energy, Self Management, Wireless Networking, Decentralized Management, Design Constraints, Security etc.

UNIT-2

Node architecture: The sensing subsystem, Analog to Digital converter, the processor subsystem, architectural overview, microcontroller, digital signal processor, application specific integrated circuit, field programmable gate array (FPGA), comparison, communication interfaces, serial peripheral interface, integrated circuit, the IMote node architecture, The XYZ node architecture, the Hogthrob node architecture.

UNIT-3

Fundamentals of Wireless Digital Communication: Basic components, source encoding, the efficiency of a source encoder, pulse code modulation and delta modulation, channel encoding, types of channels, information transmission over a channel, error recognition and correction, modulation, modulation types, quadratic amplitude modulation, signal propagation.

UNIT-4

Frequency of Wireless Communication: Development of Wireless Sensor Network based on Microcontroller and communication device-Zigbee Communication device, LORA device. Power sources- Energy Harvesting Solar and Lead acid batteries-RF Energy /Harvesting-Energy Harvesting from vibration Thermal Energy Harvesting-Energy Management Techniques Calculation for Battery Selection.

UNIT-5

Applications:

Structural health monitoring - sensing seismic events, single damage detection using natural frequencies, multiple damage detection using natural frequencies, multiple damage detection using mode shapes, coherence, piezoelectric effect, traffic control, health care - available sensors, pipeline monitoring, precision agriculture,

active volcano, underground mining.

TEXT BOOKS:

1. Fundamentals of wireless sensor networks : theory and practice -Waltenegus Dargie, Christian Poellabauer, A John Wiley and Sons, Ltd., Publication.
2. Smart Sensors, Measurement and Instrumentation , Subhas Chandra Mukhopadhyay, Springer Heidelberg, New York, Dordrecht London, 2013.
3. Wireless Sensors and Instruments: Networks, Design and Applications, HalitEren, CRC Press, Taylor and Francis Group, 2006.

REFERENCE BOOKS:

1. UvaisQidwai, Smart Instrumentation: A data flow approach to Interfacing“, Chapman and Hall; 1st Edn, December 2013.
2. Wireless Sensor Networks: Architectures and Protocols, Edgar H. Callaway Jr. and Ed gar H. Callaway.

E-RESOURCES:

1. <https://link.springer.com/book/10.1007/978-3-642-37027-4>
2. https://www.vssut.ac.in/lecture_notes/lecture1428911481.pdf

Course Outcomes:

Upon completing this course, the student will be able to

1. Analyze Smart and Wireless Instrumentation with respect to various performance parameters.
2. Design and develop Applications using WSN (Wireless sensor Network).
3. Demonstration of various Node architectures.
4. Demonstration of Fundamentals of wireless digital communication
5. Analyze the power sources, Demonstrate an ability to design strategies as per needs and specifications
6. Analysis quadratic amplitude modulation

B.Tech. VI Semester

COURSE CODE:

L T P C
3 0 0 3

MACHINE LEARNING
(PE-II)

Internal Marks: 30

External Marks: 70

Course Objectives:

1. To Understand machine learning fundamentals.
2. To Apply machine learning algorithms.
3. To Design and implement machine learning models.

UNIT-1

Introduction to Machine Learning:

What is Machine Learning?, Traditional programming approach vs Machine learning approach, History and Evolution of Machine Learning, Learning by Rotevs Learning by Induction, **Paradigms for ML** - Supervised ML, Unsupervised ML, Reinforcement ML, **Datatypes in ML** - Quantitative data (Continuous, Discrete), Qualitative data (Structured, Semi structured, Unstructured), Nominal data, Ordinal data, Interval data, Ratio data, Stages involved in Machine Learning, Main challenges of ML, Applications of Machine Learning, **IDE's for ML Programming** - Jupyter Notebook, Spyder, PyCharm, Google Colab, R Studio, VS Code, **Basic packages to deal with ML** - Numpy, Scipy, Pandas, Scikit-learn, Matplotlib, Seaborn, **Programming Languages for Machine Learning** - Python, Java, R, JavaScript, C++

UNIT-2

Explorative Data Analysis (EDA):

What is EDA? Why EDA is important?, **Types of EDA** -Univariate Analysis, Bivariate Analysis, Multivariate Analysis, **Data Cleaning** - Data Acquisition,Analyzing the data Dealing with duplicate data, Dealing with missing values, Dealing with outliers **Scaling and Transformations** - Feature Scaling and Transformation, Univariate nonlinear Transformations, **Dimensionality Reduction** - Principal Component Analysis (PCA), **Feature Engineering** - Handling Categorical attributes (One-Hot-Encoding), **Feature Expansion** - Interactions and Polynomials, **Automatic Feature Selection** - Univariate Statistics, Model-Based Feature Selection, Iterative Feature Selection

UNIT-3

Supervised Machine Learning:

What is Supervised Machine Learning?, General architecture of Supervised ML, **Types of Supervised ML** - Classification and Regression, **Different Classification Algorithms** - K-Nearest Neighbor(KNN) Classifier, Linear Models, Logistic Regression, Naive Bayes Classifiers, Decision Tree Classifier, **Ensemble learning and Decision Trees** - Voting, Bagging and pasting, Random Forests, AdaBoost, Gradient Boosting, Stacking, Support Vector Classifier (SVC)Neural Networks, **Different Regression Algorithms** - K-Neighbors Regressor, Linear Regression, Ridge Regression, Lasso Regression, Polynomial Regression, Support Vector Regressor (SVR), Decision Tree Regressor, Random Forest Regressor

