

Parallel Computing

Course Code	19CS4701D	Year	IV	Semester	I
Course Category	Program Elective - IV	Branch	CSE	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	Operating Systems, Computer Organization
Continuous Internal Evaluation :	30	Semester End Evaluation:	70	Total Marks:	100

Course Outcomes

Upon successful completion of the course, the student will be able to

CO1	Understand the concepts of Parallel computing/programming	L2
CO2	Apply various Distributed programming Algorithms for a given Program.	L3
CO3	Apply various Shared Memory Programming methods with Pthreads/OpenMP on a given matrix/program.	L3
CO4	Apply parallelism and searching for a given tree structure.	L3

Syllabus

Unit No.	Contents	Mapped CO
I	Introduction to Parallel Computing: Need of Performance, Building Parallel Systems, Why to Write Parallel Programs? How to Write Parallel Programs? Approach : Concurrent, Parallel, Distributed Parallel Hardware and Parallel Software : Background, Modifications to the von Neumann Model, Parallel Hardware, Parallel Software, Input and Output, Performance, Parallel Program Design and Writing and Running Parallel Programs	CO1
II	Distributed Memory Programming with MPI: Getting Started, The Trapezoidal Rule in MPI, Dealing with I/O, Collective Communication, MPI Derived Data types, A Parallel Sorting Algorithm.	CO1,CO2

III	Shared Memory Programming with Pthreads : Processes, Threads and Pthreads, Hello, World program ,Matrix-Vector Multiplication, Critical Sections Busy-Waiting, Mutexes, Producer-Consumer Synchronization and Semaphores, Barriers and Condition Variables, Read-Write Locks, Caches, Cache-Coherence, and False Sharing and Thread-Safety	CO1,CO3
IV	Shared Memory Programming with OpenMP : Introduction to Open MP, The Trapezoidal Rule, Scope of Variables, The ReductionClause, The Parallel For Directive, More About Loops in OpenMP: Sorting, SchedulingLoops, Producers and Consumers, Caches, Cache-Coherence, and False Sharing andThread-Safety	CO1,CO3
V	Parallel Program Development and Parallel Algorithms : Two N-Body Solvers, Tree Search and Case Studies	CO1,CO4
Learning Resources		
Text Books		
1. An Introduction to Parallel Programming, Peter S Pacheco, 2011, Elsevier India.		
References		
1. Parallel Programming for Multicore and Cluster Systems, Thomas Rauber, GudulaRünger, Second Ed., Springer, 2015 2. Introduction to Parallel Computing(From Algorithms to Programming on State-of-the-Art Platforms), Roman Trobec, BoštjanSlivnik, Patricio Bulić, BorutRobič, 2018, Springer Nature Switzerland. 3. Introduction to Parallel Computing,AnanthGrama, Anshul Gupta, George Karypis&Vipin Kumar, Second edition, 2004, Pearson Education		
e-Resources & Other Digital Material		
1. www. https://www.udemy.com/ 2. https://www.coursera.org/		