

Course Information Sheet

CSCI 4780

Distributed Computing Systems

Brief Course Description (50-words or less)	The fundamental concepts in distributed computing and the practical techniques for building distributed systems. Topics include distributed computing models, naming, synchronization, replication and consistency, fault tolerance, and security. Widely deployed distributed systems are used as case studies. Students design, implement, and analyze prototype systems.
Extended Course Description / Comments	This course is targeted for undergraduates in their junior/senior years.
Pre-Requisites and/or Co-Requisites	CSCI 2720: Data Structures And either CSCI 4730: Operating Systems OR CSCI 4760: Networks
Required, Elective or Selected Elective	Selected Elective Course
Approved Textbooks (if more than one listed, the textbook used is up to the instructor's discretion)	Author(s): Andrew S. Tanenbaum and Maarten Van Steen Title: <i>Distributed Systems: Principles and Paradigms</i> Edition: Second Edition ISBN-13: 0-13-239227-5
Specific Learning Outcomes (Performance Indicators)	<p>This course presents the fundamental concepts in distributed computing systems. At the end of the semester, all students will be able to do the following:</p> <ol style="list-style-type: none">1. Define, identify and distinguish various types of transparencies.2. Develop software prototypes applying variety of distributed system architecture s.3. Define, recognize and distinguish various types of communication (synchronous, asynchronous, persistent, transient).4. Outline the steps of a remote procedure call (RPC)5. Develop a multi-threaded software that applies thread synchronization functionality (locks and barriers).6. Outline the steps involved in resolving flat/structured names using recursive and iterative approaches.7. Hand-simulate operations of logical clocks (Lamport and Vector clocks).8. Define and distinguish various types of data consistency models9. Develop software that applies the caching principle to world wide web content.10. Outline the steps of two-phase and three-phase distributed commit protocols.

Relationship Between Student Outcomes and Learning Outcomes

		Student Outcomes										
		a	b	c	d	e	f	g	h	i	j	k
Learning Outcomes	1	●								●		
	2	●	●	●						●		●
	3	●								●		
	4	●										
	5	●		●	●					●		●
	6	●										
	7	●									●	
	8	●									●	
	9	●	●	●	●							●
	10	●									●	

Major Topics Covered
(Approximate Course Hours)

3 credit hours = 37.5 contact hours

4 credit hours = 50 contact hours

Note: Exams count as a major topic covered

- Goal and Types of Distributed Systems (4-hours)
- Distributed System Architectures (4-hours)
- Threads and processes in distributed systems (5-hours)
- Communication models (2-hours)
- Remote procedure calls, sockets and MPI (5-hours)
- Naming and name resolution (5.5-hours)
- Physical and Logical Clocks (4-hours)
- Mutual Exclusion and Leader Election (2-hours)
- Data Centric Consistency Models (2-hours)
- User Centric Consistency Models (2-hours)
- Replica Management (1-hr)
- Reliability in Client-Server Architectures (2-hours)
- Distributed Commit Protocols (2-hours)
- Authentication and Access Control in Distributed Systems (4-hours)
- Distributed File Systems (3.5-hours)
- World Wide Web-based Systems (4-hours)

Course Master

Dr. Lakshmish Ramaswamy