UNIT-4

Unsupervised Machine Learning -

What is Unsupervised Machine Learning?, General architecture of Unsupervised Machine Learning, Challenges in Unsupervised ML, **Clustering** - Introduction to Clustering, Soft

clustering vs Hard Clustering, K-Means Clustering algorithm, Centroid-based clustering algorithm, Divisive Clustering and Agglomerative Clustering, DBSCAN

UNIT-5

Model Evaluation metrics, Fine tuning the model and Visualizations -

Evaluation Metrics for Classification - Confusion Matrices, Accuracy, Precision, Recall, F1-Score, Precision-recall curves, ROC (Receiver Operating Characteristics) curves, Confusion Matrix, **Evaluation Metrics for Regression** - R^2 , Mean Squared Error (MSE), Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), **Evaluation Metrics for clustering** - Adjusted Random Index (ARI), Normalized Mutual Information (NMI), **Cross Validation** - Cross-Validation in scikit-learn, benefits of cross-validation, stratified k-fold cross validation, **Grid Search**- Simple Grid search, Grid search with cross validation, Randomized search, **Visualization** - Univariate Analysis (Bar plot, Box plot, Count plot, Density plot, Histogram, Pieplot), Bivariate Analysis (Pair plot, Scatter plot, Bar plot, Stacked barplot, Multivariate Analysis (Heat Maps)

TEXT BOOKS:

1. "Introduction to Machine Learning with Python", Andreas C.MullerandSarah Guido, O'Reilly Publications
2. "Hands-on Machine Learning with Scikit-Learn, Keras and Tensor Flow", Aurelien Geron, O'Reilly Publications.
3. "Machine Learning Theory and Practice", M N Murthy, V S Ananthanarayana, Universities Press (India), 2024

REFERENCE BOOKS:

1. "Machine Learning", Tom M. Mitchell, McGraw-Hill Publication, 2017
2. "Machine Learning in Action", Peter Harrington, Dream Tech
3. "Introduction to Data Mining", Pang-Ning Tan, Michel Stenbach, Vipin Kumar, 7th Edition, 2019.

E-RESOURCES:

1. <https://nptel.ac.in/courses/106106139>
2. <https://nptel.ac.in/courses/106106198>

Course Outcomes:

Upon completing this course, the student will be able to

1. Define machine learning and its different types and understand their applications.
2. Explain the various techniques involved in pre-processing of data for Data Analysis
3. Apply various supervised learning algorithms including decision trees and k-nearest neighbours (k-NN) etc.
4. Implement unsupervised learning techniques, viz., K-means clustering etc.
5. Learn about various performance metrics and explore them in various applications of implementing Machine learning Algorithms.
6. Understand Decision Tree Regressor

B.Tech. VI Semester

COURSE CODE:

L T P C
3 0 0 3

**BIO-MEDICAL INSTRUMENTATION
(PE-III)**

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To Understand biomedical measurement principles.
2. To Design and apply biomedical instruments.
3. To Analyze biomedical signals

UNIT-1

Introduction: Factors to be considered in the design of medical instrumentation systems, Basic objectives of medical instrumentation system, Physiological systems of human body, Sources of Bioelectric potentials: Resting and Action Potentials, Propagation of Action Potentials, The Bioelectric Potentials. Electrodes: Electrode theory, Bio Potential Electrodes, Biochemical Transducers, Introduction to bio-medical signals.

UNIT-2

The Cardiovascular System: The Heart and Cardiovascular System, The Heart, Blood Pressure, Characteristics of Blood Flow, Heart Sounds, Cardio Vascular Measurements, Electrocardiography, Measurement of Blood Pressure, Measurement of Blood Flow and Cardiac output, Plethysmography, Measurement of Heart Sounds, Event detection, PQRS and T-Waves in ECG, the first and second Heart beats, ECG rhythm analysis, the di-crotic notch in the carotid pulse detection of events and waves, analysis of exercise ECG, analysis of event related potentials, correlation analysis of EEG channels, correlation of muscular contraction.

UNIT-3

Patient Care and Monitory and Measurements in Respiratory System: The elements of Intensive Care Monitory, Diagnosis, Calibration and reparability of Patient Monitoring equipment, other instrumentation for monitoring patients, pace makers, defibrillators, the physiology of respiratory system, tests and instrumentation for mechanics of breathing, respiratory theory equipment, analysis of respiration.

UNIT-4

Bio telemetry and Instrumentation for the Clinical Laboratory, Introduction to bio telemetry, Physiological parameters adaptable to bio telemetry, the components of bio telemetry system, implantable units, applications of telemetry in patient care – The blood, tests on blood cells, chemical test, automation of chemical tests.

UNIT- 5

X-ray and radioisotope instrumentation and electrical safety of medical equipment: Generation of Ionizing radiation, instrumentation for diagnostic X-rays,

special techniques, instrumentation for the medical use of radioisotopes, radiation therapy - Physiological effects of electrical current, shock Hazards from electrical equipment, Methods of accident prevention, Modern Imaging Systems: Tomography, Magnetic Resonance Imaging System, Ultrasonic Imaging System, Medical Thermography.

