

GUJARAT TECHNOLOGICAL UNIVERSITY

Subject Name: Parallel programming (Elective I & II- Group 1)

Subject Code: 3715106

Semester: I

Type of course: M.E. Computer Engineering (IT systems and Network Security)

Prerequisite:

- Knowledge of C Programming
- Knowledge about Server systems
- Understanding about Cluster systems
- Understanding of cloud infrastructure
- Understanding on Network Communication
- Understanding of Linux/Unix

Rationale:

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	PA (V) ESE	PA (I)		
3	2	0	4	70	30	30	20	150

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment;

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Concepts of parallelism	2	4
2	Introduction Amdahl's law and Gustafson's law	2	4
3	Dependencies	2	4
4	Interconnection networks	2	4
5	Race conditions	2	4
6	mutual exclusion	2	4
7	synchronization and parallel slowdown	2	4
8	Fine-grained, coarse-grained and embarrassing parallelism	2	4
9	Types of parallelism	2	4
10	Bit-level parallelism	2	4
11	Instruction-level parallelism Data parallelism	2	4
12	Task parallelism, Classes of parallel computers	2	4
13	Multicore computing, Symmetric multiprocessing	2	4
14	Distributed computing, Cluster computing	2	6
15	Massive parallel processing	2	6

16	Grid computing Specialized parallel computers, MPI Programming.	3	6
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Reference Books: - **Parallel Programming:** Techniques and Applications Using Networked Workstations and Parallel Computers by Barry Wilkinson, Pearson

Parallel Programming: For Multicore and Cluster Systems, 1/r, Gudula Ranger, Springer

Course Outcome:

After learning the course the students should be able to:

- Understand the workings of Cluster and Cloud.
- Write the MPI programs for Clusters
- Understanding of Big Data.
- Understanding to troubleshoot the critical Servers
- Able to work for High Performance Computing development

List of Experiments: (with Open Ended Problems)

- Creating the small 3 node cluster
- Creating the private cloud
- Develop a High availability Cluster
- Develop a High Performance Computing Cluster
- Develop a failover Cluster
- Develop a load balancing cluster

Major Equipment:

- Linux
- VMWare
- Hypervisor
- Switches

List of Open Source Software/learning website:

- OpenStack
- Pirana
- Dijkstra