B. TECH 3rd SEMESTER	L	T	P	C
	2	1	-	3
19CS3T01 : DISCRETE MATHEMATICS				

COURSE OBJECTIVES:

The Objective of this course is to

- Provide the fundamentals and the concepts of Discrete Mathematical Structures with applications to Computer Sciences including Mathematical Logic, Boolean Algebra and its Applications, Switching circuit & Logic Gates, Graphs and Trees. Important theorems with constructive proofs, real life problems & graph theoretic algorithms.
- Help the students to understand the computational and algorithmic aspects of Sets, Relations, Mathematical Logic, Boolean Algebra, Graphs, Trees and Algebraic Structure in the field of Computer sciences and its applications.

COURSE OUTCOMES:

Upon successful completion of this course the student should be able to

- Identify programming errors efficiently through enhanced logical capabilities
- Find a general solution of recurrence equation
- Learn set theory, graph of the relations which are used in data structures
- Explain the concepts in graph theory
- Apply graph theory concepts in core subjects such as data structures and network theory effectively

Unit 1: Mathematical logic

Connectives, negation, conjunction, disjunction, statement formula and Truth Tables, conditional and bi-conditional, well formed formulae, tautologies, equivalence of formulae, duality, tautological implications, functionally complete set of connectives, other connectives, principal disjunctive and conjunctive normal forms, inference calculus, rules of inference, consistency of premises, indirect method of proof, Theory of inference for the statement calculus, validity using Truth tables.

Unit 2: Recurrence relations

Generating Function of Sequences, Calculating Coefficient of generating functions, Recurrence relations, solving recurrence relation by substitution and Generating functions, the method of Characteristic roots, Solution of Inhomogeneous Recurrence Relation.

Unit 3: Set theory and Relations

Relations and ordering, Relations, Properties of binary Relations in a set, Relation Matrix and the Graph of a Relation, partition and covering of a set, Equivalence, Compatibility Relations, Composition of Binary Relations, Partial ordering, Hasse diagram, Principle of Inclusion-Exclusion, Pigeonhole Principle and its applications.

Unit 4: Graph theory

Basic Concepts, Representation of Graph, Sub graphs, Multigraphs, Planar graphs, Euler Paths, Euler circuits, Hamiltonian Graphs and Graph Isomorphism and its related Problems, Chromatic Number.

Unit 5: Trees

Spanning Trees, minimal Spanning Trees, BFS, DFS, Kruskal's Algorithm, Prim's Algorithm, Binary trees.

Text Books:

1. Discrete Mathematical Structures with Applications to Computer Science, J.P. Tremblay and R. Manohar Tata McGraw Hill, 2017.
2. Discrete Mathematics for computer scientists & Mathematicians, Joe L. Mott, Abraham Kandel and T. P. Baker 2/e, Prentice Hall of India Ltd, 2012.

References:

1. Keneth. H. Rosen, Discrete Mathematics and its Applications, 6/e, Tata McGraw-Hill, 2009.
2. Richard Johnsonburg, Discrete Mathematics, 7/e, Pearson Education, 2008
3. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science, Prentice Hall of India, 2006.

B. TECH 3rd SEMESTER	L	T	P	C
	3	-	-	3
19CS3T02 : DATA STRUCTURES				

COURSE OBJECTIVES

1. To impart the basic concepts of data structures and algorithms.
2. To gain knowledge of linear and non-linear data structures.
3. To familiarize with different sorting and searching techniques.
4. To understand basic concepts about stacks, queues, lists, trees and graphs.
5. To understand about writing algorithms and step by step approach in solving problems with the help of fundamental data structures

COURSE OUTCOMES:

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

1. Implement various Searching and Sorting techniques.
2. Design applications using Stacks and implement various types of Queues.
3. Analyze and implement operations on Linked lists and demonstrate their applications.
4. Implement various operations on Binary trees.
5. Demonstrate the implementation of various types of Graphs and Graph Traversals.

