

SEMESTER II

ELECTRONIC CIRCUITS AND APPLICATIONS

Teaching scheme –
Lectures - 4 hrs /week
Practicals – 2hrs/week
Term Work-25 marks

Examination scheme -
Paper –100 marks
Practical –50 marks

UNIT 1

Diode Applications –

Voltage multiplier circuits: Working and comparison of voltage doubler, tripler and voltage quadrupler configurations. Limitations of voltage multiplier circuits. Effect of frequency on load regulation.

Clipping and clamping circuits: Series and parallel forms of clipping circuits, Biased clipper, their operation and transfer characteristics. Clamping circuits.

Mosfet Applications:

MOSFET in VLSI: V-I characteristic equation in terms of W/L ratio, MOSFET scaling and small geometry effects, MOSFET capacitances. Modeling MOS transistors using SPICE. CMOS inverter, Static characteristics – Noise margin, threshold voltage, Layout and latch-up prevention, Other logic gates- NAND and NOR gates.
[8L]

UNIT 2

Power Mosfet: Construction- Lateral double diffused MOSFET, VMOSFET. Drive requirements, Comparison with power BJT. One example of drive circuit for POWER MOSFET.

POWER BJT: Power BJT construction, Data sheet specifications, Thermal resistance, Second breakdown, Safe operating area (SOA), Thermal runaway, BJT as a switch in display and relay drive applications, Drive considerations, Anti saturation circuits, Comparison with POWER MOSFET

UNIT 3

Large signal AF BJT amplifiers: Block schematic of AF amplifier.

Classes of power amplifiers – Class A, Class B, Class AB. An overview and applications of Class C and Class D amplifiers. Class A with resistive load, Transformer coupled class A amplifier, Class B Push-pull, Class AB, Complementary symmetry and Quasi-complementary configurations. Efficiency analyses for Class A transformer coupled amplifier, Class B push-Pull amplifiers. Comparison of efficiencies of other configurations. Distortions in amplifiers, concept of Total Harmonic Distortion (THD).

UNIT 4

High frequency, small signal BJT amplifiers: Behavior of transistor at high frequencies. Modified T equivalent circuit. High frequency hybrid p CE amplifier model. CE short circuit current gains for T and hybrid p models. Definitions and derivations for,.

Amplifier bandwidth taking into account source and load resistances. Techniques to improve bandwidth. Single tuned, Double tuned and stagger tuned amplifiers. Unloaded and loaded Q. Effect of staggering on bandwidth (no derivations).

UNIT 5

Feedback Amplifiers And Oscillators: Concept of feedback. Negative and positive feedback. Classification of amplifiers based on feedback topology. (Voltage, Current, Transconductance and Transresistance amplifiers). Transfer gain with feedback. Advantages and disadvantages of negative feedback. Effect of feedback on input and output impedances and bandwidth of an amplifier. Analysis of one circuit for each feedback topology.

Oscillators: Oscillator startup mechanism, need for amplitude limiting. Study of following oscillator circuits (using FET) – (Derivations not expected)
LC oscillators – General form of LC oscillator. Hartley oscillator, Colpitts oscillator, Clapp oscillator.
Crystal oscillator, Crystal clock

UNIT 6

Linear Voltage Regulators And Voltage References: Block schematic of linear regulators. Emitter follower regulator, Transistor series regulator and its analysis for performance parameters. 3 terminal floating, dual and adjustable regulators. Method of boosting output current using external series pass transistor. Performance parameters – Load and Line regulation, Ripple rejection, Output resistance and efficiency. Protection circuits – Reverse polarity protection, over current, fold back current limiting, over voltage protections. Important data sheet specifications of linear regulators. Voltage references, their peculiarities and applications.

Text Books

Thomas L. Floyd ,-Electronic Devices, - Pearson Education(Sixth edition).
Donald A. Neamen - Electronic circuit analysis & Design,- Tata McGraw Hill(Second Edition)

Reference books

Mark N. Horenstein - Microelectronic Circuits & Devices,- Prentice Hall(Second Edition).
Millman Halkies,- Electronic Devices & Circuits,- Tata McGraw Hill
Millman Halkies - Integrated Electronics,- Tata McGraw Hill
Chryssis - Switched mode power supplies
Pucknell - Basic VLSI design ,- PHI
Reinhold Ludwig and Pavel Bretchko - RF circuit design- Theory and applications ,
Pearson education.

