Course Syllabus

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COSC 3360 COURSE SYLLABUS

Semester and Year the Course is Offered:	Summer 2023
Department:	Computer Science
Course Number and Name:	3360 Fundamentals of Operating Systems
Instructor:	Carlos Alberto Rincon Castro
Email Address:	carincon AT uh DOT edu
Class Schedule:	TuWeTh 10:00 am. to 12:00 pm. (S 105).
Office Hours:	TuTh 9:00 am. to 10:00 am. (MS Teams).
Course Web Page:	UH Canvas Official Website Moodle website (moodle2 DOT cs DOT uh DOT edu).
Teaching Assistant:	Salah Uddin Kadir Office Hours: Friday 4:00 PM to 6:00 PM (MS Teams)

NOTES:

- The information contained in this class syllabus is subject to change. Students are expected to be aware of any additional course policies presented by the instructor during the course.
- Computer and internet access are required for the course. For the current list of minimum technology requirements and resources, copy/paste/navigate to the URL

http://www.uh.edu/online/tech/requirements. For additional information, contact the Office of Online & Special Programs at **UHOnline@uh.edu (mailto:UHOnline@uh.edu)** or 713-743-3327.

LEARNING OBJECTIVES

At the end of this course, the student should be able to:

- Describe the key functions of an operating system and its relationship with the components of a computer system.
- Understand the process management aspects of the operating system: control and description of processes, threads, interprocess communication, and concurrency mechanisms.
- Explain how operating systems schedule processes and threads.
- Understand the different memory management solutions provided by the operating system.
- Understand the I/O management tools and file system design aspects and implementation.

Course Outcome	Learning Objective
Describe the key functions of an operating system and its relationship with the components of a computer system.	1. Describe how a program is executed at the processor level. 2. Recognize the different levels of the memory hierarchy. 3. Identify the techniques for I/O operations (programmed I/O, interrupt-driven, and direct memory access). 4. Discuss the design aspects of an operating system (Processes, Memory, I/O, and File System)
Discuss the process management aspects of the operating system.	1. Describe the operating system structures used to manage processes. 2. Create process trees using the fork() system call. 3. Implement multithreaded processes using POSIX threads. 4. Employ interprocess communication using pipes, shared memory segments, message passing, sockets, and remote procedure calls. 5. Implement concurrency and synchronization mechanisms using semaphores, condition variables, and messages. 6. Describe the mechanism used to prevent, avoid, and detect deadlocks.
Explain how operating systems schedule processes and threads.	1. Describe the design aspects of scheduling algorithms for uniprocessors and multiprocessors. 2. Classify the type of scheduling algorithms for uniprocessors and multiprocessors. 3. Execute non-preemptive and preemptive algorithms for uniprocessors (FCFS, Round Robin, SPN, SRPN, HRRN). 4. Describe the design aspects of Real-time Systems.

	5. Execute scheduling algorithms for Real-time Systems (EDF and Rate Monotonic).
Differentiate the memory management solutions provided by the operating system.	1. Discuss the design aspects of memory management. 2. Describe the different main memory management techniques (static partitioning, dynamic partitioning, buddy system, paging, and segmentation). 3. Describe the different techniques for virtual memory management (paging and segmentation). 4. Execute different page replacement algorithms (FIFO, LRU, and CLOCK).
Identify the I/O management tools and file system design aspects and implementation.	1. Classify I/O devices. 2. Review the OS I/O Management design aspects. 3. Execute the disk scheduling algorithms (FIFO, SSTF, SCAN, and C-SCAN). 4. Describe the different levels of RAID (redundant array of independent disks). 5. Review the design aspect of file systems. 6. Describe the implementation of file systems on different operating systems.

TENTATIVE LIST OF DISCUSSION/LECTURE TOPICS

DATES	**TOPIC**
6/6 – 6/20	**UNIT 1:** Computer Systems Overview Operating Systems Overview Processes: Description and Control and Threads.
6/21	Exam Unit 1
6/22 – 7/5	**UNIT 2:** Interprocess communication. Processes concurrency: Mutual exclusion and synchronization, Deadlock, and starvation.

7/6	Exam Unit 2
7/11 – 7/25	**UNIT 3:** Uniprocessor Scheduling and Multiprocessor Scheduling Memory Management and Virtual Memory I/O and File Systems
7/26	Exam Unit 3 (11 am. - 1 pm.)

TENTATIVE PROGRAMMING ASSIGNMENTS SCHEDULE

DATES	**TOPIC**
6/23	PROGRAMMING ASSIGNMENT 1: Processes and Threads
7/7	PROGRAMMING ASSIGNMENT 2: Interprocess Communication
7/21	PROGRAMMING ASSIGNMENT 3: Interprocess Synchronization

GRADING

Evaluation	**%**
Exam Unit 1	20
Exam Unit 2	20
Exam Unit 3	20
Programming Assignment 1	10

Programming Assignment 2	15
Programming Assignment 3	15

GRADING SCALE

A >= 92.5 Excellent	**A- >= 89.5 and < 92.5** Outstanding	**B+ >= 86.5 and < 89.5** Very Good
B >= 83.5 and < 86.5 Good	**B- >= 79.5 and < 83.5** Above Average	**C+ >= 76.5 and < 79.5** High Average
C >= 72.5 and < 76.5 Average	**C- >= 69.5 and < 72.5** Low Average	**D+ >= 65.5 and < 69.5** Below Average
D >= 62.5 and < 65.5 Poor	**F < 62.5** Failing	

PROGRAMMING ASSIGNMENTS GRADING POLICY

- All programming assignments will be in C or C++ under Linux and submitted through the Moodle server (no email submissions will be accepted).
- Because the assignments for the course are posted a month before their deadline, you need to submit your solution before the assignment's due date, as the link on the Moodle server will not be available after this date. However, you can contact me (up to 24 hours before the assignment's deadline) if a situation outside your control prevents you from submitting your solution on time. After reviewing your case, I will give you the guidelines for submitting your solution after the assignment's due date on the Moodle server.
- The Moodle server flags all programming assignment submissions with a similarity ratio greater or equal to the similarity threshold set for each assignment. You will be contacted by email if Moodle flags your solution, and the grading process for your submission will start after you talk about this issue with the instructor.

