B. E. SYLLABUS

INFORMATION SCIENCE & ENGINEERING

III & IV SEMESTER

With
Scheme of Teaching
& Examination

DEPARTMENT : INFORMATION SCIENCE & ENGINEERING

Sl. No.	Name	Qualification	Designation
1	Dr. B. Neelima	Ph. D.	Prof. & Head
2	Dr. Balasubramani R.	Ph. D.	Professor/Chief Project Leader, EDC
3	Mr. Karthik Pai B. H.	M. Tech. (Ph. D.)	Assoc. Prof.
4	Ms. Ashwini B.	M. Tech. (Ph. D.)	Assoc. Prof.
5	Mr.Vasudeva Pai	M. Tech.	Asst. Prof. Gd. II
6	Mr. Pranesh	M. Tech. (Ph. D.)	Asst. Prof. Gd. II
7	Ms. Deepa J Shetty	M. Tech. (Ph. D.)	Asst. Prof. Gd. II
8	Mr. Devidas	M. Tech. (Ph. D.)	Asst. Prof. Gd. II
9	Ms. Rashmi Naveen	M. Tech. (Ph. D.)	Asst. Prof. Gd. II
10	Mr. Jason Elroy Martis	M. Tech. (Ph. D.)	Asst. Prof. Gd. II
11	Ms. Chinmai Shetty	M. Tech.	Asst. Prof. Gd. II
12	Mr. Abhishek Rao	M. Tech.	Asst. Prof. Gd. II
13	Mr. Abhir Bhandary	M. Tech. (Ph. D.)	Asst. Prof. Gd. I
14	Mr. Srikanth Bhat. K.	M. Tech.	Asst. Prof. Gd. I
15	Ms. Akshaya	M. Tech.	Asst. Prof. Gd. I
16	Ms. Prathyakshini	M. Tech.	Asst. Prof. Gd. I
17	Ms. Anusha Nayak	M. Tech.	Asst. Prof .Gd. I

DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

VISION :

To uniquely position the Department as a leader in innovation and excellence in information science and engineering through education, research and scholarship in a professional framework by addressing evolving global needs. Also the Department aims at creating top quality successful and sustainable programs and curricula for the students to address the emerging educational challenges and market demands.

MISSION :

- To provide outstanding education and research training to the students for their productive careers in industry, academia and government.
- To provide a learning environment that promotes excellence and innovation, ethical practice and responsibility towards society.
- To prepare the students to practice their professions competently to meet the ever- changing needs of society and to continue learning their discipline, allowing them to move into other related fields.
- To promote active learning, critical thinking, and engineering judgment coupled with business and entrepreneurial skills.

Programme Educational Objectives (PEOs):

- Graduates must gain both theoretical and practical knowledge to identify, formulate & solve challenges in Information Science & Engineering problems.
- Graduates must work productively as Information Science Engineers, including supportive and leadership roles on multidisciplinary teams.
- Graduates must communicate effectively, recognize and incorporate societal needs and constraints in their professional endeavors, and practice their profession with high regard to legal and ethical responsibilities.
- Graduates must engage in life-long learning, such as graduate study, to remain current in their profession and be leaders in our technological society.

Programme Outcomes (POs):

After successful completion of the program students will be able to:

1. Apply the knowledge of mathematics, science, engineering fundamentals and Information Science & Engineering principles to the solution of complex engineering problems.
2. Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
3. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal and environmental considerations.
4. Design solutions to the problems that cannot be solved by straightforward application of knowledge, theories and techniques applicable to the engineering discipline.
5. Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequence responsibilities relevant to the professional engineering practice.
7. Understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.
8. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.
10. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.
11. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcome

1. An ability to strengthen the knowledge and understanding in computer networking and related areas. **(Programme Specific Outcome – PSO)**

2. An ability to strengthen the knowledge and understanding in software development and related areas. **(Programme Specific Outcome – PSO)**

Graduate Attributes :

Sl. No.	Graduate Attributes
a	Engineering Knowledge
b	Problem Analysis
c	Design / development of solutions
d	Conduct investigations of complex problems
e	Modern tool usage
f	The engineer and society
g	Environment and sustainability
h	Ethics
i	Individual and team work
j	Communication
k	Project management and finance
l	Life-long learning

DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING
SCHEME OF TEACHING AND EXAMINATION

III SEMESTER B.E. **28 Hours / Week**

Sl. No.	Sub. Code	Subject	Theory/Tuto./Prac./ Self Study	Total Hrs./Week	C.I.E	S.E.E	Credits
1	16IS301	Generating Functions and Transform Techniques	4+0+0+0	4	50	50	4
2	16IS302	Software Engineering	3+0+0+S	3	50	50	3
3	16IS303	Discrete Mathematical Structures	3+1+0+0	4	50	50	3
4	16IS304	Computer Organization and Architecture	4+0+0+0	4	50	50	4
5	16IS305	Data Structures	4+1+0+0	5	50	50	4
6	16IS306	Programming With C++	4+0+0+0	4	50	50	4
8	16IS307	Programming Lab	0+0+4+0	4	50	50	2
TOTAL			**28**	**28**	**450**	**450**	**24**

DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING
SCHEME OF TEACHING AND EXAMINATION

IV SEMESTER B.E. **30 Hours / Week**

Sl. No.	Sub. Code	Subject	Theory/Tuto./Prac./ Self Study	Total Hrs./Week	C.I.E	S.E.E	Credits
1	16IS401	Probability Theory and Numerical Methods	4+0+0+0	4	50	50	4
2	16IS402	Design & Analysis of Algorithms	4+0+0+0	4	50	50	4
3	16IS403	Finite Automata & Formal Languages	4+1+0+0	5	50	50	4
4	16IS404	Data Communications	3+0+0+0	3	50	50	3
5	16IS405	Object Oriented Modeling and Design	3+0+0+S	3	50	50	3
6	16IS406	Digital System Design	4+0+0+0	4	50	50	4
7	16HU41	Enhancing Self Competence	1+2+0+0	3	50	50	2
8	16IS408	Design and Analysis of Algorithms Lab	0+0+2+0	2	50	50	1
9	16IS409	Digital System Design Lab	0+0+2+0	2	50	50	1
TOTAL			**30**	**30**	**450**	**450**	**26**

GENERATING FUNCTIONS AND TRANSFORM TECHNIQUES

Sub Code	**: 16IS301**	**Credits**	**: 04**
Hrs/Week	**: 4+0+0+0**	**Total Hours**	**: 52**

Course Learning Objectives:

This Course will enable students to

1. Identify various types of graphs and apply these concepts in life related problems.
2. Represent periodic functions in the analytic form using Fourier principles.
3. Use various concepts of Z-transform of a function to solve life related problems.
4. Understand the difference between nonnegative and positive integer solutions of a linear equation and find the corresponding solutions.
5. Find the sequence generated by exponential generating function.

UNIT – I

INTRODUCTION TO GRAPH THEORY

Definitions and examples, Subgraphs, Complements, Graph Isomorphism, Euler Trails and Circuits, Hamiltonian paths and Cycles, Planar Graphs, Graph Colouring, Trees: Definitions, Properties and Examples. **10 Hours**

UNIT – II

FOURIER ANALYSIS

Periodic functions, Euler's formulae, Fourier series of odd and even functions, functions with arbitrary period, half range series. Harmonic Analysis.Fourier integral theorem, Fourier Transforms, Inverse Fourier transform, Convolution theorem and Parseval's identity. Fourier sine and Fourier cosine transforms, Inverse Fourier sine and Inverse Fourier cosine transforms(simple problems) **12 Hours**

UNIT – III

Z TRANSFORMS

Z-transform, standard forms, linearity property, damping rule, shifting rule. Inverse Z-transform, Finite differences and difference equations, Solving Difference equations using Z-transforms. **10 Hours**

UNIT – IV

COMBINATORICS

Combinations with Repetition, Non-negative integer solution for linear equation, positive integer solution for linear equation.