LIST OF PRACTICALS –

1.Center tapped bridge rectifiers, Dual Power supply

- 2.Clipping and clamping circuits
- 3.Voltage multiplier circuits – Regulation characteristics and effect of frequency
- 4.Class A transformer coupled, Class B push-pull amplifier – Efficiency calculations
- 5.Transistor inverter in relay and LED driving application
- 6.Tuned amplifiers – Single and double tuned amplifiers
- 7.Voltage series, current series feedback amplifier
- 8.Voltage shunt and current shunt feedback amplifiers.
- 9.Simulation of LC oscillator
- 10.Linear Voltage regulators – Floating, Adjustable three terminal regulators, current boosting,
- 11.CV and CC modes of operation.

ENGINEERING MATHEMATICS-III

Teaching scheme:
Lectures: 4 hrs/week.

Examination scheme:
Paper: 100 marks.

Unit I: Linear differential equation (LDE)

General nth order LDE. Solution of n th order LDE with constant coefficient. PI by variation of parameters. Cauchy's & Legendre's DE. Solution of Simultaneous and Symmetric Simultaneous DE. Application to electrical circuits.

Unit II: Complex variables

Functions of complex variables, analytic functions, C-R equations, Conformal mapping, Bilinear transformation, Residue theorem, Cauchy's Integral theorem and Cauchy's Integral formula (without proofs).

Unit III: Transforms

Fourier Transform (FT): Fourier integral theorem. Sine and Cosine integrals.

Fourier Transform, Fourier Cosine Transform, Fourier Sine Transforms and their inverses. Problems on wave equation.

Introductory Z Transform (ZT): Definition, Std. Properties (without proof), ZT of std. Sequences and Inverse. Solution of simple difference equations.

Unit IV: Laplace Transform (LT)

Definition of LT, Inverse LT. Properties & theorems. LT of standard functions. LT of some special functions viz. error, 1st order Bessel's, Periodic, Unit Step, Unit Impulse and ramp. Problem on finding LT & inverse LT. Applications of LT for solving ordinary differential equations.

Unit V: Vector Calculus

Vector Differentiation & its physical interpretation. Vector differential operator. Gradient, Divergence & Curl. Directional derivative. Vector identities.

Unit VI: Vector Analysis

Line, Surface & Volume integrals. Conservative, Irrotational & solenoidal fields. Scalar potential. Gauss, Stroke's and Green's theorems (without proof). Applications to problems in Electromagnetic fields.

Text Books

1. Advanced Engineering Mathematics, 5e, by Peter V. O'Neil (Thomson Learning).
2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).

Reference books

1. Advanced Engineering Mathematics by Wylie C.R & Barrett L.C (McGraw-Hill, Inc.)
2. Higher Engineering Mathematics by B.S. Grewal (Khanna Publication, Delhi)
3. Advanced Engineering Mathematics, 2e, by M.D. Greenberg (Pearson Education).
4. Engineering Mathematics by B.V. Raman (Tata McGraw-Hill).
5. Applied Mathematics (Volumes I and II) by P.N Wartikar & J.N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune).
6. Advanced Engineering Mathematics with MATLAB, 2e, by Thomas L. Harman, James Dabney and Norman Richert (Brooks/Cole, Thomson Learning).

ELECTRICAL CIRCUITS AND MACHINES**Teaching scheme:****Lectures: 04****Practicals : 02****Examination scheme:****Paper: 100 marks.****Term Work: 25 Marks**

Unit 1: Transformers

Single-phase transformers: Ideal & Practical Transformers, Equivalent circuit, Determination of transformer parameters (O.C and S.C tests), Efficiency and regulation of transformer, Design of Single phase transformer for instrument power supply. Coupled circuit.

Special transformer: (Theoretical treatment only) Auto transformer, current transformer, induction heating transformers, isolation transformers, ferrite core transformer, Welding transformer, Phase shift transformer, Three phase transformer, Star/Delta, Delta/Star, Application of each Type.

