Gurugram University Gurugram

Curriculum for UG Degree Course

in

Electronics and Computer Engineering

(Engineering & Technology)

Gurugram University Scheme of Studies and Examination

Bachelor of Technology (Electronics and Computer Engineering)

SEMESTER-III

S. No.	Category	Course Code	Course Title	Hours per week			Credits	Marks for Sessional	Marks for End Term Examination	Total
				L	T	P				
1	PCC		Advanced data Structure	3	0	0	3	30	70	100
2	PCC		Database Management Systems with SQL	3	0	0	3	30	70	100
3	PCC		Introduction to AI & ML	3	0	0	3	30	70	100
4	PCC		Digital Electronics	3	0	0	3	30	70	100
5	PCC		Network Analysis and Synthesis	3	0	0	3	30	70	100
6	BSC		Probability Theory and Stochastic Processes.	3	0	0	3	30	70	100
7	PCC		Advanced data Structure Lab(P)	0	0	2	1	50	50	100
8	PCC		Database Management System Lab(P)	0	0	2	1	50	50	100
9	PCC		Digital Electronics Lab(P)	0	0	2	1	50	50	100
10	PCC		Network Analysis and Synthesis _Lab(P)	0	0	2	1	50	50	100
11	MC		Constitution of India	2	0	0	0	30	70	100*
Total				**28**			**22**	**380**	**620**	**1000**

NOTE:

Constitution of India :The examination of the regular students will be conducted by the concerned college/Institute internally. Each student will be required to score a minimum of 40% marks to qualify in the paper. The marks will not be included in determining the percentage of marks obtained for the award of a degree.

ADVANCE DATA STRUCTURE

Course code					
Category	**Professional Core Courses**				
Course title	Advance Data Structure				
Scheme and Credits	L	T	P	Credits	Semester = III
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

NOTE: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES

1. To impart the basic concepts of dictionaries and implementation of dictionaries.
2. To demonstrate operations of non-linear data structures Trees.
3. To demonstrate operations of non-linear data structures Graphs.
4. To familiar with File Organization.

UNIT-I

Review of Linear Data Structures: Linked List: Traverse, Insertion, Deletion; Circular List: Traverse, Insertion, Deletion, Doubly List and Circular List: Insertion and deletions; Stacks and Queue implementation using linked list.

Introduction to Dictionaries: Definition, Dictionary Abstract Data Type, Implementation of Dictionaries: Hashing: Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.

UNIT-II

Advanced Trees: Skip Lists: Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists, and various computational geometry methods for efficiently solving the new evolving problem

Trees: Review of binary trees and binary search trees: traversing, insertion, and deletion; AVL Trees, Red-Black Trees, 2-3 Trees, B-Trees, Splay Trees- all operations.

UNIT-III

Sets and Files: **Sets:** Representation on Sets, Operations on Sets, Application on Sets,

Files: File Concepts, File organization, Files and Streams, Working with Files Using I/O Stream, Sequential File Organization, Direct File Organization, Indexed Sequential Organization

UNIT-IV

Binary Search (Iterative and Recursive), Linear Search, Jump Search, Interpolation Search, Review of sorting algorithms and their complexity analysis.

COURSE OUTCOMES: **By the end of the course, a student would be able to:**

1. Design and Analyze programming problem statements.
2. Understand the ADT/libraries, and use it to design algorithms for a specific problem.
3. Select algorithm design approaches in a problem specific manner.
4. Understand and implement non linear data structures - graphs
5. Apply data structures and algorithms in real time applications
6. Discriminate the usage of various structures in approaching the problem solution.

TEXT AND REFERENCE BOOKS:

1. Seymour Lipschutz:Data Structures with C, Schaum's outline by TMH
2. E Horowitz and S. Sahni: Fundamentals of Data Structures in C, Second Edition, UniversitiesPress, Hyderabad.
3. R.B. Patel: Expert Data Structures in C, Khanna Publishers,2001.
4. R.L. Kruse: Data Structures & Program Design in C, PHI.
5. D.F. Knuth: The art of Computer Programming Vol 1, Narosa Publications,1985.
6. Byron S. Gottfried & J K Chhabra: Theory and Problems of Programming with C Language, SchaumSeries, TMH,2005.

DIGITAL ELECTRONICS

Course Code					
Category	**Professional Core Courses**				
Course title	**Digital Electronics**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester : III**
	3	**0**	**0**	**3**	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

NOTE: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objective: The objectives of this course are as under:

1. To provide a comprehensive introduction to digital logic design leading to the ability to understand binary codes, binary arithmetic and Boolean algebra and its relevance to digital logic design.
2. To study number system and codes.
3. To design & analyze combinational circuits and synchronous sequential logic circuits.
4. To familiarize students with basics of digital logic families.

UNIT I

Number system and codes: Binary, octal, hexadecimal and decimal Number systems and their inter conversion, BCD numbers (8421-2421), gray code, excess–3 code, cyclic code, code conversion, ASCII, EBCDIC codes. Binary addition and subtraction, signed and unsigned binary numbers, 1's and 2's complement representation.

UNIT II

Boolean Algebra: Basic logic circuits: Logic gates (AND, OR, NOT, NAND, NOR, Ex-OR, Ex_NOR and their truth tables,), Universal Gates, Laws of Boolean algebra, De-Morgan's theorem, Min term, Max term, POS, SOP, K_Map, Simplification by Boolean theorems, don't care condition

Logic Families: Introduction to digital logic family such as RTL, DTL, TTL, ECL, CMOS, IIR, HTL etc., theircomparative study, Basic circuit, performance characteristics, Wired logic, open collector output etc

UNIT III

Combinational Logic: The Half adder, the full adder, subtractor circuit. Multiplexer demultiplexer, decoder, BCD to seven segment decoder ,encoders. Flip flop and Timing circuit : set-reset laches, D-flipflop, R-S flip-flop, J-K Flip-flop, Master slave Flip flop, edge triggered flip-flop, T flip-flop.

UNIT IV

Registers & Counters: Synchronous/Asynchronous counter operation, Up/down synchronous counter, application of counter, Serial in/Serial out shift register, Serial in/Serial out shift register, Serial in/parallel out shift register, parallel in/ parallel out shift register, parallel in/Serial out shift register, Bi-directional register.

Course outcomes:

1. To present a problem oriented introductory knowledge of Digital circuits and its applications.
2. Learn Number system and codes.
3. Study Boolean algebra and theorems
4. To focus on the study of electronic circuits
5. Design and analyze combinational circuits.
6. Design and analyze synchronous sequential logic circuits.

Text/Reference Books:

1. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill.
2.Digital Fundamentals by Morris and Mano, PHI Publication
3 Fundamental of digital circuits by A.ANANDKUMAR,PHI Publication

DATABASE MANAGEMENT SYSTEMS WITH SQL

Course code					
Category	Professional Core Courses				
Course title	Database Management Systems with SQL				
Scheme and Credits	L	T	P	Credits	Semester III
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

NOTE: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES

1. Understand the different issues involved in the design and implementation of a database management system.
2. Understand SQL for manipulating the Data.
3. Study the physical, conceptual and logical database designs
4. Study basic concepts of Transaction, Concurrency and Recovery Management Strategies
5. Design and build a database management system.