TEST BOOKS:

1. Biomedical Instrumentation and Measurements C.Cromwell, F.J.Weibell, E.A.Pfeiffer – Pearson education.
2. Biomedical Signal Analysis – Rangaraj, M. Rangayya – Wiley Inter Science – JohnWiley and Sons Inc.

REFERENCE BOOKS:

1. Hand Book of Bio-Medical Instrumentation – R.S. Khandpur, TMH.
2. Introduction to Bio-Medical Engineering – Domach, Pearson.
3. Introduction to Bio-Medical Equipment Technology – Cart, Pearson.

E-RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc25_bt49/preview
2. https://onlinecourses.swayam2.ac.in/nou23_bt05/preview

Course Outcomes:

Upon completing this course, the student will be able to

1. Demonstrate a foundational understanding of the anatomy and physiology of the human body.
2. Apply knowledge of different techniques used for measuring various physiological parameters.
3. Explain modern imaging techniques employed in medical diagnosis and identify the diverse therapeutic equipment utilized in the biomedical field.
4. Understand and apply bio-telemetry principles for transmitting bioelectrical variables.
5. Analyze patient safety measures and evaluate recent advancements in the medical field.
6. Analyze the physiology of respiratory system

B.Tech. VI Semester

COURSE CODE:

L T P C
3 0 0 3

MICROWAVE ENGINEERING
(PE-III)

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To Understand microwave fundamentals
2. To Analyze microwave components
3. To Design microwave circuit

UNIT-1

MICROWAVE TRANSMISSION LINES: Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides – TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Filter Characteristics, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross-section, Mode Characteristics – Phase and Group Velocities, Wavelengths and Impedance Relations; Power Transmission and Power Losses in Rectangular Guide. Related Problems.

MICROSTRIP LINES– Introduction, Z_0 Relations, Effective Dielectric Constant, Losses, Q factor

UNIT-2

MICROWAVE TUBES: Limitations and Losses of conventional tubes at microwave frequencies. Microwave tubes – O type and M type classifications. O-type tubes : 2 Cavity Klystrons – Structure, Re-entrant Cavities, Velocity Modulation Process and Applegate Diagram, Bunching Process and Small Signal Theory – Expressions for o/p Power and Efficiency. Reflex Klystrons – Structure, Applegate Diagram and Principle of working, Mathematical Theory of Bunching, Power Output, Efficiency, Electronic Admittance; Oscillating Modes and o/p Characteristics, Electronic and Mechanical Tuning. Applications.

UNIT-3

HELIX TWTS: Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Amplification Process (qualitative treatment), Suppression of Oscillations, Nature of the four Propagation Constants, Gain Considerations (qualitative treatment).

M-type Tubes; Introduction, Cross-field effects, Magnetrons – Different Types, 8-Cavity Cylindrical Travelling Wave Magnetron – Hull Cut-off and Hartree Conditions, Modes of Resonance and PI-Mode Operation, Separation of PI-Mode, o/p characteristics.

UNIT-4

WAVEGUIDE COMPONENTS AND APPLICATIONS: Coupling Mechanisms – Probe, Loop, Aperture types. Waveguide Discontinuities – Waveguide irises, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators – Resistive Card, Rotary Vane types; Waveguide Phase Shifters – Dielectric, Rotary Vane types, Scattering Matrix– Significance, Formulation and Properties, S-Matrix Calculations for – 2,3,4 port Junctions: E-plane and H-plane Tees, Magic Tee, Hybrid Ring; Directional Couplers –

2Hole, Bethe Hole types-Matrix Calculations Ferrite Components- Faraday Rotation, Gyrator, Isolator, Circulator, Related Problems.

UNIT-5

MICROWAVE SOLID STATE DEVICES: Introduction, Classification, Applications. TEDs – Introduction, Gunn Diode – Principle, RWH Theory, Characteristics, Basic Modes of Operation, Oscillation Modes

MICROWAVE MEASUREMENTS: Description of Microwave Bench – Different Blocks and their Features, Precautions; Microwave Power Measurement – Bolometer Method. Measurement of Attenuation, Frequency, Q- factor, Phase shift, VSWR, Impedance Measurement

TEXT BOOKS:

1. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.
2. Microwave Engineering- Annapurna Das and SisirK.Das, McGraw Hill Education, 3rd Edition.

REFERENCE BOOKS:

1. Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rd Edition, 1994.
2. Microwave Engineering – G S N Raju , I K International
3. Microwave and Radar Engineering-M.Kulkarni, Umesh Publications, 3rd Edition

E-RESOURCES:

1. <https://archive.nptel.ac.in/courses/108/103/108103141/>
2. <https://archive.nptel.ac.in/courses/108/101/108101112/>

Course Outcomes:

Upon completing this course, the student will be able to

1. Design different mode sin waveguide structures
2. Distinguish between Microwave tubes and Solid State Devices, calculation of efficiency of devices.
3. Understand HELIX travelling wave tubes.
4. Calculate S-matrix for various waveguide components and splitting the microwave energy in a desired direction
5. Measure various microwave parameters using a Micro wave test bench.
6. Understand Modes of Resonance and PI-Mode Operation.

B.Tech. VI Semester

COURSE CODE:

L T P C
3 0 0 3

EMBEDDED SYSTEMS
(PE-III)

Internal Marks: 30
External Marks: 70

Course Objectives:

1. This course emphasizes on comprehensive treatment of embedded hardware and real time operating systems along with case studies in tune with the requirements of industry.
2. The objectives of this course are to enable the students to understand embedded system programming
3. The objective of this course is applying that knowledge to design and develop embedded system.