Unit 2: DC Machines

DC Generator: Construction, Types, role of commutator, induced emf equation, characteristics and applications.

DC Motors: Operation, types, losses, basic equations of DC Motors, Torque-speed characteristics, Speed control methods, speed regulation, starters (manual, electronic), braking, and applications.

Unit 3: Active, Reactive and Apparent Power

Instantaneous power, active power, reactive power, Power factor, distinction between active and reactive power, combined active and reactive loads (apparent power). Measurement and Calculation of active, reactive power and power factor in 3 f balanced circuit using Two Wattmeter and One Wattmeter. Measurement of 1 f and 3 f power using CT and PT. Electronic meters for energy measurement. Introduction to energy audit.

Unit 4: Three phase Induction Motors

Construction, operation, types, equivalent circuit, torque-slip characteristics, slip and torque equations, max torque, starting torque, full load torque, condition for max torque, power flow diagram, starters for IM (manual and soft starters). Introduction to speed control, braking, protection circuits (e.g. single phase preventer, ELCB, MCB) and applications.

Unit 5: Synchronous machines

Synchronous Generators: Construction, types (rotating field & rotating armature), Synchronous speed and emf equation. Coil span factor and distribution factor (derivation not expected). Alternator on no load and on load. Armature reaction in 3-phase alternators, Regulation of alternator by synchronous impedance method.
Synchronous motors: - Construction, operation, effect of variation of load, Hunting, V curves, Starting methods, Synchronous Condenser, applications.

Unit 6: Special purpose machines

Principle of operation, working, types and applications of: single phase IM, universal motors, reluctance motor, stepper motors, AC & DC servo motors.

Text Books:

1. Guru, Hiziroglu -Electric Machinery & Transformers,- Oxford university Press
2. H. Cotton -Electrical Technology

Reference Books:

1. Fitzgerald -Electric Machinery- TMH (Sixth Edition).
2. Theodore Wildi-Electrical machines, Drives & Power systems- Pearson Education.
3. Nagrath Kothari - Electric Machines- TMH
4. Irving Kosow - Electrical Machinery and transformers.

List of Experiments (Any Eight)

1. Speed control of DC Shunt motor.
2. Load test on D.C. shunt motor.
3. Load test on D.C. Series motor.
4. Power measurement in 3-phase circuit by two-wattmeter method.
5. Reactive power measurement in 3-phase circuit by one-wattmeter method.
6. O.C & S.C test on single-phase transformer.
7. Load test on 3-phase Induction motor.
8. Study of IM starters.
9. Direct loading on alternator.
10. O.C & S.C test on Alternators.
11. V curves of synchronous motor.
12. Study of stepper motor.

DATA STRUCTURES AND FILES

Teaching Scheme: -

Lectures: - 4 Hrs / Week

Practical: - 2 Hrs / Week

Examination Scheme:-

Theory: 100 Marks

Practical: 50 Marks

Learning Objectives:

1. Study the representation and use of primitive data types, built in data structures.
2. Study how the data structures in the topic list are allocated and used in memory and study common applications of each.
3. Implement the user defined data structures in a high level language.
4. Compare alternative implementations of data structures with respect to performance.

5. Compare and contrast the cost and benefits of dynamic and static data structures implementations.
6. Choose the appropriate data structures for modeling a given problems.

Unit – I

Review of 'C':

Arrays, Pointers: arrays and pointers

Functions: Parameter passing call by value and call by reference, scope rules, concept of recursion and recursive functions, functions and pointers.

Structure and Union: Passing and returning structure and union as parameter for function structure / union and pointer.

Input / Output Files: Concept, file operations, types: sequential & random access files.

Unit – II

Introduction to data structures:

Overview - algorithm, data structure, how to create a program, how to analyze the program. Abstract Data Types.

Concept of sequential organization, concept of linear and non linear data structure, arrays as ADT, storage representations (row major and column major). Concept of ordered list & polynomial representation using arrays.

Searching and sorting techniques:

Searching: Basic search techniques, sequential searching, binary search, indexed sequential search. Analysis of these algorithms.