UNIT-I

Database system architecture: Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML).

Data models: Entity-relationship model, network model, relational and object-oriented data models, integrity constraints, data manipulation operations.

UNIT-II

Relational query languages: Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server.

Relational database design: Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Lossless design.

Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.

UNIT-III

Transaction processing: Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp-based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery.

Storage strategies: Indices, B-trees, hashing,

UNIT-IV

Database Security: Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.

Advanced topics: Object-oriented and object-relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.

COURSE OUTCOMES: **By the end of the course, a student would be able to**

1. For a given query, write relational algebra expressions for that query and optimize the developed expressions
2. For a given requirement specification, design the databases using E R method and normalization.
3. For a given specification, construct the SQL queries for Open source and Commercial DBMS - MYSQL, ORACLE, and DB2.
4. For a given query, optimize its execution using Query optimization algorithms
5. For a given transaction-processing system, determine the transaction atomicity, consistency, isolation, and durability.
6. Implement the isolation property, including locking, and time stamping based on concurrency control and Serializability of scheduling.

TEXT AND REFERENCE BOOKS:

1. Database System Concepts, 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill
2. Principles of Database and Knowledge–Base Systems, Vol 1 by J. D. Ullman, Computer Science Press.
3. Fundamentals of Database Systems, 5th Edition by R. Elmasri and S. Navathe, Pearson Education
4. Foundations of Databases, Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley

INTRODUCTION TO AI AND ML

Course code					
Category	Professional Core Courses				
Course title	Introduction to AI & ML				
Scheme and Credits	L	T	P	Credits	Semester = III
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

NOTE: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. Understand the very basics and Uses of Artificial Intelligence (AI)
2. Understand the basics and uses of Machine Learning (ML)
3. To provide the most fundamental knowledge to the students so that they become familiar with basic principles of AI towards problem solving, inference, knowledge representation and learning
4. Understand the logic-building methods and inferences for the knowledge representation.
5. Explore application of AI techniques in Expert systems, Neural Networks.

UNIT - I

Introduction to AI: What is AI, Turing test, History of AI, Artificial Intelligence Techniques, advantages, and limitations of AI, Impact and Examples of AI

Applications of AI by domain: Transportation, home/service robots, healthcare, education, low-resource communities, public safety and security, employment and workplace, entertainment, finance, banking and insurance.

Introduction to Machine Learning: What is Machine Learning,History of Machine Learning,Machine Learning and Statistics,Types of Machine Learning – Supervised, Unsupervised, Semi-supervised, Reinforcement Learning,

UNIT - II

Intelligent agent,Nature of Agents, Rationality and Rational agent with performance measures Flexibility and Intelligent agents, Task environment and its properties, Types of agents, other aspects of agents;

Multi-Agent Systems: Agents and Objects; Agents and Expert Systems; Generic Structure of Multiagent System, Semantic Web, Agent Communication, Knowledge Sharing using Ontologies, Agent Development Tools.

UNIT - III

Knowledge Representation schemes and reasoning: Approaches and issues, procedural vs declarative knowledge, Matching, conflict resolution.

Logic: Propositional logic, predicate logic, Resolution, Resolution in proportional logic and predicate logic, Clause form, unification algorithm.

Uncertain Knowledge and reasoning: Methods, Bayesian probability and belief network, Probabilistic reasoning, Forward andbackward reasoning, Other uncertain techniques-Data mining , Fuzzy logic, Dempster -shafer theory

UNIT –IV

Planning: The Planning problem, planning with state space search, partial order planning, planning graphs, planning with propositional logic, Analysis of planning approaches, Hierarchical planning, conditional planning, Continuous and Multi Agent planning.

Learning: Introduction to Learning, Types of Learning: Learning by Induction, Rote Learning, Symbol Based Learning, Identification Trees, Explanation Based Learning, Transformational Analogy,Introduction to Neural Networks, Expert Systems.

Course Outcomes: :

1. Formulate a problem and build intelligent agents
2. Apply basic principles of AI in solutions that require problem solving, inference, knowledge representation and learning.
3. Analyze the problem and infer new knowledge using suitable knowledge representation schemes
4. Develop planning and apply learning algorithms on real world problems
5. Design an expert system and implement advance techniques in Artificial Intelligence.
6. Create a real life and industrial problems related mini project.

TEXT AND REFERENCE BOOKS:

1. Artificial Intelligence 3e: A Modern Approach Paperback – By Stuart J Russell & Peter Norvig; Publisher – Pearson
2. Artificial Intelligence Third Edition by Kevin Knight, Elaine Rich, B. Nair – Mc Graw Hill
3. Artificial Intelligence Third Edition by Patrick Henry Winston – Addison-Wesley Publishing Company
4. Machine Learning using Pythons, U Dinesh Kumar, Manaranjan Pradhan, John Wiley & Sons.
5. A Classical Approach to Artificial Intelligence, M. C. Trivedi, Khanna Publishing House.
6. Machine Learning, V. K. Jain, Khanna Publishing House.
7. Advanced Data Analytics Using Python: With Machine Learning, Deep Learning, Sayan Mukhopadhyay, Apress.
8. Introduction to Machine Learning, Jeeva Jose, Khanna Publishing House.

PROBABILITY THEORY AND STOCHASTIC PROCESSES

Course Code					
Category	**Basic Science Courses**				
Course title	**Probability Theory and Stochastic Processes**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: III**
	3	**0**	**0**	**3**	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

NOTE: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objective: The objectives of this course are as under:

1. To introduce the fundamentals of probability theory and random processes and illustrate these concepts with engineering applications.
2. To introduce random variables.
3. The course introduces the concept of Stochastic Processes.
4. To understand regression analysis.

UNIT-I

Sets and set operations; Probability space; Conditional probability and Bayes theorem; Combinatorial probability and sampling models. Discrete random variables, probability mass function, probability distribution function, example random variables and distributions;
Continuous random variables, probability density function, probability distribution function, example distributions;

UNIT -II

Joint distributions, functions of one and two random variables, moments of random variables; Conditional distribution, densities and moments; Characteristic functions of a random variable; Markov, Chebyshev and Chernoff bounds;

UNIT -III

Random sequences and modes of convergence (everywhere, almost everywhere, probability, distribution and mean square); Limit theorems; Strong and weak laws of large numbers, central limit theorem. Random process. Stationary processes. Mean and covariance functions. Ergodicity. Transmission of random process through LTI. Power spectral density

UNIT -IV

Regression analysis (linear and non-linear) ,Confidence intervals, Hypothesis testing ,Error analysis

Course Outcomes:

1. Develop understanding of basics of probability theory.
2. Understand random variables.
3. Identify different distribution functions and their relevance.
4. Apply the concepts of probability theory to different problems.
5. Extract parameters of a stochastic process and use them for process characterization.
6. Apply regression analysis.