UNIT-1

Introduction: Embedded System-Definition, History, Classification, application areas and purpose of embedded systems, The typical embedded system-Core of the embedded system, Memory, Sensors and Actuators, Communication Interface, Embedded firmware, PCB and passive components. Characteristics, Quality attributes of an Embedded systems, Application-specific and Domain-Specific examples of an embedded system, Main processing elements of embedded system, hardware and software partitions.

UNIT-2

Embedded Hardware Design: Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real timeclock.

UNIT-3

Embedded Firmware Design: Embedded Firmware design approaches, Embedded Firmware development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA, Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.

UNIT-4

Real Time Operating System: Operating system basics, Types of operating systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Threads, Processes and Scheduling, Task Scheduling, Communication, Synchronization, Device Drivers, how to choose an RTOS. Electronics and Communication Engineering

Hardware Software Co-Design: Fundamental Issues in Hardware Software Co- Design, Computational models in embedded design, Hardware software Trade-offs, Integration of Hard ware and Firm ware, ICE.

UNIT-5

Embedded System Development: The integrated development environment, Types of files generated on cross-compilation, Deassembler/Decompiler, Simulators, Emulators and Debugging, Target hardware debugging, Boundary Scan, Embedded Software development process and tools.

Embedded System Implementation and Testing: The main software utility tool, CAD and the hardware, Translation Tools-Pre-processors, Interpreters, Compilers and Linkers, debugging tools, Quality assurance and testing of the design, Testing on host machine, Simulators, Laboratory Tools. Test and evolution of an embedded systems (Build in self-test etc).

Case study-typical embedded system design flow with an example.

TEXT BOOKS:

1. Embedded Systems Architecture by Tammy Noergaard, Elsevier Publications,2005
2. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley Publications.

REFERENCE BOOKS:

1. Embedding system building blocks By Labrosse, CMP publishers.
2. Embedded Systems-Lyla B.Das-Pearson Publications,2013.

E-RESOURCES:

1. <https://nptel.ac.in/courses/108102045>
2. <https://archive.nptel.ac.in/courses/106/105/106105193/>

Course Outcomes:

Upon completing this course, the student will be able to

1. Know basics of embedded system, classification, memories, different communication interface and what embedded firmware is and its role in embedded system, different system components.
2. Distinguish all communication devices in embedded system, other peripheral device.
3. Choose an operating system, and learn how to choose an RTOS
4. Distinguish concepts of C versus embedded C and compiler versus cross-compiler.
5. Implementation and Testing of Embedded System.
6. Analyse Concepts of C versus Embedded C and Compiler versus Cross-compiler.

B.Tech. VI Semester

COURSE CODE:

L T P C
3 0 0 3

ARTIFICIAL INTELLIGENCE
(PE-III)

Internal Marks: 30

External Marks: 70

Course Objectives:

1. To Understand AI fundamentals
2. To Apply machine learning algorithms
3. To Design intelligent systems

UNIT-1

What is AI (Artificial Intelligence)?: The AI Problems, The Underlying Assumption, what are AI Techniques, The Level of The Model, Criteria for Success, Some General References, One Final Word Problems, State Space Search and Heuristic Search Techniques: Defining the Problems as A State Space Search, Production Systems, Production Characteristics, Production System, Characteristics and Issues in The Design of Search Programs, Additional Problems. Generate-And-Test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis.

UNIT-2

Knowledge Representation Issues: Representations And Mappings, Approaches to Knowledge Representation. Using Predicate Logic: Representation Simple Facts in Logic, Representing Instance and Isa Relationships, Computable Functions and Predicates, Resolution. Representing Knowledge Using Rules: Procedural Versus Declarative Knowledge, Logic Programming, Forward Versus Backward Reasoning.

UNIT-3

Symbolic Reasoning Under Uncertainty: Introduction to Non-monotonic Reasoning, Logics for Non-monotonic Reasoning. Statistical Reasoning: Probability And Bayes' Theorem, Factors And Rule-Base Systems, Bayesian Networks, Dempster Shafer Theory

UNIT-4

Fuzzy Logic. Weak Slot-and-Filler Structures: Semantic Nets, Frames. Strong Slot-and-Filler Structures: Conceptual Dependency, Scripts, CYC

UNIT-5

Game Playing: Overview, And Example Domain: Overview, Mini Max, Alpha-Beta Cut-off, Refinements, Iterative deepening, The Blocks World, Components of A Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical Planning, Reactive Systems, Other Planning Techniques. Understanding: What is understanding? What makes it hard? As constraint satisfaction

Natural Language Processing: Introduction, Syntactic Processing, Semantic Analysis, Semantic Analysis, Discourse And Pragmatic Processing, Spell Checking Connectionist Models: Introduction: Hopfield Network, Learning In Neural Network, Application Of Neural Networks, Recurrent Networks, Distributed Representations, Connectionist AI And Symbolic AI.

TEXT BOOKS:

1. Elaine Rich and Kevin Knight “Artificial Intelligence”, 2nd Edition, Tata McGraw-Hill, 2005.
2. Stuart Russel and Peter Norvig, “Artificial Intelligence: A Modern Approach”, 3rd Edition, Prentice Hall, 2009.

