Course No.	Course Name	L-T-P - Credits	Year of Introduction
IT202	Algorithm Analysis & Design	4-0-0-4	2016

Prerequisite: CS205 Data structures

Course Objectives

- To develop an understanding about basic algorithms and different problem solving strategies.
- To improve creativeness and the confidence to solve non-conventional problems and expertise for analysing existing solutions.

Syllabus

Properties of an Algorithm- Asymptotic Notations – 'Oh', 'Omega', 'Theta', Worst, Best and Average Case Complexity-Recurrence Relations – Solving Recurrences using Iteration and Recurrence Trees.- Divide and Conquer- Greedy Strategy -Dynamic Programming -Backtracking -Branch and Bound Techniques -Sophisticated Algorithms- Approximation Algorithms -String Matching Algorithms -Lower Bound Theory-randomized algorithm

Expected outcome .

The students will be able to

- Describe the performance analysis of algorithms and asymptotic notations.
- Solve recurrence equations using iteration and recursion tree methods.
- Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it.
- Discuss greedy and dynamic programming in algorithm design and recite algorithms that employ this paradigm.
- Explain backtracking and branch and bound technique used in algorithms
- Interpret the approximation algorithms, randomized algorithms and string matching algorithms

Text Book:

1 Fundamentals of Computer Algorithms – Horowitz and Sahni, Galgotia

References:

1. Computer Algorithms – Introduction to Design and Analysis – Sara Baase & Allen Van Gelder, Pearson Education
2. Data Structures algorithms and applications – Sahni, Tata McGrHill
3. Foundations of Algorithms – Richard Neapolitan, Kumarss N., DC Hearth & Company
4. Introduction to algorithm- Thomas Coremen, Charles, Ronald Rivest -PHI

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	Introduction and Complexity What is an algorithm – Properties of an Algorithm, Development of an algorithm, Pseudo-code Conventions, Recursive Algorithms – Performance Analysis - Space and Time Complexity –Asymptotic Notations – 'Oh',	10	15%

	'Omega', 'Theta', Worst, Best and Average Case Complexity, Running Time Comparison, Common Complexity Functions - Recurrence Relations – Solving Recurrences using Iteration and Recurrence Trees – Example Problems Profiling - Amortized Complexity.		
II	**Divide and Conquer** - Control Abstraction, Finding Maximum and Minimum,Binary Search, Divide and Conquer Matrix Multiplication, Stressen's Matrix Multiplication, Quick Sort, Merge Sort.	8	15%
FIRST INTERNAL EXAMINATION			
III	**Greedy Strategy**- Control Abstraction, General Knapsack Problem, Minimum Cost Spanning Trees – PRIM's Algorithm, Kruskal's Algorithm, Job sequencing with deadlines.	8	15%
IV	**Backtracking**– State Space Tree - Fixed Tuple and Variable Tuple Formulation - Control Abstraction – Generating Function and Bounding Function - Efficiency of the method - Monte Carlo Method – N-Queens Problem, Sum of Subsets. **Branch and Bound Techniques**– FIFO, LIFO, and LC Control Abstractions, 15-puzzle.	9	15%
SECOND INTERNAL EXAMINATION			
V	**Dynamic Programming**- Principle of Optimality, Multistage Graph Problem, Forward Approach, Backward Approach, All-Pairs Shortest Paths, Traveling Salesman Problem. Sophisticated Algorithms- Approximation Algorithms – Planar Graph Coloring, Vertex cover	10	20%
VI	String Matching Algorithms – Rabin Karp algorithm - Topological Sort - Deterministic and Non-Deterministic Algorithms. Lower Bound Theory- Comparison Trees for Searching and Sorting, lower bound on comparison based algorithms, Sorting, Selection & Merging; Oracles and Adversary Arguments – Merging,Basic concepts of randomized algorithm-Las Vagas algorithm for search.	9	20%
END SEMESTER EXAM			

QUESTION PAPER PATTERN (End semester examination)

Maximum Marks : 100 Exam Duration: 3 Hrs

Part A –(Modules I and II) 2 out of 3 questions (uniformly covering the two module) are to be answered. Each question carries 15 marks and can have a maximum of 4 sub divisions

Part B – (Modules III and IV) 2 out of 3 questions (uniformly covering the two module) are to be answered. Each question carries 15 marks and can have a maximum of 4 sub divisions

Part C – (Modules V and VI) 2 out of 3 questions (uniformly covering the two module) are to be answered. Each question carries 20 marks and can have a maximum of 4 sub divisions