DEPARTMENT OF INFORMATION TECHNOLOGY				*CLASS: II B.Sc.* **Information Technology**				
Sem	**Course Type**	**Course Code**	**Course Title**	**Credits**	**Contact Hours/week**	**CIA**	**Ext**	**Total**
III	Major Core - 5	20U3FMC5	Data Structures and Algorithms	5	5	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives

1. To demonstrate various methods of organizing large amount of data.
2. To get familiarity with the concepts of trees and its variants.
3. To develop the program using linked lists, trees and graphs.
4. To implement operations like searching and sorting using divide and conquer technique.
5. To apply a greedy technique to solve a specific problem.

UNIT	CONTENT	Hrs	K-Level	CLO
I	**Stacks and Queues** **Introduction:** Introduction of algorithms, Basics of C++, Data Abstraction and Encapsulation, Arrays: Representation of Arrays and Polynomials **Stacks and Queues:** The Stack & Queue abstract data types – Evaluation of Expressions. **Linked Lists:** Singly Linked Lists – Doubly Linked List - Circular list- Linked Stacks and Queues – Polynomials.	**15**	**Up to K2**	**1**
II	**Trees:** Basic Terminology – Binary Trees- Properties - Representations - Binary Tree Traversal – Additional Binary Tree operations-Threaded Binary Trees - Binary Search Tree.	**15**	**Up to K3**	**2**
III	**Graphs:** Definitions and Representations – Elementary Graph operations-Minimum Cost Spanning Trees – Shortest Path and Transitive Closure – Activity Networks.	**15**	**Up to K4**	**3**
IV	**Divide and Conquer:** The General Method – Binary Search – Finding the Maximum and Minimum – Merge Sort – Quick Sort – Selection Sort.	**15**	**Up to K4**	**4**
V	**The Greedy Method:** The General Method – Knapsack problem- job sequencing with deadlines- Optimal storage on tapes-Optimal merge patterns-Single source shortest path.	**15**	**Up to K3**	**5**

Books for Study

1. "Fundamentals of Data structures in C++" by Ellis Horowitz, Sartaj Sahni & Dinesh Mehta –- 2nd Edition - Universities Press 2007.
2. "Fundamentals Of Computer Algorithms" by Ellis Horowitz , Sartaj Sahni & Sanguthevar Rajasekaran - 2nd Edition- Universities Press 2007.

Chapters

Book 1

Unit I: 1.2,1.3,1.4, 2.3, 2.5, 3.2, 3.3, 3.6, 4.1, 4.4, 4.6, 4.7

Unit II: 5.1.1, 5.2, 5.3.1, 5.3.2, 5.3.3, 5.3.4, 5.4, 5.5, 5.7

Unit III: 6.1, 6.2, 6.3, 6.4, 6.5

Book 2

Unit IV: 3.1 – 3.6

Unit V: 4.1 – 4.4, 4.6 – 4.8

Books for Reference

1. "Data structures using C " by Yedidyah langsam, Moshe J.Augenstein and Aaron M. Tenenbaum - PHI.
2. "Data Structures" by Seymour Lipschutz - TataMcGrawhill – Year 2006.
3. "An Introduction to Data structure with Application" by Jean Paul Tremblay and Paul G Sorenson – THM, II Edition – 1991.

Web Resources

1. https://www.geeksforgeeks.org/data-structures/
2. https://www.tutorialspoint.com/data_structures_algorithms/greedy_algorithms.htm
3. https://www.tutorialspoint.com/data_structures_algorithms/pdf/greedy_algorithms.pdf
4. https://www.javatpoint.com/divide-and-conquer-introduction

Rationale for Nature of the course

- Helps the students in developing logic and structured programs and to storing and organizing data in a particular way in a computer.

Activities on Knowledge and Skill Development

- Analyze the applicability of algorithms in various fields.
- Compare the efficacy of various data structure.

Pedagogy

Chalk and talk, Materials, PPT, Assignment , Seminar , Problem solving , Group discussion , Interaction and Demonstration.

Course Designer(s) Name

1. Mrs.R. LakshaPriya
2. Mr.M. Ashok Kumar

Lesson Plan

Unit	Topics	Hours	Mode
I	**Introduction of algorithms** Basics of C++, Data Abstraction and Encapsulation, Representation of Arrays and Polynomials **Stacks and Queues** The Stack abstract data type – The Queue abstract data type Evaluation of Expressions Linked List – Singly – Double – Circular linked list	5 3 7	Lecture Lecture, GD Lecture
II	**Trees** Basic Terminology – Binary Trees- Properties – Representations Binary Tree Traversal Additional Binary tree operations-Threaded Binary Trees – Binary Search Trees	5 5	Lecture Lecture, Lecture, PPT
III	**Graphs** Definitions and Representations – Elementary Graph operations Minimum Cost Spanning Trees – Shortest Path and Transitive Closure – Activity Networks.	5 10	Lecture, case studies Lecture
IV	**Divide and Conquer** Binary Search Finding the Maximum and Minimum Merge Sort – Quick Sort – Selection Sort.	2 2 11	Lecture, case studies Lecture Lecture, GD
V	**The Greedy Method** Introduction - Knapsack problem -job sequencing with deadlines Optimal storage on tapes-optimal merge patterns-single source shortest path.	7 8	Lecture, Assignment Lecture, PPT

