Batch 2024-25

Syllabus

2nd Semester

Integrated

M.C.A.

MCA CIntegrated

Semester 2

242/MCA/DS201

Course code	DSC-3			
Category	Discipline Specific Courses (DSC)			
Course title	Data Structure and Algorithm			
Course ID				
Scheme and Credits	L	T	P	Credits
	3	-	2	4
Theory Internal	25			
Theory External	50			
Practical Internal	05			
Practical External	20			
Total	100			
Duration of Exam	3 HRS			

Note: The examiner will set nine questions in total. Question one will have seven parts from all units and the marks of first question will be of 20% of total marks of Question Paper and the remaining eight questions to be set by taking two questions from each unit and the marks of each question from Question no.2 to 9 will be of 20% of total marks of Question paper . The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course outcomes

CO1. List or describe types of data structures and operations that can be implemented on these data structures.

CO2. Demonstrate the use of various data structure and their related operations

CO3. Apply appropriate data structures with respect to effective storage of data and efficiency of the required operations on data for solving real world problems.

CO4. Analyse the time complexity of searching and algorithms.

CO5. formulate data structures and prescribe operations for given real world situations.

UNIT – I

Introduction: Elementary data organization, Data Structure definition, Data type vs. data structure, Categories of data structures, Data structure operations, Applications of data structures, Algorithms complexity and time-space tradeoff, Big-O notataion. Strings: Introduction, String operations, Pattern matching algorithms.

Arrays: Introduction, Linear arrays, Representation of linear array in memory, address calculations, Traversal, Insertions, Deletion in an array, Multidimensional arrays, Sparse arrays.

UNIT – II

Sorting Techniques: Bubble Sort, Merge Sort, Selection Sort, Heap Sort, Insertion Sort.

Searching Techniques: Linear and Binary Search.

Linked List: Introduction, Array vs. linked list, Representation of linked lists in memory, Traversal, Insertion, Deletion, Searching in a linked list, Header linked list, Circular linked list, Two-way linked list, Threaded lists, Applications of linked lists.

UNIT – III

Stack: Introduction, Array and linked representation of stacks, Operations on stacks, Applications of stacks: Polish notation, Recursion. **Queues:** Introduction, Array and linked representation of queues, Operations on queues, Deques, Priority Queues, Applications of queues.

UNIT – IV

Tree: Introduction, Definition, Representing Binary tree in memory, Traversal of Binary Trees: In order, Pre-order & Post-order. **Graph:** Introduction, Graph theory terminology, Sequential and linked representation of graphs.

SUGGESTED READINGS

1. Seymour Lipschutz, "Data Structure", Tata-McGraw-Hill

2. Horowitz, Sahni& Anderson-Freed, "Fundamentals of Data Structures in C", Orient Longman.

3. Trembley, J.P. And Sorenson P.G., "An Introduction to Data Structures With Applications", Mcgrraw- Hill International Student Edition, New York.

4. Mark Allen Weiss Data Structures and Algorithm Analysis In C, Addison- Wesley, (An Imprint Of Pearson Education), Mexico City.Prentice- Hall Of India Pvt. Ltd., New Delhi.

5. YedidyanLangsam, Moshe J. Augenstein, and Aaron M. Tenenbaum, "Data Structures Using C", Prentice- Hall of India Pvt. Ltd., New Delhi

Data Structure and Algorithm Lab

List of Experiments

Note: At least 8 experiments are to be performed by the students.

1. Write a program to search an element in a two-dimensional array using linear search.
2. Using iteration & recursion concepts write programs for finding the element in the array using Binary Search Method
3. Write a program to perform following operations on matrix
4. Addition (b) Subtraction (c) Multiplication (d) Transpose
5. Using iteration & recursion concepts write the programs for Quick Sort Technique
6. Write a program to implement selection sort
7. Write a program to implement insertion sort
8. Write a program to implement bubble sort
9. Write a program to implement the various operations on string such as length of string concatenation, reverse of a string & copy of a string to another.
10. Write a program to implement stack operations.
11. Write a program to implement queue operations.
12. Write a program to create a linked list & perform operations such as insert, delete, update, reverse in the linked list.

242/MCA/DS202

Course code	DSC-4			
Category	Discipline Specific Courses (DSC)			
Course title	Operating System			
Course ID				
Scheme and Credits	L	T	P	Credits
	3	-	2	4
Theory Internal	25			
Theory External	50			
Practical Internal	05			
Practical External	20			
Total	100			
Duration of Exam	3 HRS			

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

COURSE OUTCOMES:

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

CO1. Experiment with Unix commands and shell programming.

