CENTRAL UNIVERSITY OF KERALA
DEPARTMENT OF COMPUTER SCIENCE
M.Sc. COMPUTER SCIENCE

CORE COURSE					
COURSE CODE	COURSE TITLE	CONTACT HRS/WEEK			CREDITS
		LEC	LAB	TUT	
CSC5103	Advanced Data Structures and Algorithms	2	2	1	4

Lec = Lecture, Tut = Tutorial, Lab = Practical

This is a problem solving **skill development course**.

Course Objective:
The objective of the course is to provide theoretical and practical aspects of advanced data structures and algorithms.

By completing this course, students will obtain the following course/learning outcomes:
1. Knowledge to be gained:
   (i) fundamental concepts of design and analysis of algorithms
2. Skill to be gained:
   (ii) Critical analyzing and choosing appropriate data structures and algorithms to solve a specific problem
   (iii) Design an algorithm in the context of space and time complexity
3. Competency to be gained:
   (iv) Design optimized algorithms with appropriate data structure for real world problems

Prerequisites: Basic knowledge in programming

Grading:

Lab implementation	– 15%
Assignment/Quiz/presentation	– 5%
Mini project (individual)	– 8%
Class Test	– 12%
Final Exam	– 60%

CSC5103 - Advanced Data Structures and Algorithms

Module 1: Introduction and Analysis of Algorithm
Introduction to algorithms, Role of Algorithms in computing, asymptotic notations: big O, omega, theta notations– properties of asymptotic notations. Divide and Conquer: General method, Maximum sub array problem, Convex hull problem. Greedy Method: The General Method, Knapsack problem, Minimum Cost Spanning Trees.

Module 2: Algorithm Design
Dynamic Programming: The General Method, Matrix chain multiplication, Rod cutting problem. Back Tracking: The General method, 8-queens problem, Knapsack problem. NP-Hard and NP-Complete problems.

Module 3: Selection and Search Structures
Heap Structures and its operations: - Min-max heaps, Deaps, Binomial heaps – Fibonacci heaps. Binary search trees – AVL trees –2-3-4 trees – Red-black trees – B-trees.

Module 4: Multimedia Structures
Segment trees – k-d trees – Point Quad trees – MX-Quad trees – R-trees TV trees. Analysis and complexity of all above topics. Hash list- Hash table- Hash tree- Applications: Huffman coding

References:

1. Thomas H. Corman, Charles E. Leiserson, Ronald L. Rivest, *Introduction to Algorithms*, Third Edition, PHI 2009.
2. Adam Drozdex, *Data Structures and Algorithms in C++,* Second Edition, Thomson learning – Vikas publishing house, 2001.
3. E. Horowitz, S. Sahni and Dinesh Mehta, *Fundamentals of Data structures in C++,* Galgotia, 1999.
4. G. Brassard and P. Bratley, *Algorithmics: Theory and Practice*, Printice –Hall,1988.
5. V.S. Subrahmanian, *Principles of Multimedia Database systems*, Morgan Kaufman, 1998.
6. E. Horowitz, et.al., *Fundamentals of Computer Algorithms*, Galgotia Publications, 1998.