Text/Reference Books:

1. H. Stark and J. Woods, `Probability and Random Processes with Applications to Signal Processing," Third Edition, Pearson Education
2. A.Papoulis and S. Unnikrishnan Pillai, ``Probability, Random Variables and Stochastic Processes," Fourth Edition, McGraw Hill.
3. K. L. Chung, Introduction to Probability Theory with Stochastic Processes, Springer International
4. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability, UBS Publishers,
5. S. Ross, Introduction to Stochastic Models, Harcourt Asia, Academic Press

NETWORK ANALYSIS & SYNTHESIS

Course Code					
Category	**Professional Core Courses**				
Course title	**Network Analysis & Synthesis**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: III**
	3	**1**	**0**	**3**	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objective: The objectives of this course are as under:

1. To give students knowledge of AC theorems
2. To make the students understand concepts of two port networks, and network synthesis.
3. To give the students a fair knowledge on the Laplace transforms
4. To understand filters.

UNIT - I

Node and mesh analysis, matrix approach of network containing voltage & current sources and reactance's, source transformation and duality.

Network theorems: Superposition, reciprocity, Thevenin's, Norton's, Maximum power transfer, compensation and Tallegen's theorem as applied to A.C. circuits.

UNIT - II

Trigonometric and exponential Fourier series: Discrete spectra and symmetry of waveform, steady state response of a network to non-sinusoidal periodic inputs, power factor, effective values, Fourier transform and continuous spectra, three phase unbalanced circuit and power calculation.

UNIT - III

Laplace transforms and properties: Partial fractions, singularity functions, waveform synthesis, analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms evaluation of initial conditions.

UNIT - IV

Transient behavior, concept of complex frequency, driving points and transfer functions poles and zeros of immittance function, their properties, sinusoidal response from pole-zero locations, convolution theorem and two four port network and interconnections, behaviour of series and parallel resonant circuits, introduction to band pass, low pass, high pass and band reject filters.

Course Outcomes: At the end of this course students will demonstrate the ability to:

1. Understand basics electrical circuits with nodal and mesh analysis.
2. Appreciate electrical network theorems.
3. Understand Trigonometric and exponential Fourier series.
4. Apply Laplace transform for steady state and transient analysis.
5. Determine different network functions.
6. Appreciate the frequency domain techniques.

Text/Reference Books

1. Franklin F. Kuo, "Network Analysis and Synthesis," Wiley India Education, 2nd Ed., 2006.
2. Van, Valkenburg, "Network analysis," Pearson, 2019.
3. Sudhakar, A., Shyammohan, S. P., "Circuits and Network," Tata McGraw-Hill New Delhi, 1994.
4. A William Hayt, "Engineering Circuit Analysis," 8th Edition, McGraw-Hill Education.
5. A. Anand Kumar, "Network Analysis and Synthesis," PHI publication, 2019.

ADVANCE DATA STRUCTURE LAB

Course code					
Category	Laboratory Course				
Course title	Advance Data Structure Lab(C/C++/Python)				
Scheme and Credits	L	T	P	Credits	Semester III
	0	0	2	2	
Classwork	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	02 Hours				

Notes:

(i) At least 10 experiments are to be performed by students in the semester.

(ii) At least 7 experiments should be performed from the list, remaining three experiments may either be performed from the above list or designed and set by the concerned institution as per the scope of the syllabus

COURSE OBJECTIVES:

1. To impart the basic concepts of dictionaries and implementation of dictionaries.
2. To program a non-linear data structures Trees & data structures Graphs.
3. To familiar with File Organization.

CONTENTS

1. Write a program to perform the following:
   i) Creating a Binary Tree of integers
   ii) Traversing the above binary tree in preorder, inorder and postorder.
2. Write a program to create an AVL Tree of integers
3. Write a program to create a SplayTree of integers
4. Write a program to create a B-Tree of integers.
5. Write a program that implements Kruskals algorithm using a disjoint set data structure. The program takes as input a file (data.txt), in which each line either represents a vertex or an edge. For the edge lines, the first integer on that line representing the starting vertex, the second the ending vertex, and the third the weigh of the edge. Use this file to construct, line by line, the graph upon which Kruskal's algorithm will be run
6. Write a program to simulate various graph traversing algorithms.
7. Write a program to find the minimal spanning tree of a graph using the Prim's algorithm. The program should be able to read in the weight matrix of a graph and produce the minimal spanning tree Generate weight matrices (using a random number generator) with a large number of nodes .

COURSE OUTCOMES: By the end of the course, a student would be able to:

1. Apply appropriate advanced data structure and efficient algorithms to approach the problems of various domain.
2. Design the algorithms to solve the programming problems
3. Use effective and efficient data structures in solving various Advanced Data Computer Engineering domain problems.
4. Analyze the algorithmic solutions for resource requirements and optimization.
5. Use appropriate modern tools to understand and analyze the functionalities confined to the data structure usage.
6. Compare & Contrast various non-linear data structures.

DATABASE MANAGEMENT SYSTEM LAB

Course code					
Category	Laboratory courses				
Course title	Database Management System Lab				
Scheme and Credits	L	T	P	Credits	Semester III
	0	0	2	1	
Classwork	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	02 Hours				

Notes:

(iii) At least 10 experiments are to be performed by students in the semester.

(iv) At least 7 experiments should be performed from the list, remaining three experiments may either be performed from the above list or designed and set by the concerned institution as per the scope of the syllabus

COURSE OBJECTIVES:

1. Keep abreast of current developments to continue their own professional development
2. To engage themselves in lifelong learning of Database management systems theories and technologies this enables them to purse higher studies.
3. Develop team spirit, effective work habits, and professional attitude in written and oral forms, towards the development of database applications.

CONTENTS:

1. Creation of a database and writing SQL queries to retrieve information from the database.
2. Performing Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on conditions.
3. Creation of Views, Synonyms, Sequence, Indexes, Save point.
4. Creating an Employee database to set various constraints.
5. Creating relationship between the databases. iv. Study of PL/SQL block.
6. Write a PL/SQL block to satisfy some conditions by accepting input from the user.
7. Write a PL/SQL block that handles all types of exceptions.
8. Creation of Procedures
9. Creation of database triggers and functions
10. Mini project (Application Development using Oracle/ MySQL)
    a. Inventory Control System
    b. Material Requirement Processing.
    c. Hospital Management System.
    d. Railway Reservation System.
    e. Personal Information System.
    f. Web Based User Identification System.
    g. Time Table Management System.
    h. Hotel Management

COURSE OUTCOMES: By the end of the course, a student would be able to:

1. Students get practical knowledge on designing and creating relational database systems
2. Implement DDL and DML commands.
3. Implement various advanced queries execution such as relational constraints, joins, set operations, aggregate functions, trigger and view.
4. Design & implement embedded SQL.
5. Develop the ability to handle databases of varying complexities

DIGITAL ELECTRONICS LABORATORY

Course Code					
Category	**Laboratory Courses**				
Course title	**Digital Electronics Laboratory**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: III**
	0	**0**	**2**	**1**	
Class Work	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	2Hrs				

Notes:

(1) At least 10 experiments are to be performed by students in the semester.

