MCA -201
Data Structures

Subject Code	Sub ject Name & Title	Total Marks	End Semester Exam Marks		Sessional Marks		Total Credits
			Max	Min	Max	Min	
MCA-201	Data Structures	100	60	21	40	14	3

Course Objective :
To introduce the fundamental concept of data structures and to emphasize the importance of data structures in developing and implementing efficient algorithms.

Syllabus :

1. Review of Computer Programming, Definition of Data Structure, Types of Data Structures, Concept of data and information, Abstract Data Types, Design and Implementation issues of Data Structures and their memory representation.

2. Stacks: Stacks as ADT, Implementation of various operations on stack, Application of stack: Infix-Prefix expressions, their evaluation and conversions, Recursion. Queues: Definition, Queues as an ADT, Types of Queues: Circular Queue, Deque, Priority Queue, Implementation of various Operations on Queues, Applications of Queue. Linked List: Representation of linked list in memory, Implementation of linked list, Types of Linked List: Circular linked list, Doubly linked list, Header linked list, Linked Implementation of Stacks and Queues, Applications of linked list.

3. Trees: Definitions: height, depth, order, degree, etc., Binary Tree, Types of Binary Tree, Binary Search Tree: Introduction, Operations, Traversal, Search, Implementation, Applications of Trees: Representation and Evaluation of an expression with binary operators, Huffman's Algorithm, Heap; AVL Tree, Threaded Binary Tree, Multiway Trees: B tree, B+ tree.

4. Graphs: Introduction, Directed and Undirected graphs, Representation, Graph Traversal: Depth First search (DFS) and Breadth First Search (BFS), Minimum Spanning Tree: Kruskal, Prim's algorithms, Shortest Path Algorithm: Dijkstras and Warshalls algorithm, Applications of Graphs.

5. Sorting: Introduction, Different Sorting Techniques like: Bubble Sort, Quick Sort, Selection Sort, Heap Sort, Insertion Sort, Shell Sort, Merge Sort, Radix Sort, Comparison of various Sorting Techniques. Searching: Basic Search Techniques: Sequential Search, Binary Search, Indexed Sequential Search, Hashing, Comparison of various Searching techniques.

Books Recommended:

1. Langston, Augestine, Tannenbaum, “Data structures using C & C++”, Pearson Education.
2. Seymour Lipschutz, Schaums’s Outline Series, “Theory and problems of Data Structures”, TMH.
3. Kruse, Tondo, Leung, “Data structures and Program Design in C”, Prentice Hall
4. H. Sahni, “Fundamentals of Computer Algorithms”, Galgotia, 1984.
5. Wirth Niklaus , “Algorithm + Data Structures= programs”, Pearson Education

Course Outcome

• Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms
• Describe common applications for arrays, records, linked structures, stacks, queues, trees, and graphs
• Write programs that use arrays, records, linked structures, stacks, queues, trees, and graphs
• Demonstrate different methods for traversing trees
• Compare alternative implementations of data structures with respect to performance
• Compare and contrast the benefits of dynamic and static data structures implementations
• Describe the concept of recursion, give examples of its use, describe how it can be implemented using a
• Design and implement an appropriate hashing function for an application
• Discuss the computational efficiency of the principal algorithms for sorting, searching, and hashing

MCA -202
Data Base Management System

Subject Code	Subject Name & Title	Total Marks	End Semester Exam Marks		Sessional Marks		Total Credits
			Max	Min	Max	Min	
MCA-202	Database Management System	100	60	21	40	14	3

COURSE OBJECTIVE:

1. To explain basic database concepts, applications, data models, schemas and instances.
2. To demonstrate the use of constraints and relational algebra operations. Describe the basics of SQL and construct queries using SQL.
3. To emphasize the importance of normalization in databases.
4. To facilitate students in Database design
5. To familiarize issues of concurrency control and transaction management.

Syllabus :

UNIT - I Fundamental of DBMS and ER diagram

Introduction: DBMS, Advantage of DBMS approach, various view of data, data independence, schema and sub-schema, primary concepts of data models, Database languages, transaction management, Database administrator and users, data dictionary, overall system architecture.ER model: basic concepts, design issues, mapping constraint, keys, ER diagram, weak and strong entity sets, specialization and generalization, aggregation, inheritance, design of ER schema, reduction of ER schema to tables.