REFERENCE BOOKS:

1. Embedding system building blocks By Labrosse, CMP publishers.

E-RESOURCES:

1. <https://nptel.ac.in/courses/106102220>
2. https://onlinecourses.nptel.ac.in/noc22_cs56/preview

Course Outcomes:

Upon completing this course, the student will be able to

1. Understand the concepts of computational intelligence like machine learning
2. Ability to get the skill to apply machine learning techniques to address the real time Problems in different areas
3. Understand the Neural Networks and its usage in machine learning application.
4. Apply principles and algorithms evaluate models generated from data
5. Apply the algorithms to a real world problems
6. Understand Dempster Shafer Theory

B.Tech. VI Semester

COURSE CODE: ---

L	T	P	C
3	0	0	3

OPEN ELECTIVE-2

Internal Marks: 30

External Marks: 70

The student can choose any one OE-2 subject offered by other Branches. The list of OEs are available in Course Structure.

B.Tech. VI Semester

COURSE CODE:

L T P C
0 0 3 1.5

VLSI DESIGN LAB

Internal Marks: 30
External Marks: 70

Course Objective

The objective of this laboratory course is

1. To enable students to design, simulate, and implement CMOS-based digital and analog circuits using industry-standard Electronic Design Automation (EDA) tools.
2. To develop a comprehensive understanding of schematic capture, layout design.
3. To verify methodologies as per current CMOS technology standards.

List of Experiments:

Students shall design the schematic diagrams using CMOS logic, generate corresponding layout diagrams, and perform simulation and analysis using the latest CMOS process technology with the aid of **professional-grade EDA tools (Cadence/Synopsys/Mentor Graphics/Tanner/Microwind or any Industry Standard EDA Tools).**

The following experiments shall be carried out:

1. Design and implementation of an inverter
2. Design and implementation of universal gates
3. Design and implementation of full adder
4. Design and implementation of full Subtractor
5. Design and implementation of RS-latch
6. Design and implementation of D-latch
7. Design and implementation asynchronous counter
8. Design and Implementation of static RAM cell
9. Design and Implementation of differential amplifier
10. Design and Implementation of ring oscillator

Equipment Required:

1. Cadence/Synopsys/Mentor Graphics/Tanner/Microwind or any Industry Standard EDA Tools

2. Personal computer with necessary peripherals.

Note: Minimum 10 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

E-RESOURCES:

1. <https://nptel.ac.in/courses/117106092>
2. https://onlinecourses.nptel.ac.in/noc23_ee142/preview

Course Outcomes:

Upon completing this course, the students will be able to

1. Write HDL code for basic as well as advanced digital integrated circuits.
2. Import the logic modules into FPGA Boards.
3. Ability to design the logic circuits.
4. Synthesize, place and Route the digital IP's.
5. Design, implement and simulate circuits using VHDL.
6. Design RAM Cell Using Verilog

MICROPROCESSOR AND MICROCONTROLLERS LAB

Internal Marks: 30
External Marks: 70

Course objectives:

1. This course introduces the assembly language programming of 8086 and 8051 microcontroller.
2. It gives a practical training of interfacing the peripheral devices with the 8086 microprocessor.
3. The course objective is to introduce the basic concepts of microprocessor and to develop in the student the assembly language programming skills and real time applications of microprocessor as well as microcontroller.

List of Experiments:

PART- A: (Minimum of 5 Experiments has to be performed) 8086 Assembly Language Programming and Interfacing

1. Programs for 16 -bit arithmetic operations (using Various Addressing Modes).
 - a. Addition and subtraction of n-BCD numbers.
 - b. Multiplication and Division operations.
 - c. Addition of an array of numbers with overflow detection.
2. Program for sorting an array.
3. Program for Factorial of given n-numbers.
4. Interfacing ADC to 8086
5. Interfacing DAC to 8086.
6. Interfacing stepper motor to 8086.
7. Interfacing Seven-Segment display to 8086
8. Keyboard interface with 8086

PART-B: (Minimum of 5 Experiments has to be performed) 8051 Assembly Language Programming and Interfacing

1. Finding number of 1's and number of 0's in a given 8-bit number
2. Average of n-numbers.
3. Program and verify Timer/ Counter in 8051.
4. Interfacing Traffic Light Controller to 8051.
5. UART operation in 8051
6. Interfacing LCD to 8051.
7. Interfacing temperature sensor (LM 35) with 8051
8. Stepper motor control with 8051

PART-C (Minimum of 2 Experiments has to be performed) Conduct the following experiments using ARM CORTEX M3 PROCESSOR USING KEIL MDK ARM

1. Write an assembly program to multiply of 2 16-bit binary numbers.
2. Write an assembly program to find the sum of first 10 integers numbers.
3. Write a program to toggle LED every second using timer interrupt.
4. PWM signal generation
5. Analog signal measurement (ADC)

6. Interfacing with serial communication (UART)

Equipment Required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. 8086 Microprocessor kits
4. 8051 microcontroller kits
5. ADC module, DAC module
6. Stepper motor module
7. Key board module
8. LED, 7-Segment Units, LCD display modules
9. Temperature sensor module
10. Digital Multimeters
11. ROM/RAM Interface module
12. Bread Board etc.
13. ARM CORTEX M3
14. KEIL MDKARM, Digital Multi-meters

Note: Minimum 12 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

E-RESOURCES:

1. <https://nptel.ac.in/courses/108105102>
2. <https://nptel.ac.in/courses/106108100>

Course Outcomes:

Upon completing this course the students will be able to

1. Identify relevant information to supplement to the Analog Electronic Circuit
2. Set up testing strategies and select proper instruments to evaluate performance characteristics of analog electronic circuit.
3. Design amplifiers with required Q point and analyse amplifier characteristics
4. Examine the effect multistage amplification on frequency response
5. Investigate feedback concept in amplifiers and oscillator.
6. Generate Square wave using 8086 microprocessor

B.Tech. VI Semester

COURSE CODE:

L T P C

0 1 2 2

MICROWAVE AND OPTICAL COMMUNICATIONS LAB

Internal Marks: 30

External Marks: 70

Course Objectives:

1. To expose to characterization of microwave components and measurements at microwave frequencies.
2. To measure the Attenuation.
2. To familiarize with the fiber optic communication system.

