



## CSYE 6230-Operating Systems

### Course Information

Course Title: Operating Systems

Course Number: CSYE 6230

Term and Year: Fall 2023

Credit Hour: 4

Course Format: Livecast on Tuesdays 7:00 PM -10:30 PM ET

### Instructor Information

Full Name: Prof. Ahmed Banafa

Email Address: [a.banafa@northeastern.edu](mailto:a.banafa@northeastern.edu)

**Instructor Biography** – Prof. Ahmed Banafa has extensive experience in research, operations and management, with a focus on IoT, Blockchain, Cybersecurity and AI. He is the recipient of Certificate of Honor from the City, and County of San Francisco, the Haskell Award for Distinguish Teaching from University of Massachusetts Lowell, and Author & Artist Award of San Jose State University. He was named as No.1 tech voice to follow, technology fortune teller and influencer by LinkedIn in 2018 by LinkedIn, his research featured on Forbes, IEEE and MIT Technology Review, and Interviewed by ABC, CBS, NBC, CNN, BBC, NPR, NHK, FOX, and Washington Post. Prof. Banafa's educational journey includes Cybersecurity studies at Harvard University and Digital Transformation studies at the Massachusetts Institute of Technology (MIT), he is holding a Master's Degree in Electrical Engineering and a PhD in Artificial Intelligence.

**Course Prerequisites** Knowledge of C/C++, Assembly Language and Data Structure

### Course Description

Principles of operating system design and implementation. Concurrent processes, interprocess communication, job and process scheduling, deadlock. Issues in memory management (virtual memory, segmentation, paging) and auxiliary storage management (file systems, directory structuring, protection mechanisms). Performance issues. Programming projects.

## Standard Learning Outcomes

*Learning outcomes common to all College of Engineering Graduate programs:*

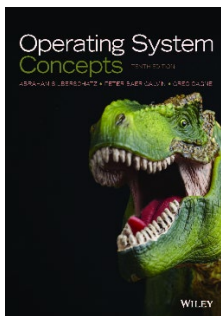
1. *An ability to identify, formulate, and solve complex engineering problems.*
2. *An ability to explain and apply engineering design principles, as appropriate to the program's educational objectives.*
3. *An ability to produce solutions that meet specified end-user needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.*

*The Information Systems Program accepts students of different engineering backgrounds with minimum programming skills and produces first class Information Systems engineers that operate at the intersection of real-world complexity, software development, and IT management. Graduating students will be able to construct end-to-end advanced software applications that meet business needs.*

### **Student Learning Outcomes:**

1. *Explain the objectives and functions of modern operating systems*
2. *Analyze the tradeoffs inherent in operating system design*
3. *Discuss the advantages and disadvantages of using interrupt processing*
4. *Summarize the range of mechanisms that can be employed at the operating system level to realize concurrent systems and describe the benefits of each*
5. *Compare and contrast the common algorithms used for both preemptive and non-preemptive scheduling of tasks in operating systems, such as priority, performance comparison, and fair-share schemes*
6. *Describe the difference between processes and threads*
7. *Cover in detail principles of virtual memory as applied to caching and paging*

### **Course Textbooks:**



#### **Textbook**

**Operating System Concepts Tenth Edition (older edition accepted)**

Avi Silberschatz, Peter Baer, Galvin Greg Gagne

John Wiley & Sons, Inc.  
ISBN 978-1-118-06333-0

**Course Activities:**

4 Homework assignments (50 points each)	20%	200 Points
Test 1	10%	100 Points
Test 2	10%	100 Points
Midterm Exam	15%	150 Points
Final Exam	25%	250Points
Research Paper	05%	050 Points
Creating OS (Team Project)	05%	050 Points
In-Class Quizzes	10%	100 Points
		<b>1000 Points</b>

**Course Schedule**

<b>Week</b>	<b>Topics</b>
1	Introduction and Operating-System Structures
2	Threads & Concurrency & CPU Scheduling
3	Synchronization Tools & Synchronization Examples
4	<b>First Test 01/30</b>
5	Deadlocks & Main Memory
6	Virtual Memory & Mass-Storage Structure
7	I/O Systems & File-System Interface
8	<b>Midterm Exam 02/27</b>
9	File-System Implementation & File-System Internals
10	Security
11	Protection
12	<b>Second Test 04/02</b>
13	Virtual Machines
14	Networks and Distributed Systems
15	Review for Final Exam
16	<b>Final Exam 04/23</b>

## Grading Scale:

95-100% A	87-89.9% B+	77-79.9% C+	69.9% or below F
	84-86.9% B	74-76.9% C	
90-94.9% A-	80-83.9% B-	70-73.9% C-	

## Attendance Policy

Students are expected to complete course readings, participate in class discussions or other learning activities during the unit, and complete written assignments for each unit during the time of that unit. It is understood that there might be one week when active participation in ongoing class conversations and learning activities might be delayed. Beyond one week's time, if there is an absence or lateness in participation (1) faculty must be notified in advance; (2) grades will be adjusted accordingly.

