Course Syllabus

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CS 332: Principles of Operating Systems - Honors, Fall 2025

Course Overview

The goal of this course is to understand the operating system principles. Topics include process management, thread concurrency, CPU scheduling, synchronization, memory management, file systems, and virtualization.

Instructor: Prof. Zhihao “Zephyr” Yao, Ph.D.

Email: zhihao.yao@njit.edu

Office Hours: M 1:00 PM - 1:50 PM GITC 4317A

Class Schedule:

M 10:00 AM - 11:20 AM **CKB 215**
W 10:00 AM - 11:20 AM **TIER 106**

Teaching Assistant: TBA

TA's Office Hours: TBA

Course Textbook:

Required reading:
Operating System Concepts, 10th Edition
ISBN: 978-1-119-32091-3
Authors: Abraham Silberschatz, Peter B. Galvin, Greg Gagne

Optional reading:
Linux in a Nutshell: A Desktop Quick Reference (6th Edition)
ISBN: 978-0596154486
Authors: Ellen Siever, Stephen Figgins, Robert Love, Arnold Robbins

Operating Systems: Three Easy Pieces

ISBN: 978-1985086593
Authors: Remzi H Arpaci-Dusseau, Andrea C Arpaci-Dusseau

Linux Kernel Development (3rd Edition)
ISBN: 978-0672329463
Authors: Robert Love

Assessment and Grading

Standard grading matrix:

Midterm Exam 1	20%
Midterm Exam 2	20%
Final Exam	20%
Course Project	20%
Quizzes	20%
Extra Credit (Course Evaluation)	1%

Letter Grades

Letter Grades will be assigned in accordance with the NJIT undergraduate grade legend (**https://www.njit.edu/dos/policies/gradingpolicy.php (https://www.njit.edu/dos/policies/gradingpolicy.php)**) converting numerical scores to letter grades. A curve is not guaranteed and should not be expected. However, the instructor reserves the right to apply a curve at their discretion if deemed necessary to ensure fair assessment.

- A: 90.00% and above
- B+: 85.00% and above
- B: 80.00% and above
- C+: 75.00% and above
- C: 70.00% and above
- D: 60.00% and above
- F: Below 60.00%

Exams: All exams are closed-book, and 1 hour 20 minutes. Midterm 1: Focuses on the material covered from the beginning of the course up to the exam date. Midterm 2: Covers content discussed after Midterm 1 and prior to the second exam. Final Exam: Comprehensive, covers the entire course content. All exams are conducted in-person, except for (1) individual cases approved by the Dean of Student, (2) an official campus closure due to extreme weather or other circumstances.

Quizzes:

There is a quiz each week except for the first week and the weeks that already have a midterm exam or the final exam. The quiz will be administered during a lecture session at an unspecified time. It is the student's responsibility to be familiar with all the material covered in class, as well as in the assigned readings.

The two quizzes with the lowest scores will be dropped from the final grade calculation. There is no make-up quizzes. Each quiz will be approximately 20 minutes, mainly focuses on the topic that we have covered in the previous week.

Course Projects:

A team can have at most three people. Each of team members must contribute. Reports need to specify the contributions of each team member. At any point, a team may be split, but no new teams are allowed to form after the team name and formation due date. After a team is split, the separated members are allowed to use the team's work prior to the split.

Team name and formation due 9/8 11:59 PM EST
First progress report due 10/6 11:59 PM EST
Second progress report due 11/10 11:59 PM EST

Final report, code, and testing results (as a zip file) due before presentation. As part of efforts to perform Authentic Assessment, **https://www.njit.edu/ite/authentic-assessment (https://www.njit.edu/ite/authentic-assessment)** , each student in the project team must be able to individually articulate the operating system principles used in the project. The presentation part will be graded individually. The presentation will take place during the final week, and each group will be required to sign up for a 10 minutes time slot to demonstrate that their code fulfills all the rubrics described in the project page.

The first and second report will each contribute to the total project grade by 25%; the final submission and presentation will contribute 50%. Please see **https://njit.instructure.com/courses/54548/pages/cs332-course-project (https://njit.instructure.com/courses/54548/pages/cs332-course-project)** for detailed requirements and rubrics.

