CSCI 3510: Principles of Operating Systems

Basic Information

- **ADA University, Spring Semester, 2025**
- **Course name and CRN: CSCI 3510: Principles of Operating Systems (6 credits)**
- **Course meeting times and location:**
- **Instructor:** Mr. Umid Suleymanov
- **How to contact the Instructor:**
  - In-person office hours: Tuesday/Thursday, 07:30 – 08:30, Online
  - E-mail addresses: usuleymanov@ada.edu.az
  - Phone numbers: 437 3235
  - Preferred mode of communication: **E-mail**
- **Course Web page URL:**
  - Students are expected to check the Blackboard course page and email regularly for getting timely updates.

Course Description

- **Prerequisites:**
  - INFT 2404 (IT Systems: Hardware & Software)
  - CSCI 2406 (Computer Organization & Architecture)

- **Course Purpose**
  In this course we will cover core principles of Operating Systems: OS history, process, threads, multicore, concurrency problems and their solutions, deadlocks and their prevention, memory management, virtual memory, scheduling, I/O management, disk scheduling, file management, etc.

- **Overview of the course:**
  The course is essentially a very deep introduction to the core of Operating Systems principles. The course requires knowledge and familiarity with computer organization and architecture as well as some system programming background. Operating Systems code is written in C language, thus knowing the C programming language is an unofficial requirement. It is essential to understand implementation details and complete projects and homework. We will start by getting familiar to the definition and history of OS as well as reviewing computer hardware. We will continue by covering core topics in detail. Each core topic might take from 2 weeks up to a month to cover. Reading the text and studying the material is essential. By the end of course, students are expected to develop own group project using the knowledge obtained during the study.

- **Student learning outcomes**:
  Upon successful completion of this course, you should be able to:

  - Describe how computing resources (such as CPU and memory) are managed by the operating system, describe the basic principles used in the design of modern operating systems.
  - Summarize the full range of considerations in the design of file systems, summarize techniques for achieving synchronization in an operation system,
  - Explain the objective and functions of modern operating systems, explain memory hierarchy and cost-performance trade-offs, explain the operation, implementation and performance of modern operating systems, and the relative merits and suitability of each for complex user applications
  - Compare and contrast the common algorithms used for both pre-emptive and non-pre-emptive scheduling of tasks in operating systems, such a priority, performance comparison, and fair-share schemes. Contrast kernel and user mode in an operating system
  - Evaluate and report appropriate design choices when solving real-world problems
  - Analyze the key trade-offs between multiple approaches to operating system design.

- **Methods of instruction:**
  The class will be taught through lectures, including discussion around class examples/case studies, laboratory assignments and homework. Discussions based on student contributions add a vital and dynamic element to the class. Students are expected to come to the class with comments or questions from the course readings and actively participate in in-class discussions. Final project that will be assigned to student-groups of 3-4 students and their presentation will help to students to get experience of solving real data-driven problems of cross-sectoral business and share the experience they acquired to classmates.

- **Workload:** It is estimated that the students will need to spend 3-5 hours of study and preparation for the classes every week. Estimated amount of time to spend on course homework is additional 3-5 hours per week.

Materials

- **Primary or required books/readings for the course:**
  - Tanenbaum, A. Modern Operating Systems, 4th edition. 2014.
  - Tanenbaum, A., Woodhull, A. Operating Systems Design and Implementation, 3rd edition. 2006.
- **Additional materials:**
  - Throughout the course additional materials in a form or white papers and articles might be provided by course instructor.

Requirements

- **Exams and quizzes:** Students will take 2 exams (midterm and final). These will be closed book (no books, no laptops or other devices) tests consisting of limited number multiple-choice, open-ended test questions, problem solving using codding and understanding scheduling algorithms, threads and processes, I/O, OS security and ability to transform them to code and vice-versa. Time and place will be communicated during the term.
- **Assignment/problem sets/projects/reports/research papers:**
  o Quiz refers to a written in-class assignment, which should be done individually by each student. Solutions are paper based and should be submitted till the end of class.
  o Students are expected to work independently. Offering and accepting solutions from others is an act of plagiarism, which is a serious offense, and all involved parties will be penalized according to the Academic Honesty Policy. Discussion amongst students is encouraged, but when in doubt, direct your questions to the professor, tutor, or lab assistant.
  o No late assignments will be accepted under any circumstances.
- **Other requirement:** Academic honesty is required in all stages of exams, assignments, labs and projects.

Policies

- **Grading procedures:**
  - The students will be graded on an absolute scale.
  - The course grade will be calculated from the following components:

Project - 20%
Homeworks – 20%
Midterm – 25%

Final – 35%

- Students, who contend that their grade is not an accurate reflection of their accomplishments in the class, should first discuss their grade assessment with the instructor. For further steps please refer to the university procedures.

