

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme									
Hrs / week				Credits	TH Paper Hrs.	Marks							
TH	TU	PR	HRS			Max.	TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	04	07	05	03	Max.	80	20	100	25	--	25	150
						Min.	32	--	40	10	--	10	--

1.0 RATIONALE:

The primary objective of this course is to provide students ways of organizing data in computer so that it can be used efficiently. An emphasis on design and implementation of abstract data structures for solving complex problems.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Analyse data structure organization & classification.
2. Explain and apply sorting and searching techniques on data.
3. Apply the data structure stack, queue, and link list in the application program.
4. Apply the data structure Trees and graphs in the application program.
5. Understand the use of data structure in real world applications.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Describe data structure organization & classification.
2. Use various searching and sorting techniques for solving problems
3. Define data structure like Stack, Queue.
4. Implement the basic operation on Linked List.
5. Use different methods for traversing tree

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I Introduction to Data Structure	1a. Define Basic Terminology 1b. List Operations on data structures 1c. Approaches to design an algorithm 1d. Estimate Complexity 1e. Interpret Big 'O' Notation	1.1 Basic Terminology <ul style="list-style-type: none">• Elementary data structure organization• Classification of data structure 1.2 Operations on data structures <ul style="list-style-type: none">• Traversing, Inserting, deleting• Searching, sorting, merging 1.3 Different Approaches to designing an algorithm <ul style="list-style-type: none">• Top-Down approach• Bottom-up approach 1.4 Complexity <ul style="list-style-type: none">• Time complexity• Space complexity 1.5 Big 'O' Notation	06
Unit-II Searching	2a. Introduction to sorting 2b. Analysis Efficiency of sorting algorithms	2.1 Introduction 2.2 Efficiency of Sorting Algorithms 2.3 Searching Methods	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
&Sorting Methods	2c. Explain and distinguish Sorting Techniques 2d. Explain Searching Techniques	2.4 <ul style="list-style-type: none"> • Linear search • Binary search Sorting techniques • Bubble Sort, • Selection Sort, • Insertion Sort, • Merge Sort, 	
Unit-III Stack and Queue	3a. Introduction to stack 3b. Applications of Stack 3c. Introduction to queue 3d. Types of queue and Application of Queues	3.1 Introduction to Stack. <ul style="list-style-type: none"> • Stacks as an Abstract Data Type • Primitive operations of stacks • Representation of Stack through arrays, linked list. 3.2 Application of Stack <ul style="list-style-type: none"> • Reversing a list • Polish notations • Conversion of infix to postfix, infix to prefix expression • Evaluation of postfix, prefix expression • Recursion 3.3 Introduction <ul style="list-style-type: none"> • Queue as an Abstract Data Type • Representation of Queues • Operations on queue: Searching, Insertion, Deletion. 3.4 Types of Queue <ul style="list-style-type: none"> • Circular Queues • Double Ended Queue • Priority Queue • Application of Queues 	12
Unit-IV Linked List	4a. Introduction to linked list 4b. Types of linked list 4c. Operations on linked list	4.1 Introduction, <ul style="list-style-type: none"> • Terminologies: Node, Address, Pointer, Information, Next, Null • Pointer, Empty list. 4.2 Types of Linked list <ul style="list-style-type: none"> • Linear list • Circular list • Doubly list 4.3 Operations on a singly linked list <ul style="list-style-type: none"> • Traversing a singly linked list • Searching a linked list • Inserting a new node in a linked list at front, middle and end. • Deleting a node from a linked list from front, middle and end. 	06
Unit-V Tree and	5a. Introduction to Trees 5b. Types of tree 5c. Expression tree	5.1 Introduction <ul style="list-style-type: none"> • Terminologies: tree, degree of a node, degree of a tree, level 	14

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Graph	5d. Introduction to graphs. 5e. Graph Representation 5f. Explain Traversal of graphs 5g. Application	of a node, leaf node, Depth / Height of a tree, In-degree & out-degree, Directed edge, Path, Ancestor & descendant nodes. 5.2 Tree Types and Traversal Methods <ul style="list-style-type: none">• Type of Trees<ul style="list-style-type: none">◦ General tree◦ Binary tree◦ Binary search tree (BST).• Binary tree traversal (only algorithm)<ul style="list-style-type: none">◦ In order traversal◦ Pre order traversal◦ Post order traversal 5.3 Expression tree 5.4 Introduction <ul style="list-style-type: none">• Terminologies: graph, node (Vertices), arcs (edge), directed• graph, in-degree, out-degree, adjacent, successor, predecessor,• Relation, weight, path, length. 5.5 Representations and of a graph <ul style="list-style-type: none">• Array Representation• Linked list Representation 5.6 Traversal of graphs <ul style="list-style-type: none">• Depth-first search (DFS).• Breadth-first search (BFS). 5.7 Applications of Graph	
		TOTAL	48

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Introduction to Data Structure	04	04	02	10
II	Searching & Sorting Methods	04	04	06	14
III	Stack and Queue	06	08	08	22
IV	Linked List	04	04	02	10
V	Trees and Graph	06	08	10	24
TOTAL		24	28	28	80

Legends: R = Remembrance (Knowledge); U= Understanding; A= Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/TUTORIALS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills (**Outcomes in cognitive, psychomotor and affective domain**) so that students are able to acquire the competencies.