Policies

Accommodations and Supports

If you need an accommodation due to a disability please contact the Office of Accessibility Resources and Services at OARS@NJIT.EDU, or visit us in Kupfrian Hall 201 to discuss your specific needs. A Letter of Accommodation Eligibility from the office authorizing student accommodations is required.

Deadlines

- All deadlines are firm (in EST).

- Late project submissions will be accepted up to 50 hours past the deadline, with a 2% deduction for each hour late.

Absenteeism

- You are responsible for catching up on any material or information missed if you do not attend class. If you miss one exam due to special circumstances, you must contact the Dean of Students (DOS) within 2 working days from the day the reason for the absence is lifted with all necessary documentation. If DOS approves, your missing exam grade will be set equal to the average of the non-missing exam grades.
- **Student Absences for Religious Observations:** NJIT is committed to supporting students observing religious holidays. Students must notify their instructors in writing of any conflicts between course requirements and religious observances, ideally by the end of the second week of classes and no later than two weeks before the anticipated absence. For questions or additional guidance, please review the policy at **https://www.njit.edu/registrar/njit-policy-student-absences-religious-observances (https://www.njit.edu/registrar/njit-policy-student-absences-religious-observances)** . **(mailto:inclusiveexcellence@njit.edu)**

Incomplete

A grade of I (incomplete) is given only in **rare** circumstances when a student would normally have completed the course work, but could not do so because of documented special circumstances. See NJIT Catalog for details: **https://catalog.njit.edu/undergraduate/academic-policies-procedures (https://catalog.njit.edu/undergraduate/academic-policies-procedures,)**

Exceptions to Policies

- I have strict policies regarding deadlines and absenteeism. But, exceptions to these policies include documented medical and other officially excusable absence determined by the Dean of Students (DOS): **https://www.njit.edu/dos/student-absence-verification (https://www.njit.edu/dos/student-absence-verification)**
- You must contact the Dean of Students (DOS) within 2 working days from the day the reason for the absence is lifted with all necessary documentation.

Use of ChatGPT and other AI Writing or Coding Tools in Course Project

- The use of AI tools, such as ChatGPT, in course projects is allowed but must adhere to the following guidelines:
  - Students are fully responsible for the accuracy and correctness of all content in their submissions, including any text or code generated by AI. If AI-generated content is incorrect, the assignment will be graded accordingly. Note that AI is known to output incorrect statements and codes.
  - Students must disclose their use of AI tools in a visible part of the assignment, such as a code comment, footnote, or a separate section. The disclosure must clearly identify the AI tool and version

used and describe any post-generation edits made.

- Using a single set of prompts to generate an entire coding project or report is prohibited. These attempts are easily detectable by both human graders and software tools and will result in a grade of zero for the submission.

Course Schedule

Week	Date	Topic	Activities and Deadlines
1	Sept 3 (Wed)	Introduction & Chapter 1 - Computer Organization	
2	Sept 8 (Mon)	Chapter 1 - Computer Organization (cont.)	Project team formation due Reading: Chapter 2
	Sept 10 (Wed)	Chapter 2 - Operating-System Structures	
3	Sept 15 (Mon)	Chapter 3 - Processes	Reading: Chapter 3; Optional: **CTSS Technical Notes (Chapter 1) (https://dspace.mit.edu/bitstream/handle/1721.1/149338/MIT-LCS-TR-016.pdf)**
	Sept 17 (Wed)	Chapter 3 - Processes (cont.)	
4	Sept 22 (Mon)	Chapter 4 - Threads and Concurrency	Reading: Chapter 4; Optional: **The Linux scheduler: a decade of wasted cores (https://dl.acm.org/doi/pdf/10.1145/2901318.2901326)**
	Sept 24 (Wed)	Chapter 4 - Threads and Concurrency (cont.)	
5	Sept 29	Chapter 5 - CPU	Reading: Chapter 5; Optional: **RainbowCake: Mitigating Cold-starts in Serverless with Layer-wise Container Caching and Sharing**