List of Experiments:

Part – A: (Minimum 7)

1. Reflex Klystron characteristics.
2. Gunn diode characteristics.
3. Attenuation measurement.
4. Directional coupler characteristics.
5. VSWR Measurement.
6. Frequency and Wavelength measurement.
7. Waveguide parameters measurement.
8. S matrix of Circulator.
9. S matrix of Magic Tee.

Part – B: (Minimum 5)

1. Characterization of LED.
2. Characterization of Laser diode.
3. Intensity modulation of laser output through an optical fiber
4. Measurement of data rate for digital optical link.
5. Measurement of numerical aperture.
6. Measurement of losses in plastic fiber.

Note: Minimum 12 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

Equipment Required for Laboratories:

- | | |
|--|---|
| 1. Regulated Klystron Power Supply, Klystron mount | 13. Wave guide shorts |
| 2. VSWR Meter | 14. SS Tuner |
| 3. Micro Ammeter | 15. Directional Coupler |
| 4. Multi meter | 16. E, H, Magic Tees |
| 5. CRO | 17. Circulators, Isolator |
| 6. GUNN Power Supply, Pin Modulator | 18. Matched Loads |
| 7. Crystal Diode detector | 19. Fiber Optic Analog
Trainer based LED |
| 8. Micro wave components (Attenuation) | 20. Fiber Optic Analog
Trainer based laser |
| 9. Frequency Meter | 21. Fiber Optic Digital Trainer |
| 10. Slotted line carriage | 22. Fiber cables –
(Plastic, Glass) |
| 11. Probe detector | |

E-RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc22_ee103/preview
2. https://onlinecourses.nptel.ac.in/noc21_ee42/preview

Course Outcomes:

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

1. Obtain the characteristics of microwave components.
2. Predict the scattering matrix of microwave components.
3. Find numerical aperture of an optical fiber.
5. Demonstrate the characteristics of LED and LASER
6. Demonstrate the characteristics of plastic fiber.

B.Tech. VI Semester

COURSE CODE:

L T P C
0 0 0 0

RESEARCH METHODOLOGY AND IPR

Internal Marks: 30
External Marks: 00
Semester End Exam:70

Course Objectives:

1. To Understand research methodology.
2. To Apply research techniques.
3. To Understand intellectual property rights.

UNIT-1

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT-2

Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT-3

Nature of Intellectual Property: Patents, Designs, Trademarks and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT-4

Patent Rights: Scope of Patent Rights, Licensing and transfer of technology, Patent information and databases, Geographical Indications.

UNIT-5

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

TEXT BOOKS

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science and engineering students".
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"

REFERENCE BOOKS

1. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step-by-Step Guide for beginners"
2. Halbert, "Resisting Intellectual Property", Taylor and Francis Ltd,2007.
3. Mayall , "Industrial Design", McGraw Hill,1992.

E-RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc23_ge36/preview
2. https://onlinecourses.swayam2.ac.in/ntr24_ed08/preview

Course Outcomes:

Upon completing this course, the student will be able to

1. Understand research problem formulation.
2. Analyze research related information, Follow research ethics
3. Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
4. Understanding that when IPR would take such important place in growth of individuals and nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general and engineering in particular.
5. Understand that IPR protection provides an incentive to inventors for further research work and investment in R and D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.
6. Analysis Patenting under PCT.

B.Tech. VI Semester

COURSE CODE:

L T P C
3 0 0 3

LINEAR AND DIGITAL IC APPLICATIONS
(OE-2)

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To Understand linear ICs.
2. To Design linear IC applications.
3. To Understand digital ICs

UNIT-1

Operational Amplifier: Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, features of 741 Op-Amp, Modes of Operation-Inverting, Non-Inverting, Differential, Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger, Introduction to Voltage Regulators, Features of 723 Regulator, Three Terminal Voltage Regulators.

UNIT-2

Op-Amp, IC-555 and IC565 Applications: Introduction to Active Filters, Characteristics of Bandpass, Band reject and All Pass Filters, Analysis of 1st order LPF and HPF Butterworth Filters, Waveform Generators – Triangular, Sawtooth, Square Wave, IC555 Timer-Functional Diagram, Monostable and Astable Operations, Applications, IC565 PLL-Block Schematic, principle and Applications.

UNIT-3

Data Converters: Introduction, Basic DAC techniques, Different types of DACs- Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, Different Types of ADCs – Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

UNIT-4

Combinational Logic ICs: Specifications and Applications of TTL-74XX and CMOS 40XX Series ICs - Code Converters, Decoders, LED and LCD Decoders with Drivers, Encoders, Priority Encoders, Multiplexers, De-multiplexers, Priority Generators/Checkers, Parallel Binary Adder/Subtractor, Magnitude Comparators.

