Course	CSE524 Parallel and Distributed Systems	Semester	Monsoon Semester 2024
Faculty Name(s)		Contact	
School	SEAS	Credits	3
GER Category:		Teaching Pedagogy Enable:NO	P/NP Course: Can not be taken as P/NP
Schedule			
Prerequisite	CSC340 Operating Systems/CSE340 Operating Systems OR CSE 3XX Design and Analysis of Algorithms/CSE200 Design and Analysis of Algorithms OR CSC200 DSA200/CSC200 Design and Analysis of Algorithms and Data Structures & CSC200 DSA200/CSC200 Design and Analysis of Algorithms and Data Structures		
Antirequisite	Not Applicable		
Corequisite	Not Applicable		
Course Description	The course has three parts. The first part overviews the basic terms and concepts in parallel and distributed computing. The second part will overview various central aspects of distributed systems: including naming, processes, concurrency, and consistency. The final part introduces 7 basic problems and through problem-solving sessions, the students will apply the earlier learned concepts in designing parallel and distributed algorithms that are not memory and network architecture specific.		
Course Objectives	Introduce students to some of the algorithm design techniques in the context of a parallel and distributed systems; Introduce and apply some of the fundamental parallel and distributed system concepts in analyzing algorithms/distributed systems.		

Learning Outcomes	The student should gain mastery over • Design and analysis of parallel and distributed system concepts • tools and techniques for analysis of parallel and distributed algorithms from a distributed system design and optimal resource allocation of distributed applications
Pedagogy	Classroom lectures, presentations, and problem solving sessions
Expectation From Students	Approximately one major topic will be covered every two weeks and there will be approximately one problem set assigned every two weeks followed by a discussion. The problem sets will consists of individual assignments and group activities. These problem sets are intended to help students apply and master elementary concepts in Design and Analysis of Parallel and Distributed Systems. The group activities are intended to develop critical thinking and problem solving ability.

Assessment/Evaluation	• Mid-Semester Examination:
	  ◦ Exam - 30%
	• End Semester Examination:
	  ◦ Exam - 40%
	• Other Components:
	  ◦ Assignment - 30%

Attendance Policy	As per Ahmedabad University Policy.
Project / Assignment Details	Mid-semester exam: 30% End semester exam: 40% Problem-solving sessions 25% Class Participation 5%
Course Material	
Additional Information	Textbook 1: M. van Steen and A.S. Tanenbaum, Distributed Systems, 3rd ed., distributed-systems.net, 2017. Reference Textbook: Elements of Parallel Computing by Eric Aubane, Chapman & Hall/CRC

Session Plan

NO.	TOPIC TITLE	TOPIC & SUBTOPIC DETAILS	READINGS,CASES,ETC.	ACTIVITIES	IMPORTANT DATES
1	Course Overview and Introduction to Parallel and Distributed Computation and Network Architectures.	Course Overview, Motivation for the study of Parallel and Distributed Algorithms.	Chapter 1 of Textbook[1]		
2	Course Overview and Introduction to Parallel and Distributed Computation and Network Architectures.	Course Overview, Motivation for the study of Parallel and Distributed Algorithms.	Chapter 1 of Textbook[1]		
3	An overview of simplest networks for parallel computation.	Algorithm Design and Analysis using the word model. Matrix computation on Arrays.	Chapter 1 of Textbook[1]	Group Activities that motivate the challenges in design and analysis of parallel algorithms on Arrays.	
4	An overview of simplest networks for parallel computation.	Algorithm Design and Analysis using the word model. Matrix computation on Arrays.	Chapter 1 of Textbook[1]	Group Activities that motivate the challenges in design and analysis of parallel algorithms on Arrays.	
5	Design and Analysis of Parallel Algorithms on simple networks	Algorithm Design and Analysis using the word model. Matrix computation on Trees.	Chapter 1 of Textbook[1]	Group Activities that motivate the challenges in design and analysis of parallel algorithms on Trees.	