	(Mon)	Scheduling	(https://dl.acm.org/doi/pdf/10.1145/3617232.3624871)
	Oct 1 (Wed)	Chapter 5 - CPU Scheduling (cont.)	
6	Oct 6 (Mon)	Chapter 6 - Synchronization Tools	Project first report due; Reading: Chapter 6; Optional: Checking for race conditions in file accesses (https://www.usenix.org/legacy/publications/compsystems/1996/spr_bishop.pdf)
	Oct 8 (Wed)	Chapter 6 - Synchronization Tools (cont.)	
7	Oct 13 (Mon)	Chapter 7 - Synchronization Examples	Reading: Chapter 7; Optional: Man in the binder: He who controls ipc, controls the droid (https://sc1.checkpoint.com/downloads/Man-In-The-Binder-He-Who-Controls-IPC-Controls-The-Droid-wp.pdf)
	Oct 15 (Wed)	Midterm 1 (Chapters 1-6)	
8	Oct 20 (Mon)	Chapter 7 - Synchronization Examples (cont.)	Reading: Chapter 8; Optional: From L3 to seL4 what have we learnt in 20 years of L4 microkernels? (https://dl.acm.org/doi/pdf/10.1145/2517349.2522720)
	Oct 22 (Wed)	Chapter 8 - Deadlocks	
9	Oct 27 (Mon)	Chapter 8 - Deadlocks (cont.)	Reading: Chapter 9; Optional: Prevention of system deadlocks (https://dl.acm.org/doi/pdf/10.1145/363156.363160)
	Oct 29 (Wed)	Chapter 9 - Main Memory	
10	Nov 3 (Mon)	Chapter 9 - Main Memory	Reading: Chapter 10; Optional: Virtual memory in contemporary microprocessors (https://ieeexplore.ieee.org/document/710872)

		(cont.)	
	Nov 5 (Wed)	Chapter 10 - Virtual Memory	
11	Nov 10 (Mon)	Chapter 10 - Virtual Memory (cont.)	Project second report due; Reading: Chapter 12; Optional: **Improved kernel security through memory layout randomization (https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6742768)**
	Nov 12 (Wed)	Chapter 12 - I/O System	
12	Nov 17 (Mon)	Chapter 12 - I/O System (cont.)	Reading: Chapter 13; Optional: **ProvCam: A Camera Module with Self-Contained TCB for Producing Verifiable Videos (https://dl.acm.org/doi/pdf/10.1145/3636534.3649383)**
	Nov 19 (Wed)	Midterm 2 (Chapters 7-12)	
13	Nov 24 (Mon)	Chapter 13 - File-System Interface	Reading: Chapter 13 (cont.); Optional: **A case for redundant arrays of inexpensive disks (RAID) (https://dl.acm.org/doi/pdf/10.1145/50202.50214)**
	Nov 26 (Wed)	No Class (Friday Classes Meet)	
14	Dec 1 (Mon)	Chapter 13 - File-System Interface (cont.)	Reading: Chapter 18; Optional: **Sugar: Secure GPU acceleration in web browsers (https://dl.acm.org/doi/pdf/10.1145/3296957.3173186)**
	Dec 3 (Wed)	Chapter 18 - Virtual Machine	
15	Dec 8 (Mon)	Chapter 18 - Virtual Machine (cont.)	
	Dec 10 (Wed)	Final exam (Chapters 1-10, 12, 13, 18)	

Final project submission deadline and presentation: TBD

Learning Outcomes

- **Describe the structure and organization of operating systems**, including their fundamental components and functions.
- **Explain and apply concepts of process management and CPU scheduling**, analyzing and implementing various scheduling algorithms.
- **Analyze the interaction of concurrent processes**, including concepts of concurrency, synchronization, and methods to avoid deadlocks.
- **Understand the role of interrupts and I/O device handling** within an operating system.
- **Describe memory and virtual memory management**, including the hardware support required for these systems.
- **Explain the principles of file management**, including file systems interfaces and the abstraction of storage devices.

Academic Integrity:

Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: ***NJIT Academic Integrity Code*** **(https://t.e2ma.net/click/r146wkb/3i2x1wml/rhhrpwx)** *.*

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at ***dos@njit.edu*** **(mailto:dos@njit.edu)**

This syllabus is subject to updates. See below for a history of syllabus revisions:

Syllabus Revisions:

Note that this syllabus is subject to updates. Any changes to the syllabus after the first day of class will be announced and recorded below.

History of syllabus revisions:

Course Summary:

Date	Details	Due
Sat Sep 13, 2025	Academic Engagement: Fall 2025 (https://njit.instructure.com/courses/54548/assignments/580101)	due by 11:59pm