



MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AN AUTONOMOUS INSTITUTION)

(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)

Accredited by NAAC with 'A' Grade & Recognized Under Section 2(f) & 12(B) of the UGC act, 1956

COURSE CONTENT

PARALLEL COMPUTING								
II Semester: CSE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		C	CIA	SEE
2525814	Foundation	3	0	0	3	40	60	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
Prerequisites: UG level course in enterprise cloud concepts								

Course Overview:

This course introduces the principles and models of parallel computing for high-performance problem-solving covers parallel architectures (shared memory, distributed systems), parallel programming models such as OpenMP and MPI, and GPU computing basics.

Course Objectives:

1. To understand the fundamentals, motivation, and scope of parallel computing.
2. To study parallel computing architectures and programming models such as MPI and PThreads.
3. To develop efficient parallel algorithms for matrix operations, sorting, and graph processing.
4. To analyze performance and scalability of parallel programs using analytical models.
5. To apply parallel computing techniques for solving large-scale scientific and real-world computational problems.

Course Outcomes: After Completion of the Course, Students should be able to

1. Apply basic parallel programming platforms and communication operations to implement scalable scientific applications.
2. Design analytical models with parallel algorithms for program efficiency in real-time systems.
3. Evaluate message passing (MPI) and shared memory (PThreads) paradigms for suitable programming models in heterogeneous computing environments.
4. Distinguish dense matrix and sorting algorithms to optimize performance in engineering simulations and data-intensive applications.
5. Create efficient parallel graph and search algorithms to solve large-scale problems in social network analysis.

UNIT - I:

Parallel Computing: Introduction, Motivation and scope - Parallel Programming Platforms
– Basic Communication Operations

UNIT - II:

Principles of Parallel Algorithm Design - Analytical Modelling of Parallel Programs

UNIT - III:

Programming using Message Passing Paradigm (MPI) – Programming Shared Address Space Platforms (PThreads)

UNIT - IV:

Dense Matrix Algorithms (Matrix-Vector Multiplication, Matrix-Matrix Multiplication) – Sorting Algorithms (Issues, Bubble Sort, Quick Sort, Bucket Sort, Enumeration Sort, Radix Sort)

UNIT - V:

Graph Algorithms (Minimum Spanning Tree: Prim's Algorithm - Single-Source Shortest Paths: Dijkstra's Algorithm) Search Algorithms (DFS, BFS)

TEXT BOOKS:

1. Introduction to Parallel Computing, Second Edition, Ananth Grama, George Karypis, Vipin Kumar, Anshul Gupta, Addison-Wesley, 2003, ISBN: 0201648652

REFERENCE BOOKS:

1. Parallel Computing – Theory and Practice, Second Edition, Michael J. Quinn, Tata McGraw- Hill Edition.
2. Parallel Computers – Architectures and Programming, V. Rajaraman, C. Siva Ram Murthy, PHI

ELECTRONIC RESOURCES:

1. <https://www.classcentral.com/course/swayam-introduction-to-parallel-programming-with-openmp-and-mpi-58484>
2. <https://www.coursera.org/specializations/high-performance-parallel-computing>
3. <https://ppc.cs.aalto.fi/>
4. <https://www.tutorialspoint.com/ebook/parallel-algorithm-tutorial/index.asp>

MATERIALS ONLINE:

1. Course template
2. Tutorial question bank
3. Tech talk and Concept Video topics
4. Open-ended experiments
5. Definitions and terminology
6. Assignments
7. Model question paper – I
8. Model question paper – II
9. Lecture notes
10. E-Learning Readiness Videos (ELRV)