Fibonacci numbers, Catalan Numbers, The Principle of Inclusion and Exclusion, Generalization of the Principle, Derangements – Nothing is in its Right place, Rook Polynomials. **10 Hours**

UNIT – V

GENERATING FUNCTIONS

Definition and Examples – Calculational Techniques, Partitions of Integers, the Exponential Generating Function, and the Summation Operator. The method of Generating Functions to solve Recurrence relations **10 Hours**

Course Outcomes:

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

Sl. No.	Course Outcome (CO)	Bloom's Taxonomy Level (BTL)
C301.1	Understand the concepts like graphs,subgraphs,isomorphicgraphs,proper coloring and chromatic polynomial of a graphand their applications.	L2
C301.2	Use Fourier series, harmonic analysis and Fourier transform techniques to represent periodic functions in terms of sine or cosine waves.	L3
C301.3	Solve difference equations with boundary conditions using Z-transform techniques.	L4
C301.4	Apply calculational/derangement/rook polynomial techniques as a tool to solve problems on life related situations.	L3
C301.5	Apply ordinary generating function/exponential generating function principles to solve life related problems.	L3

Mapping of POs & COs:

POs COs	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	PO m	PO n
C301.1	**M**												**M**	
C301.2	**M**				**L**								**M**	
C301.3					**H**								**L**	
C301.4					**H**						**M**		**L**	**L**
C301.5					**H**						**M**			

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

TEXT BOOKS:

1. Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, VI-Edition.
2. Ralph P.Grimaldi, "Discrete and combinatorial Mathematics", 5th Edition, PHI/PearsonEducation, 2004.

3. NarsingDeo, "Graph theory with Applications to Engg. and Computer Science",PHI.
4. Grahamknuth&Patashnik, "Concrete Mathematics"

REFERENCE BOOKS:

1. Richard A.Brualdi,"Introductory Combinatorics", 4th Edition, Pearson Prentice Hall, 2004.
2. F.Harary, "Graph theory", Narosa Publishing House, 1988.

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SOFTWARE ENGINEERING

Sub Code : 16IS302 **Credits : 03**

Hrs/Week: 3+0+0+S* **Total Hours : 39**

*** Self Study to be exercised under the supervision of course instructor and to be restricted to not more than 10% of the total teaching hours.**

Course Learning Objectives:

This Course will enable students to

1. To understand principles, concepts, methods, and techniques of the software engineering .
2. To Understand the approach to producing quality software (particularly for large, complex systems).
3. To organize and manage a medium-sized software development project, including project plans and documentation, schedule and cost estimates, and quality assurance activities.
4. To function effectively as a member of a team engaged in technical work.
5. To value ethical and social issues in software engineering.

UNIT – I

OVERVIEW

INTRODUCTION

FAQ's about software engineering, Professional and ethical responsibility.

SOCIO-TECHNICAL SYSTEMS

Emergent system properties; Systems engineering; Organizations, people and computer systems; Legacy system.

CRITICAL SYSTEMS

A simple safety-critical system; System dependability; Availability and reliability.

SOFTWARE PROCESSES

Models, Process iteration, Process activities; The Rational Unified Process; Computer-Aided Software Engineering.

SOFTWARE REQUIREMENTS

Functional and Non-functional requirements; User requirements; System requirements; Interface specification; The software requirements document.

REQUIREMENTS ENGINEERING PROCESSES

Feasibility studies; Requirements elicitation and analysis; Requirements validation; Requirements management . **10 Hours**

UNIT - II

SYSTEM MODELS

Context models; Behavioral models; Data models; Object models; Structured methods.

PROJECT MANAGEMENT

Management activities; Project planning; Project scheduling; Risk management. **7 Hours**

UNIT- III

ARCHITECTURAL DESIGN

Architectural design decisions; System organization; Modular decomposition styles; Control styles

OBJECT-ORIENTED DESIGN

Objects and Object ClassesAn Object-Oriented design process; Design evolution. **7 Hours**

UNIT - IV

RAPID SOFTWARE DEVELOPMENT

Agile methods; Extreme programming; Rapid application development.

SOFTWARE EVOLUTION

Program evolution dynamics; Software maintenance; Evolution processes; Legacy system evolution.

VERIFICATION AND VALIDATION

Planning; Software inspections; Automated static analysis; Verification and formal methods. **8 Hours**

UNIT – V

MANAGING PEOPLE

Selecting staff; Motivating people; Managing people; The People Capability Maturity Model.

SOFTWARE COST ESTIMATION

Productivity; Estimation techniques; Algorithmic cost modeling, Project duration and staffing. **7 Hours**

Course Outcomes:

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

Sl No.	Course Outcome (CO)	Bloom's Taxonomy Level (BTL)
C302.1	Understand the importance software engineering and ethical and professional responsibilities that are important for software engineers	L2
C302.2	Understand the phases and activities of the various software process models.	L2
C302.3	Describe the importance of Requirement Engineering process	L3
C302.4	Design , develop, verify and validate systems suitable for enterprise contexts	L4
C302.5	Understand the concept of software evolution, people management and software cost estimation	L2

Mapping of POs & COs:

POs COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
C302.1		L				M		H	M	H		L		H
C302.2	M			L						H	H	M		H
C302.3	M		H		M		M			L		M		H
C302.4		L			M								M	H
C302.5									H	H	H	M		H

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

TEXT BOOK:

1. Ian Sommerville: Software Engineering, 8th Edition, Person Education Ltd., 2007.

REFERENCE BOOKS:

1. Roger.S.Pressman: Software Engineering-A Practitioners approach, 7th Edition, McGraw-Hill, 2007.
2. Pfleeger: Software Engineering Theory and Practice, 3rd Edition, Pearson Education,2006.
3. Waman S Jawadekar: Software Engineering Principles and Practice, Tata McGraw Hill, 2004.

E-RESOURCES:

1. http://nptel.ac.in/courses/106101061/

DISCRETE MATHEMATICAL STRUCTURES

Sub Code : 16IS303 **Credits : 03**
Hrs/Week : 3+1+0+0 **Total Hours : 39**

Course Learning Objectives:

This Course will enable students to

1. Understand the notion of mathematical thinking, mathematical proofs, and algorithmic thinking and be able to apply them in problem solving.
2. Identify, design and formulate recursive formula for recursive problems.
3. Compare and contrast relation and functions, ability to apply these concepts in different computer science subjects like Relational database, Data mining etc.
4. Understand concepts of partial ordered set, lattices and its applications in design of network models.
5. Understand basics of group algebraic structure, number theory and its relevance in cryptography.

UNIT – I

SET THEORY AND COUNTING

Sets and subsets, Operations on sets, The Pigeonhole principle and Recurrence Relations.

RELATIONS AND ITS PROPERTIES

Product sets and Partitions, Relations and Digraphs, Paths in relations and Digraphs.

8 Hours

UNIT – II

RELATIONS AND ITS PROPERTIES CONTD

Properties of relations, Equivalence relations, Computer representation of Relations and Digraphs and Transitive closure and Warshall's algorithm.

FUNCTIONS

Definition, Types of functions, Invertible functions, Functions for computer science and Permutation functions. **8 Hours**

UNIT – III

ORDER RELATIONS AND STRUCTURES

Partially Ordered Sets, Extremal elements of Partially ordered sets, Lattices, Semigroups and Groups. Semigroups, Groups-Abelian groups. **7 Hours**

UNIT – IV

FUNDAMENTALS OF LOGIC

Propositions and Logical Operations, Conditional Statements, Biconditional statements, The laws of logic, Logical implication- Rules of inference, Quantifiers, Mathematical induction.

8 Hours

UNIT – V

INTRODUCTION TO NUMBER THEORY

Prime and Relatively prime numbers, Properties of integers, Modular arithmetic, Fermat's and Euler's Theorems, Testing for primality, Euclid's Algorithm, The Chinese Remainder Theorem. **8 Hours**

Course Outcomes:

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

Sl. No.	Course Outcome (CO)	Bloom's Taxonomy Level (BTL)
C303.1	Apply the set theory concepts and recurrence relations in computer science applications	L3
C303.2	Apply the relations and function concepts in different computer science subjects like Relational database, Data mining etc.	L3
C303.3	Apply the partial ordered set, lattices concepts to applications in design of network models	L3
C303.4	Prove some mathematical arguments applicable to computer algorithms and apply the fundamentals of logic in computer science applications.	L4
C303.5	Understand the fundamentals of group algebraic structure, number theory and its relevance to cryptography.	L2

Mapping of POs & COs:

POs Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
C303.1	H		L		L						L			
C303.2	H		L		M						L			
C303.3	H		L		M						L		M	
C303.4	H		L		H						L		M	
C303.5	H		L		M						L			

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

TEXT BOOKS:

1. "Discrete Mathematical Structures" - Bernard Kolman, Robert C. Busby, Sharon Ross,III edition, PHI 2001.
2. "Elementary Number Theory" - David M. Burton, II Edition, UBS New Delhi.