Course Learning outcomes

On the completion of the course the student will be able to

CLOs	Course Learning Outcomes	K - Levels
CLO 1	Describe how stacks, queues and linked structures are represented in memory and their applications.	**Up to K2**
CLO 2	Demonstrate the representation of trees and its variants.	**Up to K3**
CLO 3	Analyze the various applications using Graph operations.	**Up to K4**
CLO 4	Discuss the computational efficiency of the divide and conquer algorithms for sorting and searching.	**Up to K4**
CLO 5	Implement various applications of greedy method.	**Up to K3**

Mapping of CLOs with PSOs

CLOs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CLO 1	3	3	2	2	2	1
CLO 2	3	3	3	2	2	3
CLO 3	3	3	2	1	2	3
CLO 4	3	3	3	3	2	2
CLO 5	3	3	3	2	2	1

(3 – Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Mapping of CLOs with POs

CLOs/POs	PO1	PO2	PO3	PO4	PO5
CLO 1	3	2	3	3	2
CLO 2	3	3	3	2	2
CLO 3	3	2	2	1	3
CLO 4	3	3	1	3	3
CLO 5	3	2	1	3	3

(3 – Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Learning Outcome Based Education & Assessment (LOBE)

Formative Exam – Blue Print - Data Structures and Algorithms (CIA I & II)
Articulation Mapping - K Levels with Courses Learning Outcomes (CLOs)

Internal	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K- Level	No. of Questions	K- Level		
CIA I	CLO 1	Up to K2	2	K1& K2	1	K1	2(K1&K1)	1(K2)
	CLO 2	Up to K3	2	K1& K2	2	K2	2(K2&K2)	2(K3)
CIA II	CLO 3	Up to K4	2	K1 & K2	1	K2	2(K4&K4)	1(K3)
	CLO 4	Up to K4	2	K1 & K2	2	K2	2(K3&K3)	2(K4)
Question Pattern (CIA I & II)	No. of Questions to be asked		4		3		4	3
	No. of Questions to be answered		4		3		2	2
	Marks for each question		1		2		5	10
	Total Marks for each section		**4**		**6**		**10**	**20**

- *CLO5 will be allotted for individual Assignment which carries five marks as part of CIA component.*

Distribution of Section-wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	**Total Marks**	% of Marks without choice	Consolidated %
K1	2	2	10	-	**14**	23.33	**67**
K2	2	4	10	10	**26**	43.33	
K3	-	-	-	20	**20**	33.33	**33**
K4	-	-	-	-	**-**	-	**-**
Total Marks	**4**	**6**	**20**	**30**	**60**	**100.00**	**100%**
K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	**Total Marks**	% of Marks without choice	Consolidated
K1	2	-	-	-	**2**	3.33	**17**
K2	2	6	-	-	**8**	13.33	
K3	-	-	10	10	**20**	33.33	**33**
K4	-	-	10	20	**30**	50.00	**50**
Total Marks	**4**	**6**	**20**	**30**	**60**	**100.00**	**100%**

Learning Outcome Based Education & Assessment (LOBE)
Blue Print for Summative Examination -Data Structures and Algorithms
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S.NO	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No Of Questions	K - Level	No Of Questions	K - Level		
1	CLO 1	Up to K2	2	K1& K2	1	K1	2(K1&K1)	1(K2)
2	CLO 2	Up to K3	2	K1& K2	1	K2	2(K2&K2)	1(K3)
3	CLO 3	Up to K4	2	K1 & K2	1	K2	2(K4&K4)	1(K3)
4	CLO 4	Up to K4	2	K1 & K2	1	K2	2(K3&K3)	1(K4)
5	CLO 5	Up to K3	2	K1 & K2	1	K1	2(K3&K3)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

- K1 – Remembering and recalling facts with specific answers
- K2 – Basic understanding of facts and stating main ideas with general answers
- K3 – Application oriented – Solving Problems
- K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (No choice)	Section C (Either/or)	Section D (Open choice)	**Total Marks**	% of Marks without	**Consolidated**
K1	5	4	10	-	**19**	15.83	**42%**
K2	5	6	10	10	**31**	25.83	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100	**100%**