GUJARAT TECHNOLOGICAL UNIVERSITY

B.E. SEMESTER : VIII

COMPUTER ENGINEERING

Subject Name: **PARALLEL PROCESSING**

Sr. No.	Course Contents	Total Hrs
1.	**Parallel Programming Platforms** • Implicit Parallelism: Trends in Microprocessor Architectures • Limitations of Memory System Performance • Dichotomy 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	04
2.	**Principles of Parallel Algorithm Design algorithms** • Preliminaries • Decomposition Techniques • Characteristics of Tasks and Interactions • Mapping Techniques for Load Balancing • Methods for Containing Interaction Overheads • Parallel Algorithm Models	06
3.	**Basic Communication Operations, algorithms** • One-to-All Broadcast and All-to-One Reduction • All-to-All Broadcast and Reduction • All-Reduce and Prefix-Sum Operations • Scatter and Gather • All-to-All Personalized Communication • Circular Shift • Improving the Speed of Some Communication Operations	08
4.	. **Analytical Modeling of Parallel Programs** • Sources of Overhead in Parallel Programs • Performance Metrics for Parallel Systems • Effect of Granularity and Data Mapping on Performance • Scalability of Parallel Systems • Minimum Execution Time and Minimum Cost-Optimal Execution Time • Asymptotic Analysis of Parallel Programs • Other Scalability Metrics	06
5.	**Programming Using the Message Passing Paradigm** • Principles of Message-Passing Programming • The Building Blocks: Send and Receive Operations • MPI: The Message Passing Interface • Topologies and Embedding • Overlapping Communication with Computation • Collective Communication and Computation Operations • Groups and Communicators	08
6.	**Programming Shared Address Space Platforms Thread Basics** • Why Threads? • The POSIX Thread Application Programmer Interface • Synchronization Primitives in POSIX • Controlling Thread and Synchronization Attributes • Thread Cancellation • Composite Synchronization Constructs	08

7.	. **Dense Matrix Algorithms** • Matrix-Vector Multiplication • Matrix-Matrix Multiplication	**06**
8.	**Sorting** Issues in Sorting on Parallel Computers • Sorting Networks • Bubble Sort and its Variants • Quick sort	**06**
9.	**Graph Algorithms** • Definitions and Representation • Minimum Spanning Tree: Prim's Algorithm • Single-Source Shortest Paths: Dijkstra's Algorithm • All-Pairs Shortest Paths	**08**

Text Books:

1. Introduction to Parallel Computing, Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar, By Pearson Publication
2. Introduction to Parallel Processing, M. SasiKumar, Dinesh Shikhare, P.Raviprakash By PHI Publication

Reference Books:

1 Introduction To Parallel Programming - By Steven Brawer
2 Introduction To Parallel Processing – By M.Sasikumar, Dinesh Shikhare And P. Ravi Prakash
3 Parallel Computers – Architecture And Programming – By V. Rajaraman And C. Siva Ram Murthy