(2) At least 7 experiments should be performed from the list, remaining three experiments may either be performed from the above list or designed and set by the concerned institution as per the scope of the syllabus

COURSE OBJECTIVES:

1. To develop programs in Hardware Description Language.
2. To design and implement synchronous sequential, asynchronous sequential circuits.
3. To be familiar with basic combinational and sequential components used in the typical data path designs.

LIST OF EXPERIMENTS

1. To study of TTL gates – AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR.
2. To design & realize a given function using K-maps and verify its performance.
3. To verify the operation of multiplexer & Demultiplexer.
4. To verify the operation of comparator.
5. To verify the truth tables of S-R, J-K, T & D type flip flops.
6. To study FLIP-FLOP conversion.
7. To verify the operation of bi-directional shift register.
8. To design & verify the operation of 3-bit synchronous counter.
9. To design and verify the operation of synchronous UP/DOWN decade counter using
10. J K flip-flops & drive a seven-segment display using the same.
11. To design and verify the operation of asynchronous UP/DOWN decade counter using
12. J K flip-flops & drive a seven-segment display using the same.
13. To design a 4-bit shift register and verify its operation.

COURSE OUTCOMES: By the end of the course, a student would be able to:

1. Implement basic & universal gates.
2. Analyze & design combinational circuits.
3. Ability to design asynchronous sequential circuits using basic flip-flops& counters.
4. Ability to design synchronous sequential circuits using basic flip-flops& counters.
5. Familiarize with the necessary software skills to design basic digital systems.
6. Technical expertise in debugging the digital circuits.

NETWORK ANALYSIS & SYNTHESIS LABORATORY

Course Code						
Category	**Laboratory Courses**					
Course title	**Network Analysis & Synthesis Laboratory**					
Scheme	**L**	**T**	**P**	**Credits**	**Semester: III**	
	0	**0**	**2**	**1**		
Class Work	50 Marks					
Exam	50 Marks					
Total	100 Marks					
Duration of Exam	3Hrs					

Notes:

(i) At least 10 experiments are to be performed by students in the semester.
(ii) At least 7 experiments should be performed from the list, remaining three experiments may either be performed from the above list or designed and set by the concerned institution as per the scope of the syllabus
(i) Group of students for practical should be 15 to 20 in number.

Course Objective: The objectives of this course are as under:

1. To impart practical knowledge to the students about the basic theory concepts of network theory and familiarize them with various kits, filters and parameters used in the circuits.
2. To enable students to design and analyze various circuits using the network components (Resistor, capacitor and inductor).
3. To make students practically capable of designing various types of filters implement such filters for various high level applications and systems.

LIST OF EXPERIMENTS:

1. Introduction of circuit creation & simulation software like MATLAB, TINA PRO etc.
2. Study of Transient response of RC, RL circuit.
3. To find the resonance frequency, Band width of RLC series circuit.
4. To plot the frequency response of low pass filter and determine half-power frequency.
5. To plot the frequency response of high pass filter and determine the half-power frequency.
6. To plot the frequency response of band-pass filter and determine the band-width.
7. To calculate and verify "Z" & "Y" parameters and "ABCD" parameters of a two-port network
8. To determine equivalent parameter of parallel-series, cascading and parallel connections of two port network.
9. To calculate and verify Compensation theorem and Tellegen's theorem.
10. To synthesize a network of a given network function and verify its response.
11. To calculate and verify Maximum power transfer and Reciprocity theorem.

** Note: Use appropriate Software or simulation tool for experiments.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Implement the basic network theory concepts practically and will be able to verify filter results derived in theory.
2. Design and analyze various network and filter circuits for various practical problems.
3. Understand all the concepts and parameters of network theory.
4. Understand to design and verify theorems.
5. Implement the circuit on software.
6. Can verify transient response virtually.

CONSTITUTION OF INDIA

Course code					
Category	Mandatory courses				
Course title	Constitution of India				
Scheme and Credits	L	T	P	Credits	Semester : III
	2	0	0	-	
Classwork	50 Marks				
Exam	50 Marks				
Total	100* Marks				
Duration of Exam	3Hrs				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

UNIT - I

Philosophy of Indian Constitution: Salient features of Indian Constitution, Preamble, and Nature of Indian Constitution, Procedure for amendment of the Constitution.

UNIT - II

Federal structure and distribution of legislative and financial powers between the Union and the States

UNIT - III

Organs of Governance: President – Qualification and Powers of the President, Governor- Qualification and Powers of Governor,

Parliament: Composition, Qualifications and Disqualifications, Judiciary: Appointment, Tenure and Removal of Judges.

UNIT - IV

Fundamental Rights: Origin and development of Fundamental rights, Need for fundamental rights. Introduction to Rights to equality, right to freedom, right against exploitation, Right to freedom of religion, Cultural and Education rights and Fundamental duties.

COURSE OUTCOMES: At the end of this course, students will demonstrate the ability to

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to a revolution in India.
3. Exercise his fundamental rights in proper sense at the same time identifies his responsibilities in national building.
4. Analyse the Indian political system, the powers and functions of the Union, State and Local Governments in detail.
5. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
6. Discuss the passage of the Hindu Code Bill of 1956.

TEXT AND REFERENCE BOOKS:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S.N. Busi, Dr. B.R. Ambedkar framing of Indian Constitution, latest Edition
3. M.P. Jain, Indian Constitution Law, Lexis Nexis, latest edition
4. D.D. Basu, Introduction to Constitution of India, Lexis Nexis, latest edition.

NOTE: The examination of the regular students will be conducted by the concerned college/Institute internally. Each student will be required to score a minimum of 40% marks to qualify in the paper. The marks will not be included in determining the percentage of marks obtained for the award of a degree. However, these marks will be shown in the detailed marks certificate of the students.

Gurugram University Scheme of Studies and Examination

Bachelor of Technology (Electronics and Computer Engineering)

SEMESTER-IV

S. No.	Category	Course Code	Course Title	Hours per week			Credits	Marks for Sessional	Marks for End Term Examination	Total
				L	T	P				
1	PCC		Analog and Digital Communication	3	0	0	3	30	70	100
2	ESC		Electronic Devices and Circuits	3	0	0	3	30	70	100
3	PCC		Design and Analysis of Algorithm	3	0	0	3	30	70	100
4	PCC		Computer Organization & Architecture	3	0	0	3	30	70	100
5	BSC		Discrete Mathematics	3	0	0	3	30	70	100
6	PCC		Electromagnetic field Theory	3	0	0	3	30	70	100
7	LC		Design and Analysis of Algorithm LAB	0	0	2	1	50	50	100
8	LC		Analog and Digital Communication Lab	0	0	2	1	50	50	100
9	LC		Electronic Devices and Circuits	0	0	2	1	50	50	100
10	MC		Scientific & Technical writing Skill*	2	0	0	-	30	70	100*
Total				**27**			**22**	**330**	**570**	**900**

NOTE:

1. Scientific & Technical writing Skills: The examination of the regular students will be conducted by The concerned college/ Institute internally. Each student will be required to score a minimum of 40% marks to qualify in the paper. The marks will not be included in determining the percentage of marks obtained for the award of a degree.
2. At the end of 4th semester each student has to undergo Practical Training of 4/6 weeks in an Industry/ Institute/ Professional Organization/Research Laboratory/ training centre etc. and submit typed report along with a certificate from the organization & its evaluation shall be carried out in the 5thSemester.