Sorting: General background, bubble sort, quick sort, selection sort , insertion sort & merge sort .Analysis of these algorithms.

Hash Tables: Introduction, hashing functions, overflow/collision Handling.

Unit – III

Linear Data structure using linked organization:

Concept of link organization. Singly linked list, doubly linked list, Circular linked list. Insertion, deletion & traversal on above data structures. Representation & manipulation of polynomials using linked list.

Generalized lists: Representation of polynomial using generalized list..

Unit – IV

Stack: Definition & examples, representing stack in C, implementing stack using linked list. Example: infix, post fix and prefix (basic definition and examples, evaluating postfix expressions, program to evaluate postfix expression , converting infix to postfix expression , program to convert infix to postfix.)

Queues: The queue and its sequential representation, linked implementation of queues, circular queue, concept of priority queue.

Unit- V

Trees: Basic terminology, binary trees, binary tree representation ,binary tree traversal, primitive operations on binary trees, Binary search trees-primitive operations on binary

search trees, Threaded binary trees, traversal of threaded binary tree.

Unit –VI

Graphs: Concepts and terminology, Representation of graphs using adjacency matrix, adjacency list. Traversal: Depth first search Breath First Search. Algorithms for minimal spanning tree and shortest path.

Text Books:

1. Yedidyah Langsam, Moshe J Augenstein, Aaron M Tenenbaum,- Data structures using C and C++ ,- PHI publications
2. Ellis Horowitz, Sataraj Sahni- Fundamentals of Data Structures-, Galotia Books source.

Reference books:

- 1 Brain W Kernighan and Deniss M Ritchie- The programming Language- PHI publications.
2. Robert L Kruse- Data structures & program design - PHI publications.

List of Practicals (Any Eight)

- 1) a) Program to create & manipulate database using structure.
b) Program to add two polynomials using array of structure.
- 2) Program to implement primitive operations on Sequential file.
- 3) a) Program to search for a record from a given list of records stored in an array using,
i) Linear Search ii) Binary Search.
- 4) Program to sort an array of names using
i) Bubble Sort ii) Insertion Sort iii) Quick Sort.
- 5) a) Program to implement following operations on singly linked list:
i) Create ii) Delete iii) Insert iv) Display v) Search.
b) Program to add two polynomials using linked list.
- 6) a) Program to implement stack using : i) Array ii) Linked List.
b) Program to Convert an infix expression to postfix expression & evaluate the resultant expression.
- 7) Program to Implement Queue using: i) Array ii) Linked List.
- 8) Program to create a Binary Search Tree & Perform following primitive operations on it:

- i) Search ii) Delete iii) Traversals (inorder, preorder, postorder -recursive) and
- iv) Non-recursive in-order traversal

9) Program to create a graph using adjacency matrix/ adjacency list & traverse it using BFS & DFS methods.

ANALOG COMMUNICATION

Teaching Scheme:

Lectures: 04 Hrs/week

Practical:- 02 Hrs/week

Examination Scheme:

Paper: 100 Marks

Oral: 50 Marks

UNIT: 1

Introduction To Communication/Pulse Modulation

Block Schematic of Communication System, Base Band Signals and their bandwidth requirements, RF Bands, Types of Communication Channels (Transmission Lines, Parallel wires, Co-axial Cables, Waveguides and Optical Fiber). Necessity of Modulation, Types of Modulation: AM, FM, PM and Pulse Modulation. Block Schematic of PAM, PWM, PPM. Multiplexing: TDM, FDM.

UNIT: 2

Amplitude Modulation

Mathematical treatment and expression for AM, Frequency Spectrum, Modulation Index, Power Relation as applied to Sinusoidal Signals, Representation of AM wave, Mathematical treatment as applied to general signals in Communication, Generation of AM using non-linear property.

Types of AM Transmitters: DSB-FC, DSB-SC, SSB, ISB & VSB, their generation methods and Comparison in terms of Bandwidth and Transmission Power requirements & Complexity (Block diagram Treatment only).

UNIT: 3

Angle Modulation

Mathematical analysis of FM and PM using Sinusoidal Signals, Frequency Spectrum, Mathematical treatment as applied to general non-sinusoidal Signals, Modulation Index, Bandwidth requirements (all three relations), Narrowband and Wideband FM, Comparison of FM and PM, Direct and Indirect methods of FM generation, Need for Pre-emphasis, Comparison of AM and FM.

