1. Analog Electronic Circuits

2. Data Structure and Algorithms

3. Object Oriented programming Using C++

4. Mathematics-III (Differential Calculus)

5. Technical Writing

CSE

Third Semester

Analog Electronic Circuits

Module-1

Diode Circuits (4 Lectures)

P-N junction diode, I-V characteristics of a diode; review of half-wave and full-wave rectifiers, Zener diodes, clamping and clipping circuits.

Module-2

BJT Circuits (8 Lectures)

Structure and I-V characteristics of a BJT, BJT as a switch. BJT as an amplifier: smallsignal model, biasing circuits, current mirror; common-emitter, common-base and common-collector amplifiers, Small signal equivalent circuits, high-frequency equivalent circuits.

Module-3

MOSFET Circuits (8 Hrs)

MOSFET structure and I-V characteristics. MOSFET as a switch. MOSFET as an amplifier: small-signal model and biasing circuits, common-source, common-gate and common-drain amplifiers; small signal equivalent circuits - gain, input and output impedances, trans-conductance, high frequency equivalent circuit.

Module-4

Differential, Multi stage and operational amplifiers (8 Hrs)

Differential, multi-stage and operational amplifiers: Differential amplifier; power amplifier; direct coupled multi-stage amplifier; internal structure of an operational amplifier, ideal op-amp, nonidealities in an op-amp (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product)

Module-5

Linear Application of OP-amp (8 Hrs)

Linear applications of op-amp: Idealized analysis of op-amp circuits. Inverting and non-inverting amplifier, differential amplifier, instrumentation amplifier, integrator, active filter, P, PI and PID controllers and lead/lag compensator using an op-amp, voltage regulator, oscillators (Wein bridge and phase shift). Analog to Digital Conversion.

Module-6

Nn-Linear Application of OP-amp (4 Hrs)

Nonlinear applications of op-amp: Hysteretic Comparator, Zero Crossing Detector, Square-wave and triangular-wave generators. Precision rectifier, peak detector, Monoshot.

BOOKS

Suggested books

1.P.R. Gray, R.G. Meyer and S. Lewis, "Analysis and Design of Analog Integrated Circuits", John Wiley & Sons, 2001.
2. J. Millman and A. Grabel, "Microelectronics", McGraw Hill Education, 1988.
3. A S Sedra and K. C. Smith, "Microelectronic Circuits", New York, Oxford University Press, 1998.
4. J. V. Wait, L. P. Huelsman and G. A. Korn, "Introduction to Operational Amplifier theory and applications", McGraw Hill U. S., 1992.

Data Structure and Algorithms

Module-1

Introduction to Basic Terminology (4 Hrs)

Introduction: Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off.

LAB

Module-2
Stack and Queue (10 Hrs)

Stacks and Queues: ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each Type of Queues: Algorithms and their analysis.

Module-3
Linked List (6 Hrs)

Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.

Module-4
Searching, Sorting and Hashing (12 Hrs)

Searching, Sorting and Hashing: Linear Search and Binary Search Techniques and their complexity analysis. Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing.

Module-5
Trees and Graphs (8 Hrs)

Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis.
Graph: Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

LAB

Able to Practice

1.For a given Search problem (Linear Search and Binary Search) student will able to implement it.

2. For a given algorithm student will able to analyze the algorithms to determine the time and computation complexity and justify the correctness.

3. For a given problem of Stacks, Queues and linked list student will able to implement it and analyze the same to determine the time and computation complexity.

4. Student will able to write an algorithm Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity.

5. Student will able to implement Graph search and traversal algorithms and determine the time and computation complexity.

Object oriented Programming

Module-1

Introduction to C++ (3 Hrs)

Introduction to C++ : Object Oriented Technology, Advantages of OOP, Input- output in C++, Tokens, Keywords, Identifiers, Data Types C++, Derives data types. The void data type, Type Modifiers, Typecasting, Constant, Operator, Precedence of Operators, Strings.

Module-2

Control Structures and Functions

Control Structures and Functions: Decision making statements like if-else, Nested if-else, goto, break, continue, switch case, Loop statement like for loop, nested for loop, while loop, do-while loop. Parts of Function, User- defined Functions, Value- Returning Functions, void Functions, Value Parameters, Function overloading, Virtual Functions.

Module-3

Classes and Data Abstraction

Structure in C++, Class, Build- in Operations on Classes, Assignment Operator and Classes, Class Scope, Reference parameters and Class Objects (Variables), Member functions, Accessor and Mutator Functions, Constructors, default Constructor, Destructors.

