

Subject code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tut.	Theory	TW/Pract	Tut	Total
SEITC302	Data Structure and Algorithm Analysis	04	02	-	04	01	-	05

Subject code	Subject Name	Examination Scheme							Total
		Theory Marks				TW	Pract	Oral	
		Internal Assessment			End Semester Exam				
SEITC302	Data Structure and Algorithm Analysis	Test1	Test2	Average of Test1 and Test2					
		20	20	20	80	25	25	-	150

### Objectives:

- To teach efficient storage mechanisms of data for an easy access.
- To design and implementation of various basic and advanced data structures and algorithm analysis.
- To introduce various techniques for representation and analysis of the data in the real world.
- To develop application using data structures and algorithm and analysis.
- To teach the concept of protection and management of data.
- To improve the logical ability

### Outcomes:

- Student will be able to choose appropriate data structure as applied to specified problem definition and analysis the algorithm.
- Student will be able to handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures and algorithm analysis.
- Students will be able to apply concepts learned in various domains like DBMS, compiler construction etc.
- Students will be able to use linear and non-linear data structures like stacks, queues, linked list etc.

Module	Detailed Contents	Hours
1	<b>Introduction:</b> Introduction, Mathematics Review, Exponents, Logarithms, Series, Modular Arithmetic, The P Word, A Brief Introduction to Recursion, Recursion and Induction.	3
2	<b>Algorithm Analysis:</b> Mathematical Background, Model, What to Analyze, Running Time Calculations, General Rules, Solutions for the Maximum Subsequence Sum Problem, Logarithms in the Running Time, Euclid's Algorithm, Exponentiation, Checking Your Analysis, A Grain of Salt.	4
3	<b>Stacks, Queues and List</b> Stacks, Queues, Linked Lists, Double-ended Queues. Abstract Data Type (ADT), The List ADT, Simple Array Implementation of Lists, Linked Lists, Programming Details, Common Errors, Doubly Linked Lists, Circularly Linked Lists, Examples, Cursor Implementation of Linked Lists, The Stack ADT, Implementation of Stacks, Applications, The Queue ADT, Array Implementation of Queues, Applications of Queues.	10
4	<b>Trees and Search Trees:</b> Tree, Implementation of Trees, Tree Traversals with an Application, Binary Trees, Expression Trees, the Search Tree ADT-Binary Search Trees, AVL Trees, Single Rotation, Double Rotation, Red-Black Trees, External searching in B-Trees, Tree Traversals, B-Trees	10
5	<b>Priority queues:</b> The priority queues Abstract data Type, Implementing a Priority queues with a List, Heaps, Adaptable priority queues.	6
8	<b>Sorting Sets, and Selection:</b> Insertion Sort, Shellsort, Heapsort, Quicksort, Bucket Sort, Merge Sort and radix Sort, and A Lower Bound on comparison-based Sorting and radix Sort, the complexity of some sorting algorithms, comparison of Sorting Algorithms, The Set ADT and union / file Structures	6
9	<b>Graphs:</b> The graph Abstract Data Type, Data Structures for Graphs, Graph Traversals Directed Graphs, Weighted Graphs, Shortest Paths, and Minimum spanning Trees. Applications of DFS and BSF, Shortest-Path Algorithms, Dijkstra's Algorithm, Graphs with Negative Edge Costs, Acyclic Graphs, Network Flow Problems, Minimum Spanning Tree.	9

#### TEXT BOOKS:

1. Mark Allien Weiss, "Data Structure and Algorithm Analysis in C", Person.
2. Micheal Goodriect, Roberto Tamassia,"Data Structure and Algorithm in C++", Wiley India

3. Data Structures A Pseudocode Approach with C, Richard F. Gilberg & Behrouz A. Forouzan, second edition, CENGAGE Learning.
4. Data Structures Using C & C++, Rajesh K. Shukla, Wiley- India
5. Data Structures using C, Reema Thareja, Oxford University press.
6. Introduction to Data Structure and its Applications Jean-Paul Tremblay, P. G. Sorenson