REFERENCE BOOKS:

1. "Discrete and Combinatorial Mathematics" - Ralph P. Grimaldi, Pearson Education, Asia, IV Edition-2002.
2. "Discrete Mathematical Structures with applications to computer Science" - J. P. Tremblay, R. Manohar, Tata McGraw Hill-1987.
3. "Discrete Mathematics and its applications" - Kenneth H. Rosen, Tata McGraw Hill, V Edition-2003.
4. "Cryptography and Network Security" - William Stallings, II edition, Pearson Education Asia.

E-RESOURCES:

1. http://nptel.ac.in/courses/111104026/

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COMPUTER ORGANIZATION AND ARCHITECTURE

Sub Code : 16IS304 **Credits : 04**

Hrs/Week : 4+0+0+S **Total Hours: 52**

*** Self Study to be exercised under the supervision of course instructor and to be restricted to not more than 10% of the total teaching hours.**

Course Learning Objectives:

This Course will enable students to

1. Understand the types of operating Systems and its classifications
2. Apply the Concept of performance and its Measurement
3. Apply security and layered approach in hardware and its operation
4. Understand Processing unit concepts
5. Analyze the caching and buffering with respect to memory systems

UNIT – I

BASIC STRUCTURE OF COMPUTERS

Computer Types, Functional Units,Operational Concepts, Bus Structures, Performance – Processor Clock,Basic Performance Equation, Clock Rate, Performance Measurement.Machine Instructions and Programs: Numbers, Arithmetic Operations andCharacters, Memory Location and Addresses, Memory Operations,Instructions and Instruction Sequencing.

Addressing Modes, Assembly Language, Basic Input and Output Operations, Stacks and Queues, Subroutines, Additional Instructions, Encoding of Machine Instructions.

12 Hours

UNIT – II

INPUT / OUTPUT ORGANIZATION

Accessing I/O Devices, Interrupts –Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Controlling Device Requests, Exceptions, Direct Memory Access, Buses, Interface Circuits. Input / Output Organization: Standard I/O Interfaces – PCI Bus, SCSI Bus, USB. **12 Hours**

UNIT - III

MEMORY SYSTEM

Basic Concepts, Semiconductor RAM Memories, ReadOnly Memories, Speed, Size, and Cost, Cache Memories –Mapping Functions, Replacement Algorithms and Performance Considerations.

Memory System: Virtual Memories, Secondary Storage. **12 Hours**

UNIT - IV

ARITHMETIC

Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed Operand Multiplication, Fast Multiplication. Integer Division, Floating-point Numbers and Operations. **8 Hours**

UNIT - V

BASIC PROCESSING UNIT

Some Fundamental Concepts, Execution of a Complete Instruction, Multiple Bus Organization. Hard-wired Control and Micro programmed Control. **8 Hours**

Course Outcomes:

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

Sl. No.	Course Outcome (CO)	Bloom's Taxonomy Level (BTL)
C304.1	Know about the basic structure of Computers and their architecture	L2
C304.2	Know about interrupts and ways how buses respond to them	L6
C304.3	Analyse the structure of memory system and design them	L2
C304.4	Analyse the arithmetic processing of Computers and its working	L6
C304.5	Correlate the basic working of central processing unit and its micro organization	L4

Mapping of POs & COs:

POs COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
C304.1	L													
C304.2		L		H		M	M	M		M		H		
C304.3			H	H	L		L		L		M			
C304.4		H												
C304.5			H	M	H	M		L					M	M

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

TEXT BOOK:

1. Computer Organization, Carl Hamacher, ZvonkoVranesic, SafwatZaky, 5thEdition, TMH, 2002.

REFERENCE BOOKS:

1. Organization & Architecture, William Stallings, 7th Edition, PHI, 2006.
2. Computer Systems Design & Architecture, Vincent P Heuring& Harry F Jordan, 2ndEdition, Pearson Publication 2004.
3. Computer Architecture – A hardware approach through Microprocessors – Dr. K M Hebbar, Mac Millan Publishers India Limited – 2009.

E-RESOURCES:

1. http://nptel.ac.in/courses/106104073/

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DATA STRUCTURES

Sub Code : 16IS305 **Credits : 04**

Hrs/Week : 4+1+0+0 **Total Hours : 52**

Pre-requsites

A preliminary knowledge of C programming is required; Computer Concepts and C programming.

Course Learning Objectives:

This Course will enable students to

1. To understand and analyze various data organization.
2. To identify and implement the appropriate data structure and modify it if required for modeling a given problem and perform various operations on it.
3. To classify and examine linear and non linear data structures

4. To demonstrate and practice iterative and recursive solutions for elementary problems.
5. To formulate algorithms and programs that use data structures such as arrays, linked lists, stacks, queues, trees.

UNIT – I

INTRODUCTION AND OVERVIEW

Definitions, Concepts of data structures, types, Overview of data structures.

Pointers Definition and Concepts, Accessing variables through pointers, Pointers and functions, Arrays and pointers, Array of pointers, Pointer arithmetic.

LINEAR DATA STRUCTURES – STACKS

Introduction and Definition, Representation of stack: Array and structure representation of stacks, Operations on stacks, Applications of stack: Conversion of Expressions, Evaluation of expressions, Recursion: Implementation, Simulating Recursion, examples on Recursion.

10 Hours

UNIT – II

LINEAR DATA STRUCTURES – QUEUES

Introduction and Definition Representation of Queue: Array and Structure representation of queue, various queue Structures: ordinary queue, circular queue, priority queue.

LINEAR DATA STRUCTURES - SINGLY LINKED LISTS

Memory allocation functions. Definition and concepts singly Linked List: Representation of link list in memory, Operations on singly Linked List , Circular Linked List **10 Hours**

UNIT – III

LINEAR DATA STRUCTURES - DOUBLY LINKED LISTS

Doubly Linked List: Representation and Operations, Circular doubly Link list: Representation and Operations. Linked List representation of stack, Linked List representation of queue.

NONLINEAR DATA STRUCTURES - TREE DATA STRUCTURES 1

Basic Terminologies, Binary Trees: Properties, Representation of Binary Tree: Linear representation, Linked representation, Operations on Binary Tree: Insertion, Simple Deletion, Traversals. Binary Search Tree, Operations on Binary Search Tree: Insertion, Traversals.

12 Hours

UNIT – IV

NONLINEAR DATA STRUCTURES - TREE DATA STRUCTURES 2

Expression Tree: Evaluating expression tree, Constructing expression tree from postfix expression, traversals, Threaded binary Tree: types, B-Trees, B+ Trees, AVL Trees: Definition, Constructing a general AVL tree. **10 Hours**

UNIT – V

NONLINEAR DATA STRUCTURES – GRAPHS

Graph terminologies: Walks, Paths, Circuits, Connected graphs, Disconnected graphs and Components, Euler graphs. Directed graphs, Undirected graphs, Hamiltonian paths and Circuits.

Representation Of Graphs

Set Representation, Linked representation, Matrix representation. Operations on Graphs: Insertion and Deletion of edges and vertices (linked representation), DFS, BFS. 10 Hours

Course Outcomes:

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

Sl. No.	Course Outcome (CO)	Bloom's Taxonomy Level (BTL)
C305.1	Understand the concepts of data structure, data type and array data structure, pointers, stacks.	L2
C305.2	Apply the concept of queues and singly linked list data structure to solve problems.	L3
C305.3	Apply the concept of circular and doubly linked list data structure	L3
C305.4	Apply the concept of Trees to solve problems	L3
C305.5	Apply the concept of threaded binary tress and study hashing techniques	L3

Mapping of POs & COs:

POs COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
C305.1	L		M			L					L	H		M
C305.2	L	M		H					L			H	M	
C305.3	L		M									H	M	
C305.4	L	M		H					H			H	M	
C305.5	L		M			H					L	H		M

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

TEXT BOOKS:

1. Fundamentals of Data Structures In C; 2nd Edition; Ellis Horowitz, Anderson-Freed, Sahni ; Universities Press, 2008.
2. Data Structure using C; Aaron M. Tenenbaum, YedidyahLangsam& Moshe J. Augenstein; Pearson Education/PHI, 2006.
3. Data Structures With C; Seymour Lipschutz ; Tata Mcgraw Hill Education Private Limited 2010.
4. Data Structures Using C And C++; 2nd Edition; LangsamYedidyah, Augenstein Moshe J., Tenenbaum Aaron M; Prentice-Hall 2009.

