Course Name: CS-347, **Parallel and Distributed Computing**

Credit Hours: 2-1

Contact Hours: 2-3

Pre-requisites: Operating Systems

Course Introduction:

In the "Parallel and Distributed Computing" course, students will first gain a comprehensive understanding of the principles and challenges associated with parallel and distributed computing, focusing on their fundamental concept. They will also delve into the intricacies of optimizing performance and scalability within parallel and distributed systems. Furthermore, students will apply their knowledge practically by utilizing parallel and distributed computing techniques to tackle real-world problems across various domains, showcasing their ability to implement these strategies effectively. Finally, they will develop critical analytical skills by evaluating and analyzing the performance of parallel and distributed systems, enabling them to make informed decisions and optimizations.

CLO No	**Course Learning Outcomes**	**Bloom Taxonomy**
CLO-1	Understand the principles and challenges of parallel and distributed computing	C2 (Understand)
CLO-2	Understand and optimize performance and scalability of parallel and distributed systems	C2 (Understand)
CLO-3	Apply parallel and distributed computing techniques to solve real-world problems in various domains	C3 (Apply)
CLO-4	Analyze and evaluate the performance of parallel and distributed systems	C4 (Analyze)

Course Plan:

#	**Weekly Distribution of Course Contents**
Week-1	Introduction to Parallel and Distributed Computing
Week-2	Comparative analysis of Parallel and Distributed Computing
Week-3	Performance Metrics
Week-4	Memory Hierarchy and CPU Architecture
Week-5	Parallel Programming Models
Week-6	Parallelism in Multi-core Processors and GPUs, with Message Passing Interface (MPI)
Week-7	Parallelism in Multi-core Processors and GPUs, with OpenMP

Week-8	Distributed Computing Environments, Coordination and Synchronization
Week-9	Coordination and Synchronization, Cloud Computing Architecture
Week-10	Cloud Computing Services
Week-11	Cloud Storage and Data Management
Week-12	High-Performance Computing, Supercomputers and High-Performance Clusters
Week-13	Performance Tuning and Optimization, Benchmarking and Profiling
Week-14	Quantum Computing
Week-15	Distributed Computing Applications in Big Data Analytics
Week-16	Distributed Computing Applications in Machine Learning, Computer Vision and Image Processing, Scientific Simulations

Reference Materials:

1. "Distributed Systems: Concepts and Design" by George Coulouris, Jean Dollimore, and Tim Kindberg (2011)
2. "Parallel Computing: Theory and Practice" by Michael J. Quinn (2018)
3. "High Performance Computing" by Charles Severance and Kevin Dowd (2018)
4. "Big Data: Principles and best practices of scalable real-time data systems" by Nathan Marz and James Warren (2015)