Course Syllabus

Course CS 6378.001
Course Title Advanced Operating Systems
Professor Ravi Prakash
Term Spring 2021

Meetings MW 8:30 am-9:45 am on Microsoft Teams

Professor's Contact Information

Office Phone	(972) 883-2289
Other Phone	(972) 883-2185 (CS Department Phone Number)
Office Location	ECS South 4.210
Email Address	ravip@utdallas.edu
Office Hours	Mondays, Thursdays: 2:00-3:00 pm Office hour meetings will be held using Microsoft Teams. If you wish to meet me during this time just initiate a meeting with me. You don't need an appointment. If you wish to meet me at other times, please email me or send a Teams message.
Other Information	During the listed class times, lectures will be conducted **using Microsoft Teams**. A recurring calendar link appears in the Microsoft Teams/Outlook calendar for every student. A weblink is also provided on the main course page in eLearning. You can join the lecture by clicking on either of these links. All lectures will be recorded and then become available on Microsoft Streams for those who wish to have asynchronous access to lectures. The best way to communicate with me at times other than class meetings and office hours is through email. You do not need an appointment to visit me during my office hours. **Please do not hesitate to seek an appointment if you wish to meet me at times other than my office hours.**

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General Course Information

Pre-requisites, Co-requisites, & other restrictions	Prerequisites: CS 5343 and CS 5348 or equivalent. Must have knowledge of C, UNIX, and Socket Programming
Course Description	Concurrent processing, inter-process communication, process synchronization, deadlocks, introduction to queuing theory and operational analysis, topics in distributed systems and algorithms, checkpointing, recovery, multiprocessor operating systems.
Learning Outcomes	1. Ability to understand the concepts of concurrent and distributed execution in modern operating systems and networks of systems. 2. Ability to understand the notion of time and clocks in a system with no global time-keeper. 3. Ability to understand the concept of causal ordering of events and deadlocks. 4. Ability to understand the concept of distributed mutual exclusion and resource management, including processor, memory and file systems. 5. Ability to design new algorithms/protocols for resource management. 6. Ability to understand the concept of process failure and approaches to build fault-tolerance in a distributed execution environment including checkpointing, voting protocols and replication. 7. Ability to design and conduct simulation experiments to quantitatively evaluate various distributed algorithms, and analyze and interpret the data. 8. Ability to communicate and work as a group on a team software project.
Required Texts & Materials	We will use a collection of research papers, some new and some old. The list will be distributed in class and will be available on eLearning. All papers are available at no charge to students through the university's subscription to digital content.
Suggested Texts, Readings, & Materials	None

Assignments & Academic Calendar
[Topics, Reading Assignments, Due Dates, Exam Dates]

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Number of Lectures	Topic
1	Introduction
4	Theoretical Foundations: Causality, logical time, scalar and vector clocks, causally ordered message delivery, snapshot collection
3	Distributed Mutual Exclusion: Lamport's algorithm, Ricart-Agrawala algorithm, Roucairol-Carvalho optimization, Maekawa's algorithm, Raymond's tree-based algorithm
3	Physical Clock Synchronization: Christian's algorithm, Berkeley algorithm, NTP, Srikanth-Toueg algorithm
3	Agreement Protocols: Byzantine Fault Tolerance (Fischer's survey paper), ~~Practical Byzantine Fault Tolerance~~ (time permitting)
6	Recovery and Fault Tolerance: Model for recovery, 2- and 3-phase commit, Koo-Toueg algorithm, replica consistency, static and dynamic voting
4	File Systems and Data Store: Google file system, Amazon Dynamo; MapReduce, BigTable, Chubby, etc. as time permits
2	Distributed Scheduling
1	Distributed Shared Memory
1	Software Transactional Memory
Last day of class	May 5, 2021
Midterm Examination	Early March, eLearning + HonorLock
Final Examination	During Finals week, eLearning + HonorLock