- **Attendance and tardiness**: Attendance is an indispensable element of the educational process. In compliance with Azerbaijani legislation, instructors are required to monitor attendance and inform the Registrar and the Dean of the respective School when students miss significant amounts of class time. Azerbaijani legislation mandates that students who fail to attend at least 75% of classes will fail the course.
  - ADA attendance policy excuses two (2) student absences of all classes, though these should reflect a serious need on the student's part to be away from class.
  In case of involuntary and unpredictable serious disruption of normal life, students may appeal to a grievance procedure through Office of the Dean of the School of Education.
- **Classroom decorum:** To avoid distractions late students are asked NOT to enter the class after the doors are closed. Cell phones shell be placed on silent mode or switched OFF, and shall NOT be used in the classroom during class sessions. As an exception, students may be allowed to leave or enter the room with the instructor's permission. Students are not allowed to leave classroom to use their cell phones.
- **Class participation:** Students are encouraged to contribute to class discussion. Certain percent of the course grade will depend upon contributions to class sessions. Class participation provides the opportunity to practice speaking and persuasive skills, as well as the ability to listen. What matters is the quality of one's contributions, not the number of times one speaks.
- **Missed or late assignments/extensions:**
  - All assignments must be submitted on time. Late submission of any assignment will be penalized by **25%** every day of a delay duration.
- **Standards for academic honesty and penalties for infractions:** If student found guilty of academic dishonesty first time, he or she would fail the course. If the case repeats again, student will be expelled. For more information please read the Honor Code.

Schedule

- **Tentative calendar of topics and readings:** The course is organized in 15 weeks.

Week#	Topics and Readings (tentative)	Readings
1	Course Introduction	Chapter 1.1- 1.5
	What is Operating System, History of Operating Systems	

2	Computer Hardware Review, Operating System Concepts	Chapter 1.5-1.12
	Lab0 Fork	
3	Lec2 - System Calls	Chapter 2.1-2.3
	Lec3 - Processes	
4	Lec4 - Race Conditions	
	Lec4 - Scheduling, Linux Commands	Chapter 2.4—2.7
5	Lec5 - Memory	Chapter 3.1-3.4
	Quiz	
6	Memory	Chapter 3.4-3.9
	Memory	
7	File Systems	Chapter 4
	No Class	
8	Midterm Exam Topics Review	
	MIDTERM EXAM	
9	**Spring Break and Nowruz Holiday, NO CLASSES**	
	Spring Break and Nowruz Holiday, NO CLASSES	
10	File Systems	Chapter 4
	File Systems	
11	Quiz	
	File Systems Lab	
12	Input Output - IO	Chapter 5
	Input Output - IO	
13	Ramadan Holiday, NO CLASSES	
	Deadlocks	Chapter 6
14	Deadlocks	
	Multiple Processor Systems	Chapter 8
15	Multiple Processor Systems	

	Operating System Security	Chapter 9
16	Final Project Presentations	
	Final Exam Topics Review	

Resources

• **Support services on campus:**

Adjusting to student life, pursuing academic and personal goals can be emotionally stressful and challenging. Students are encouraged to make individual appointments with Counselor to receive a professional psychological support. Please contact Zohra Malikova, Counselor at phone (012) 4373235 x164 or by email: zmelikova@ada.edu.az

• **Tips for success**

- Students will need to read the course readings throughout the term to learn the material and to be able to contribute to class discussions.
- Here are some words of wisdom from Dr. Morgan Liu of The Ohio State University on "How to Read an Academic Book or Article": Reading an academic article/book is not like reading a newspaper or novel. Following these guidelines will help keep you from being overwhelmed, and make you better prepared for discussions & essays.

1. Read actively, not passively. You read because you are trying to mine the text for insights. You are not reading because you have to get through it. Take an active posture while reading: you are trying to take something away from the reading.
2. Before you begin, ask yourself: what is my purpose for reading this? First ask yourself: What topic is the course covering this week? What are the active issues and recurrent themes? What sorts of insights do I hope to get out of the reading? The Reading Questions will help you get a grip.
3. Do not always read from start to finish. Read the introduction or opening paragraphs. Then skip to the back and read the conclusion to see where the thing is going. Flip through the article/book and take note of the section or chapter titles. Read the beginning & end of each section to see what they're about. Stop. Think about what this article/book is trying to accomplish and how it will get there. Get a sense of the overall arguments first, and how the author will develop them. Then step back, close your eyes and think, what are the most important parts that I must read? What can I skim over for now?
4. Read selectively. Do not read every word in the text. Read the most important parts first, and see what else you need to read as you go. You can always go back. You have my permission to skip the less important parts – no guilt, really!! But you got to be thoughtful to figure what those are. Better to read the most important parts thoughtfully, than try to get through the entire thing like a zombie.
5. Stop frequently and ask yourself: what did I just learn? Make notes as you go. Write down questions. Don't get bogged down in unimportant detail. If your mind starts to wander, stop and refocus on the big picture: what's been happening in the text, and where is it.

Statement on Accommodation

- ADA University provides upon request appropriate academic accommodations for qualified students with documented disabilities. Any student who feels she/he may need an accommodation based on the impact of a disability should notify the Office of Disability Services and Inclusive Education about his/her needs before the start of the academic term. Please contact Elnur Eyvazov, Director of the Office of Disability Services and Inclusive Education at phone: (012) 4373235 x249 or by e-mail: eeyvazov@ada.edu.az
- Reasonable accommodation is possible for students' religious beliefs, observations, and practices or for foreseeable conflicts because of athletic competition

Disclaimer

- This syllabus, including the course schedule is subject to change as necessary and students will be notified accordingly.