Analog and Digital Communication

Course Code					
Category	**Professional Core Courses**				
Course title	**Analog and Digital Communication**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester : IV**
	3	**0**	**0**	**3**	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

NOTE: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objective: The objectives of this course are as under:

1. To introduce the students to the basics of different types of modulation techniques
2. To aim at a comprehensive coverage of design of radio transmitter and receiver
3. The course aims to make the student familiar with Digital Modulation and Demodulation techniques, Digital transmission, reception etc.

UNIT - I

Course Contents: Review of signals and systems, Frequency domain of signals, Principles of Amplitude Modulation Systems- DSB, SSB and VSB modulations. Angle Modulation, Representation of FM and PM signals, Spectral characteristics of angle modulated signals.

UNIT - II

Review of probability and random process. Gaussian and white noise characteristics, Noise in amplitude modulation systems, Noise in Frequency modulation systems. Pre-emphasis and Deemphasis, Threshold effect in angle modulation. Pulse modulation. Sampling process. Pulse Amplitude and Pulse code modulation (PCM), Differential pulse code modulation. Delta modulation, Noise considerations in PCM, Time Division multiplexing, Digital Multiplexers.

UNIT - III

Elements of Detection Theory, Optimum detection of signals in noise, Coherent communication with waveforms- Probability of Error evaluations. Baseband Pulse Transmission- Inter Symbol Interference and Nyquist criterion.
Bandpass Digital Modulation schemes- Phase Shift Keying, Frequency Shift Keying, Quadrature Amplitude Modulation, Continuous Phase Modulation and Minimum Shift Keying.

UNIT - IV

Information Measures: Discrete Source models – Memoryless and Stationary, Mutual Information, Self-Information, Conditional Information, Average Mutual Information, Entropy, Entropy of the block.

Course Outcomes:

1. Illustrate the principles of amplitude and angle modulation techniques
2. Analyse the performance of waveform coding techniques.
3. Understand various digital modulation techniques.
4. Compare bandpass digital modulation techniques for bit error rate, bandwidth and power requirements
5. Understand the concept of information rate and channel capacity.

Text and Reference Books:

1. B.P.Lathi,Zhi Ding “Modern Digital and Analog Communication”, Oxford, 4th Edition,2011
2. Haykin S., "Communications Systems", John Wiley and Sons, 2001.
3. Proakis J. G. and Salehi M., "Communication Systems Engineering", Pearson Education, 2002.
4. Taub H. and Schilling D.L., "Principles of Communication Systems",Tata McGraw Hill, 2001.
5. Proakis J.G., ``Digital Communications", 4th Edition, McGraw Hill, 2000.
6. R. Anand, Communication Systems, Khanna Book Publishing Company, 2011.

Electronic Devices and Circuits

Course Code					
Category	ESC				
Course Title	Electronic Devices and Circuits				
Semester and Credits	L	T	P	Credits	Semester - IV
	3	0	0	3	
Class Work	30 Marks				
Examination	70 Marks				
Total	100 Marks				
Duration of Exams	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objectives:

1. The student should be made to:
2. Understand the structure of basic electronic devices.
3. Be exposed to active and passive circuit elements.
4. Explore the characteristics of amplifier gain and frequency response.
5. Learn the required functionality of positive and negative feedback systems

UNIT I

PN junction diode structure, operation and V-I characteristics, diffusion and transition capacitance Rectifiers: Half Wave and Full Wave Rectifier, Display devices: LED, Laser diodes, Zener diode characteristics, Zener Reverse characteristics , Zener as regulator, thyristors and IGBTS structure and characteristics.

UNIT II

BJT small signal model: Analysis of CE, CB, CC amplifiers-Gain and frequency response MOSFET small signal model: Analysis of CS and Source follower, Gain and frequency response High frequency analysis.

UNIT III

BIMOS cascade amplifier, Differential amplifier :Common mode and Difference mode analysis FET input stages ,Single tuned amplifiers , Gain and frequency response ,Neutralization methods, power amplifiers Types (Qualitative analysis).

UNIT IV

Advantages of negative feedback ,voltage / current, series, Shunt feedback ,positive feedback Condition for oscillations, phase shift ,Wien bridge, Hartley, Colpitts and Crystal oscillators.

Course Outcomes: After completing this course, the students should be able to

CO1 : Explain the structure and working operation of basic electronic devices.
CO2 : Able to identify and differentiate both active and passive elements
CO3 : Analyse the characteristics of different electronic devices such as diodes and transistors
CO4 : Choose and adapt the required components to construct an amplifier circuit.
CO5 : Employ the acquired knowledge in design and analysis of oscillators

TEXT BOOKS:

1. David A. Bell ,"Electronic devices and circuits", Oxford University higher education, 5th edition 2008.
2. Electronic Devices and Circuit Theory" by Robert L. Boylestad and Louis Nashelsky.

REFERENCE BOOKS

1. Balbir Kumar, Shail.B.Jain, “Electronic devices and circuits” PHI learning private limited, 2nd edition 2014.
2. Thomas L.Floyd, “Electronic devices” Conventional current version, Pearson prentice hall, 10th Edition, 2017.
3. Donald A Neamen, “Electronic Circuit Analysis and Design” Tata McGraw Hill, 3rd Edition, 2003.
4. Robert L.Boylestad, “Electronic devices and circuit theory”, 2002

Design & Analysis of Algorithms

Course code					
Category	**Professional Core Courses**				
Course title	**Design & Analysis of Algorithms**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Semester IV**
	3	**0**	**0**	**3**	
Classwork	**30 Marks**				
Exam	**70 Marks**				
Total	**100 Marks**				
Duration of Exam	**03 Hours**				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

1. Analyze the asymptotic performance of algorithms.
2. Write rigorous correctness proofs for algorithms.
3. Demonstrate a familiarity with major algorithms and data structures.
4. Apply important algorithmic design paradigms and methods of analysis.
5. Synthesize efficient algorithms in common engineering design situations.

UNIT-I

Introduction to Algorithms: Algorithm, Performance Analysis (Time and Space complexity), Asymptotic Notation (Big OH, Omega and Theta)-best, average and worst-case behaviour. Elementary Data Structures (Basic terminology of Stacks and Queues, Tree, Graph), Sets and Disjoint Set Union.

Divide and Conquer: General method, Binary Search, Merge Sort, Quick Sort, and other sorting algorithms with divide and conquer strategy, Strassen's Matrix Multiplication algorithms and analysis of these problems.

UNIT-II

Greedy Method: General method, Fractional Knapsack problem, Job Sequencing with Deadlines, Minimum Cost Spanning Trees, Single source shortest paths.

