



Kadi Sarva Vishwavidyalaya

Faculty of Engineering & Technology

Fourth Year Bachelor of Engineering (IT)

(To be Proposed For: Academic Year 2020-21)

Subject Code: IT801-N	Subject Title: Distributed and Parallel Computing
Pre-requisite	C, C++, Java Programming, Computer Organization

Teaching Scheme (Credits and Hours)

Teaching scheme				Total Credit	Evaluation Scheme					
L	T	P	Total		Theory		Mid Sem Exam	CIA	Pract.	Total
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	Marks
03	00	02	05	04	03	70	30	20	30	150

Course Objective:

- To learn the advanced concepts of Parallel and Distributed Computing and its implementation for assessment of understanding the course by the students.
- Understand the distributed and parallel computing systems.
- Familiar with parallel and distributed languages MPI, Pthread, and OpenMP
- Design parallel and distributed algorithms using these parallel languages

Outline of the Course:

Sr. No	Title of the Unit	Minimum Hours
1	Introduction	3
2	Message Passing Computing	5
3	Partitioning and Divide-and-Conquer Strategies	5
4	Pipelined Computations	7
5	Synchronous Computations	8
6	Load Balancing and Termination Detection	6
7	Programming with Shared Memory	7
8	Distributed Shared Memory Systems and Programming	7

Total hours (Theory): 48

Total hours (Lab): 32

Total hours: 80



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Detailed Syllabus

Sr. No	Topic	Lecture Hours	Weightage (%)
1	Introduction: The Demand for Computational Speed, Types of Parallel Computers, Cluster Computing	3	6
2	Message Passing Computing: Basics of Message-Passing Programming, Using a Cluster of Computers, Debugging and Evaluating Parallel Programs Empirically	5	10
3	Partitioning and Divide-and-Conquer Strategies: Partitioning, Partitioning and Divide-and-Conquer Examples	5	10
4	Pipelined Computations: Pipeline Technique, Computing Platform for Pipelined Applications, Pipeline Program Examples	7	15
5	Synchronous Computations: Synchronization, Synchronized Computations, Synchronous Iteration Program Examples, Partially Synchronous Methods	8	17
6	Load Balancing and Termination Detection: Load Balancing, Dynamic Load Balancing, Distributed Termination Detection Algorithms, Program Example	6	12
7	Programming with Shared Memory: Shared Memory Multiprocessors, Sharing Data, Parallel Programming Languages and Constructs, OpenMP, Performance Issues	7	15
8	Distributed Shared Memory Systems and Programming: Distributed Shared Memory, Implementing Distributed Shared Memory, Distributed Shared Memory Programming Primitives	7	15
	Total	48	100

Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lecture and laboratory which carries 10 marks in overall evaluation.
- One internal exam will be conducted as a part of internal theory evaluation.
- Assignments based on the course content will be given to the students for each unit and will be evaluated at regular interval evaluation.
- Surprise tests/Quizzes/Seminar/tutorial will be conducted having a share of five marks in the overall internal evaluation.



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- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.

Learning Outcome:

On successful completion of this course, the student should be able to:

- After the completion of this course student will be able to understand various parallel platforms and algorithms.
- Students will learn about parallel and distributed computers. They will be able to write portable programs for parallel or distributed architectures using Message-Passing Interface (MPI) library.
- Students will learn about load balancing and shared memory.

E-Resources:

- <https://nptel.ac.in/courses/106/106/106106107/>
- Introduction to Parallel Computing from Livermore Computing
- Links to Parallel and Network Programming Resources MPI, OpenMP, posix threads, socket programming, CUDA...
- Some Cluster and Distributed Systems Papers
- IEEE Distributed Systems Online
- The Top 500 Supercomputers
- ParaScope IEEE Listing of Parallel Computing Sites
- HPC Wire

Text Books:

- Parallel Programming - Techniques and applications Using Networked Workstations and Parallel Computers (2nd Edition), Barry Wilkinson and Michael Allen, Prentice Hall, 2001.

References:

- Documentation (MPI, Pthread, OpenMP).
- Parallel Programming in C with MPI and OpenMP, Michael J. Quinn, McGraw Hill 2003.
- Designing and Building Parallel Programs, Ian Foster, Addison Wesley, 1995.



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List of experiments

No	Name of Experiment
1	Parallel Odd-Even Transposition Sort
2	Mandelbrot Set Computation
3	N-Body Simulation
4	Heat Distribution Simulation
5	Sample MPI program in C
6	Implement simple cluster using master and slave node
7	Divide and conquer parallel computing program using C
8	Implement sample program for load balancing
9	OpenMP concepts implementation
10	Implement distributed shared memory