UNIT-I:

Introduction: Definition of data structure, types and overview of data structures.
Algorithm: Preliminaries of algorithm, Algorithm analysis and complexity
Searching: Linear Search, Binary Search and Fibonacci search.
Sorting: Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort and Radix sort.

UNIT-II:

Stacks and Queues: Stack Representation using Arrays, operations on stack, Applications of stacks - Factorial Calculation, Infix to postfix Transformation, Evaluating Arithmetic Expressions. Queue Representation using Arrays, operations on queues, Applications of queues, Circular queues, Priority queues, Implementation of queue using stack.

UNIT-III:

Linked Lists: Introduction, Single linked list, representation of a linked list in memory, Operations on a single linked list, Applications of single linked list, Circular linked list, Operations on a circular linked list Double linked list, Operations on a double linked list.

UNIT-IV:

Trees: Basic tree concepts. **Binary Trees:** Properties, Representation of Binary Trees using Arrays and Linked List, Binary Tree Traversals, Creation of binary tree from in, pre and post order traversals, threaded binary tree. **Binary search trees:** Basic concepts, BST operations: Search, insertion, deletion and traversals, Creation of binary search tree from in-order and pre (post)order traversals.

UNIT-V:

Graphs: Basic concepts, Representations of Graphs: using Linked list and adjacency matrix, Graph Traversals - BFS & DFS, Applications: Dijkstra's shortest path algorithm, Minimum Spanning Tree using Prim's algorithm and Kruskal's algorithm, Transitive closure, Warshall's algorithm.

TEXT BOOKS:

1. Data Structures: A Pseudo code approach with C by Richard F. Gilberg and Behrouz.A. Forouzan, 2nd edition, Cengage, 2012.
2. Debasissamanta, Classic Data Structures, PHI, 2nd edition, 2016.
3. Data Structures through C, 2nd edition by Yashavant Kanetker, BPB publications, 2017.

REFERENCE BOOKS

1. Seymour Lipschutz, Data Structure with C, TMH, 2017
2. G. A. V. Pai, Data Structures and Algorithms, TMH, 2017.

Horowitz, Sahni, Anderson Freed, Fundamentals of Data Structure in C, University Press, 2nd edition, 2018.

B. TECH 4th SEMESTER	L	T	P	C
	3	-	-	3
19CS4T02 : DATABASE MANAGEMENT SYSTEMS				

COURSE OBJECTIVES:

The objectives of the course is

1. To describe a sound introduction to the discipline of database management systems.
2. To give a good formal foundation on Entity- Relationship (E-R) model, the relational model of data and usage of Relational Algebra.
3. To introduce the concepts of basic SQL as a universal Database language.
4. To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization.
5. To provide an overview of transaction management, Database storage and indexing techniques.

COURSE OUTCOMES

Upon successful completion of this course, students should be able to:

CO1: Explain the basic concepts of database management system and design an Entity-Relationship (E-R) model and convert E-R model to relational model.

CO2: Construct database using Relational algebra and SQL.

CO3: Apply Normalization techniques to normalize the database.

CO4: Discuss transaction management using different concurrency control protocols and recovery algorithms.

CO5: Illustrate different file organization and indexing methods.

UNIT-1

Introduction-Database System Applications, Purpose of Database Systems, View of Data - Data Abstraction, Instances and Schemas, Data Models, Database Languages , Database Architecture, Database Users and Administrators.

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model.

Relational Model: Introduction to the Relational Model - Integrity Constraints over Relations.

Enforcing Integrity constraints, querying relational data, Logical data base Design, Views.

UNIT-II

Relational Algebra: Relational Algebra - Selection and Projection, Set operations, Renaming, Joins, Division.

SQL: Form of Basic SQL Query - Examples of Basic SQL Queries, UNION, INTERSECT, and EXCEPT, Introduction to Nested Queries, Correlated Nested Queries, Set Comparison

Operators, Aggregate Operators, NULL values - Comparison using Null values - Logical connectives - AND, OR and NOT - Outer Joins, Disallowing NULL values, Triggers.

