

## Overview

Instructor:	Dr. Yao Liu <a href="mailto:yaoliu@binghamton.edu">yaoliu@binghamton.edu</a>
Class Meeting:	Mondays, Wednesdays, and Fridays 1:10pm – 2:10pm Online synchronous via Zoom
Office Hours:	Mondays and Fridays 9am – 10am Online via Zoom
Textbooks:	<b>(Required)</b> <i>Maarten van Steen and Andrew Tannenbaum, Distributed Systems, 3rd edition, distributed-systems.net, 2017.</i> (TBook) Available online at: <a href="https://www.distributed-systems.net/index.php/books/ds3/">https://www.distributed-systems.net/index.php/books/ds3/</a> <b>(Recommended but not required)</b> <i>George Coulouris, Jean Dollimore, Tim Kindberg, and Gordon Blair, Distributed Systems: Concepts and Design, Addison-Wesley, 5th edition, 2011</i> (CBook)
Teaching Assistant:	Prathamesh Liladhar Patil ( <a href="mailto:ppatil7@binghamton.edu">ppatil7@binghamton.edu</a> )
TA Office Hours:	Tuesdays 3pm – 5pm on Zoom
Course Grader:	Na Li ( <a href="mailto:nli19@binghamton.edu">nli19@binghamton.edu</a> )

## Course Description

This course provides students with an introduction to the fundamental issues in the design, implementation, and management of distributed systems. Topics to be covered include, but are not limited to distributed system architectures, remote communication, distributed synchronization, concurrency control, consistency and replication, and fault tolerance. Students will also gain hands-on programming experience building distributed systems.

## Prerequisites

- CS350 Operating Systems (strictly enforced).
- Working knowledge of the Linux environment.
- Proficiency in at least one of the following programming languages: Python (preferred), C++, and Java.
- Basic knowledge of computer networking, e.g., TCP/IP, socket programming, etc.

## Credit and Contact Hours (for CS 457)

- Credit hours: 4
- Contact hours: 3
- This course is a 4-credit course, which means that in addition to the scheduled meeting times, students are expected to do at least 9.5 hours of course-related work outside of class each week during the semester. This includes time spent completing assigned readings, participating in lab sessions, studying for tests and examinations, preparing written assignments, and other course-related tasks.

## Relationship with ABET (for CS 457)

- Exposure to networking & communications: This course is a designated course for this requirement.

## Tentative Schedule

Lecture	Topic
Lecture 1	Introduction to distributed systems – concept, main challenges
Lecture 2	Communication in distributed systems – review of computer networks
Lecture 3	Communication in distributed systems – remote procedure call
Lecture 4	Web content delivery
Lecture 5	Peer-to-peer systems
Lecture 6	Time and ordering – physical and logical clocks
Lecture 7	Multicast
Lecture 8	Distributed snapshot
Lecture 9	Mutual exclusion and leader election
Lecture 10	Transaction and concurrency
Lecture 11	Replication and consistency
Lecture 12	Key-value/NoSQL store
Lecture 13	Distributed file system
Lecture 14	Mapreduce and Hadoop
Lecture 15	Fault tolerance
Lecture 16	Bitcoin and Blockchain

## Grading

The course will be graded according to the following proportions.

Item	Percentage
Class Participation	10%
Programming Assignments	40%
Quizzes	30%
Final Exam	20%

The final letter grading is relative to the rest of the class, but cutoffs will not be higher than:  $A : \geq 92$ ,  $A^- : [90, 92)$ ,  $B^+ : [88, 90)$ ,  $B : [82, 88)$ ,  $B^- : [80, 82)$ ,  $C^+ : [78, 80)$ ,  $C : [72, 78)$ ,  $C^- : [70, 72)$ ,  $D : [60, 70)$ ,  $F : < 60$ .

- **Class Participation:** Class participation will be graded based on Zoom lecture attendance, response to polls, and how actively a student participates in class discussions. Attendance is required and will be checked regularly. Each student can have **up to two** un-excused absences. Students with legitimate reasons may be excused with prior consent from the instructor. Please inform the instructor of any expected absence in advance.
- **Programming Assignments:** There will be **three** programming assignments. There will be both individual and group programming assignments. All programming assignments will be graded on the

CS department computers: [remote.cs.binghamton.edu](http://remote.cs.binghamton.edu). Late submissions will be accepted **up to two days** after the deadline with a penalty of 5% of the project each day. Students with legitimate excuses should contact the instructor before the deadline and submit appropriate document to be exempt from this rule. Disputes to any grading must be resolved with the Teaching Assistant or the instructor **within one week** after the score is released to students. Re-grading requests submitted later than one week after the score is released will not be considered.

- **Quizzes:** There will be **three** online quizzes throughout the semester. Quizzes will cover disjoint material and will not be cumulative. These quizzes are held during class time, about 50 minutes long. Quizzes are tentatively scheduled during the week of September 21–25, October 19–23, and November 16–20. Exact dates will be announced at least one week in advance. There will be no early quiz or make-up quiz.
- **Final Exam:** According to the university calendar, the final exam will be scheduled during the period of December 8–10. The final exam is cumulative. The final exam will be an online exam. No early exam will be given. Students with legitimate and verified excuses should contact the instructor before the exam date to arrange a make-up exam.

## Academic Honor Policy

Computer science faculty at Binghamton wrote a letter to all computer science students about the importance of academic honesty. This letter is available from this course's MyCourses page.

Students are required to strictly follow the rules and guidelines laid out in the Watson School [Student Academic Honesty Code](#). Please review the document and make sure that you understand it.

Cheating and copying will NOT be tolerated. Anything submitted as a programming assignment must be the student's original work. We reserve the right to use [MOSS](#) to detect plagiarism in the programming assignments.

- Each programming assignment submitted by the student should include a file, `STATEMENT`, containing the following statement followed by the student's full name:

"I have done this assignment completely on my own. I have not copied it, nor have I given my solution to anyone else. I understand that if I am involved in plagiarism or cheating I will have to sign an official form that I have cheated and that this form will be stored in my official university record. I also understand that I will receive a grade of **0** for the involved assignment and my grade will be reduced by one level (e.g., from A to A- or from B+ to B) for my first offense, and that I will receive a grade of **"F" for the course** for any additional offense of any kind."

- If a programming assignment is a group assignment, then each student should include a separate file containing the following statement followed by the student's full name:

"We have done this assignment completely on our own. We have not copied it, nor have we given our solution to anyone else. We understand that if we are involved in plagiarism or cheating we will have to sign an official form that we have cheated and that this form will be stored in our official university records. We also understand that we will receive a grade of **0** for the involved assignment and our grades will be reduced by one level (e.g., from A to A- or from B+ to B) for our first offense, and that we will receive a grade of **"F" for the course** for any additional offense of any kind."

- Each quiz and exam will have the following statement on the first page:

“I understand that if I am caught copying or talking during the exam, I will have to sign an official form that I have cheated and that this form will be stored in my official university record. I also understand that I will receive a grade of **0** for the involved exam and my grade will be reduced by one level, and that I will receive a grade of **“F” for the course** for any additional offense of any kind.”