Course Code	Course Name	Credits
MTC302	**Data Structures and Algorithms**	**03**

Prerequisite: FEC205 C programming

Objectives:
1. To design and implement various data structures and their operations.
2. To introduce the concept of algorithm and its analysis.
3. To learn various algorithm designing strategies.
4. To introduce the appropriate search method on a given problem
5. To develop application using suitable data structure and algorithms.

Outcomes: Learner will be able to…
1. Implement various operations using linear data structures.
2. Apply concepts of Trees and Graphs to a given problem.
3. Analyse time and space complexity of an algorithm.
4. Apply divide and conquer strategy to solve problems.
5. Apply the concept of Greedy and Dynamic Programming approach to solve problems.
6. Apply the concept of backtracking, branch and bound strategy to solve problems.

Module	Detailed Contents	Hrs.
01	**Introduction :** Introduction to Data Structures, Types of Data Structures : Linear and non-linear data structures **Stack:** Introduction to Stack, Stack as ADT, Operations on stack, Application of Stack **Queues** Introduction to Queue, Queue as ADT, Operations on Queue, Circular Queue. Application of Queue	06
02	**Linked List:** Introduction to Linked List, Types of Linked List: Singly Linked list, Doubly list, Circular linked list, Operations on linked list, Linked representation of stack, Linked representation of Queue, Applications of linked list.	05
03	**Trees**: Introduction to Trees, Types of Trees: Binary tree, Operations on binary tree, Traversal of binary trees, Binary search tree, Applications of Trees, Heap: Operations on Heap data structure, Heap sort, **Graph:** Graph Terminologies, Graph Representation, Graph traversal techniques: Depth first search (DFS) and Breadth First search(BFS)	07
04	**Analysis of Algorithms:** Introduction to Algorithm, Analysis of algorithm and it's characteristics, Time and Space complexity, Asymptotic notations. Analysis of Selection Sort and Insertion Sort **Divide and Conquer:** Introduction, Binary search, Finding the minimum and maximum, Merge sort, Quick sort	05
05	**Greedy Method Approach :** General Method, Knapsack problem, Minimum cost spanning tree- Kruskal's algorithm and Prim's algorithm **Dynamic Programming Approach :** General Method 0/1 knapsack Problem	06

06	**Backtracking and Branch bound**	10
	Travelling salesman problem	
	General Method	
	8 queen problem(N-queen problem)	
	Graph coloring	
	15 puzzle problem,	
	Travelling salesman problem.	
	Uninformed Search Techniques:	
	DFS, BFS, Uniform cost search,	
	Informed Search Methods:	
	Best First Search, A*, IDA*, SMA*	

Assessment:

Internal Assessment for 20 marks: Consisting Two Compulsory Class Tests First test based on approximately 40% of contents and second test based on remaining contents (approximately 40% but excluding contents covered in Test I). Duration of each test shall be one hour.

End Semester Theory Examination:
1. Question paper will comprise of total 06 questions, each carrying 20marks.
2. Total 04 questions need to be solved.
3. Question No: 01 will be compulsory and based on entire syllabus wherein sub-questions of 2 to 5 marks will be asked.
4. Remaining questions will be mixed in nature.(e.g. Suppose Q.2 has part (a) from module3 then part (b) will be from any module other than module 3)
5. In question paper weightage of each module will be proportional to number of respective lecture hrs as mentioned in thesyllabus.

Text Books:
1. Data structures using C by Tenenbaum, Langsam, Augenstein,Pearson.
2. Data Structures using C, ReemaThareja, Oxford.
3. C and Data structures, Prof.P.S.Deshpande, Prof.O.G.Kakde, Dreamtech Press.
4. Introduction to Data Structure and its Applications Jean-Paul Tremblay, P. G. Sorenson
5. Stauart Russell and Peter Norvig, "Artificial Intellingence: A Modern approach", 3rd Edition Prentice Hall, New Jersey, 1995. 2)

References:
1. Data Structures Using C & C++, Rajesh K. Shukla, Wiley- India.
2. Computer Algorithms by Ellis Horowitz and SartajSahni, Universities Press.
3. Data Structures and Algorithm Analysis in C,MarkA.Weiss ,Pearson
4. ALGORITHMS Design and Analysis, Bhasin, OXFORD.Elaine Rich and Kelvin Knight, "Artificial Intelligence", 3 rd Edition Tata McGraw Hill, New Delhi, 1991.