

Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)										
AY 2025-26										
Course Information										
Programme	B.Tech. (Artificial intelligence and Machine Learning)									
Class, Semester	Second Year B. Tech., Sem IV									
Course Code	1AI224									
Course Name	Computational Algorithms									
Desired Requisites:	Data Structures and Algorithms									
Teaching Scheme		Examination Scheme (Marks)								
Lecture	3 Hrs/week	ISE	MSE	ESE	Total					
Tutorial		20	30	50	100					
Credits: 3										
Course Objectives										
1	To introduce fundamental algorithmic techniques and their applications in problem-solving.									
2	To develop skills in designing and analyzing algorithms for efficiency.									
3	To introduce parallel programming concepts using MPI for scalable algorithm design.									
Course Outcomes (CO) with Bloom's Taxonomy Level										
At the end of the course, the students will be able to,										
CO	Course Outcome Statement/s			Bloom's Taxonomy Level	Bloom's Taxonomy Descriptor					
CO1	Analyze and compare the efficiency of algorithms using asymptotic notation.			4	Analyze					
CO2	Design and implement divide-and-conquer, greedy, and dynamic programming algorithms			6	Create					
CO3	Apply graph algorithms to solve real-world problems.			5	Evaluate					
CO4	Develop parallel algorithms using MPI for scalable performance.			6	Create					
Module	Module Contents				Hours					
I	Introduction to Algorithms: Algorithm analysis, Asymptotic notation (Big-O, Big-Ω, Big-Θ), Time and space complexity. Greedy Algorithms: Activity selection, Fractional Knapsack, Huffman coding.				7					
II	Divide and Conquer Algorithms: QuickSort, Binary Search Dynamic Programming: Matrix chain multiplication, Longest Common Subsequence (LCS), Matrix Chain multiplication, 0/1 Knapsack.				7					
III	Introduction to Parallel Computing: Basics of parallelism, MPI basics, Distributed memory Architecture, Parallel matrix multiplication, Parallel MergeSort				7					
IV	Graph based shortest path Algorithm: Bellman-Ford algorithm, topological sorting of vertices, Dijkstra's algorithm				7					
V	Other Shortest Path Algorithms: All-pairs shortest paths, Matrix-multiplication, Floyd-Warshall algorithm, Johnson's algorithm, Max Flow, Complexity classes				7					
VI	Advanced Topics: Randomized algorithms, Approximation algorithms. Parallel BFS and DFS, Parallel Prim's algorithm				7					