## Late Work Policy

Students must submit assignments by the deadline in the time zone noted in the syllabus. Students must communicate with the faculty prior to the deadline if they anticipate work will be submitted late. Work submitted late without prior communication with faculty will not be graded.

## End-of-Course Evaluation Surveys

Your feedback regarding your educational experience in this class is particularly important to the College of Professional Studies. Your comments will make a difference in the future planning and presentation of our curriculum.

At the end of this course, please take the time to complete the evaluation survey at <https://neu.evaluationkit.com>. Your survey responses are **completely anonymous and confidential**. For courses 6 weeks in length or shorter, surveys will be open one week prior to the end of the courses; for courses greater than 6 weeks in length, surveys will be open for two weeks. An email will be sent to your Husky Mail account notifying you when surveys are available.

## Academic Integrity

A commitment to the principles of academic integrity is essential to the mission of Northeastern University. The promotion of independent and original scholarship ensures that students derive the most from their educational experience and their pursuit of knowledge. Academic dishonesty violates the most fundamental values of an intellectual community and undermines the achievements of the entire University.

As members of the academic community, students must become familiar with their rights and responsibilities. In each course, they are responsible for knowing the requirements and restrictions regarding research and writing, examinations of whatever kind, collaborative work, the use of study aids, the appropriateness of assistance, and other issues. Students are responsible for learning the conventions of documentation and acknowledgment of sources in their fields. Northeastern University expects students to complete all examinations, tests, papers, creative projects, and assignments of any kind according to the highest ethical standards, as set forth either explicitly or implicitly in this Code or by the direction of instructors.

Go to <http://www.northeastern.edu/osccr/academic-integrity-policy/> to access the full academic integrity policy.

## **University Health and Counseling Services**

As a student enrolled in this course, you are fully responsible for assignments, work, and course materials as outlined in this syllabus and in the classroom. Over the course of the semester if you experience any health issues, please contact UHCS.

For more information, visit <https://www.northeastern.edu/uahcs>.

## **Student Accommodations**

Northeastern University and the Disability Resource Center (DRC) are committed to providing disability services that enable students who qualify under Section 504 of the Rehabilitation Act and the Americans with Disabilities Act Amendments Act (ADAAA) to participate fully in the activities of the university. To receive accommodations through the DRC, students must provide appropriate documentation that demonstrates a current substantially limiting disability.

For more information, visit <https://drc.sites.northeastern.edu>.

## **Library Services**

The Northeastern University Library is at the hub of campus intellectual life. Resources include over 900,000 print volumes, 206,500 e-books, and 70,225 electronic journals.

For more information and for education specific resources, visit <https://library.northeastern.edu>.

## **24/7 Canvas Technical Help**

For immediate technical support for Canvas, call 617-373-4357 or email [help@northeastern.edu](mailto:help@northeastern.edu)

Canvas Faculty Resources: <https://canvas.northeastern.edu/faculty-resources/>

Canvas Student Resources: <https://canvas.northeastern.edu/student-resources/>

For assistance with my Northeastern e-mail, and basic technical support:

Visit ITS at <https://its.northeastern.edu>

Email: [help@northeastern.edu](mailto:help@northeastern.edu)

ITS Customer Service Desk: 617-373-4357

## **Diversity and Inclusion**

Northeastern University is committed to equal opportunity, affirmative action, diversity, and social justice while building a climate of inclusion on and beyond campus. In the classroom, members of the University community work to cultivate an inclusive environment that denounces discrimination through innovation, collaboration, and an awareness of global perspectives on social justice.

Please visit <http://www.northeastern.edu/oidi/> for complete information on Diversity and Inclusion

**Title IX**

*Title IX of the Education Amendments of 1972 protects individuals from sex or gender-based discrimination, including discrimination based on gender-identity, in educational programs and activities that receive federal financial assistance.*

Northeastern's Title IX Policy prohibits Prohibited Offenses, which are defined as sexual harassment, sexual assault, relationship or domestic violence, and stalking. The Title IX Policy applies to the entire community, including male, female, transgender students, faculty, and staff.

In case of an emergency, please call 911.

Please visit <https://www.northeastern.edu/ouec> for a complete list of reporting options and resources both on- and off-campus.