The University of Texas at Tyler
Department of Electrical and Computer Engineering

CMPE 4350: Special Topics in Computer Engineering

Syllabus

Catalog Description :

This course explores the foundational principles and technologies behind distributed computing and cloud-based services. The course covers essential topics such as communication protocols, fault tolerance, scalability, cloud computing architecture, virtualization, containers and security in distributed systems. Students will learn to design and implement scalable, reliable, and secure cloud applications, gaining hands-on experience with Hadoop, MapReduce and Hive . Through a combination of lectures, case studies, and practical projects, the course equips students with the skills needed to build modern distributed systems and manage cloud infrastructures effectively.

Prerequisites:	COSC 2315: Computer Organization; CMPE 4342: Data Communications and Networking.

Credits:	(	3	hours lecture,	0	hours laboratory per week)

Text(s):	1. George Koulouri's, Jean Dollimore, Tim Kindberg and Gordon Blair, Distributed Systems: Concepts and Design, Fifth Edition, Pearson Education, 2017 (Recommended) 2. M. Van Steen, A.S. Tanenbaum, Distributed Systems, Third Edition, CreateSpace Independent Publishing Platform, 2017
Additional Material:	TBD
Course Coordinator/Instructor:	Dr. Vijayalakshmi Saravanan, Assistant Professor, Computer Engineering

Topics Covered: (paragraph of topics separated by semicolons)

C1) Introduction to types of distributed systems 2) Scalable performance 3) Models of computation 4) Communication in Distributed Systems 5) High-level communication, Map reduce 6) deadlock detection 7) Distributed Databases 8) Distributed file systems 9) Google FS (GFS)/ Hadoop Distributed FS (HDFS), Bigtable/HBase MapReduce 10) Client Centric Consistency 11) Fault tolerance and recovery 12) Case Studies 13) If time permits advanced topics

Evaluation Methods: (only items in dark print apply):

1. Examinations
2. Assignments/ Project
3. Quizzes
4. Final Exam
5. Presentation
6. Course Participation
7. Peer Review

Course Learning Outcomes[1] By the end of this course students will be able to:

1. Understand the design principles and architectures for distributed systems.[1,4]
2. Apply various distributed algorithms related to clock synchronization, concurrency, control, deadlock detection, load balancing, voting etc. [1,6,7]
3. Analyze fault tolerance and recovery in distributed systems and algorithms for the same.[6,7]
4. Analyze the functioning of existing distributed systems and file systems.[4,6,7]
5. Implementation and analysis of different distributed algorithms over current distributed platforms[6,7]

[1]*Numbers in brackets refer to the method(s) used to evaluate the course objective.*

Relationship to Student Outcomes (only items in dark print apply)[2]: This course supports the following Electrical and Computer Engineering Student Outcomes, which state that our students will possess:

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics [1,2,5]
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors [4,5]
3. An ability to communicate effectively with a range of audiences
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts [2]
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions [5, 4,3,2]
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies. [1]

[2]*Numbers in brackets refer to course objective(s) that address the Student Outcome.*

Contribution to Meeting Professional Component: (in semester hours)

Mathematics and Basic Sciences:		hours
Engineering Sciences and Design:	3	hours
General Education Component:		hours

Prepared By:	Vijayalakshmi Saravanan	Date:	01/03/2025
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