UNIT - II Keys and Relational algebra and calculus

Domains, Relations and Keys: domains, relations, kind of relations, relational database, various types of keys, candidate, primary, alternate and foreign keys. Relational Algebra & SQL: The structure, relational algebra with extended operations, modifications of Database, idea of relational calculus, basic structure of SQL, set operations, aggregate functions, null values, nested sub queries, derived relations, views, modification of Database, join relations, DDL in SQL.

UNIT - III Normalization

Functional Dependencies and Normalization: basic definitions, trivial and non- trivial dependencies, closure set of dependencies and of attributes, irreducible set of dependencies, introduction to normalization, non-loss decomposition, FD diagram, first, second, third

Normal forms, dependency preservation, BCNF, multivalued dependencies and fourth normal form, Join dependency and fifth normal form.

UNIT - IV ACID properties and serializability

Database Integrity: general idea. Integrity rules, domain rules, attribute rules, relation rules, Database rules, assertions, triggers, integrity and SQL.Transaction, concurrency and Recovery: basic concepts, ACID properties, Transaction states, implementation of atomicity and durability, concurrent executions, basic idea of serializability, basic idea of concurrency control, basic idea of deadlock, failure classification, storage structure types, stable storage implementation, data access, recovery and atomicity- log based recovery, deferred Database modification, immediate Database modification, checkpoints. Distributed

UNIT - V Distributed database

Database: Basic idea, distributed data storage, data replication, data fragmentation-horizontal, vertical and mixed fragmentation Emerging Fields in DBMS: object oriented Databases-basic idea and the model, object structure, object class, inheritance, multiple inheritance, object identity, data warehousing- terminology, definitions, characteristics, data mining and it's overview, Database on www, multimedia Databases-difference with conventional DBMS, issues, similarity based retrieval, continuous media data, multimedia data formats, video servers.

BOOKS :

1. A Silberschatz, H.F Korth, Sudersan "Database System Concepts" –, MGH Publication.
2. C.J Date "An introduction to Database Systems" –6th ed.
3. Elmasri & Navathe "Fundamentals of Database systems" – III ed.
4. B.C. Desai. "An introduction to Database systems" BPB
5. Raghurama Krishnan "Database Systems" TMH

COURSE OUTCOME :

1. Describe the fundamental elements of relational database management systems
2. Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.
3. Design ER-models to represent simple database application scenarios
4. Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.
5. Improve the database design by normalization.

MCA -203
Theory of Computation

Subject Code	Subject Name & Title	Total Marks	End Semester Exam Marks		Sessional Marks		Total Credits
			Max	Min	Max	Min	
MCA-203	Theory of Computation	100	60	21	40	14	3

COURSE OBJECTIVE:

1. Introduce students to the mathematical foundations of computation including automata theory;
2. The theory of formal languages and grammars;
3. The notions of algorithm, decidability, complexity, and computability.

Syllabus :

UNIT - I Finite State Systems

Basic Definitions Non-Deterministic finite automata (NDFA), Deterministic finite automata (DFA), Equivalence of DFA and NDFA Finite automata with Emoves, Regular Expressions, Equivalence of finite automata and Regular Expressions, Regular expression conversion and vice versa, Myhill-Nerode Theorem and minimization of finite Automata. Concept of basic Machine, Properties and limitations of FSM. Moore and mealy Machines, Equivalence of Moore and Mealy machines.

UNIT - II Properties of Regular Sets

The Pumping Lemma for Regular Sets, Closure properties of regular sets. Context free grammar and ambiguity, reduced forms, Removal of useless symbols and unit production, Chomsky Normal Form (CNF), Griebach Normal Form (GNF).

UNIT - III Pushdown Machine

Introduction to Pushdown Machines, Application of Pushdown Machines, context free grammar to PDA and vice versa, Closure properties of CFL.

UNIT - IV Turing Machines

Deterministic and Non-Deterministic Turing Machines, Design of T.M, Halting problem of Turing Machine, PCP Problem.

UNIT - V Chomsky hierarchies

Chomsky hierarchies of grammars, Context sensitive grammar, unrestricted grammars, Context sensitive languages, Relation between languages of classes. Computability: Basic concepts, Primitive Recursive Functions.

