

PARALLEL COMPUTING (MCA506B)

Module-I (10 hours)

Introduction to Parallel Computing; Motivating Parallelism, Scope of Parallel Computing; Parallel Programming; Platforms : Implicit parallelism, Limitation of Memory System Performance, Dichotomy of Parallel Computing Platforms, Physical Organization of Parallel Platforms: PRAM Model, Interconnection network, network topology, Evaluation of interconnection network.

Module-II (10 hours)

Communication Costs of Parallel Machines, Routing Mechanism for Interconnection Networks, Impact of Process-processor Mapping and Mapping Techniques.

Principles of Parallel Algorithm Design : Preliminaries, Decomposition Techniques, Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing, Methods for containing interaction Overheads,

Module-III (10 hours)

Parallel Algorithm Models: Basic Communication Operations: One-to-All Broadcast and All-to-One Reduction, All-to-All Broadcast and Reduction, Scatter and Gather, All-to-All Personalized Communication, Circular Shift. All reduce and prefix sum.

Module-IV (10 hours)

Analytical Modeling of Parallel Programs: Sources of Overhead, Performance metrics. Effect of Granularity on Performance, Scalability of Parallel Systems, minimum Execution time and minimum cost-optimal Execution time, Asymptotic Analysis of Parallel Programs,

Introduction to MPI Principles of Message: The Building Blocks (Send and Receive Operations), Message Passing Interface, Collective Communication and Computation Operations.

Module V (06 Hours)(as per choice of faculty)

Portion covered can be tested through Internal evaluation only not to be included in University examination)

Text Books:

1. Ananth Grama, George Karypis, Vipin Kumar, Anshul Gupta, “*Introduction to Parallel Computing*”, 2nd Edition, 2004, Pearson Education, Inc. New Delhi.
2. Michael J. Quinn, “*Parallel Computing: Theory and Practice*”, 1994, McGraw-Hill Education (India), New Delhi.

Reference Books:

1. Calvin Lin, Larry Snyder, “*Principles of Parallel Programming*”, 1st Edition, 2009, Pearson Education, Inc. New Delhi.
2. Michael J. Quinn, “*Parallel Programming in C with MPI and OpenMP*”, 2004, McGraw-Hill Education (India), New Delhi.
3. Barry Wilkinson, “*Parallel Programming: Techniques and Applications Using Networked Workstations and Parallel Computers*”, 2nd Edition, 2005, Pearson Education, Inc. New Delhi.
4. Yves Robert, Henri Casanova, Armand Legrand, “*Parallel Algorithms*”, 1st Edition, 2009, CRC Press. ISBN-13:9781584889458.
5. Harry F. Jordan, Gita Alagband, “*Fundamentals of Parallel Processing*”, first Edition, 2003, PHI Learning Pvt. Ltd. New Delhi.