UNIT-5

Sequential Logic IC's and Memories: Familiarity with commonly available 74XX and CMOS40XX Series ICs - All Types of Flip-flops, Synchronous Counters, Decade Counters, Shift Registers.

Memories - ROM Architecture, Types of ROMS and Applications, RAM Architecture, Static and Dynamic RAMs.

TEXT BOOKS:

1. Ramakanth A.Gayakwad-Op-Amps and Linear ICs, PHI,2003.
2. Floyd and Jain-Digital Fundamentals, 8thEd., Pearson Education,2005.

REFERENCE BOOKS:

- 1.D.Roy Chowdhury – Linear Integrated Circuits, New Age International (p) Ltd, 2ndEd., 2003.
- 2.John.F.Wakerly–DigitalDesignPrinciplesandPractices,3rdEd.,Pearson,,2009.
- 3.Salivahana-Linear Integrated Circuits and Applications,TMH,2008.
- 4.WilliamD.Stanley-OperationalAmplifierswithLinearIntegratedCircuits,4thEd.,Pearson Education India, 2009

E-RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc24_ee73/preview
2. <https://archive.nptel.ac.in/courses/108/106/108106158/>

Course Outcomes:

Upon completing this course, the student will be able to

1. Analyze and design various configurations of operational amplifiers, and applications such as instrumentation amplifiers, voltage regulators, comparators, and waveform generators.
2. Design and implement active filters and waveform generators using op-amps, IC-555, and IC-565, and evaluate their performance for signal processing applications
3. Compare different data conversion techniques (DAC and ADC) and implement digital-to-analog and analog-to-digital conversion circuits in real-time applications.
4. Apply combinational logic ICs such as multiplexers, de-multiplexers, encoders, decoders, and arithmetic circuits to solve complex digital design problems.
5. Develop sequential circuits using flip-flops, counters, and shift registers, and analyze their use in digital memory systems, including ROM, RAM, and their variants
6. Design Successive Approximation ADC.

B.Tech. VI Semester COURSE CODE:

L T P C
3 0 0 3

PRINCIPLES OF COMMUNICATIONS
(OE-2)

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To Understand communication fundamentals.
2. To Analyze analog and digital communication systems.
3. To Understand communication channels.

UNIT-1

Basic tools for communication, Fourier Series/Transform, Properties, Autocorrelation, Energy Spectral Density, Parsevals Relation, Amplitude Modulation (AM), Spectrum of AM, Envelope Detection, Power Efficiency, Modulation Index.

UNIT-2

Double Sideband Suppressed Carrier (DSB-SC) Modulation, Demodulation, Costas Receiver, Single Sideband Modulation (SSB), Hilbert Transform, Complex Pre-envelope/ Envelope, Demodulation of SSB, Vestigial Sideband Modulation (VSB)

UNIT-3

Angle Modulation, Frequency Modulation (FM), Phase Modulation (PM), Modulation Index, Instantaneous Frequency, Spectrum of FM Signals, Carsons Rule for FM Bandwidth, Narrowband FM Generation, Wideband FM Generation via Indirect Method, FM Demodulation

UNIT-4

Introduction to Sampling, Spectrum of Sampled Signal, Aliasing, Nyquist Criterion, Signal Reconstruction from Sampled Signal, Pulse Amplitude Modulation, Quantization, Uniform Quantizers – Midrise and Midtread, Quantization noise, non- uniform Quantizers, Delta Modulation, Differential Pulse Code Modulation (DPCM)

UNIT-5

Basics of Probability, Conditional Probability, MAP Principle, Random Variables, Probability Density Functions, Applications in Wireless Channels, Basics of Random Processes, Gaussian Random Process, Noise.

TEXT BOOKS:

1. Simon Haykin, Communications Systems, 4th Edition. John Wiley and Sons, Inc
2. Fundamentals of Wireless Communication by David Tse

REFERENCE BOOKS:

1. Principles of Communication Systems (2/e); H. Taub and D. L. Schilling, Tata McGrawHill, New Delhi

2. Communication System Engineering (2/e); J. G. Proakis and M. Salehi; Pearson Education (Singapore) Pte Ltd.

E-RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc22_ee05/preview
2. <https://archive.nptel.ac.in/courses/108/104/108104091>

Course Outcomes:

Upon completing this course, the student will be able to

1. Analyze the performance of analog modulation schemes in time and frequency domains.
2. Analyze the performance of angle modulated signals.
3. Characterize analog signals in time domain as random processes and noise
4. Characterize the influence of channel on analog modulated signals
5. Determine the performance of analog communication systems in terms of SNR
6. Analyze pulse amplitude modulation, pulse position modulation, pulse code modulation and TDM systems.

**PRINCIPLES OF SIGNAL PROCESSING
(OE-2)**

**Internal Marks: 30
External Marks: 70**

Course Objectives:

1. To Understand signal fundamentals
2. To Analyze signals
3. To Apply signal processing techniques.

UNIT-1

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, impulse Function, step function, signum function and ramp function. Introduction, Linear system, impulse response, Linear time invariant (LTI) system, Linear time invariant (LTV) system, Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Transfer function of a LTI system, Related problems.