REFERENCE BOOKS:

1. Classic Data Structures; D.Samanta.
2. Data Structures and Program Design in C; R. Kruse etal, , Pearson Education Asia, Delhi-2002.
3. Computer Science A Structured Programming Approach Using C; Second Edition; Behrouz A. Forouzan and Richard F. Gilberg;Thomson, 2003.
4. Ronald J Tocci, Neal S. Widmer, Gregory L Moss, Digital Systems Principles and Applications, 10th Edition, PHI/Pearson Education, 2007.

E-RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc16_cs06/

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PROGRAMMING With C++

Sub Code : 16IS306 **Credits : 04**

Hrs/Week : 4+0+0+0 **Total Hours : 52**

Course Learning Objectives:

This Course will enable students to

1. Understand the basic concepts, its benefits and application of object oriented programming
2. Provide solutions to problems using object oriented approach.
3. Understand and Apply concepts like Class,polymorphism,dynamic binding
4. Create solutions using Inheritance
5. Design solutions usingtemplates.

UNIT – I

INTRODUCTION

A look at Procedure Oriented Programming, Object Oriented Programming Paradigm, Basic Concepts of OOP, Benefits of OOP, and Object oriented languages, Application of OOP. What is C++, Applications of C++, Structure of C++ program.

Basic Data types, derived data types, user defined data types, variables in C++, dynamic initialization of variables, reference variables, operators in c++, scope resolution operator, memory management operators, type cast operators, manipulators, namespace. **10 Hours**

UNIT – II

CLASSES AND OBJECTS

Function prototyping , Infinite Functions, Default Arguments, Function Overloading.
Introduction, C Structure Revisited, Specifying a Class, Defining Member Functions, Static Data Members, and Static Member Functions. Arrays of Objects, Objects as Functions Arguments, this pointer, Friend Functions, Returning Objects, Constant Member Functions.

10 Hours

UNIT – III

CONSTRUCTORS AND DESTRUCTORS

Introduction, Constructors, Parameterized Constructors, Multiple Constructors in a Class. Constructors with Default Arguments, Copy Constructors, Dynamic Constructors, Constant Objects, Destructors.

OPERATOR OVERLOADING

Introduction, Defining Operator Overloading, overloading the Various Operators, Overloading the Increment and the Decrement Operators (Prefix and Postfix), Overloading the Unary Minus and the Unary Plus Operator, Overloading the Arithmetic Operators. Overloading the Relational Operators, Overloading the Assignment Operator, Overloading the Insertion and Extraction Operators, Rules for overloading operators.Type conversions.

12 Hours

UNIT – IV

INHERITANCE

Introduction, Defining Derived Classes, single Inheritance, Protected Access Specifier, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid Inheritance, Virtual Base Classes, Abstract Classes, Constructors in Derived Classes, Nesting of Classes.

POINTERS, VIRTUAL FUNCTIONS AND POLYMORPHISM

Introduction, Pointers, Pointers to objects, pointers to derived classes, Virtual Functions, PureVirtual Functions**.** **10 Hours**

UNIT – V

TEMPLATES

Introduction, Function Templates, Class Templates, Overloading of template Function.

EXCEPTION HANDLING

Basics of exception Handling, Exception Handling Mechanism, Limitation of Exception Handling.

WORKING WITH FILES

Classes for Files Stream Operations, Opening and Closing a File, Error Handling during File Operations. **10 Hours**

Course Outcomes:

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

Sl. No.	Course Outcome (CO)	Bloom's Taxonomy Level (BTL)
C306.1	Understand the basics of object oriented concepts.	L2
C306.2	Develop and solve problems using Class concept	L5
C306.3	Design and analyze using constructors and destructors, use operator overloading to solve problem.	L4
C306.4	Apply inheritance and polymorphism in programs	L4
C306.5	Understand the working with file handling,exception handling and using temples.	L3

Mapping of POs & COs:

POs COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
C306.1	L	M	L	M			M					M		L
C 306.2		M				L						L		M
C 306.3	L											L		
C 306.4		L		M		L						L		
C 306.5			L	H			M				L	M		M

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

TEXT BOOK:

1. Herbert Schildt: C++ The Complete Reference.

REFERENCE BOOKS:

1. Robert Lapore: Object–Oriented Programming in turbo C++
2. E. Balaguruswamy. Object – Oriented Programming with C++ ,third Edition, Tata McGraw Hill.
3. K.R.Venugopala: Mastering in C++

E-RESOURCES:

1. http://nptel.ac.in/courses/106105151/

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PROGRAMMING LAB

Sub Code : 16IS307 **Credits : 02**

Hrs/Week : 0+0+4+0 **Total Hours : 52**

Course Learning Objectives :

This Course will enable students to

1. Learn the fundamentals of data structure and C++ with its syntax
2. Identify and implement the appropriate data structure and perform various operations on it.Demonstrate the use of Classes – Objects, and Constructors – Destructors
3. Classify and examine linear and non linear data structures
4. Use the following features : Inheritance, Polymorphism, Types of Functions.
5. To formulate algorithms and programs that use data structures such as arrays, linked lists, stacks, queues, trees and File handling issues.

Students need to write, execute and test programs covering the entire syllabus of Data Structures.

Typical programs would be:

1. Managing records using structures, pointers – writing functions for insert, search and other operations. Same program to be implemented using dynamic memory allocation.
2. Dynamic memory allocation programs – searching, sorting, sum of n numbers.
3. Stack – Basic operations, infix to postfix, infix to prefix, evaluating a postfix expression, validity of a mathematical expression.
4. Recursive program examples including Tower of Hanoi.
5. Queues - Ordinary Queue, circular queue, priority queue, double ended queue implementation.
6. Linked list creation, insertion /deletion and display using pointers.
7. Operator Overloading program examples including matrix operations, complex number.
8. Use of Constructors/Destructors and types of functions- template function.
9. File handling programs-Add, update, search and display a perticular record.

Course Outcomes (COs):

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

Sl. No.	Course Outcome (CO)	Bloom's Taxonomy Level (BTL)
C307.1	Understand the concepts of data structure and Object Oriented Programming with its syntax.	L2
C307.2	Identify the appropriate data structure for given problem.	L4
C307.3	Apply the concept of circular and doubly linked list using C++.	L3
C307.4	Design the features like Inheritance, Polymorphism and Virtual Functions in C++.	L5
C307.5	Analyze the templates, Exception handling, File handling issues and trees in C++.	L4

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PROBABILITY THEORY AND NUMERICAL METHODS

Sub Code : 16IS401 **Credits : 04**
Hrs/Week : 4+0+0+0 **Total Hours : 52**

Course Learning Objectives:

This Course will enable students to

1. **Apply** the theory of matrices and vector spaces to solve various engineering problems.
2. **Understand** the notion of linear transformation, Gradient and Hessian of linear and quadratic function.
3. **Solve** problems using Bayes' theorem and find marginal distribution and variance of two dimensional random variable.
4. **Derive** the mean and variance of Binomial, Poisson and normal distributions.
5. **Classify** a given situation and solve life related problems in stochastic process. State the importance of sampling distribution.

UNIT – I

MATRIX & VECTOR SPACE:

Review of Matrix Properties, Trace, Norms, Relation between trace and Eigen values of a matrix, Eigen values and Eigen vectors of symmetric matrices.

Vector spaces, subspaces, bases and dimension, coordinates, Summary of row-equivalence and computations concerning subspaces. **12 Hours**

UNIT – II

LINEAR TRANSFORMATIONS:

Linear transformations, algebra of linear transformations, representation of transformations by matrices, isomorphism, Range and Null space.

Gradient, Hessian, Gradient and Hessian of linear and quadratic functions, Least squares.

10 Hours

UNIT – III

INTRODUCTION TO PROBABILITY:

Finite sample space, conditional probability and independence(overview),Bayes' theorem. One dimensional random variable, pdf , cdf , expectation and variance. Two and higher dimensional random variables, joint pdf and marginal pdf.

10 Hours

UNIT – IV

DISTRIBUTIONS: Binomial, Poisson,uniform,normal,gamma and exponential distributions, simple problems. Curve fitting(linear and quadratic), correlation and regression.