UNIT-III

SCHEMA REFINEMENT AND NORMAL FORMS: Introduction to Schema Refinement - Problems Caused by redundancy, Decompositions - Problem related to decomposition, Functional Dependencies - Reasoning about FDS, Normal Forms - FIRST, SECOND, THIRD Normal forms - BCNF - Properties of Decompositions - Loss less join Decomposition, Dependency preserving Decomposition, Multi valued Dependencies - FOURTH Normal Form, Join Dependencies, FIFTH Normal form.

UNIT-IV

Transaction Management - The ACID Properties - Transactions and Schedules- Concurrent Execution of Transactions- Lock-Based Concurrency Control- 2PL, Serializability, and Recoverability- Dealing With Deadlocks - Concurrency Control without Locking.

CRASH RECOVERY: Introduction to ARIES- The Log - The Write-Ahead Log Protocol – Checkpoints - Recovering from a System Crash(ARIES) - Media Recovery.

UNIT-V

Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing- Clustered Indexes, Primary and Secondary Indexes, Index data Structures - Hash Based Indexing, Tree based Indexing, Comparison of File Organizations.

Tree Structured Indexing: Intuitions for tree indexes, Indexed Sequential Access Methods(ISAM), B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.

TEXT BOOKS:

1. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, McGrawHill Education, 3rd Edition, 2014.
2. Data base System Concepts, A.Silberschatz, H.F. Korth, S.Sudarshan, McGraw Hill, 6th edition, 2016.

Reference Books:

1. Fundamentals of Database Systems, Ramez Elmasri, Shamkant B Navathe-7th Edition, 2016.
2. Introduction to Database Systems, 8/e, C.J. Date, Pearson, 2012.
3. Database System Design, Implementation and Management, 5/e, Rob, Coronel, Thomson, 2012.

B. TECH 4th SEMESTER	L	T	P	C
	2	-	-	2
19IT4T04 : SOFTWARE ENGINEERING				

COURSE OBJECTIVES:

The student should be made to:

1. Understand the phases in a software project
2. Understand fundamental concepts of requirements engineering and Analysis Modeling.
3. Understand the major considerations for enterprise integration and deployment.
4. Learn various testing and implementation techniques
5. Understand the activities involved in project management

COURSE OUTCOMES:

At the end of the course, the student should be able to

1. Identify, formulate and solve software engineering problems
2. Elicit, analyze and specify software requirements with various stakeholders of a software development project and different software development process models.
3. Apply systematic procedure for software design and deployment.
4. Compare and contrast the various testing methods
5. Identify the key activities in managing a software project.

UNIT I

INTRODUCTION AND SOFTWARE PROCESS: Evolving Role of Software, Software Characteristics, Changing Nature of Software, Software Myths, Software Engineering- A layered Technology, a Process Framework, Capability Maturity Model Integration(CMMI), Process Assessment, Process Models – Waterfall Model, Incremental Process Models, Evolutionary Process Models, The Unifies Process.

UNIT II

REQUIREMENTS ANALYSIS AND SPECIFICATION: Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management-Classical analysis: Structured system Analysis, Petri Nets- Data Dictionary.

UNIT III

SOFTWARE DESIGN: Design process – Design Concepts-Design Model– Design Heuristic – Architectural Design – Architectural styles, Architectural Design, Architectural Mapping using Data Flow- User Interface Design: Interface analysis, Interface Design –Component level Design: Designing Class based components, traditional Components.

UNIT IV

TESTING AND IMPLEMENTATION: Software testing fundamentals-Internal and external views of Testing-white box testing- basis path testing-control structure testing-black box testing- Regression Testing – Unit Testing – Integration Testing – Validation Testing – System Testing And Debugging – Software Implementation Techniques: Coding practices-Refactoring.