UNIT-2

Analysis of continuous time signals Fourier Series and Fourier Transform:

Fourier series representation of continuous time periodic signals, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Deriving Fourier transform from Fourier series, Fourier transform of standard signals, properties of Fourier transforms, Related problems.

Laplace Transforms:

Introduction, Concept of region of convergence (ROC) for Laplace transforms, Properties of L.T's, Inverse Laplace transform, Relation between Laplace Transform and Fourier Transform of a signal.

UNIT-3

Sampling Theorem: Graphical and analytical proof or Band Limited Signals, impulse sampling, Reconstruction of signal from its samples, Aliasing

Z-Transforms: Concept of Z-Transform of a discrete sequence. Region of convergence in Z- Transform, Inverse Z-transform, properties of Z-transforms

UNIT-4

Fourier Transforms of discrete signal: Fourier Transform of Discrete Signal, Properties, and Inverse Fourier Transforms, related problems

Discrete Fourier Transforms: Definition, Properties, Inverse DFT, related problems. Fast Fourier Transform: Decimation in Time domain and Decimation in Frequency Algorithms.

UNIT-5

Digital Filters: Structures of IIR filters and FIR filters: Direct form-1 and Direct form 2; cascade form; parallel form **Analog filter design:** LPF, BPF, HPF and BEF filter design using Butterworth Frequency Transformations: Analog to Analog; Digital and Digital **IIR Filter Design:** IIR filter from analog filter – IIR filter design by Impulse Invariance, Bilinear transformation. **FIR Filter Design:** Filter design using windowing techniques. Rectangular Window, Hamming Window, Hanning Window.

TEXT BOOKS:

1. Signals, Systems and Communications - B. P. Lathi, BS Publications, 2003.
2. Digital Signal Processing - P. Ramesh Babu, 5th Edition, SCITECH Publishers.

REFERENCE BOOKS:

1. Signals and Systems – Simon Haykin and VanVeen, Wiley, 2nd Edition, 2007.
2. Signals and Systems-A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2ndEdn, 1997.
3. Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer, 3rd Edition, Pearson, 2014.
4. Digital Signal Processing- Tarun Kumar Rawat, Oxford University Press, 2014

E-RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc20_ee15/preview
2. <https://nptel.ac.in/courses/108104100>

Course Outcomes:

Upon completing this course, the student will be able to

1. Acquire the knowledge in signals and systems.
2. Get familiarized with various transforms to analyze continuous time signals.
3. Understand sampling theorem and z-transform.
4. Get familiarized with the transforms of discrete time signals.
5. Design the digital filter design
6. Understand Concept of Z-Transform of a discrete sequence

B.Tech. VI Semester COURSE CODE:

L T P C
3 0 0 3

MICROPROCESSORS AND MICROCONTROLLERS
(OE-2)

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To Understand microprocessor architecture.
2. To Program microprocessors.
3. To Understand microcontroller architecture

UNIT-1

Introduction: Microprocessor based system, Origin of microprocessors, Harvard and Von Neumann architectures with examples, Microprocessor Unit versus Microcontroller Unit.

8086 Architecture: internal architecture of 8086 microprocessor, register organization, physical memory organization, general bus operation.

UNIT-2

8086 Programming: instruction set, addressing modes, assembler directives, programming with assembler, writing simple programs with an assembler, stack and stack structure, interrupts and interrupt service routines, interrupt cycle of 8086.

UNIT-3

8086 Interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDs, Interfacing seven segment displays, Intel 8251 USART architecture and interfacing, stepper motor, A/D and D/A converters.

UNIT-4

Intel 8051 MICROCONTROLLER and Interfacing

Introduction to microcontrollers, internal architecture of 8051 microcontroller, I/O ports and memory organization, MCS51 addressing modes and instruction set, assembly language programming, simple programs, counters/timers, serial data input/output, interrupts. Interfacing to 8051: A/D and D/A Convertors, keyboard, LCD Interfacing.

UNIT-5

ARM Architectures and Processors: introduction to CISC and RISC architectures, ARM Architecture, ARM Processors Families, Introduction to 16/32 bit processors, ARM7 architecture and organization, Thumb instructions, ARM Cortex-M3 Processor Functional Description.

TEXT BOOKS:

1. Advanced microprocessors and peripherals by K. M. Bhurchandi, A. K. Ray 3e

2. The 8051 Microcontrollers and Embedded systems Using Assembly and C, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; Pearson 2nd-Edition, 2011.
3. Microprocessors and Microcontrollers by N. Senthil Kumar, M. Saravanan and S. Jeevanathan Oxford higher education

REFERENCE BOOKS:

1. Embedded Systems Fundamentals with Arm Cortex-M based Microcontrollers: A Practical Approach in English, by Dr. Alexander G. Dean, Published by Arm EducationMedia, 2017.
2. Cortex-M3 Technical Reference Manual.
3. The Definitive Guide to ARM Cortex-M3 and Cortex-M4 Processors by Joseph Yiu., Newnes Third edition

E-RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc22_ee12/preview
2. <https://archive.nptel.ac.in/courses/108/105/108105102>

Course Outcomes:

Upon completing this course, the student will be able to

1. Understand the architecture of 8086 and its operation.
2. Develop the students to compose the assembly language program for 8086.
3. Applying 8086 processor to interface with necessary peripherals.
4. Understand the architecture of 8051 and interfacing with necessary peripherals.
5. Understand the introductory concepts of advanced processors, viz., ARM processors.
6. Understand Intel 8251 USART architecture