REFERENCE BOOKS :

1. Introduction to automata theory, language & computations Hopcroaft & O.D. Ullman, R Mothwani,
2. Theory of Computer Sc.(Automata, Languages and computation): K.L.P. Mishra
3. N. Chandrasekaran,
4. Introduction to formal Languages & Automata Peter Linz,
5. Fundamentals of the Theory of Computation- Principles and Practice Ramond
6. Greenlaw and H. James Hoover
7. Introduction to the Theory of Computation Michael Sipser

COURSE OUTCOME:

1. Learn about theoretical concepts of computer science.
2. Learn about language hierarchy and their computational machines.

MCA -204
Object Oriented Analysis & Programming

Subject Code	Subject Name & Title	Total Marks	End Semester Exam Marks		Sessional Marks		Total Credits
			Max	Min	Max	Min	
MCA-204	Object Oriented Analysis & Java Programming	100	60	21	40	14	3

Course Objective:

- This course provides an introduction to **object oriented programming (OOP)** .
- Its main objective is to teach the basic concepts and techniques which form the **object oriented programming paradigm**

Syllabus:

Unit 1: Introduction: Inherent Complexity of Software, Attributes of Complex Systems, Elements of the Object Model: Minor and Major elements.

Unit 2: Object Oriented Concepts: Problem Solving using Object Oriented approach, Objects and classes, attributes and methods, constructors, data abstraction and encapsulation, data hiding.

Unit 3: Introduction to Object Oriented Fundamentals: Basic language elements, Primitive and Non primitive data types, Unicode Character set, Variables: default and initial value of variables, Operators And Assignments, Access Modifiers, Methods: declaration, calling.

Unit 4: Object Oriented Programming : Arrays, control structures, String handling, Conversions, packages and interfaces, class inheritance , polymorphism :Compile time and Run time, wrapper class, error handling with exceptions, multithreaded programming, I/O and advanced features of object oriented programming.

Unit 5: Introduction to Object Oriented Analysis and Design: Design concept, Use Cases, Class diagrams, State Transition diagrams, Object diagrams.

Books Recommended :

1. Grady Booch, “Object Oriented Analysis and Design with Applications”, Pearson, 2/e, 2001.
2. H. Schildt, “Java The Complete Reference”, TMH, 2001.
3. Khalid A Mughal “A Programmer’s Guide to Java SCJP Certification”.

Course Outcome:

- The model of object oriented programming: abstract data types, encapsulation, inheritance and polymorphism
- Fundamental features of an object oriented language like Java: object classes and interfaces, exceptions and libraries of object collections
- How to take the statement of a business problem and from this determine suitable logic for solving the problem; then be able to proceed to code that logic as a program written in Java.
- How to test, document and prepare a professional looking package for each business project using javadoc.

MCA -205
Data Structure Lab

Subject Code	Subject Name & Title	Total Marks	End Semester Exam Marks		Sessional Marks		Total Credits
			Max	Min	Max	Min	
MCA-206	Data Structure Lab	100	60	21	40	14	3

Course Objective :

- To implement linear and non-linear data structures
- To understand the different operations of search trees
- To implement graph traversal algorithms
- To get familiarized to sorting and searching algorithms

Syllabus :

1. Array implementation of Stack and Queue ADTs

2. Array implementation of List ADT

3. Linked list implementation of List, Stack and Queue ADTs

4. Applications of List, Stack and Queue ADTs

5. Implementation of Binary Trees and operations of Binary Trees

6. Implementation of Binary Search Trees

Course Outcomes:

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

- Write functions to implement linear and non-linear data structure operations
- Suggest appropriate linear / non-linear data structure operations for solving a given problem
- Appropriately use the linear / non-linear data structure operations for a given problem

MCA -206
Project I

Subject Code	Subject Name & Title	Total Marks	End Semester Exam Marks		Sessional Marks		Total Credits
			Max	Min	Max	Min	
MCA-206	Project I	**100**	**60**	**21**	**40**	**14**	**3**

Project1 is the course aimed at coding assignment which can be produced by a group or a person. Project1 will be a source code with enhanced capacities, need to make as a part of their instructive educational programs. These projects can be created in JAVA, VB .NET, ASP .NET, C, C++, PHP, C#, JSP, J2EE, ASP , Cloud Computing Networking, Big Data, Data Mining .