Syllabus: CSE242, Data Structures

School: SET		**Batch :**2022-26	
Program: B.Tech.		**Current Academic Year:** 2023-24	
Branch: CSE/IT		**Semester:** III	
1	Course Code	CSE242	
2	Course Title	Data Structures	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Core	
5	Course Objective	1. Learn the basic concepts of Data Structures and algorithms. 2. Design and Implementation of Various Basic and Advanced Data Structures. 3. Learn the concepts of various searching, Sorting and Hashing Techniques. 4. Choose the appropriate data structures and algorithm design method for a specified application.	
6	Course Outcomes	CO1: **Select** appropriate data structures as applied to specified problem definition. CO2: **Choose** the suitable data structures like arrays, linked list, stacks and queues to solve real world problems efficiently. CO3 **Represent** and manipulate data using nonlinear data structures like trees and graphs to design algorithms for various applications. CO4: **Compare** various techniques for searching and sorting. CO5: **Design** and implement an appropriate hashing function for an application CO6: **Formulate** new solutions for programing problems or improve existing code using learned algorithms and data structures	
7	Course Description	This course starts with an introduction to data structures with its classification, efficiency of different algorithms, array and pointer based implementations and Recursive applications. As the course progresses the study of Linear and Non-Linear data structures are studied in details. The course talks primarily about Linked list, stacks, queue, Tree structure, Graphs etc. This Course also deals with the concept of searching, sorting and hashing methods.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	
	A	Data Structure – Definition, Operations and Applications, Abstract Data Types, Algorithm – Definition, Introduction to Complexity, Big OH notation, Time and Space tradeoffs.	CO1
	B	Dynamic Memory Allocation(Malloc, calloc, realloc, free), Recursion – Definition, Examples- Tower of Hanoi problem, Tail Recursion	CO1
	C	Arrays: Implementation of One Dimensional Arrays,	CO1

		Multidimensional Arrays, Applications of Arrays, Address Calculation, Matrix Operations, Sparse martices			
	Unit 2	**Linked List**			
	A	Concept of Linked List, Garbage Collection, Overflow and Underflow, Array Implementation and Dynamic Implementation of Singly Linked Lists			CO2
	B	Array Implementation and Dynamic Implementation of Doubly Linked List, Circularly Linked List			CO3
	C	Operations on a Linked List- Insertion, Deletion, Traversal, Polynomial Representation and Addition			CO2
	Unit 3	**Stack and Queue**			
	A	Stacks: Definitions, Primitive operations, Application of stacks – Conversion of Infix Expression to Postfix form, Evaluation of Postfix Expressions			CO3
	B	Queues: Definition, Primitive Operations, Implementation of Circular Queues, Priority Queues			CO3
	C	Deques, Application of Queues. Implementation - Linked Stacks, Linked Queues.			CO3
	Unit 4	**Tree and Graphs**			
	A	Trees: Terminologies, Binary tree, Representation, Applications, Binary search Tree – Operations on Binary Search Trees (Traversing, Insertion, deletion etc.), Binary Search Algorithm, AVL Tree			CO4, CO6
	B	Graph: Terminology, Representation, Traversals- Depth First Search, Breadth First Search.			CO4, CO6
	C	Graph Applications – Minimum Spanning Trees – Prim's and Kruskal's Algorithms			CO4, CO6
	Unit 5	**Searching, Sorting and Hashing**			
	A	Implementation and Analysis - Linear search, Binary Search			CO5, CO6
	B	Implementation and Analysis- Bubble Sort, Insertion Sort, Selection Sort, Tree sort			CO5, CO6
	C	Hashing: Concepts and Applications, Hash Functions, Collisions, Methods of Resolving Collisions			CO5, CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Lipschutz, "Data Structures" Schaum's Outline Series, TMH			
	Other References	1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein "Data Structures Using C and C++" , PHI 2. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication 3. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications", McGraw Hill 4. R. Kruse etal, "Data Structures and Program Design in C", Pearson Education			

		5. G A V Pai, “Data Structures and Algorithms”, TMH	

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	**Select** appropriate data structures as applied to specified problem definition.	PO1, PO2, PO3, PO4, PO5, PO12, PSO1, PSO2, PSO3
2.	**Choose** the suitable data structures like arrays, linked list, stacks and queues to solve real world problems efficiently.	PO1, PO2, PO3, PO4, PO5, PO12, PSO1, PSO2, PSO3
3.	**Represent** and manipulate data using nonlinear data structures like trees and graphs to design algorithms for various applications.	PO1, PO2, PO3, PO4, PO5, PO12, PSO1, PSO2, PSO3
4.	**Compare** various techniques for searching and sorting.	PO1, PO2, PO3, PO4, PO5, PO12, PSO1, PSO2, PSO3
5.	**Design** and implement an appropriate hashing function for an application	PO1, PO2, PO3, PO4, PO5, PO12, PSO1, PSO2, PSO3
6.	**Formulate** new solutions for programing problems or improve existing code using learned algorithms and data structures	PO1, PO2, PO3, PO4, PO5, PO12, PSO1, PSO2, PSO3

PO and PSO mapping with level of strength for Course Name Data Structures (Course Code CSE 242)

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	-	-	-	-	-	-	2	3	3	1
CO2	3	2	3	3	2	-	-	-	-	-	-	2	3	3	1
CO3	3	3	3	3	2	-	-	-	-	-	-	2	3	3	1
CO4	2	2	2	2	2	-	-	-	-	-	-	2	3	3	1
CO5	3	3	3	3	2	-	-	-	-	-	-	2	3	3	1
CO6	3	3	3	3	2	-	-	-	-	-	-	3	3	3	1

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE242	**Data structures**	2.83	2.67	2.83	2.67	2	-	-	-	-	-	-	2.17	3.00	3.00	1.00

Strength of Correlation

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***
3. Addressed to ***Substantial (High=3) extent***