Course Syllabus
Gyanmanjari Diploma Engineering College
Semester-3 (Diploma)

Subject: Data Structure-DETCE13203

Type of course: Major (Core)

Prerequisite: Computer Programming & utilization

Rationale:

This course is designed to teach Data Structure concepts, techniques, and its applications. Data Structure emphasizes a way of organizing and storing data in a computer so that it can be accessed and manipulated efficiently. Data Structure provides a systematic way of organizing and managing data to perform various operations such as insertion, deletion, searching, and sorting. This course gives brief details about different data structure use in current scenario. Data structures play a crucial role in computer science and programming as they determine the efficiency and performance of algorithms. Choosing the appropriate data structure for a particular problem can significantly impact the efficiency of operations performed on the data.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
				Theory Marks		Practical Marks		CA	
CI	T	P	C	ESE	MSE	V	P	ALA	
4	0	2	5	60	30	10	20	30	150

Legends: CI-ClassRoom Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.

Course Content:

Sr. No	Course Content	Hrs.	% Weightage
1	**Introduction to Data Structure:** Concept and need of Data Structure, Abstract Data Type. Types of Data Structures: Linear Data Structures, Non-Linear Data Structures. Algorithm Complexity: Time and Space complexity.	08	10%
2	**Searching and Sorting:** Searching: Searching an item in a data set using following methods: Linear Search, Binary Search. Sorting: Sorting of data set in an order using following methods: Bubble Sort, Selection Sort, Insertion Sort.	16	25%
3	**Introduction of Stacks:** Stack representation in memory using array, Stack Operations - PUSH, POP. Stack Operations Conditions - Stack Full /Stack Overflow, Stack Empty / Stack Underflow.	10	20%
4	**Queue:** Queue representation in memory using array, Applications of Queue. Queue Operations Conditions: Queue Full. Queue Empty Types of Queues: Linear Queue, Circular Queue. Queue Operations: Insertion, Deletion.	10	20%
5	**Tree:** Basic Terminologies: Tree, degree of a node, degree of a tree, level of a node, leaf node, Height of a tree, In-degree & Out-Degree, Path, Ancestor & descendant nodes. Types of Trees: General tree, Binary tree, Complete Binary Tree, Binary search tree (BST).	16	25%

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	**Algorithmic Artistry:** In this activity Students use their creativity to visually represent different searching and sorting algorithms through drawings, diagrams, or multimedia presentations. This activity encourages deeper understanding and engagement with the algorithms. For getting marks students need to upload it their final diagram on GMIU web portal.	10

2	**Stack/ Queue or Tree Visualization Software:** In this activity, students will work individually to introduce interactive software or online tools that allow them to visualize Stack / Queue or Tree operations in real-time. They can input elements and observe how its changes with each different operation, providing a dynamic and visual learning experience. For getting marks students need to create small report with scree layout and upload it on GMIU web portal.		10
3	**Data Structure Deep Dive: Interview Intensive:** In this activity Faculty provide questions to students based on Dats Structure concept which may helpful for job interview and students have to answer it on GMIU web portal.		10
		Total	30

Suggested Specification table with Marks (Theory): 60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage %	30%	40%	20%	10%	-	-

Course Outcome:

	After learning the course the students should be able to:
CO1	Understand the fundamental of data structure and complexity of an algorithm.
CO2	Apply different sorting and searching algorithms on appropriate data sets.
CO3	Demonstrate algorithms to insert and delete elements from the stack and queue data structure.
CO4	Implement algorithms for inserting and deleting elements from the queue data structure.
CO5	Illustrate algorithms to insert, delete and search a node on a tree.

List of Practical

Sr. No	Description	Unit No	Hrs.
1	Implement array using row major order and column major order.	1	2
2	Implement Sequential search algorithms.	2	2
3	Implement Binary search algorithms.	2	4
4	Implement Bubble sort algorithm.	2	2
5	Implement selection sort algorithm.	2	4
6	Implement push and pop operations in stack.	3	4
7	implement Insertion operation in Queue.	4	2
8	implement Deletion operation in Queue.	4	2
9	Implement construction of binary search tree.	5	4
10	Implement inorder, preorder and postorder traversal methods in binary search tree.	5	4
		Total	30

Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory.

The internal evaluation will be done on the basis of Active Learning Assignment.

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Reference Books:

[1] An Introduction to Data Structures with Applications, Jean-Paul Tremblay & Paul G. Sorenson, Tata McGraw Hill.

[2] Data Structures using C & C++ -By Ten Baum Publisher – Prenctice-Hall International.

[3] Data and File Structures using C By Reema Thareja - Oxford University Press.