10 Hours

UNIT – V

STOCHASTIC PROCESS:

Definition, Classifications, Types of Stochastic processes, Markov process, Markov Chains, Transition probabilities, Higher transition probabilities, C-K equations**.**

SAMPLING THEORY: Random samples, sampling distribution, t, F and Chi-squrae distributions. **10 Hours**

Course Outcomes:

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

Sl. No.	Course Outcome (CO)	Bloom's Taxonomy Level (BTL)
C401.1	**Find** trace, eigen values and eigen vectors of the given symmetric matrix. Realize the importance of the notions of basis and dimension in the study of vector spaces.	L3
C401.2	**Demonstrate** the concept of linear transformation as a linear function from one vector space to another. **obtain** the Gradient and Hessian of linear transformation.	L4
C401.3	**Classify** and **appreciate** probabilistic models for situations involving chance effect and appreciate the concepts of pdf, cdf, random variables and its consequences.	L3

C401.4	**Illustrate** some of the important distributions of discrete random variables and continuous random variables. **Apply** the concepts of correlation and regression in real life situations.	L4
C401.5	**State** and **apply** the concepts of Markov processes and transition probabilities in various engineering problems. **Apply** the concepts of sampling in real life situations.	L3

Mapping of POs & COs:

POs COs	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	PO m	PO n
C401.1	**H**	**M**		**L**		**L**							**H**	**L**
C401.2	**H**	**M**		**M**									**H**	**L**
C401.3	**H**	**M**				**M**		**L**					**H**	**L**
C401.4	**H**	**H**		**M**									**H**	**L**
C401.5	**H**	**M**		**M**									**H**	**L**

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

TEXT BOOKS:

1. B.S.Grewal, "Higher Engineering Mathematics", 36th Edition.
2. P.L.Meyer, "Introduction of Probability and Statistical Applications" , second Edn. 1975, American Publishing Co..
3. David C Lay, "Linear Algebra and its applications", 3rd Edition, Person Education (Asia) Pvt. Ltd., 2005.
4. Sean Dineen, "Multivariate Calculus and Geometry", Second Edition, Springer Publications.

REFERENCE BOOKS:

1. Hogg and Craig, "Introduction of Mathematical Statistics", 4th Edn 1975 McMillan.
2. J.Medhi, "Stochastic Process".
3. B. V. Ramana, "Higher Engineering Mathematics", Tata Mc Graw –Hill Ltd.

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DESIGN & ANALYSIS OF ALGORITHMS

Sub Code : 16IS402 **Credits : 04**
Hrs/Week : 4+0+0+0 **Total Hours : 52**

Course Learning Objectives:

This Course will enable students to

1. To explain the requirements of an Algorithm.
2. To identify the basic real life problems and convert them into mathematical Model
3. To prove the correctness and analyze the running time of the basic algorithms for those classic problems in various domains.
4. To apply the algorithms and design techniques to solve problems;
5. To analyze the complexities of various problems in different domains.

UNIT – I

INTRODUCTION

What is an Algorithm?, Fundamentals of Algorithmic, Problem Solving, Important Problem Types, Fundamental Data Structures.

Fundamentals of the Analysis of Algorithm Efficiency: Analysis Framework,

Asymptotic Notations and Basic Efficiency Classes, Mathematical Analysis of Non recursive and Recursive Algorithms – Fibonacci Numbers and Tower of Hanoi. **10 Hours**

UNIT - II

BRUTE FORCE

Selection Sort and Bubble Sort, Sequential Search and Brute-Force String Matching, Exhaustive Search.

DIVIDE AND CONQUER

Merge sort, Quick sort, Binary Search, Binary tree traversals and related properties, Multiplication of large integers and Strassen's Matrix Multiplication. **10 Hours**

UNIT – III

DECREASE AND CONQUER

Insertion Sort, Depth First Search, Breadth First Search, Topological Sorting, Algorithms for Generating Combinatorial Objects.

TRANSFORM AND CONQUER

Presorting, Balanced Search Trees, Heaps and Heap sort, Problem Reduction. **10 Hours**

UNIT – IV

SPACE AND TIME TRADEOFF

Sorting by Counting, Input Enhancement in String Matching – Horspool's algorithm and Bayer-Moore algorithm

DYNAMIC PROGRAMMING

Computing a Binomial Coefficient, Warshall's and Floyd's Algorithms, The Knapsack Problem and memory functions. **11 Hours**

UNIT – V

GREEDY TECHNIQUE

Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees.

BACKTRACKING: n queens problem, subset-sum problem.

BRANCH AND BOUND: Assignment problem, Knapsack problem.

Definition of NP Completeness. **11 Hours**

Course Outcomes:

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

Sl. No.	Course Outcome (CO)	Bloom's Taxonomy Level (BTL)
C402.1	Understand the basics of algorithm design an d analyze efficiency.	L2
C402.2	Apply and analyze various algorithms using brute force and divide and conquer technique to solve problem	L4
C402.3	Apply and analyze various algorithms using decrease and conquer, transform and conquer technique to solve problem.	L4
C402.4	Apply and analyze various algorithms using dynamic programming to solve problem.	L4
C402.5	Apply and analyze various algorithms using greedy technique, backtracking and branch and bound technique to solve problem.	L4

Mapping of POs & COs:

POs COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
C402.1	H		M		L								M	
C402.2	L	M		M		M			L			H	H	
C402.3	L		M	M	M		M					H	H	
C402.4	L	M		M			M					H	H	
C402.5	L		M		L				L			H	H	

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

TEXT BOOK:

1. Introduction to the Design & Analysis of Algorithms, AnanyLevitin, 2nd Edition, Pearson Education, 2007.

REFERENCE BOOKS:

1. Introduction to Algorithms , Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 2nd Edition, PHI, 2006.
2. Computer Algorithms by Horowitz E., Sahni S., Rajasekaran S, Galgotia Publications, 2001
3. Introduction to the Design and Analysis of Algorithms A Strategic Approach, R.C.T. Lee, S.S. Tseng, R.C. Chang &Y.T.Tsai, TMH,2005.

E-RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc17_cs09

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FINITE AUTOMATA & FORMAL LANGUAGES

Sub Code :16IS403 **Credits : 04**
Hrs/Week : 4+1+0+0 **Total Hours : 52**

Course Learning Objectives:

This Course will enable students to

1. Introduce concepts in automata theory and theory of computation
2. Identify different formal language classes and their relationships
3. Design grammars and recognizers for different formal languages
4. Prove or disprove theorems in automata theory like context free languages using its properties
5. Determine the decidability and intractability of computational problems

UNIT – I

INTRODUCTION TO THE THEORY OF COMPUTATION

Mathematical preliminaries and notation, Three basic concepts Some applications

FINITE AUTOMATA

Deterministic Finite accepter-Deterministic accepter and transition graphs.Languages and DFA's, Regular languages. Nondeterministic finite accepter: Definition, Examples. Equivalence of Deterministic and Nondeterministic Finite Accepter. Reduction of the number of states in finite automata **10 Hours**

UNIT – II

REGULAR LANGUAGES AND REGULAR GRAMMARS

Regular expressions, Languages associated with regular expressions, Regular expressions denote regular languages, Regular expressions for regular languages, Regular grammars-Right and Left linear grammars. Right and Left Linear grammar examples. Right linear grammar generates regular languages, Right linear grammars for regular languages.

PROPERTIES OF REGULAR LANGUAGES

Closure properties of regular languages-Closure under simple set operations.Closure under other operations. Identifying non regular languages-Using A pumping lemma. **11 Hours**

UNIT – III

CONTEXT-FREE LANGUAGES

Context free grammars – examples, Leftmost and Rightmost derivations.Derivation Trees.Parsing and ambiguity-Ambiguity in grammars and languages.

SIMPLIFICATION OF CFG AND NORMAL FORMS

Methods for transforming grammars-Substitution rule. Removing useless, lambda, unit productions.Normal forms-Chomsky normal form and Greibach normal form. **10 Hours**

UNIT – IV

PROPERTIES OF CONTEXT-FREE LANGUAGES

Two pumping lemmas: A pumping lemma for Context-Free languages. A pumping lemma for Linear languages.

PUSHDOWN AUTOMATA

Nondeterministic pushdown automata-Definition, Language accepted by a PDA. PDA for Context Free languages, Context free grammars for pushdown automata, Deterministic pushdown automata . **10 Hours**

UNIT – V

TURING MACHINES

The standard Turing machine-Definition, examples, Turing machine as language accepter.Turing machine as Transducers.Combining Turing machines for complicated tasks.Universal turing machine. Other models of Turing machines: Multitapeturing machines, Nondeterministic turing machines etc.

A HIERARCHY OF FORMAL LANGUAGES AND AUTOMATA

Recursive and recursively enumerable languages, The Chomsky hierarchy.