CO2. Able to build shell program for process and file system management with system calls.

CO3. Able to implement and analyse the performance of different algorithm of Operating Systems likeCPU scheduling algorithm,

CO4. Able to implement and analyse the performance of different algorithm of page replacementalgorithms, deadlock avoidance, detection algorithm and so on.

CO5. Able to design and develop a course project that can have positive impact on environment or societyor mankind.

UNIT – I

Fundamentals of Operating system: Introduction to Operating System, its need and operating System services, Early systems, Structures - Simple Batch, Multi programmed, timeshared, Personal

Computer, Parallel, Distributed Systems, Real-Time Systems. Process Management: Process concept, Operation on processes, Cooperating Processes, Threads, and Inter-process Communication.

UNIT-II

CPU Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms : FCFS, SJF, Round Robin & Queue Algorithms. Deadlocks: Deadlock characterization, Methods for handling deadlocks, Banker'sAlgorithm.

UNIT-III

Memory Management: Logical versus Physical address space, Swapping, Contiguous allocation, Paging, Segmentation. Virtual Memory: Demand paging, Performance of demand paging, Page replacement, Page replacement algorithms, Thrashing.

UNIT-IV

File management: File system Structure, Allocation methods: Contiguous allocation, Linked allocation, Indexed allocation, Free space management: Bit vector, Linked list, Grouping, Counting. Device Management: Disk structure, Disk scheduling: FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK.

Suggested Readings

1. Abraham Silberschatz, Peter B. Galvin, " Operating System Concepts", Addison-Wesley publishing. Co., 7th. Ed., 2004.

2. Nutt Gary, "Operating Systems", Addison Wesley Publication, 2000.

3. Andrew S. Tannenbaum, "Modern Operating Systems", Pearson Education Asia, Second Edition, 2001.

4. William Stallings, "Operating Systems, "Internals and Design Principles", 4th Edition, PH, 2001.

5. EktaWalia, "Operating Systems Concepts", Khanna Publishes, New Delhi, 2002

LAB: List of Experiments

1. Basics of UNIX

2. UNIX commands

3. Implementation of FCFS and SJF CPU scheduling algorithms

LAB: List of Experiments

1. Basics of UNIX
2. UNIX commands
3. Implementation of FCFS and SJF CPU scheduling algorithms
4. Implementation of Round Robin and Priority CPU Scheduling
5. Implementation of Producer-Consumer problem using semaphores
6. Implementation of FIFO Page Replacement Algorithms
7. Implementation of LRU Page Replacement Algorithms
8. Implementation of Sequential File Allocation Strategies
9. Implementation of Indexed File Allocation Strategies

Course code	MDC -2			
Category	MDC			
Course title	**Mathematics -1**			
Course ID	242/MCA/MD201			
Scheme and Credits	L	T	P	Credits
	2	1		3
Theory Internal	25			
Theory External	50			
TOTAL	75			
Duration of Exam	3 HRS			

NOTE: *The examiner will set nine questions in total. Question one will have seven parts from all units and the marks of first question will be of 20% of total marks of Question Paper and the remaining eight questions to be set by taking two questions from each unit and the marks of each question from Question no.2 to 9 will be of 20% of total marks of Question paper . The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.*

UNIT I

SETS: Sets, Subsets, Equal Sets Universal Sets, Finite and Infinite Sets, Operation on Sets, Union, Intersection and Complements of Sets, Cartesian Product, Cardinality of Set, Simple Applications. DETERMINANTS: Definition, Minors, Cofactors, Properties of Determinants, Applications of determinants in finding area of triangle, Solving a system of linear equations. MATRICES: Definition, Types of Matrices, Addition, Subtraction, Scalar Multiplication and Multiplication of Matrices, Adjoint, Inverse, solving system of linear equation Cramer's Rule.

UNIT II

RELATIONS AND FUNCTIONS: Properties of Relations, Equivalence Relation, Partial Order Relation Function: Domain and Range, Onto, Into and One to One Functions, Composite and Inverse Functions. LIMITS & CONTINUITY: Limit at a Point, Properties of Limit, Computation of Limits of Various Types of Functions, Continuity of a function at a Point, Continuity Over an Interval, Sum, product and quotient of continuous functions, Intermediate Value Theorem, Type of Discontinuities.

UNIT III