**REFERENCE BOOKS:**

1. Ellis Horowitz, Sarataj Sahni, S.Rajsekaran, "Fundamentals of computer algorithm", University Press .
2. Mark Allen Weiss, "Data Structure & algorithm Analysis in C++", 3<sup>rd</sup> Edition, Pearson Education
3. Micheal Goodrich, Roberto Tamassia, "Data Structure and Algorithm in C++", Wiley India.
4. Data Structures Using C, ISRD Group, Second Edition, Tata McGraw-Hill
5. Data Structure Using C, Balagurusamy
6. C & Data Structures, Prof. P.S. Deshpande, Prof. O.G. Kakde, Dreamtech press.
7. Data Structures, Adapted by: GAV PAI, Schaum's Outlines
8. Mark Allen Weiss, "Data Structure & algorithm Analysis in C++", 3<sup>rd</sup> Edition, Pearson Education

**Term Work:**

Term Work shall consist of at least 12 programs based on the below list.

**Note:** The star (\*) marks experiments are mandatory.

<b>Linked List</b>
<ol style="list-style-type: none"> <li>1. Implementations of Linked Lists menu driven program.</li> <li>2. * Implementation of different operations on linked list – copy, concatenate, split, reverse, count no. of nodes etc</li> <li>3. Representation of Sparse matrix using multilinked structure. Implementation of sparse matrix multiplication.</li> <li>4. Implementation of polynomials operations (addition, subtraction) using Linked List.</li> <li>5. *Implementations of Linked Lists menu driven program (stack and queue)</li> <li>6. Implementations of Double ended queue using Linked Lists.</li> <li>7. Implementation of Priority queue program using Linked List.</li> </ol>
<b>Stack</b>
<ol style="list-style-type: none"> <li>1. Implementations of stack menu driven program</li> <li>2. Implementation of multistack in one array.</li> <li>3. * Implementations of Infix to Postfix Transformation and its evaluation program.</li> <li>4. Implementations of Infix to Prefix Transformation and its evaluation program.</li> <li>5. Simulation of recursion</li> </ol>
<b>Queue</b>

<ol style="list-style-type: none"> <li>1. Implementations of circular queue menu driven program</li> <li>2. * Implementations of double ended queue menu driven program</li> <li>3. Implementations of queue menu driven program</li> <li>4. Implementation of Priority queue program using array.</li> <li>5. Implementation of Johnsons Algorithm</li> <li>6. Implementation of Simulation Problem</li> </ol>
<b>Tree</b>
<ol style="list-style-type: none"> <li>1. *Implementations of Binary Tree menu driven program</li> <li>2. Implementation of Binary Tree Traversal program.</li> <li>3. *Implementation of construction of expression tree using postfix expression.</li> <li>4. Implementations of Huffman code construction</li> <li>5. Implementations of BST program</li> <li>6. Implementation of various operations on tree like – copying tree, mirroring a tree, counting the number of nodes in the tree, counting only leaf nodes in the tree.</li> <li>7. Implementations of B-tree menu driven program</li> <li>8. Implementations of B+ tree program</li> <li>9. Implementation of Preorder traversal of a threaded binary tree.</li> <li>10. *Implementations of AVL Tree menu driven program</li> </ol>
<b>Sorting</b>
<ol style="list-style-type: none"> <li>1. Implementations of Shell sort, Radix sort and Insertion sort menu driven program</li> <li>2. *Implementations of Quick Sort, Merge sort and Heap Sort menu driven program</li> </ol>
<b>Searching</b>
<ol style="list-style-type: none"> <li>1. Implementations of searching methods (Index Sequential, Interpolation Search) menu driven program</li> <li>2. Implementation of hashing functions with different collision resolution techniques</li> </ol>
<b>Graph</b>
<ol style="list-style-type: none"> <li>1. * Implementations of Graph menu driven program</li> </ol>

**Theory Examination:**

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
- Remaining question will be randomly selected from all the modules.

Weightage of marks should be proportional to number of hours assigned to each module.