LIMITS OF ALGORITHMIC COMPUTATION

Some problems that cannot be solved by Turing machines, The post correspondence problem. **11 Hours**

Course Outcomes:

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

Sl. No.	Course Outcome (CO)	Bloom's Taxonomy Level (BTL)
C403.1	Comprehend the basic concepts of theory of computation, Finite Automata	L1
C403.2	Review the properties of Regular Languages	L2
C403.3	Apply the concept of regular expression and Context Free Grammar to implement Lexical and Syntax Analysis phases of compilers	L3
C403.4	Construct Push down Automata for different problem sets	L5
C403.5	Design Turing Machine for different problem sets & Evaluate hierarchy of Formal Languages and Automata	L6

Mapping of POs & COs:

POs COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
C403.1	H	L	M											
C403.2	L	M												
C403.3	H	L	M											
C403.4	M	H												
C403.5	H	H	M	M	L		L					L	L	L

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

TEXT BOOK:

1. An Introduction to formal languages and Automata, Peter Linz 4th edition

REFERENCE BOOKS:

1. J.P.Hopcroft, Rajeev Motwani, J.D.Ullman, Introduction to Automata Theory, Languages and Computation, Pearson Education
2. John Martin, Introduction to languages and theory of computation, Tata McGraw Hill.

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DATA COMMUNICATION

Sub Code : 16IS404 **Credits : 03**
Hrs/Week : 3+0+0+0 **Total Hours : 39**

Course Learning Objectives:

This Course will enable students to

1. Clearly analyze and understand the OSI reference model and TCP/IP protocol suite.
2. Try to highlight the difference between analog and digital transmission and its applications.
3. Explain the concepts of multiplexing, error detection and correction and transmission media.
4. Study the error detection code algorithms and flow control, error control and framing.
5. Explain about medium access control protocols and its working.

UNIT – I

INTRODUCTION TO DATA COMMUNICATIONS

Communication Networks and Services: Telegraph Networks and Message Switching, Telephone Networks and Circuit Switching, the Internet, Computer Networks and Packet Switching.

APPLICATIONS AND LAYERED ARCHITECTURES

The OSI Reference model: The Seven-Layer OSI Reference Model, Unified view of Layers, Protocols, and Services.

OVERVIEW OF TCP/IP ARCHITECTURE

TCP/IP Architecture, TCP/IP Protocol, How the layer work together, Protocol Overview, Application Layer Protocols. **8 Hours**

UNIT - II

DIGITAL TRANSMISSION FUNDAMENTALS -I

Analog and Digital Data, Analog and Digital Signals,Periodic and NonperiodicSignals,PERIODIC ANALOG SIGNALS,basics of digital signals and digital signals as composite signals, Transmission Impairment Data rate limits: Nyquist Bit rate and Shannon Channel Capacity, Performance .

DIGITAL TRANSMISSION

Digital to digital Conversion: Line coding, Block coding, and Scrambling.

Analog to digital Conversion: Pulse Code Modulation Delta Modulation. Transmission Modes: Parallel and Serial transmission. **9Hours**

UNIT – III

DIGITAL TRANSMISSION FUNDAMENTALS - II

Analog Transmission: Digital to analog conversion, Amplitude shift keying, Frequency shift keying and phase shift keying. Quadrature Amplitude Shift keying.

ANALOG TO ANALOG CONVERSION

Amplitude Modulation, Frequency Modulation, Phase Modulation.

Error Detection and Correction

Introduction, Two dimensional Parity Checks, Internet Checksum, Polynomial codes, Standardized Polynomial codes, Error detecting Capability of a Polynomial Code, Linear codes, Error Correction. **8 Hours**

UNIT – IV

MULTIPLEXING AND PEER TO PEER PROTOCOLS

Multiplexing: Frequency Division Multiplexing, Wavelength Division Multiplexing, Time Division Multiplexing.

Framing, Flow and Error Control: Stop-and-Wait ARQ, Go-Back-N ARQ, Selective Repeat ARQ, Piggybacking. **8 Hours**

UNIT –V

MEDIUM ACCESS CONTROL

The Medium Access Protocols: CSMA, CSMA-CD. Scheduling Approaches to Medium Access Control: Reservation Systems, Polling, Token Pass Ring. Channelization: FDMA, CDMA, and TDMA. **6 Hours**

Course Outcomes:

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

Sl. No.	Course Outcome (CO)	Bloom's Taxonomy Level (BTL)
C404.1	Clearly analyze and understand the OSI reference model	L2
C404.2	Try to highlight the difference between analog and digital transmission	L5
C404.3	Explain the concept of multiplexing	L2
C404.4	Study the error detection code algorithms	L5
C404.5	Explain about medium access control protocols	L3

Mapping of POs & COs:

POs COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
C404.1	L	L			H							L	M	
C404.2	L			H	M							L	M	
C404.3	L			M								L	M	
C404.4	L				M							L	M	
C404.5	L			M								L	M	

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

TEXT BOOKS:

1. Behrouz A. Forouzan, Data Communications and Networking, 4th Edition, 2006, Tata McGraw-Hill.
2. Alberto Leon Garcia and IndraWidjaja, Communication Networks -Fundamental Concepts and Key architectures, 2nd edition,2004, Tata McGraw Hill.

REFERENCE BOOKS:

1. William Stallings, Data and Computer Communication, 8th Edition, Prentice Hall, India / Pearson Education.
2. William A. Shay, Understanding Data Communications and Networks, 3rd Edition, Thomson, 2003.
3. Godbole, Data Communications and Networks, Tata McGraw-Hill 2002.
4. Micael A. Gallo & William M. Handcock, Computer Communications and Networking Technologies, 2003 Edition.

E-RESOURCES:

1. http://nptel.ac.in/courses/106105082/
2. http://nptel.ac.in/courses/106108098/

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OBJECT ORIENTED MODELING AND DESIGN

Sub Code : 16IS405 **Credits : 03**

Hrs/Week : 3+0+0+S **Total Hours : 39**

*** Self Study to be exercised under the supervision of course instructor and to be restricted to not more than 10% of the total teaching hours.**

Course Learning Objectives:

This Course will enable students to

1. Explain what is meant by object-oriented modelling. Apply object-oriented modelling techniques to the problem solving. Introduce various models that can be used to describe an object-oriented design
2. Show how the UML may be used to represent these models
3. Create class diagrams that model both the domain model and design model of a software system.
4. Create interaction diagrams that model the dynamic aspects of a software system.
5. Understand and analyse the basics of Design pattern

UNIT – I

INTRODUCTION, MODELLING CONCEPTS, CLASS MODELING

What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modeling history, Modeling as Design Technique: Modeling; abstraction; The three models. Class Modeling: Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model; Navigation of class models; Practical tips.

OBJECT ORIENTED METHODOLOGIES

Rambaugh, Booch, Jacobson et al. Methodologiez **7 Hours**

UNIT - II

UNIFIED MODELING LANGUAGE

Static and Dynamic models, Modeling, The importance of modeling, Four principles of modeling, Object oriented Modeling, An overview of UML, A conceptual model of UML – Building blocks of UML, Common mechanisms in UML, Software Architecture, Software development life cycle.

ADVANCED CLASS MODELING, STATE MODELING

Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages; Practical tips. State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behaviour; Practical tips. **7 Hours**

UNIT - III

ADVANCED STATE MODELING, INTERACTION MODELING

Advanced State Modeling: Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model; Relation of class and state models; Practical tips. Interaction Modeling: Use case models; Sequence models; Activity models. Use case relationships; Procedural sequence models; Special constructs for activity models. **7 Hours**

UNIT - IV

PROCESS OVERVIEW, SYSTEM CONCEPTION, DOMAIN ANALYSIS

Process Overview: Development stages; Development life cycle. System Conception: Devising a system concept; Elaborating a concept; Preparing a problem statement. Domain Analysis: Overview of analysis; Domain class model; Domain state model; Domain interaction model; Iterating the analysis.

OBJECT ANALYSIS-CLASSIFICATION

Introduction, Classifications theory, Approaches for identifying classes, Noun phrase approach, Common class patterns approach, Use-case driven approach - identifying classes and their behaviours through Sequence/ collaboration modelling, Classes, Responsibilities and collaborators approach **8 Hours**

UNIT - V

APPLICATION ANALYSIS

Application Analysis: Application interaction model; Application class model; Application state model; Adding operations

CLASS DESIGN, IMPLEMENTATION MODELING

Class Design: Overview of class design; Bridging the gap; Realizing use cases; Designing algorithms; Recursing downwards, Refactoring; Design optimization; Reification of behavior; Adjustment of inheritance; Organizing a class design; ATM example.

