Course: 105: Data Structures and Design and Analysis of Algorithms

Course Code	**105**
Course Title	**Data Structures and Design and Analysis of Algorithms**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2020
Purpose of Course	This course introduces the various data structures and algorithms involving these data structures and their logical implementation. Students also will be able to understand complex data structures like trees and their use in various Applications
Course Objective	1. To learn fundamental data structures like arrays, stacks, lists. 2. To learn complex data structures like trees. 3. To learn and compare various sorting techniques. 4. To learn analysis of algorithms
Course Outcome	CO1. Explain the futures of various non-primitive data structure and their applications. Train students for algorithms to create, insert, delete and traversing various data structure. CO2. Explain the basics of computational complexity analysis and big O & theta notation that help for fundamental research in algorithm analysis. Students can select the efficient algorithm after analyzing a problem and identifying it's the computing requirements. CO3. Explain insight of basic technique for algorithm such as Divide & Conquer, Greedy method, Backtracking & Branch & Bound CO4. Students will be able to work with various searching and sorting techniques and compare its computational complexity. CO5. Train students with to work with Hash structure, proper hash method and collision detection techniques.

Mapping between COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	■	■	■				■	
CO2		■			■			■
CO3	■	■	■			■	■	■
CO4	■	■	■				■	
CO5	■	■						

Pre-requisite	C programming Language
Course Content	**Unit 1: Non-Primitive Data structures.** 1.1 Arrays - its storage structures & operations 1.2 Stacks - operations and its applications in Recursion, Polish expressions etc. 1.3 Queues - Types of queues, operations and its applications. 1.4 Linked lists - Types of linked list, operations and its applications. 1.5 Trees - Concept and Definitions, Operations, linked & threaded storage representation of Binary Trees. 1.6 Applications of Trees - The manipulation of Arithmetic expressions, Symbol-table construction, Syntax Analysis etc. **Unit 2: Analysis of Algorithms** 2.1 Asymptotic: Big-O and Theta **Unit 3: Basic techniques & example algorithms for** 3.1 Divide & Conquer method 3.2 Greedy method

	3.3 Backtracking
	3.4 Branch & Bound
	
	Unit 4: Searching and Sorting
	    4.1 Sequential, Binary
	    4.2 Search Trees:- Height, Balanced tree, 2-3, tree, red-black trees
	        weight-balanced trees
	    4.3 Sorting
	        4.3.1 Internal sorting - Insertion, Selection, Quick, 2-way merge and Heap
	        4.3.2 External sorting - k-way merging, Balanced merge and poly phase
	            Merge
	
	Unit 5: Hashing
	    5.1 Hash Tables
	    5.2 Hash functions
	        5.2.1 Division method
	        5.2.2 Multiplication method
	
	[Self Study]
	Graphs – Creation and Traversal

Reference Books	1. An Introduction to Data Structures with applications - Trembley – McGraw Hill 2. Theory and Problems of Data Structure – Lipschutz Semour – McGraw Hill 3. Algorithms + Data Structure Programs - Wirth, Niclaus - PHI. 4. Fundamentals of Data Structures, Horwitz, E. and Sahni S. - Computer Science Press. 5. The Art of Computer Programming, Vols. 1-2, Knuth D. - Addison Wesley. 6. Data Structures and Algorithms - Aho A.V., Hopcroft and Ullman - Addison Wesley 7. Data Structure & "C" Programming - Vanwyte C J - Addison Wesley. 8. Data Structures, Algorithms And Object Oriented Programming – Tata McGraw Hill edition Geogory L. Heileman. 9. Data Structures and the Standard Template Library - William J. Collins, Tata McGraw Hill edition. 10. Programming with C++ and Data Structures - Maria Litvin & Gary Litvin, Vikas Publishing House Pvt. ltd. 11. Data Structures using C & C++ - Y. Langsam Moshe J. Angensterin & A.M. Tenenbaum 12. Data Structures and Algorithms in C++ - Adam Drozdek, Thomson Learning 13. Data Structures & Program Design in C - Robert Kruse, C.L. Tondo, Brnceleing PHI Pvt Ltd. 14. Data Structures and Algorithms in Java, Lafore, Pearson 15. Data Structures and Algorithm Analysis in Java, Mark Allen Weiss, Pearson 16. Data Structures and Algorithms in Java, Micheal T Goodrich, Roberto Tamassia, Wiley
Teaching Methodology	Class Work, Discussion, Self Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment 70% External Assessment