AMITY UNIVERSITY
UTTAR PRADESH

L	T	P/S	SW/FW	TOTAL CREDIT UNITS
03	1	-	-	4

Course Title: **Parallel and Distributed Algorithms**
Course Level: **M.Tech**
Course Code:CSE-621 **Credit Units:** **04**

Course Objectives:

This course covers general introductory concepts in the design and implementation of distributed systems, covering all the major branches such as Cloud Computing, Grid Computing, Cluster Computing, Supercomputing, and Many-core Computing.

Pre-requisites:

You should be comfortable programming in C and /or Java in particular. No prior knowledge of parallel computing is required.

Co-Requisites:
Good knowledge of undergraduate level algorithms, data structures, operating system and computer architecture

Student Learning Outcomes:

To reason about ways to parallelize a problem and be able to evaluate a parallel platform for a given problem
To understand and explore the concepts with programming with MPI and MapReduce/Hadoop
To demonstrate the general concepts on Cloud computing, grid computing, and peer-to-peer systems
To become familiar with evaluation of online social networks and their potential

Course Contents/Syllabus:

	Weightage (%)

Module I : Introduction: The power and potential of parallelism	**20%**
The power and potential of parallelism, purpose of using parallelism, different parallel architecture, Reasoning about performance of parallel programs.	
Module II Data, Task Parallelism and Java Multithreading	**20%**
Introduction of data and task parallelism, Independent parallelism, Introduction to Java multithreading, Fork-join parallelism, Analyze fork and join parallelism, parallel prefix, parallel pack	
Module III Mutual exclusion, Deadlocks and Parallel Computational Models	**20%**

Concurrency, STM, Mutual exclusion, locks, Deadlocks, race condition, Read/write locks, condition variables, Flynn's Taxonomy, PRAM, EREW, CREW, ERCW, CRCW, Simulating CRCW, CREW and EREW, PRAM algorithms. Parallel Programming Models, PVM, MPI Paradigms	
Module IV Parallel Algorithms and Programming Languages	**20%**
Parallel Programming Language, Brent's Theorem, Simple parallel programs in MPI environments, Parallel algorithms on network, Addition of Matrices, Multiplication of Matrices., Parallel quick sort, Synchronizing shared data structure, Shared memory	
Module V Distributed System Model and Cases	**20%**
Distributed system models, Inter process communication, Message passing, Message passing algorithm, Distributed synchronization, Consistency, replication, Cluster computing, MapReduce, Distributed storage, Wide area computing, Distributed hash table, Peer-to-peer systems. **Cases** 1. Parallel computing algorithms and representative programming models, 2. Convergence of parallel, distributed and cloud computing,	

3. Cluster Computing, its performance model and system evolution.	

Pedagogy for Course Delivery:
The class will be taught using theory and case based method. In addition to assigning the case studies, the course instructor will spend considerable time in understanding the concept of innovation through the eyes of the consumer. The instructor will cover the ways to think innovatively liberally using thinking techniques.

In semester coursework assessments shall be the following:

1. Assignments/Case Study
2. Presentation
3. Term Test.

Assessment/ Examination Scheme:

Theory L/T (%)	Lab/Practical/Studio (%)	End Term Examination
100	-NA-	70

Theory Assessment (L&T):

Continuous Assessment/Internal Assessment					
Components (Drop down)	**Attendance**	**Class Test**	**Home Assignment**	**Viva/quiz**	**End Term Examination**
Weightage (%)	5	10	8	7	70

Text & References:
Text:

1. “A. Grama, A. Gupta, G. Karypis and V. Kumar. Introduction to Parallel Computing (2nd edition), Addison Wesley (2002), ISBN 0-201-64865-2.
2. H. El-Rewini and T.G. Lewis. Distributed and Parallel Computing, Manning (1997), ISBN 0-13-795592-8.
3. I. Foster. Designing and Building Parallel Programs, Addison Wesley (1995), ISBN 0-201-57594-9.

***References*:**

- Kai Hwang and Zhiwei Xu. Scalable Parallel Computing, McGraw Hill (1998), ISBN 0-07-031798-4.
- Michael J. Quinn. Parallel Programming in C with MPI and OpenMP, McGraw Hill (2003), ISBN 0-07-282256-2.
- Barry Wilkinson and Michael Allen. Parallel Programming: Techniques and Applications Using Networked Workstations and Parallel Computers (2nd Edition), Prentice Hall PTR (2005), ISBN 0-13-140563-2