Implementation Modeling: Overview of implementation; Fine-tuning classes; Fine-tuning generalizations; Realizing associations; Testing. **10 Hours**

Course Outcomes:

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

Sl. No.	Course Outcome (CO)	Bloom's Taxonomy Level (BTL)
C405.1	Importance of object orientation, modeling, and design	L2
C405.2	Learn and apply UML for class and state modeling	L4
C405.3	Learn and apply UML for advanced state Modeling and interaction modeling	L3
C405.4	Apply domain analysis, system conception, application analysis to	L5

	refine the model and design	
C405.5	Learn and apply advanced concepts like Design Patterns	L6

Mapping of POs & COs:

POs COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
C405.1	M										H	H		H
C405.2					M						H	H		H
C405.3	M				M						H			H
C405.4	M				M						H			H
C405.5	L				M						H			H

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

TEXT BOOKS:

1. Object-Oriented Modeling and Design with UML – Michael Blaha, James Rumbaugh, 2nd Edition, Pearson Education, 2005.
2. Object oriented systems development, Ali Bahrami, Tata McGraw-Hill Edition 2008.
3. The unified modeling language user guide, Grady Booch, James Rumbaugh, Ivar Jacobson, Publisher: Addison Wesley, First Edition: (Chapters 1, 2)
4. Pattern-Oriented Software Architecture: A System of Patterns - Volume 1– Frank Buschmann, RegineMeunier, Hans Rohnert, Peter Sommerlad, Michael Stal, John Wiley and Sons, 2006.

REFERENCE BOOKS:

1. 1. Rebecca Wirfs, Designing Object-oriented software, Prentice-Hall India, 1990.
2. 2. Martin. J and Odell J, Object-oriented methods: A foundation, Prentice-Hall, 1995.

E-RESOURCES:

1. nptel.ac.in/courses/106105153/

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DIGITAL SYSTEMS DESIGN

Sub Code : 16IS406 **Credits : 04**
Hrs/Week : 4+0+0+0 **Total Hours : 52**

Course Learning Objectives:

This Course will enable students to

1. Create logic circuits using basic gates such as AND, OR, NOT and universal logic gates such as NAND, NOR and Apply Boolean laws and theorems to simplify complex logic circuits.
2. Design and Build different types of Multiplexers, De-multiplexers and Decoders.
3. Interpret binary addition, subtraction, multiplication and division on binary numbers.
4. Design and analyze the operations of RS, D and JK flip-flops, Asynchronous, Synchronous and Modulo-N Counters.
5. Develop various types of Registers in Hardware Definition Language (HDL) and analyze different types of Digital Integrated Circuits.

UNIT – I

LOGIC GATES AND COMBINATIONAL LOGIC

DIGITAL LOGIC

Overview of Basic Gates and Universal Logic Gates, AND-OR-Invert Gates, Positive and Negative Logic, Introduction to HDL.

COMBINATIONAL LOGIC CIRCUITS

Boolean Laws and Theorems, Sum of Products Method, Truth Table to Karnaugh Map, Pairs, Quads, and Octets, Karnaugh simplifications, Don't Care Conditions, Product-of-sums method, Product-of-sums simplification, Simplification by Quine-McClusky Method, Hazards and Hazard cover, HDL Implementation Models **10 Hours**

UNIT – II

ALU DESIGN

DATA-PROCESSING CIRCUITS

Multiplexers, Demultiplexers, 1-of-16 Decoder, BCD-to-Decimal Decoders, Seven segment Decoders, Encoders, EX-OR gates, Parity Generators and Checkers, Magnitude Comparator, Read-Only-Memory, Programmable Array Logic, Programmable Logic, Troubleshooting with a Logic Probe, HDL Implementation of Data Processing Circuits.

ARITHMETIC CIRCUITS

Binary Addition, Binary Subtraction, Unsigned Binary Numbers, Sign-Magnitude Numbers, 2's Complement Arithmetic, Arithmetic Building Blocks, The Adder-Subtractor, Fast Add er, Arithmetic Logic Unit, Arithmetic Circuits using HDL. **11 Hours**

UNIT – III

BASICS OF SEQUENTIAL CIRCUITS

Flip-Flops: RS Flip-flops, Gated Flip-flops, Edge-triggered RS, D, JK Flip-flops, Flip-flop timing, JK Master-slave Flip-flops, Switch Contact Bounce Circuits, Various Representations of Flip-flops, Analysis of Sequential Circuits, Conversion of Flip-flops – a synthesis example, HDL implementation of Flip-flop. Design of Sequential Circuit: Design and Analysis of Synchronous and Asynchronous Sequential Circuits with examples. **11 Hours**

UNIT – IV

REGISTERS AND COUNTERS

REGISTERS

Types of Registers, Serial In – Serial Out, Serial In – Parallel Out, Parallel In- Serial Out, Parallel In – Parallel Out, Applications of Shift Register, Register Implementation in HDL.

COUNTERS

Asynchronous Counters, Decoding Gates, Synchronous Counters, Changing the Counter Modulus, Decade Counters, Presettable Counters, Counter Design as a Synthesis Problem, Counter Design Using HDL. **10 Hours**

UNIT – V

MIXED SIGNAL SYSTEMS AND IC FAMILIES

D/A CONVERSION AND A/D CONVERSION

Variable Resistor Networks, Binary Ladders, D/A Converters, D/A Accuracy and Resolution, A/D Converter – Simultaneous Conversion, A/D Converter- Counter Method, Continuous A/D Conversion, A/D Techniques.

DIGITAL INTEGRATED CIRCUITS

CMOS inverter, CMOS NAND gate, CMOS NOR gate, Two input TTL NAND gate, TTL NOR gate, AND-OR-INVERT gate. **10Hours**

Course Outcomes:

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

Sl. No.	Course Outcome (CO)	Bloom's Taxonomy Level (BTL)
C406.1	Comprehend and analyze basic logic gates and the digital logic circuit design concepts.	L4
C406.2	Describe ALU design and compare the alternatives.	L3
C406.3	Analyze and design sequential circuits, counters and registers.	L6
C406.4	Analyze advanced digital logic design using HDL, and mixed signal systems.	L3
C406.5	Illustrate the Digital to Analog conversion and the IC concepts.	L6

Mapping of POs & COs:

POs COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
C406.1	M	H	H	M							M	L		M
C406.2	M	H		M							M	L	M	
C406.3	M	H		M	M						M	L		M
C406.4	M	H		M	M						M	L	L	
C406.5	H	H			M						M	L		

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

TEXT BOOK:

1. Donald P Leach, Albert Paul Malvino & GauthamSaha, Digital Principles and Applications, , 6th Edition, TMH, 2006.

REFERENCE BOOKS:

1. Charles H. Roth, Jr., Fundamentals of Logic Design, 5th Edition, Thomson Learning, 2004.
2. Ronald J Tocci, Neal S. Widmer, Gregory L Moss, Digital Systems Principles and Applications, 10th Edition, PHI/Pearson Education, 2007.

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ENHANCING SELF COMPETENCE

Sub Code : 16HU411 **Credits : 02**
Hrs/Week : 1+2+0+0 **Total Hours : 26**

Course Learning Objectives:

This Course will enable students to

1) Introspect and learn more about oneself
2) Learn social behaviour and etiquette
3) Develop positive attitude and values in life
4) Learn to be effective in communication and interactive skills
5) Educate on writing and presentation skills and also to educate onself on legal and ethical aspects

UNIT – I

Self Awareness and Emotional Quotient:
SWOT Analysis; Johari Window **4 Hours**

UNIT – II

Grooming and Etiquette:
Personal grooming, hygiene, dressing for different occasions, making small talk, showing respect to women, eye contact, being appreciative, dos and don'ts in a conversation; Time Management. **4 Hours**

UNIT - III

Attitude Development:
Building self worth, confidence, developing empathy; Goal Setting; Motivation.

5 Hours

UNIT – IV

Interactive Behavior:
Active listening, verbal & non-verbal communication, interview skills, group discussions, dealing with people in an organization, handling feed back and criticism. **7 Hours**

UNIT - V

Writing and Presentation:
Formal and informal e-mails, framing requests, accepting or rejecting proposals, greetings, salutations, Close. Plagiarism, Presentation Skills. **6 Hours**

Course Outcomes:

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

1. Develop awareness of his or her strengths and weaknesses and handle emotions.
2. Ensure a refined behaviour.
3. Become an asset to the society.
4. Become a good communicator.
5. Present to a group, on a one to one basis and create an impact.