Note: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. Required
01	I	Implement various operations on one dimensional array. E.g. Creation, Insertion, Deletion and Display	04
02	II	Implement various sorting techniques. 1: Bubble sort 2: Insertion sort 3: Selection Sort. 4: Merge sort	08
03	II	Programs for implementing various searching techniques. -Linear search -Binary search	06
04	III	Implement C Program to perform PUSH and POP operations of stack using array	06
05	III	Implement C Program for finding factorial and Fibonacci series by using recursive	04
06	III	Implement C program to evaluate postfix expressions.	04
07	III	Implement C Program for demonstrating queue operations.	08
08	IV	Implement C Program based on singly Linked lists.	08
09	V	Implement C Program based on trees Creating and deleting a node binary tree In order, preorder and post order traversal of binary tree, deleting a node from binary tree.	08
10	V	Assignment on Graph theory	04
11	I to V	Compute the time and space complexity with Big O for following programs (Addition of 2 no's, Factorial of Number and Printing numbers from 1 to 10 using for loop)	04
TOTAL			64

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

1. Discuss various algorithms and its complexity.
2. Compare various searching and sorting methods.
3. Prepare seminars on various topics like stack, queue etc.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

1. Concept will be introduced in lectures using charts or power point.
2. Arrange expert seminar of industry person in the area of data structure and algorithm.

9.0 LEARNING RESOURCES:

A) Books:

Sr.No.	Title of Book	Author	Publication
01	Fundamentals of data structure	Ellis Horowitz, Sartaj Sahni	TMH Publications
02	Data Structures	Tremble and Sorenson	TMH Publications
03	Teach Yourself data Structure and Algorithms in 24 Hours	Robert Lafore.	BPB Publication
04	Data Structures Using C	M. Radhakrishnan, V. Srinivasan	BPB Publications

B) Software/Learning Websites:

1. <http://freevideolectures.com/Course/2519/C-Programming-and-Data-Structures>
2. <http://www.nptel.iitm.ac.in/video.php?subjectId=106102064>
3. www-old.oberon.ethz.ch/WirthPubl/AD.Pdf
4. <http://www.roseindia.net/tutorial/datastructure>

C) Major Equipment/ Instrument with Broad Specifications:

Sr.No.	Equipment	Specification
01	Desktop Computer	PC Specifications to be followed: Processor: i3 or i5 RAM: 4 GB or better HDD: 1 TB SATA Monitor: TFT LCD OS: Genuine Windows 8 or 10 Professional or Home Premium or Windows 8 or 10 Ultimate Antivirus: User License for three year
02	LCD Projector	Display Type: LCD Light Output: 3200 Lumens
03	Turbo C	Turbo C 3
04	C free 5	C free 5

10.0 MAPPING MATRIX OF PO's, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)			
	1	2	3	4	5	6	7	1	2	3	4
CO1	H	H	H	M	M	L	--	L	H	--	--
CO2	H	M	H	H	M	--	L	L	--	--	L
CO3	--	M	H	H	M	--	--	L	--	L	L
CO4	--	H	H	H	M	L	--	L	M	--	M
CO5	--	H	H	--	H	L	M	L	--	L	--

H: High Relationship, M: Medium Relationship, L: Low Relationship.

11.0 SUGGESTED QUESTION PAPER PROFILE:

Unit No	CO	Marks per Unit	1.35 Times marks	Question Number Wise Marks						Actual Distribution of Marks
				01	02	03	04	05	06	
I	CO.1	14	18.9	04	04	04	04	04	--	20
II	CO.2	18	24.3	08	--	04	04	04	04	24
III	CO.3	16	21.6	04	04	--	04	04	04	20
IV	CO.4	18	24.3	08	04	04	04	04	04	24
V	CO.5	14	18.9	04	04	04	--	04	04	20
	TOTAL	80	108*	28	16	16	16	16	16	108

a) Suggested Bitwise Distribution:

Unit No.	I	II	III	IV	V	Total																										
CO	1	2	3	4	5																											
Marks per Unit	14	18	16	18	14	80																										
1.35 Times marks	18.9	24.3	21.6	24.3	18.9	108																										
Bits	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	Total										
CO	1	1	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4	4	4	5	5	5	5	5	5	5
Q1	4	-	-	-	-	-	-	4	-	4	-	-	-	4	-	-	-	-	-	4	-	-	-	-	-	4	-	-	-	-	28	
Q2	-	4	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	4	-	-	-	-	-	4	-	-	-	-	16	
Q3	4	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	4	-	-	-	-	16	
Q4	4	-	-	-	-	-	-	4	-	-	-	-	-	4	-	-	-	-	-	4	-	-	-	-	-	4	-	-	-	-	16	
Q5	-	4	-	-	-	-	-	4	-	-	-	-	-	4	-	-	-	-	-	4	-	-	-	-	-	4	-	-	-	-	16	
Q6	-	-	-	-	-	-	-	4	-	-	-	-	-	4	-	-	-	-	-	4	-	-	-	-	-	4	-	-	-	-	16	
Sub Total	20	24	20	24	20	20	108																									
TOTAL							108																									