- The proposed grade presented by Moodle is not your final grade. I will email you as soon as the teaching assistants complete the partial grading process.

TEXTBOOK

William Stalling. *Operating Systems: Internals and Design Principles*. Seventh Edition. Prentice Hall. 2011.

Other Useful Books:

- Tanenbaum, *Operating Systems: Design and Implementation.*
- Silberschatz, Galvin. *Operating System Concepts.*
- Remzi H. Arpaci-Dusseau and Andrea C. Arpaci-Dusseau, *Operating Systems: Three Easy Pieces,* http://pages.cs.wisc.edu/~remzi/OSTEP/. (Free online)

IMPORTANT NOTES

- ~~Attendance will be considered when grading the extra credit activities. Students with attendance less than 75% will not get any points for extra credit activities.~~
- Academic Honor Code: **Cheating** and/or **plagiarism will not** be **tolerated**. It is each student's responsibility to read and understand UH Academic Honesty Policy (**https://www.uh.edu/provost/policies/honesty/_documents-honesty/academic-honesty-policy.pdf (https://www.uh.edu/provost/policies/honesty/_documents-honesty/academic-honesty-policy.pdf)**).

COUNSELING AND PSYCHOLOGICAL SERVICES (CAPS) STATEMENT

Counseling and Psychological Services (CAPS) can help students who are having difficulties managing stress, adjusting to college, or feeling sad and hopeless. You can reach CAPS (**www.uh.edu/caps (http://www.uh.edu/caps)**) by calling **713-743-5454** during and after business hours for routine appointments or if you or someone you know is in crisis. No appointment is necessary for the "Let's Talk" program, a drop-in consultation service at convenient locations and hours around campus: **http://www.uh.edu/caps/outreach/lets_talk.html**

STUDENT ACCESSIBILITY CENTER

The University of Houston complies with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, pertaining to the provision of reasonable academic adjustments/auxiliary

aids for disabled students. In accordance with Section 504 and ADA guidelines, UH strives to provide reasonable academic adjustments/auxiliary aids to students who request and require them. If you believe that you have a disability requiring an academic adjustment/auxiliary aid, please contact **the Justin Dart Jr. Student Accessibility Center (https://uh.edu/accessibility/)** (formerly the Justin Dart, Jr. Center for Students with DisABILITIES).

EXCUSED ABSENCE POLICY

Regular class attendance, participation, and engagement in coursework are important contributors to student success. Absences may be excused as provided in the University of Houston **Undergraduate Excused Absence Policy (http://catalog.uh.edu/content.php?catoid=44&navoid=15976)** and **Graduate Excused Absence Policy (https://uh.edu/provost/policies-resources/student/excused-absence-policy/)** for reasons including medical illness of a student or close relative, death of a close family member, legal or government proceeding that a student is obligated to attend, recognized professional and educational activities where the student is presenting, and University-sponsored activity or athletic competition. Under these policies, students with excused absences will be provided with an opportunity to make up any quiz, exam or other work that contributes to the course grade or a satisfactory alternative. Please read the full policy for details regarding reasons for excused absences, the approval process, and extended absences. Additional policies address absences related to **military service (http://publications.uh.edu/content.php?catoid=44&navoid=15913)**, **religious holy days, (http://publications.uh.edu/content.php?catoid=44&navoid=15699) pregnancy and related conditions (https://uhsystem.edu/compliance-ethics/_docs/sam/01/1d7.pdf)**, and **disability (https://uhsystem.edu/compliance-ethics/_docs/sam/01/1d9.pdf)**.

Course Summary:

Date	Details	Due
Tue Jun 20, 2023	**Extra Credit Activity - Exam 1 (https://canvas.uh.edu/calendar?event_id=6873&include_contexts=course_1364)**	10am to 10:20am
Wed Jun 21, 2023	**Exam 1 (https://canvas.uh.edu/calendar?event_id=6876&include_contexts=course_1364)**	10am to 12pm
Fri Jun 23, 2023	**Programming Assignment 1 Deadline (https://canvas.uh.edu/calendar?event_id=7384&include_contexts=course_1364)**	12am to 11:55pm

Date	Details	Due
Wed Jul 5, 2023	Extra Credit Activity - Exam 2 (https://canvas.uh.edu/calendar?event_id=6874&include_contexts=course_1364)	10am to 10:20am
Thu Jul 6, 2023	Exam 2 (https://canvas.uh.edu/calendar?event_id=6878&include_contexts=course_1364)	10am to 12pm
Fri Jul 7, 2023	Programming Assignment 2 Deadline (https://canvas.uh.edu/calendar?event_id=7385&include_contexts=course_1364)	12am to 11:55pm
Sun Jul 23, 2023	Programming Assignment 3 Deadline (https://canvas.uh.edu/calendar?event_id=7386&include_contexts=course_1364)	12am to 11:55pm
Tue Jul 25, 2023	Extra Credit Activity - Exam 3 (https://canvas.uh.edu/calendar?event_id=6875&include_contexts=course_1364)	10am to 10:20am
Wed Jul 26, 2023	Exam 3 (https://canvas.uh.edu/calendar?event_id=6879&include_contexts=course_1364)	11am to 1pm