UNIT V

PROJECT MANAGEMENT: Estimation – FP Based, LOC Based, Make/Buy Decision, COCOMO II – Planning – Project Plan, Planning Process, RFP Risk Management – Identification, Projection, RMMM – Scheduling and Tracking –Relationship between people and effort, Task Set & Network, Scheduling, EVA – Process and Project Metrics.

TEXT BOOK:

1. Software Engineering, A practitioner's Approach- Roger S. pressman, 8th edition, McGraw-Hill lnternational Edition, 2014.
2. Ian Sommerville, "Software Engineering", 10th Edition, Pearson Education Asia, 2016.

REFERENCE BOOKS:

1. Rajib Mall, "Fundamentals of Software Engineering", Third Edition, PHI Learning PrivateLimited, 2009.
2. Pankaj Jalote, "Software Engineering, A Precise Approach", Wiley India, 2010.
3. Kelkar S.A., "Software Engineering", Prentice Hall of India Pvt Ltd, 2007.
4. Stephen R.Schach, "Software Engineering", Tata McGraw-Hill Publishing Company Limited, 2007.
5. Systems Analysis and Design- Shely Cash man Rosenblatt, 9th Edition,Thomson publications, 2016.
6. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.
7. https://nptel.ac.in/courses/106101061/

B. TECH 4th SEMESTER	L	T	P	C
	3	-	-	3
19IT4T01 : COMPUTER ORGANIZATION AND ARCHITECTURE				

COURSE OBJECTIVES

1. To discuss the basic knowledge of computer system including the analysis and design of components of the system.
2. To understand the register transfer language, micro operations and design of basic components of the system.
3. To explain different types of addressing modes and memory organization.
4. To learn the concepts of parallel processing, pipelining and vector processing.

COURSE OUTCOMES

After completion of the course students able to

1. Explain knowledge on structure of computers and computer arithmetic.
2. Analyze Micro operations such as Arithmetic micro operations, Shift micro operations and Logic micro operations.
3. Define the appropriate addressing modes and instructions for writing programs.
4. Demonstrate the Peripheral devices for efficient operation of system.
5. Describe the basic knowledge on parallel and vector processing.

UNIT-I

Basic Structure of Computers:

Basics of computer, Von Neumann Architecture, Generation of Computer, Types of Compute, Functional unit, Basic Operational Concepts and Bus Structures.

Computer Arithmetic: Addition and Subtraction, multiplication algorithms, Division Algorithms.

UNIT-II

Register Transfer Language and Micro Operations: Register Transfer language. Register Transfer Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.

Basic Computer Organization and Design: Instruction codes, Computer Registers, Computer Instructions, Timing and control, Instruction Cycle, Memory – Reference, Input – Output and Interrupt Instructions. Design of basic computer, Design of Accumulator logic.

UNIT-III

Central Processing Unit: General Register Organization, STACK organization. Instruction formats. Addressing modes. DATA Transfer and manipulation, Program control, Reduced Instruction Set Computer.

Micro Programmed Control: Control Memory, Address sequencing, micro program example, design of control unit.

UNIT-IV

Input- Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupts, Direct memory Access.

The Memory System: Memory Hierarchy, Main Memory, Auxiliary memory, Associative Memory, Cache Memory and Virtual Memory.

UNIT-V

Parallel Processing and Vector Processing

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processors.

Text Books:

1. Computer System Organization, M. Moris Mano, 3rd Edition, Pearson / PHI, 2007.
2. Computer Organization, Carl Hamacher, Zvonks Vranesic, SafeaZaky, 5th Edition, McGraw Hill, 2016.
3. Computer Organization, a quantitative approach, John L. Hennessy and David A.Patterson, Fifth Edition, 2011.

Reference Books:

1. Computer Organization and Architecture - William Stallings, Ninth Edition, Pearson / PHI, 2012.
2. Structured Computer Organization - Andrew s. Tanenbaum, 6th Edition, PHI/ Pearson, 2012.
3. Fundamentals of Computer Organization and Design, - Sivaraama Dandamudi, Springer Int. Edition, 2006.