

TCS2037 DESIGN AND ANALYSIS OF PARALLEL ALGORITHMS

Module 1

Introduction to Parallel Computing and Programming: Motivating Parallelism, Scope of Parallel Computing, Implicit Parallelism, Limitations of Memory system performance, Dictionary of Parallel Computing Platforms Physical Organization of Parallel Platforms, Communication Costs in Parallel Machines, Routing Mechanisms for Interconnection Networks, Impact of Process – Processor Mapping and Mapping Techniques.

Module 2

Principles of Parallel Algorithm Design: Preliminaries, Decomposition Techniques, Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing, Methods for containing Interaction Overloads, Parallel Algorithm Models.

Module 3

Dense Matrix Algorithms: Matrix Vector Multiplication, Matrix – Matrix Multiplication, Solving a system of Linear Equations.

Module 4

Sorting: Issues in sorting on Parallel Computers, Sorting Networks, Bubble Sort and its variants, Quick Sort, Bucket and sample sort, other sorting Algorithms.

Module 5

Graph Algorithms: Definitions and Representation, Minimum Spanning Tree, Prim's Algorithm, Single Source shortest path : Dijkstra's Algorithms All-pairs shortest paths, Transitive closure, Connected Components, Algorithms for Sparse Graphs.

Module 6

Search Algorithms for Discrete Optimization Problems: Definitions and Examples, Sequential Search Algorithms, Search Overhead Factor, Parallel Depth – First Search, Parallel Best – First Search, Speedup Anomalies in Parallel Search Algorithms.

Module 7

Dynamic Programming: Overview of Dynamic Programming, Serial Monadic DP Formulations, Nonserial Monadic DP Formulations, Serial Polyadic DP Formulations, Nonserial Polyadic DP Formulations.

Fast Fourier Transform: The serial Algorithm, The Binary – Exchange Algorithm, The Transpose Algorithm.

Text Book:

A Grama et.al – Introduction to Parallel Computing, 2nd ed. Pearson Education, New Delhi 2003.

Reference Books:

M.J. Quinn – Parallel Computing : Theory and Practice, 2nd ed., McGraw Hill, New York, 1994.