REFERENCE BOOKS :

1) "Communicating at work – Principles and Practices for Business and the Professions" - Ronald B Adler & Jeanne Marquardt Elmhorst; McGraw-Hill College; Sixth Edition.
2) "Organizational Behaviour", - Stephen P Robbins; Prentice Hall, India.
3) "Organizational Behaviour", - Fred Luthans; McGraw Hill International Edition.

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DESIGN & ANALYSIS OF ALGORITHMS LAB

Sub Code : 16IS408 **Credits : 01**
Hrs/Week: 0+0+2+0 **Total Hours : 26**

Course Learning Objectives:

This Course will enable students to

1. To explain the requirements of an Algorithm.
2. Identify the problem given and design the algorithm using various algorithm design techniques.
3. Implement various algorithms in a high level language.
4. Analyze the performance of various algorithms.
5. Compare the performance of different algorithms for .same problem

Course Content:

1. Implement Euclid's algorithm, Middle School Procedure and Consecutive Integer Checking to compute GCD (m,n) and determine the time required.
2. Generate prime numbers using Sieve's algorithm and determine the time required to sort the elements
3. Implement Sequential search and determine the time required to search an element.
4. Sort a given set of elements using Selection sort and determine the time required to sort elements.
5. Sort a given set of elements using the Bubble sort method and determine the time required to sort the elements.
6. Implement Brute Force String Matching Technique and determine the time required.
7. Sort a given set of elements using Merge sort method and determine the time required to sort the elements.
8. Sort a given set of elements using Quick sort method and determine the time required sort the elements.
9. Implement Recursive Binary search and determine the time required to search an element.
10. Implement Strassen's matrix multiplication and determine the time required.
11. Sort a given set of elements using the Insertion sort method and determine the time required to sort the elements.
12. Check whether a given graph is connected or not using DFS method and determine the time required.
13. Print all the nodes reachable from a given starting node in a digraph using BFS method and determine the time required.
14. Find the Topological sequence of vertices for the given graph and determine the time required

15. Sort a given set of elements using the Heapsort method and determine the time required to sort the elements
16. Sort a given set of elements using the Sorting by counting method and determine the time required to sort the elements.
17. Sort a given set of elements using the Distribution counting method and determine the time required to sort the elements.
18. Implement Horspool's algorithm for String Matching and determine the time required.
19. Find the Binomial Coefficient using Dynamic Programming and determine the time required.
20. Compute the transitive closure of a given directed graph using Warshall's algorithm and determine the time required.
21. Implement Floyd's algorithm for the All-Pairs-Shortest-Paths problem and determine the time required.
22. Implement 0/1 Knapsack problem using dynamic programming and determine the time required.
23. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm and determine the time required.
24. Find Minimum Cost Spanning Tree of a given undirected graph using kruskals algorithm and determine the time required.
25. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm and determine the time required
26. Implement N Queen's problem using Back Tracking method and determine the time required.
27. Find a subset of a given set S = {sl,s2,.....,sn} of n positive integers Whose sum is equal to a given positive integer d. For example, if S= {1, 2, 5, 6, 8} and d = 9 .If there are two solutions{1,2,6}and{1,8}.A suitable message is to be displayed if the given problem instance doesn't have a solution and determine the time required.

Course Outcomes:

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

Sl. No.	Course Outcome (CO)	Bloom's Taxonomy Level (BTL)
C408.1	Understand the basics of algorithm design an d analyze efficiency.	L2
C408.2	Develop and analyze algorithms using brute force and divide and conquer technique to solve problem	L4
C408.3	Design and analyze algorithms using decrease and conquer, transform and conquer technique to solve problem.	L4

C408.4	Design and analyze algorithms using dynamic programming to solve problem.	L4
C408.5	Design and analyze algorithms using greedy technique, backtracking and branch and bound technique to solve problem.	L4

Mapping of POs & COs:

POs COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
C408.1	H		M		L								M	
C408.2	L	M		M		M			L			H	H	M
C408.3	L		M	M	M		M					H	H	M
C408.4	L	M		M			M					H	H	M
C408.5	L		M		L				L			H	H	M

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

TEXT BOOK:

1. Introduction to the Design & Analysis of Algorithms, AnanyLevitin, 2nd Edition, Pearson Education, 2007.

REFERENCE BOOKS:

1. Introduction to Algorithms , Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 2nd Edition, PHI, 2006.
2. Computer Algorithms by Horowitz E., Sahni S., Rajasekaran S, Galgotia Publications, 2001
3. Introduction to the Design and Analysis of Algorithms A Strategic Approach, R.C.T. Lee, S.S. Tseng, R.C. Chang &Y.T.Tsai, TMH, 2005.

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DIGITAL SYSTEMS DESIGN LAB

Sub Code : 16IS409 **Credits : 01**
Hrs/Week : 0+0+2+0 **Total Hours : 26**

Course Learning Objectives:

This Course will enable students to

1. Create logic circuits using basic gates such as AND, OR, NOT and universal logic gates such as NAND, NOR.
2. Apply Boolean laws and theorems to simplify complex logic circuits.
3. Design and implement different types of Multiplexers, De-multiplexers and Decoders.

4. Design and study the operations of counters and flip-flops.
5. Simulate Basic gates, Adders, Subtractors, multiplexers, flip-flops using Verilog Hardware Definition Language (HDL).

PART – A (Combinational Circuits)

1. Simplification, Realization of Logic/Universal gates.
2. i) Realization of half/full adder and half/full Subtractor using logic gates.
   ii) Realization of Half Adder/Full Adder using only NAND gates.
3. Design and implementation of Full Adder / Full Subtractor using IC 74153(4:1 Mux).
4. To design and setup the following circuit
   i. 8:1 Multiplexer (MUX) using only 4:1 Multiplexer. (74153)
   ii. 1:2 Demultiplexer (DEMUX) using only NAND gates.
5. Given any four variable logic expression, simplify using Entered Variable Map and realize the simplified logic expression using 8:1 multiplexer IC.
6. Design and implementation of a Full adder and a Full Subtractor using 3:8 decoder and 4 input NAND gates.
7. Design 1-bit and 2-bit Comparators circuit.
8. Use Decoder chip to drive LED display.

PART – B (Sequential Circuits)

1. Design and implementation of S-R flip flop using NOR gates.
2. Design and implementation of J-K flip flop using NAND gates.
3. Design and implementation of D & T flip flop.
4. Design and implement following applications of JK flip flop.
   i. 4-bit ripple counter
   ii. BCD counter
5. Design and implementation of a Mod-N (N<8) Synchronous up counter using J-K flip flop ICs.
6. Design and implementation of an Asynchronous counter using a Decade counter IC to count up from 0 to n (n<=9)
7. Design and implementation of the following using 4-bit shift register
   i) Ring counter
   ii) Johnson counter
8. Design and study the operation of Sequence Generator.

PART – C (Verilog Simulation)

1. Simulation of Logic gates.
2. Simulation of half adder and full adder.
3. Simulation of half subtractor and full subtractor.
4. Simulation of 2:1,4:1& 8:1 multiplexer.
5. Simulation 1:2Demultiplexer using only NAND gates.
6. Simulation of D & T flip-flop.

7. Simulation of Ring Counter.
8. Simulation of Johnson's Counter.

Course Outcomes:

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

Sl. No.	Course Outcome (CO)	Bloom's Taxonomy Level (BTL)
C409.1	Comprehend and analyze basic logic gates and the digital logic circuit design concepts.	L4
C409.2	Remember CPU design, apply the combinational logic and design the circuit..	L6
C409.3	Implement and design the sequential circuits.	L6
C409.4	Understand the register and counter operations and design the applications of it..	L6
C409.5	Understand and design the Verilog HDL.	L6

Mapping of POs & COs:

POs COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
C409.1	M	H	H	M							M	L		M
C409.2	M	H		M							M	L	M	
C409.3	M	H		M	M						M	L		M
C409.4	M	H		M	M						M	L	L	
C409.5	H	H			M						M	L		

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

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2. Ronald J Tocci, Neal S. Widmer, Gregory L Moss, Digital Systems Principles and Applications, 10th Edition, PHI/Pearson Education, 2007.

INTERNET RESOURCES:

1. https://www.scribd.com

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