Dynamic Programming: General method, Optimal Binary Search Trees, 0/1 knapsack, The Traveling Salesperson problem.

UNIT-III

Back Tracking: General method, The 8-Queen's problem, Sum of subsets, Graph Colouring, Hamiltonian Cycles.

Branch and Bound: The method, 0/1 knapsack problem, Traveling Salesperson problem, Efficiency considerations.

UNIT-IV

NP Hard and NP Complete Problems: Basic concepts, Cook's theorem, NP hard graph problems, NP hard scheduling problems, NP hard code generation problems, and Some simplified NP hard problems.

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

1. To identify and justify correctness of algorithms and to analyse running time of algorithms base on asymptotic analysis.
2. To understand when an algorithmic design situation calls for the divide-and-conquer paradigm.
3. Describe the greedy paradigm and dynamic-programming paradigm. Explain when an algorithmic design situation calls for it.
4. Decide and apply algorithmic strategies to solve given problem
5. Developing greedy algorithms/dynamic programming algorithms, and analyze it to determine its computational complexity.
6. To write the algorithm using Backtracking and Branch and Bound strategy to solve the problems for any given model engineering problem.

TEXT/REFERENCE BOOKS:

1. Fundamental of Computer algorithms, Ellis Horowitz and Sartaj Sahni, 1978, Galgotia Publication
2. Introduction to Algorithms, Thomas H Cormen, Charles E Leiserson and Ronald L Rivest: 1990, TMH
3. The Design and Analysis of Computer Algorithm, Aho A.V. Hopcroft J.E., 1974, Addison Wesley.
4. Algorithms-The Construction, Proof and Analysis of Programs, Berlion, P.Bizard, P., 1986. Johan Wiley & Sons,
5. Writing Efficient Programs, Bentley, J.L., PHI
6. Introduction to Design and Analysis of Algorithm, Goodman, S.E. &Hedetnieni, 1997, MGH.
7. Introduction to Computers Science- An algorithms approach, Jean Paul Trembley, Richard B.Bunt, 2002, T.M.H.
8. Fundamentals of Algorithms: The Art of Computer Programming Vol Knuth, D.E.: 1985, Naresh Publication.

COMPUTER ORGANIZATION & ARCHITECTURE

Course code					
Category	**Professional Core Courses**				
Course title	**Computer Organization & Architecture**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Semester IV**
	3	**0**	**0**	**3**	
Classwork	**30 Marks**				
Exam	**70 Marks**				
Total	**100 Marks**				
Duration of Exam	**03 Hours**				

NOTE: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

1. Understand the Computer Systems work and its basic principles
2. Familiar with Instruction Level Architecture and Instruction Execution and memory system design
3. Analyse how the I/O devices are accessed in Input-Output Organization.
4. Understand the concepts of pipelining techniques.

UNIT-I

Data representation: Data Types, Complements, Fixed-Point Representation, Conversion of Fractions, Floating-Point Representation, Gray codes, Decimal codes, Alphanumeric codes, Error Detection Codes.

Register Transfer and Microoperations : Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Microoperations, Logic Microoperations, Shift Microoperations, Arithmetic Logic Shift Unit.

UNIT-II

Basic Computer Organization and Design : Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instruction, Input-Output Instruction, Complete Computer Description, Design of Basic Computer, Design of Accumulator Logic.

Central Processing Unit : General Register Organization, Stack organization, Instruction Format, Addressing Modes, Data Transfer and Manipulation, Program Control, RISC, CISC.

UNIT-III

Pipelining: Parallel Processing, Amdahl's law, Pipelining, Arithmetic Pipeline, Instruction Pipeline, Pipeline Hazards, RISC Pipeline.

Parallel Processors: Introduction to Parallel Processors, Concurrent access to memoryandCache Coherency.

Vector Processing : Vector Operations, Memory Interleaving, Supercomputers, Array Processors:Attached Array Processor, SIMD Array Processor.

UNIT-IV

Input-output Organization : I/O deviceinterface, I/O transfers–program controlled, interrupt driven and DMA, Privileged and Non-Privileged Instructions, Software Interrupts.

Memory organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache

Memory, Associative Mapping, Direct Mapping, Set-Associative Mapping, Writing into Cache, Cache Initialization, Virtual Memory.

COURSE OUTCOMES: **At the end of course, the student will be able to:**

1. Draw the functional block diagram of a single bus architecture of a computer and describe the function of the instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set.
2. Write assembly language program for specified microprocessor for computing 16 bit multiplication, division and I/O device interface (ADC, Control circuit, serial port communication).
3. Write a flow chart for Concurrent access to memory and cache coherency in Parallel Processors and describe the process.
4. Given a CPU organization and instruction, design a memory module and analyze its operation by interfacing with the CPU.
5. Given a CPU organization, assess its performance, and apply design techniques to enhance performance using pipelining, parallelism and RISC methodology.
6. Evaluate various design alternatives in processor organization

TEXT/REFERENCE BOOKS:

1. "Computer System Architecture", 3rd Edition by M.Morris Mano, Pearson.
2. "Computer Organization and Design: The Hardware/Software Interface", 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.
3. "Computer Organization and Embedded Systems", 6th Edition by Carl Hamacher, McGraw Hill Higher Education.
4. "Computer Architecture and Organization", 3rd Edition by John P. Hayes, WCB/McGraw-Hill
5. "Computer Organization and Architecture: Designing for Performance", 10th Edition by William Stallings, Pearson Education.
6. "Computer System Design and Architecture", 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education.

DISCRETE MATHEMATICS

Course code					
Category	**Basic Science courses**				
Course title	**Discrete Mathematics**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Semester IV**
	3	**1**	**0**	**4**	
Classwork	**30 Marks**				
Exam	**70 Marks**				
Total	**100 Marks**				
Duration of Exam	**03 Hours**				

NOTE: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

1. To get familiar and understand the fundamental notions in discrete mathematics
2. To understand and demonstrate the basic concept of an algorithm and its application in combinatorial mathematics
3. To identify the basic properties of graphs and trees and model simple applications

UNIT-I

SET THEORY, RELATIONS, FUNCTIONS, LOGIC AND PROPOSITIONAL CALCULUS

Set Theory: Introduction to set theory, Venn diagrams, Set operations, Algebra of sets, Duality, Finite and infinite sets, Counting principles, Power sets, Partitions, and Multi sets.

Relations: Cartesian product, Representation of relations, Types of relation, Binary relation, Equivalence relations, Partitions, Partial ordering relations, POSET, Hasse diagram, Lattices and its types.

Functions: Definition, Types of functions, Bijective functions, Composition of functions, Inverse functions, recursively defined functions, Finite and infinite sets, Countable and uncountable sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem.

Logic And Propositional Calculus: Introduction, Propositions and compound propositions, Logical operations, Propositions and truth tables, Tautologies, Contradictions, Logical equivalence, Algebra of propositions, Conditional and Bi-conditional statements, The use of Quantifiers.

