REFERENCES:

1. Scobey, Pawan Lingras, "Web Programming and Internet Technologies An E-Commerce Approach", Second Edition, Jones & Bartlett Publishers, 2016.

EVALUATION METHOD TO BE USED:

Sl. no	Category of Courses	Continuous Assessment	Mid – Semester Assessment	End Semester
1.	Practical Integrated with Theory	40(P)	20(T)	40(P)

CS6104 DATA STRUCTURES AND ALGORITHMS

Prerequisites for the course: NIL

OBJECTIVES:

- To understand the concepts of linear and non-linear data structures
- To get an idea about suitability of data structure for an application
- To learn some fundamental algorithm design strategies
- To understand how the correctness of an algorithm can be proved
- To learn how to analyze an algorithm
- To understand the concept of NP-Completeness

CS6104	DATA STRUCTURES AND ALGORITHMS	L	T	P	EL	CREDITS
		3	1	4	3	7

MODULE I	INTRODUCTION	L	T	P	EL
		4	1	0	4

Abstract Data Types – Algorithm Properties – Overview on Proof of Correctness & Algorithm Analysis – Asymptotic Notations & Properties, Linear Search.

SUGGESTED ACTIVITIES :

- Workout on design of algorithms for some small simple problems, provide proof of correctness, and determine the complexity.
- EL - Study on average case analysis for some standard algorithms.

SUGGESTED EVALUATION METHODS:

- Assignment - Based on design, correctness and efficiency.

MODULE II LINEAR DATA STRUCTURES	L	T	P	EL
	4	1	4	3

Stack - Queue - Linked lists - Some applications based on linear data structures.

SUGGESTED ACTIVITIES :

- EL – Converting an algorithm from recursive to non-recursive using stack.
- Practical - An application based on linear data structure.

SUGGESTED EVALUATION METHODS:

- Programming exercises in the laboratory
- Quizzes

MODULE III NON-LINEAR DATA STRUCTURES	L	T	P	EL
	4	1	4	3

Trees - Graphs - Traversals - Threaded binary trees.

SUGGESTED ACTIVITIES :

- EL - Applications of trees and graphs.
- Practical - Implementing tree and graph traversals.

SUGGESTED EVALUATION METHODS:

- Assignment related to application
- Programming exercises in the laboratory
- Quizzes

MODULE IV DIVIDE & CONQUER	L	T	P	EL
	4	1	4	3

Strassen's Matrix Multiplication - Selection in Linear Time.

SUGGESTED ACTIVITIES :

- EL – Merge Sort & Quick Sort
- Practical – Implementation of Merge Sort & Quick Sort.

SUGGESTED EVALUATION METHODS:

- Programming exercises in the laboratory
- Assignment problems
- Quizzes

MODULE V GREEDY METHOD	L	T	P	EL
	4	1	4	3

Greedy Strategy – Knapsack Problem - Spanning Trees –Single Source Shortest Path problems

SUGGESTED ACTIVITIES :

- EL – Tree Vertex Splitting
- Practical – Spanning Tree Implementation

SUGGESTED EVALUATION METHODS:

- Programming exercises in the laboratory
- Quizzes

MODULE VI DYNAMIC PROGRAMMING	L	T	P	EL
	4	1	4	3
Principles of Optimality - Matrix chain multiplication - Longest common subsequences				
SUGGESTED ACTIVITIES : ● EL – All Pair shortest path. ● Practical - Implementation of All pair shortest path				
SUGGESTED EVALUATION METHODS: ● Programming exercises in the laboratory ● Quizzes				

MODULE VII BACKTRACKING & BRANCH AND BOUND	L	T	P	EL
	4	1	4	3
Backtracking:8-Queens & Sum of subsets – Branch & Bound: 0/1 Knapsack				
SUGGESTED ACTIVITIES : ● Flipped class rooms ● Practical - Implementations of sum of subset problem. ● EL –Travelling Salesperson using Branch & Bound				
SUGGESTED EVALUATION METHODS: ● Programming exercises in the laboratory ● Assignment problems ● Quizzes				

MODULE VIII MORE ON SORTING & INDEXING	L	T	P	EL
	5	1	4	3
Heap Sort – External sorting – Hashing				
SUGGESTED ACTIVITIES : ● EL – Comparison of internal sorting algorithms ● Practical – Implementation of Hash table				
SUGGESTED EVALUATION METHODS: ● Programming exercises in the laboratory ● Quizzes				

MODULE IX STRING MATCHING	L	T	P	EL
	2	1	2	2
Naïve Algorithm – KMP Algorithm				
SUGGESTED ACTIVITIES : ● Tutorial ● Practical – Implementation of KMP algorithm				
SUGGESTED EVALUATION METHODS: ● Programming exercises in the laboratory ● Quizzes				

MODULE X NP-COMPLETENESS	L	T	P	EL
	5	1	0	5
Polynomial time verification – Theory of reducibility - NP Completeness proof for Vertex cover &Hamiltonian Cycle.				
SUGGESTED ACTIVITIES : EL – Study of proof for NP completeness on any two problems				
SUGGESTED EVALUATION METHODS: ● Quizzes				

TEXT BOOKS:

1. Ellis Horowitz and Sartaj Sahni, “Fundamentals of Data Structures”, Galgotia, 1976.
2. Ellis Horowitz and Sartaj Sahni, “Fundamental of Computer Algorithms”, Galgotia, 1985.
3. Thomas H Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, “Introduction to Algorithms”, Third Edition, Prentice Hall, 2010.

REFERENCES:

1. Jean-Paul Tremblay and Paul G Sorenson, “An Introduction to Data Structures with Applications”, Second Edition, Tata McGraw Hill, 1991.
2. Kenneth A. Berman and Jerome L Paul, “Algorithms”, Cengage Learning India, 2010.

OUTCOMES:

Upon completion of the course, the students will be able to:

- Point out various representations of data structures
- Write functions to implement linear and non–linear data structure operations
- Suggest and use appropriate linear/non–linear data structure operations for solving a given problem
- Apply various algorithm design techniques and analysis
- Apply appropriate hash functions that result in a collision free scenario for data storage and retrieval
- Show how to prove a problem to be NP-Complete

Evaluation Pattern:

Category of Course	Continuous Assessment	Mid – Semester Assessment	End Semester
Theory Integrated with Practical	**15(T) + 25 (P)**	**20**	**40**

CO - PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	PO11	PO12
CO1	√											
CO2					√							
CO3	√	√	√									
CO4	√			√	√							
CO5	√	√			√							√
CO6	√	√	√									