6	Design and Analysis of Parallel Algorithms on simple networks	Algorithm Design and Analysis using the word model. Matrix computation on Trees.	Chapter 1 of Textbook[1]	Group Activities that motivate the challenges in design and analysis of parallel algorithms on Trees.	
7	Design and Analysis of Parallel Algorithms on mesh of trees – Part I	Design and Analysis of Parallel Algorithms for Graph Problems using Mesh of Trees – Part I	Chapter 2 of Text Book[1].		
8	Design and Analysis of Parallel Algorithms on mesh of trees – Part I	Design and Analysis of Parallel Algorithms for Graph Problems using Mesh of Trees – Part I	Chapter 2 of Text Book[1].		
9	Design and Analysis of Parallel Algorithms on mesh of trees – Part II	Design and Analysis of Parallel Algorithms for Graph Problems using Mesh of Trees – Part II	Chapter 2 of Text Book[1].	Group Activities that motivate the challenges in design and analysis of parallel algorithms for Graph Problems on Mesh of Trees	
10	Design and Analysis of Parallel Algorithms on mesh of trees – Part II	Design and Analysis of Parallel Algorithms for Graph Problems using Mesh of Trees – Part II	Chapter 2 of Text Book[1].	Group Activities that motivate the challenges in design and analysis of parallel algorithms for Graph Problems on Mesh of Trees	
11	Design and Analysis of Parallel Algorithms on mesh of trees – Part II	Design and Analysis of Parallel Algorithms for Graph Problems using Mesh of Trees – Part II	Chapter 2 of Text Book[1].	Group Activities that motivate the challenges in design and analysis of parallel algorithms for Graph Problems on Mesh of Trees	
12	Design and Analysis of Parallel Algorithms on mesh of trees – Part II	Design and Analysis of Parallel Algorithms for Graph Problems using Mesh of Trees – Part II	Chapter 2 of Text Book[1].	Group Activities that motivate the challenges in design and analysis of parallel algorithms for Graph Problems on Mesh of Trees	

13	Mid-term Review				
14	Hypercubes and related networks	Sorting Algorithms in Hypercubes.	Chapter 3 of Text Book[1]	Group Activities that motivate the challenges in design and analysis of parallel algorithms for Sorting Problems on Hypercubes.	
15	Hypercubes and related networks	Sorting Algorithms in Hypercubes.	Chapter 3 of Text Book[1]	Group Activities that motivate the challenges in design and analysis of parallel algorithms for Sorting Problems on Hypercubes.	
16	Hypercubes and related networks	Sorting Algorithms in Hypercubes.	Chapter 3 of Text Book[1]	Group Activities that motivate the challenges in design and analysis of parallel algorithms for Sorting Problems on Hypercubes.	
17	Hypercubes and related networks	Sorting Algorithms in Hypercubes.	Chapter 3 of Text Book[1]	Group Activities that motivate the challenges in design and analysis of parallel algorithms for Sorting Problems on Hypercubes.	
18	Overview of Central Problems in Distributed Computing	Overview of problems including leader election, network searching, spanning tree construction, distributed consensus, mutual exclusion, and resource allocation.	Part I of Text Book 2.		
19	Overview of Central Problems in Distributed Computing	Overview of problems including leader election, network searching, spanning tree construction, distributed consensus, mutual exclusion, and resource allocation.	Part I of Text Book 2.		
20	Formal model for Synchronous Networks	Simple Computation model for synchronous network algorithms.	Chapter 2 of Text Book 2		

21	Leader Election Algorithm	Leader Election Algorithms in a Ring, in more general networks.	Chapter 3 of Textbook 2		
22	Graph Algorithms	Breadth-first search, MST, finding shortest paths and maximal independent set/	Chapter 4 of Textbook 2		
23	Graph Algorithms	Breadth-first search, MST, finding shortest paths and maximal independent set/	Chapter 4 of Textbook 2		
24	Algorithms for Distributed Consensus.	Coordinated attack problem and its randomized version.	Chapter 5 of Textbook 2		
25	Algorithms for Distributed Consensus.	Coordinated attack problem and its randomized version.	Chapter 5 of Textbook 2		
26	Final Exam Review				