UNIT: 4

Am & Fm Receivers

Block diagram of AM and FM Receivers, Super heterodyne Receiver, Performance characteristics: Sensitivity, Selectivity, Fidelity, Image Frequency Rejection, IFRR, Tracking, De-emphasis, Mixers.

AM Detection: Envelope detection, Synchronous detection, Practical diode detection, AGC. SSB and DSB detection methods.

FM Detection: Phase discriminator and Ratio Detector, Mathematical analysis of FM Detection.

UNIT: 5

Noise

Sources of Noise, Types of Noise, White Noise, SNR, Noise Figure, Noise Temperature, Friss formula for Noise Figure, Noise Bandwidth, Performance of AM (DSB, SSB & VSB) and FM in presence of Noise: Mathematical treatment.

UNIT:6

Radiation And Propagation:

Concept of Radiation, Basic Antenna System (Dipole), Antenna parameters, Yagi-Antennas. Mechanism of Propagations: Ground Wave, Sky Wave, Space Wave, Duct, Tropospheric Scatter and Extraterrestrial Propagation. Concept of Fading and diversity reception.

Text Books:

- 1) B.P Lathi : Modern Digital and analog communication Systems : Oxford Press Publication.
- 2) Kennedy & Devis, -Electronic Communication Systems-PHI

Reference Books:

- 1) Dennis Roddy & Coolen, -Electronic Communication,- PHI
- 2) Proakis And Salehi, -Communication Systems Engineering,- Pearson.
- 3) Louis Frenzel - Communication Electronics - TMH

List of Practicals

1. Study of AM Generation (DSB-FC).
2. Study of AM transmitter using Spectrum Analyzer.
3. Study of Envelope Detector - practical diode detector.
4. Study of FM Generation.
5. Study of FM Transmitter using Spectrum Analyzer.
6. Study of FM detection – Ratio Detector.
7. Measurement of Receiver Characteristics: Sensitivity, Selectivity, Fidelity.
8. Study of DSB-SC & SSB Generator using Spectrum Analyser.
9. Study of DSB-SC & SSB Detector.
10. Measurement of Antenna radiation pattern for different antennas.

ELECTRONICS SOFTWARE WORKSHOP

Teaching scheme:
Tutorial : 1 hr/week
Practical : 2 hrs/week

Examination scheme:
Term Work: 50 marks

Objective:

To make the students aware of:

- 1) Programming practice in C for numerical methods.
- 2) use of application specific software tools in the design, development, simulation and testing of electronic circuits.
- 3) Use of mathematical software packages for understanding and modeling electrical signals and linear systems.

Section A: Numerical computational techniques:

Instructions of following techniques assisted by C program/ function implementation of atleast three of them is expected

Solution of thanscendentan and polynomial equations, Bisection method, Newton-Raphson, Secant, Successive methods, solution of linear equations using Gauss-elimination, Gauss-jordan methods, Newton's forward and Backward difference equations, Interpolation, Numerical Integration and Differentiation:Trapezoidal rule Simpson's 1/3 and 3/8 rule, Euler's method .

List of suggested assignments:

- 1) Program to solve numerical method; Bisection method, Newton Raphson method using user defined functions.Functions should incorporate parameter passing techniques.
- 2) Program using Function to solve Differential Equations by Euler's modified method.
- 3) Program using Function to find integration by Simpson's 1/3 rd and 3/8 th method.

Section B: Simulation of typical circuits using Circuit Simulation tools such as pSpice, MultiSim, Simulink, Proteus.

- a) Transistorized circuits.
 - 1) Two stage amplifier.
 - 2) Series regulator
 - 3) Audio Driver/ Audio Power Amplifier
- b) IC Based Circuits
 - 1) Sequential Digital Circuits
 - 2) Combinational Logic.
 - 3) Timer circuits.

Section C: MATLAB/OCTAVE 20 SIM based Experiments/ Assignments:

Assignments related to Control Systems, Signal and Systems and Network theory.