UNIT-II

RECURRENCE RELATION

Recursion AndRecurrence Relation: Polynomials and their evaluation, Sequences, Introduction to AP, GP and AG Series, Partial Fractions, Recurrence Relation, Linear Recurrence Relations with Constant Coefficients, Linear Homogeneous Recurrence Relations with Constant Coefficients, Particular Solution- Homogeneous Linear Difference Equations, Non-Homogeneous Linear Difference Equations, Total Solution, Solving recurrence relation using generating functions.

UNIT-III

ALGEBRAIC STRUCTURES

Definitions and examples of Algebraic Structures with one Binary Operation: Semi Groups, Monoids, Groups, Semigroups, Subgroups, Abelian groups, Cyclic group, Congruence Relation

Definitions and examples of Algebraic Structures with two Binary Operation: Rings, Fields; Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form.

UNIT-IV

GRAPHS THEORY AND TREES:

Graphs Theory: Introduction to graphs and their properties, Degree, Connectivity, Path, Cycle, Directed and undirected graphs, Subgraph, Bipartite Graphs, Regular Graphs, Connected Graphs, Multigraph and Weighted graph, Homomorphic and Isomorphic graphs, Paths and circuits, Shortest path algorithm for weighted graphs, Eulerian paths and circuits, Hamiltonian path and circuits, Planar Graphs, Euler's formulae, Graph Colouring.

Trees: Binary trees and its traversals, Trees Sorting, Spanning trees, and Minimal Spanning tree(Prim's and Kruskal's Algorithm).

COURSE OUTCOMES: **By the end of the course, a student would be able to**

1. To solve mathematical problems based on concepts of set theory, relations, functions and lattices.
2. To express logical sentences in terms of quantifiers and logical connectives.
3. To apply basic counting techniques to solve permutation and combination problems.
4. To solve recurrence relations.
5. To classify the algebraic structure of any given mathematical problem.
6. To evaluate Boolean functions and simplify expressions using the properties of Boolean algebra
7. To develop the given problem as graph networks and solve with techniques of graph theory.

TEXT AND REFERENCE BOOKS:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, 6th Edition, Tata McGraw Hill, 2011.
2. Satinder Bal Gupta: A Text Book of Discrete Mathematics and Structures, University Science Press, Delhi.
3. C. L. Liu and D. P. Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, Tata McGraw Hill, 3rd Edition, 2008.
4. J.P. Trembley and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill – 13th reprint, 2012.
5. Richard Johnsonbaugh, Discrete Mathematics, 6th Edition, Pearson Education Asia, 2011.
6. S. Lipschutz and M. Lipson, Discrete Mathematics, Tata McGraw Hill, 3rd Edition, 2010.
7. B. Kolman, R. C. Busby and S. C. Ross, Discrete Mathematical structures, 6th Edition, PHI, 2010.

Electromagnetic Field Theory

Course Code						
Category	**Professional Core Courses**					
Course title	**Electromagnetic field Theory**					
Scheme	**L**	**T**	**P**	**Credits**	**Semester : IV**	
	3	**0**	**0**	**3**		
Class Work	30 Marks					
Exam	70 Marks					
Total	100 Marks					
Duration of Exam	3Hrs					

NOTE: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objective: The objectives of this course are as under:

1. To introduce the basic mathematical concepts related to electromagnetic vector fields.
2. To impart knowledge on the concepts of electrostatics, electric potential, energy density and their applications.
3. To impart knowledge on the concepts of magneto statics, magnetic flux density, scalar and vector potential and its applications.
4. To impart knowledge on the concepts of Faraday‘s law, induced emf and Maxwell‘s equations.
5. To impart knowledge on the concepts of Concepts of electromagnetic waves and Transmission lines.

UNIT I

Transmission Lines- Equations of Voltage and Current on TX line, Propagation constant, Characteristic impedance and reflection coefficient, Impedance Transformation, Loss-less and Low Loss Transmission line and VSWR, Power transfer on TX line, Smith Chart, Admittance Smith Chart, Applications of transmission lines, Impedance Matching, Lossy transmission line, Problems on Transmission line, Types of transmission line.

UNIT II

Maxwell’s Equations- Basics of Vectors, Vector calculus, Basic laws of Electromagnetics, Maxwell's Equations, Boundary conditions at Media Interface.

Uniform Plane Wave- Uniform plane wave, Propagation of wave, Wave polarization, Pioncere's Sphere, Wave propagation in conducting medium, Wave propagation and phase velocity, Power flow and Poynting vector, Surface current and power loss in a conductor Plane Waves at a Media Interface- Plane wave in arbitrary direction,

UNIT III

Plane wave at dielectric interface, Reflection and refraction at media interface, Total internal reflection, Polarization at media interface, Reflection from a conducting boundary.

Waveguides- Parallel plane waveguide,Wave propagation in parallel plane waveguide, Analysis of waveguide general approach,

UNIT IV

Rectangular waveguide, Modal propagation in rectangular waveguide, Surface currents on the waveguide walls, Field visualization and Attenuation in waveguide, Attenuation in waveguide continued.

Radiation- Solution for potential function, Radiation from the Hertz dipole, Power radiated by hertz, dipole, thin linear antenna, Radiation Parameters of antenna, receiving antenna, Monopole and Dipole antenna, Fourier transform relation between current and radiation pattern.

Course outcomes:

1. Appreciate the importance of transmission lines and analyse transmission line problems.
2. Solve Maxwell's equations to understand propagation of electromagnetic waves.
3. Analyse plane wave at dielectric interface.
4. Understand waveguides.
5. Analyse electromagnetic wave propagation in rectangular metallic waveguides and resonators.
6. Understand antenna characteristics, and design linear antennas and their arrays.

Text/Reference Books:

1. R.K. Shevgaonkar, „Electromagnetic Waves, Tata McGraw Hill India, 2005
2. R.L. Yadav, Electromagnetic Fields and Waves, Khanna Book Publishing, 2021
3. E.C. Jordan & K.G. Balmain, Electromagnetic waves & Radiating Systems, Prentice Hall, India
4.Narayana Rao, N: Engineering Electromagnetics, 3rd ed., Prentice Hall, 1997.
5. David Cheng, Electromagnetics, Prentice Hall

DESIGN & ANALYSIS OF ALGORITHMS LAB

Course code					
Category	**Laboratory Course**				
Course title	**Design & Analysis of Algorithms Lab**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Semester: IV**
	0	**0**	**2**	**2**	
Classwork	**50 Marks**				
Exam	**50 Marks**				
Total	**100 Marks**				
Duration of Exam	**02 Hours**				

COURSE OBJECTIVES:

1. To provide an introduction to formalisms to understand, analyze and denote time complexities of algorithms
2. To introduce the different algorithmic approaches for problem solving through numerous example problems

CONTENTS:

1. Write a Program for iterative and recursive Binary Search.
2. Write a Program to sort a given set of elements using the Quick Sort/Merge Sort/Selection Sort method and determine the time required to sort the elements.
3. Write a Program for implementation of Fractional Knapsack problem using Greedy Method and 0/1 Knapsack problem using Dynamic Programming.
4. Write a Program to find the shortest path from a given vertex to other vertices in a weighted connected graph using Dijkstra's algorithm.
5. Write a Program to find the minimum cost spanning tree (MST) of a given undirected graph using Kruskal's algorithm /Prim's Algorithms.
6. Write a Program to implement N-Queens problem using backtracking.
7. Write a Program to check whether a given graph is connected or not using DFS method.
8. Write a program to implement the Travelling Salesman Problem (TSP).