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Course Policies

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Grading (credit) Criteria	Midterm examination: 20%, Final examination: 20%, Programming Assignments: 25%, Quizzes: 15%, Paper review: 10%, Class participation (during class and online discussion forum): 10%
Make-up Exams	Make-up examinations will be offered only if the student has a valid medical reason and produces a doctor's letter. If a student has to be absent for several classes because of job related obligations, he/she will not be eligible for an incomplete grade. In such instances the student is advised to drop the course.
Extra Credit	No extra credit work will be assigned.
Late Work	Programming assignments, paper review and online discussion material submitted after the due date will be penalized at the rate of 10% of the total credit for that assignment for every day (not including weekends and holidays) by which they are late. Late submissions will not be accepted once the solution has been discussed in class and the graded submissions have been returned.
Special Assignments	None
Class Participation	Regular class participation is expected regardless of course modality. Students who fail to participate in class regularly are inviting scholastic difficulty. A portion of the grade for this course is directly tied to your participation in this class. It also includes engaging in group or other activities during class that solicit your feedback on homework assignments, readings, or materials covered in the lectures (and/or labs). Class participation is documented by faculty. Successful participation is defined as consistently adhering to University requirements, as presented in this syllabus. Failure to comply with these University requirements is a violation of the Student Code of Conduct.
Expectations	Unless a student has chosen the asynchronous access, I expect students to participate in the live lectures as such participation provides an opportunity to ask questions and obtain immediate clarifications. All course material will be posted on eLearning, and it is expected attending the online lecture will preview the material prior to class. All examinations will be online and a 24-hour time widow will be available to take the examinations. All homeworks and/or programming projects should be submitted via eLearning. Examinations, homeworks, projects are supposed to be completed independently, without seeking help of other classmates, friends, or third parties. For clarifications and assistance about these students should reach out to the Teaching Assistant and the instructor. Any suspected collaboration among students, or plagiarism will be reported to the Dean of Students for further investigation and adjudication.

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Asynchronous Learning Guidelines	All course material, including syllabus, slides, supplementary reading material, etc. will be posted on eLearning. All recordings of lectures will be posted on Microsoft Streams. Students should try to view the recordings at the earliest possible opportunity so as to not fall behind the rest of the class. Any queries and doubts should be directed towards the TA and the instructor. There will also be a discussion board on eLearning for discussion about course content. Further information about asynchronous access can be find at the following location: https://www.utdallas.edu/fall-2020/asynchronous-access-for-fall-2020/
Class Recordings	The instructor may record meetings of this course. Any recordings will be available to all students registered for this class as they are intended to supplement the classroom experience. Students are expected to follow appropriate University policies and maintain the security of passwords used to access recorded lectures. Unless the Office of Student AccessAbility has approved the student to record the instruction, students are expressly prohibited from recording any part of this course. Recordings may not be published, reproduced, or shared with those not in the class, or uploaded to other online environments except to implement an approved Office of Student AccessAbility accommodation. If the instructor or a UTD school/department/office plans any other uses for the recordings, consent of the students identifiable in the recordings is required prior to such use unless an exception is allowed by law. Failure to comply with these University requirements is a violation of the [Student Code of Conduct]().
Class Materials	The Instructor may provide class materials that will be made available to all students registered for this class as they are intended to supplement the classroom experience. These materials may be downloaded during the course, however, these materials are for registered students' use only. Classroom materials may not be reproduced or shared with those not in class, or uploaded to other online environments except to implement an approved Office of Student AccessAbility accommodation. Failure to comply with these University requirements is a violation of the [Student Code of Conduct.]()
Classroom Citizenship	The instructor encourages students to take active part in class discussions. No question is too simple/stupid to be asked. So, do not hesitate to ask questions. A vigorous discussion of ideas in a respectful environment promotes learning.
Comet Creed	*This creed was voted on by the UT Dallas student body in 2014. It is a standard that Comets choose to live by and encourage others to do the same:* *"As a Comet, I pledge honesty, integrity, and service in all that I do."*

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UT Dallas Syllabus Policies and Procedures	*The information contained in the following link constitutes the University's policies and procedures segment of the course syllabus.* *Please go to http://go.utdallas.edu/syllabus-policies for these policies.*

The descriptions and timelines contained in this syllabus are subject to change at the discretion of the Professor.