Module-4

Overloading, Templates and Inheritance (8 Hrs)

Operator Overloading, Function Overloading, Function Templates, Class Templates. Single and Multiple Inheritance, virtual Base class, Abstract Class, Pointer and Inheritance, Overloading Member Function.

Module-5

Pointers, Arrays and Exception Handling (11 Hrs)

Pointers, Arrays and Exception Handling: Void Pointers, Pointer to Class, Pointer to Object, Void Pointer, Arrays. The keywords try, throw and catch. Creating own Exception Classes, Exception Handling Techniques (Terminate the Program, Fix the Error and Continue, Log the Error and Continue), Stack Unwinding.

Mathematics-III (Differential Calculus)

Module-1

Successive Differentiation, Leibnitz's Theorem. Limit, Continuity and Differentiability of function for one variable.

Module-2

Limit, Continuity and Differentiability (8 Hrs)

Limit, Continuity and Differentiability of function for several variables. Partial Derivatives, Euler's Theorem for Homogeneous functions, Total derivatives, Change of Variables. Maxima and Minima of Several Variables. Methods of Lagrange Multipliers. Taylor's and Maclaurin's Theorem with remainders of several variables.

Module-3

Vector Calculus (8 Hrs)

Vector Calculus: Gradient, Divergence and Curl of a Vector and their Physical Interpretations, Vector Identities. Directional Derivatives. Line, Surface and Volume integrals, Application of Green's, Stokes and Gauss Divergence Theorem (Without Proof).

Module-4

First Order Ordinary Differential Equations (6 Hrs)

Exact, Linear and Bernoulli's Equations, Euler's Equations, Equations not of First Degree: Equations Solvable for P, Equations Solvable for Y, Equations Solvable for X and Clairaut's Type.

Module-5

Ordinary Differential Equations od Higher Orders (8 Hrs)

Ordinary Differential Equations of Higher Orders: Second Order Linear Differential Equations with Variable Coefficients, Method of Variation of Parameters, Cauchy-Euler Equation; Power Series Solutions; Legendre Polynomials, Bessel Functions of the First Kind and their properties.

Module-6

Partial Differential Equations (6 Hrs)

Partial Differential Equations – First Order: First Order Partial Differential Equations, Solutions of First Order Linear and Non-Linear PDEs.

Technical Writing

Module-1

Introduction (10 Hrs)

Introduction: Fundamentals of Technical Writing: Need for Clear and Concise Technical Writing, Attributes of Technical Writing, Types of Technical Writing, Benefits of Technical Writing, Technical, Managerial and General Readers, Expressing versus Impressing, Correct use of Noun, Pronoun, Verb, Adjective, Adverbs, Tense and Punctuation.

Module-2

Performing Technical Studies (10 Hrs)

Performing Technical Studies: Types of Technical Studies, General Methodology- Proposing a Project, Gathering Background Information, Designing Test Plans, Performing Experiments, Reporting Results.

Writing Strategy: Analysis of Readers, Scope of Writing, Purpose and Objective.

Document Options: Document Hierarchy, Report Types and Selection.

Criteria for Good Technical Writing: Technical Content, Presentation, Language Skills.

Writing Style: Elements of Style, Examples of Writing Styles, Recommended Style, Learn to Prepare Effective Illustrations

Module-3
Formal Reports (10 Lectures)

The Outline and Introduction (Outline, Title, Front Matter, Writing the Introduction), Writing the Body (Writing a Procedure, Describing Machines/Processes, Writing Test Results, Writing the Discussion Section), Closure (Conclusions, Recommendations, References, Abstract, Back Matter, Report Distribution, Saving Reports).
Informal Reports: Elements of an Informal Report, Investigation Reports, Service Work, Action Letters and Proposals.
Typical Memo Reports.

Module-4
Review and Editing (10 Hrs)

Review and Editing: Types of Review and Edit, Review and Editing Methodology, Examples of Reviews.
Oral Presentations: Types of Oral Presentations, Preparation, Visual Aids, Impediments to Technical Writing, Maintaining Writing Skills, Measuring Report Results.

BOOKS

A.A Guide to Technical Writing", T. A. Rickard, Franklin Classics.
B. Technical Writing", S. Jayprakash, Himalaya Publishing House Pvt. Ltd.
C. Technical Writing", O. N. Pandey.