

GUJARAT TECHNOLOGICAL UNIVERSITY
MASTER OF COMPUTER APPLICATIONS (MCA)
SEMESTER: V

Subject Name: **Parallel Programming (PP) (Elective-II)**
Subject Code: **650005**

Objectives:

- To study the technologies enabling parallel computing
- To study the different types of interconnection networks
- To study the different parallel programming models
- To study the software support needed for shared memory programming
- To learn message passing interface

Prerequisites: C programming, Computer Organization, O.S.

Content:

- 1. Introduction** [3Hrs]
Why Parallel Processing? , Warnings!, Laws of Caution? Parallel Processing, Shared memory Multiprocessing, Distributed memory, Using Parallelism
- 2. The power and Potential of Parallelism, Examining sequential and Parallel Programs, Parallelism using Multiple Instruction stream, The Goals: Scalability and Performance Portability** [3Hrs]
- 3. Parallel Processing Architecture: Parallelism in sequential machines, Abstract model of Parallel Computer, Multiprocessor architecture, pipelining, Array Processors, Introduction to six Parallel Computers.** [6Hrs]
- 4. Parallelism versus Performance, Threads and Processes, Latency and Throughput, Sources of Performance Loss, Parallel Structure, Performance Trade-offs, Measuring Performance**[3Hrs]
- 5. Data Dependency Analysis** [6Hrs]
Introduction, Types of Dependencies, Loop and Array Dependence, Loop dependence Analysis, Solving Diophantine Equations, Program Transformations
- 6. Shared Memory Programming using process** [12Hrs]
Shared Memory Programming, General Model of Shared memory Programming, Process model under UNIX(including mutual exclusion,synchronization), Appendices C UNIX Library for Shared Memory Abstraction (Use of system calls

fork,wait,ps,semget,semop,semctl,shmget,shmat,shmctl,ipcs)

7. Shared Memory Programming using POSIX threads [6Hrs]

POSIX threads, Mutual Exclusion, Synchronization, safety issues, Performance issues, Case studies.

8. Distributed Computing-I: Message Passing Model [7Hrs]
Message Passing Interface(MPI) , Parallel Virtual Machine

9. Algorithms for Parallel machines [2Hrs]
Histogram computation, matrix chain multiplication

Text Books:

1. M.Sasikumar, Dinesh Shikhare, P.Ravi Prakash, "Introduction to Parallel Processing". PHI. First Edition-2000.
2. Calvin Lin, Lawrence Snyder, "Principles of Parallel Programming" Pearson Education, First Edition-2009.

Reference Books:

1. Barry Wilkinson, Michael Allen, "Parallel Programming Techniques and applications using Networked Workstations and Parallel Computers" Pearson, 2nd edition.
2. Peter S. Pacheco, "An introduction to Parallel Programming" Morgan Kaufmann, 1st Edition.
3. Michael J. Quinn, "Parallel Programming in C with MPI and OpenMP", Tata McGraw-Hill

Chapter wise Coverage from Text Book(s):

<i>Sr No / Topic No</i>	<i>Book#</i>	<i>Chapters (according to topics)</i>
1	1	1
2	2	1
3	1	2
	2	2
4	2	3
5	1	4
6	1	5
7	2	6
8	2	7
	1	7.4
9	1	9.2,9.5