

Devi Ahilya University, Indore, India Institute of Engineering & Technology				MSc – I Year (Applied Mathematics) with Specialization in Computing & Informatics Semester- IV				
Subject Code & Name		Instructions Hours per Week			Credits			
AM4PC2: Analysis of Algorithm		L	T	P	L	T	P	Total
		3	1	-	3	1	-	4
Duration of Theory Paper: 3 Hours								

Learning Objectives:

- To introduce approaches for analyzing algorithms in various domains.
- Techniques for designing efficient algorithms.
- Have a sense of the complexities of various problems in different domains.

Prerequisite: Knowledge of data structures may assist the learning process.

COURSE OF CONTENTS

UNIT-I

Introduction to Algorithms: Design & analysis issues; Types of algorithms; Performance issues - Time and space complexity; Asymptotic analysis. Mathematical preliminaries; functions & their growth rates; Recurrence relations, Methods for solving recurrences.

UNIT-II

Analysis of Some Sorting and Searching Algorithms: Elementary sorting techniques: Selection, Bubble, and Insertion sorts; Advanced sorting techniques: Heap, Merge and Quick sorts; Radix & Bucket sorts. Searching techniques: Linear and binary search; Searching minimum and maximum elements.

UNIT-III

Algorithms Design Techniques: Divide-and-Conquer, Greedy Method, Dynamic programming, Backtracking and Branch-and-Bound; Illustration of above strategies using appropriate examples like; Knapsack problem, Optimal storage on tapes, finding shortest path, all pairs shortest path, finding minimum cost spanning trees, Queens problems, Travelling salesperson problem etc.

UNIT-IV

Analysis of Matrix and Polynomial Algorithms: Boolean Matrix Multiplication's; Strassen's matrix multiplication; Matrix chain multiplication problem; Solving Linear Equations, Computation of polynomials – Horner's method. String matching algorithms.

UNIT-V

Non-deterministic Algorithms: Introduction. Nondeterministic Complexity, Computational classes: – P, NP, NPC complete, and NP-Hard; reducibility, Decision and optimization problems, Some NP and NP-Hard problems: Hamiltonian cycle, Traveling Salesperson (TSP). Satisfiability, Clique problems etc.

Learning Outcomes:

Upon completing the course, students will be able to:

- Apply design principle and concept to algorithm design.
- Knowledge of mathematical foundation in analysis of algorithms.
- Analyse the efficiency of algorithms using time and space complexity theory.
- Learn how to analyse algorithms and estimate their worst-case and average-case behaviour.

- Become familiar with fundamental data structure and with the manner in which these data structure can best be implemented.

BOOKS RECOMMENDED:

- [1] T.H. Cormen, C.E. Leiserson and R.L. Rivest, Introduction to Algorithms, Prentice Hall of India, 1990.
- [2] E. Horowitz, S. Sahni, S Rajasekaran, Computer Algorithms, Galgotia Publications, ND, 2002.
- [3] Saara Base, Computer Algorithms: Introduction to Design and Analysis, Addison Wesley, 2/e, 1988.
- [4] Knuth, D, The art of computer programming , Vols. 1-2-3, Addison Wesley, 1968-73.
- [5] A V Aho, J E Hopcroft& J D Ullman, The Design and Analysis of Computer Algorithms, Addison Wesley, 1974.