COURSE OUTCOMES: By the end of the course, a student would be able to

1. Calculate the time complexity of algorithm.
2. Sort the given numbers using various sorting algorithms.
3. Write programs for the problems using Divide and Conquer.
4. Write programs for the problems using Greedy Method.
5. Write programs for the problems using Dynamic programming.
6. Write programs for the problems using Backtracking.

Analog and Digital Communication Lab

Course code					
Category	**Laboratory Courses**				
Course title	**Analog and Digital Communication Lab**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Semester: IV**
	0	**0**	**2**	**2**	
Classwork	**50 Marks**				
Exam	**50 Marks**				
Total	**100 Marks**				
Duration of Exam	**02 Hours**				

Note:-

1 Total ten experiments are to be performed in the semester

2 At least seven experiments should be performed from the above list. Remaining three experiments should be performed as designed and set by the concerned institution as per the scope of the syllabus.

COURSE OBJECTIVES:

1. To provide the basic understanding about various modulation techniques.
2. To analyze different characteristic parameters of these modulation techniques.

LIST OF EXPERIMENTS:

1. To study and waveform analysis of amplitude modulation and determine the modulation index of amplitude modulation.
2. To study and waveform analysis of amplitude demodulation by any method.
3. To study and waveform analysis of frequency modulation and determine the modulation index of frequency modulation.
4. To study and waveform analysis of frequency demodulation by any method.
5. To study Amplitude Shift Keying (ASK) modulation.
6. To study Frequency Shift Keying (FSK) modulation.
7. To study Phase Shift Keying (PSK) modulation.
8. To study and waveform analysis of phase modulation.
9. To study Phase demodulation.
10. To study Pulse code modulation.
11. To study Pulse amplitude modulation and demodulation.
12. To study Pulse width modulation.
13. To study Pulse position modulation.

COURSE OUTCOMES:

1. Students are able to analyze digital communication signals.
2. Understand modulation and demodulation concept.
3. Students understand the basics of PAM, QAM, PSK, FSK, and MSK.
4. They can analyze noise and disturbance in modulated signals.
5. Know the methods use for analog and digital communication

Electronic Devices and Circuit Lab

Category	**Laboratory Courses**				
Course Title	**Electronic Devices And Circuit Lab**				
Semester and Credits	L	T	P	Credits	Semester - IV
	0	0	2	1	
Class Work	50 Marks				
Examination	50 Marks				
Total	100 Marks				
Duration of Exams	02 Hours				

Notes:

1. At least 10 experiments are to be performed by students in the semester.
2. At least 7 experiments should be performed from the list, remaining three experiments may either be performed from the above list or designed and set by the concerned institution as per the scope of the syllabus

Course Objective: The objectives of this course are as under:

1. To introduce students to the characteristics of diodes, transistors, JFETs, and op-amps .
2. To provide understanding about the operation and characteristics of different configurations of BJT.
3. To provide understanding about the operation and characteristics of different special semiconductor devices.

LIST OF EXPERIMENTS:

1. Analysis &study of half wave and full wave rectifiers
2. Analysis & study of power supply filter.
3. Analysis & study of diode as a clipper and clamper.
4. Analysis & study of Zener diode as a voltage regulator.
5. Analysis & study of CE amplifier for voltage, current and Power gains input, output impedances.
6. Analysis & study of CC amplifier as a buffer.
7. Analysis & study the frequency response of RC coupled amplifier.
8. Analysis & study of transistor as a constant current source in CE configuration .
9. To study characteristics of FET.
10. Analysis & study of FET common source amplifier.
11. Analysis & study of FET common drain amplifier.
12. 1Study and design of a DC voltage doubler.
13. To study characteristics of SCR.
14. To study characteristics of DIAC.
15. To study UJT as a relaxation oscillator.

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

1 .Understand the characteristics of diodes, transistors, JFETs, and op-amps.
2. Understand the operation and characteristics of different configurations of BJT.
3 Understand the operation and characteristics of different special semiconductor devices.

SCIENTIFIC & TECHNICAL WRITING SKILLS

Course Code					
Category	**Non-Credit**				
Course title	**Scientific & Technical writing Skills**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: IV**
	2	**0**	**0**	**0**	
Class Work	**30 Marks**				
Exam	**70 Marks**				
Total	**100 Marks**				
Duration of Exam	**03 Hours**				

Note: The examination of the regular students will be conducted by the concerned college/Institute internally. Each student will be required to score minimum 40% marks to qualify in the paper. The marks will not be included in determining the percentage of marks obtained for the award of degree. However, these marks will be shown in the detailed marks certificate of the students

The following course content to conduct the activities is prescribed for the Scientific & Technical writing Skills Lab:

1. Activities on Writing Skills - Structure and presentation of different types of writing - letter writing/ Resume writing/ e-correspondence/ Technical report writing/ Portfolio writing - planning for writing - improving one's writing.
2. Activities on Presentation Skills - Oral presentations (individual and group) through JAM sessions/seminars/PPTs and written presentations through posters/ projects/ reports/ e-mails/ assignments etc.
3. Activities on Group Discussion and Interview Skills - Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conferencing and Mock Interviews.

Text references:

1. A Course Book of Advanced Communication Skills (ACS) Lab published by Universities Press, Hyderabad.

Books Recommended:

1. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
2. Advanced Communication Skills Laboratory Manual by Sudha Rani, D, Pearson Education 2011.
3. Technical Communication by Paul V. Anderson , 2007. Cengage Learning pvt. Ltd. New Delhi.
4. Business and Professional Communication: Keys for Workplace Excellence, Kelly M. Quintanilla & Shawn T. Wahl. Sage South Asia Edition. Sage Publications, 2011.
5. The Basics of Communication: A Relational Prespective, Stev Duck & David T. Mc Mahan. Sage South Asia Edition. Sage Publications, 2012.
6. English Vocabulary in Use series, Cambridge University Press 2008.
7. Management Shapers Series by Universities Press(India) Pvt Ltd., Himayatnagar, Hyderabad 2008.
8. Handbook for Technical Communication by David A. McMurrey& Joanne Buckley, 2012. Cengage Learning.
9. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
10. Handbook for Technical Writing by David A McMurrey& Joanne Buckely CENGAGE Learning 2008.
11. Job Hunting by Colm Downes, Cambridge University Press 2008.
12. Master Public Speaking by Anne Nicholls, JAICO Publishing House, 2006.
13. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc graw Hill 2009.
14. Books on TOFEL/ GRE/ GMAT/ CAT/ IELTS by Barron's/ DELTA/ Cambridge University Press.
15. International English for Call Contres by Barry Tomalin and Suhashini Thomas, Macmillan Publishers, 2009.