UNIVERSITY OF GUAM
UNIBETSEDÅT GUAHAN

COLLEGE OF NATURAL & APPLIED SCIENCES
Division of Mathematics & Computer Sciences

CS 385 Introduction to Operating Systems
SYLLABUS

CLASS MEETING TIMES

Semester: Fall 2024
Section: CS385-01
Course Delivery Mode: Face-to-Face
Class Hours: 11:00 am – 12:20 pm Monday & Wednesday.
Classroom: Warehouse B Room 2

INSTRUCTOR

Name: Dr.Byoungyong Lee
Office: Warehouse B Room 4
Phone: 671-735-2831
E-mail: leeby@triton.uog.edu
Office Hours: Mon/Wed: 08:30 am – 09:30 am / 12:30 pm – 01:00 pm
Tue/Thu: 11:00 am – 12:00 pm / 03:30 pm – 04:00 pm

COURSE DESCRIPTION

The course will study the introductory concepts in operating systems: historical development of batch, multi-programmed, and interactive systems; virtual memory, process, and thread management; interrupt and trap handlers, abstraction layer, message passing; kernel tasks and kernel design issues; signals and interprocess communication; synchronization, concurrency, and deadlock problems.

PREREQUISITES

CS375 Computer Organization and Architecture with grade C or higher

REQUIRED TEXTBOOK, EQUIPMENT, AND/OR READINGS

Silberschatz, A., Galvin, P.B. and Gagne, G. Operating System Concepts. Addison Wesley Publishing Co., New York. (9th Edition)

other possible textbook/reference

W. Stallings, Operating Systems – Internals and Design Principles, 7th ed. Pearson 2012

Andrew S. Tanenbaum, Herbert Bos, Modern Operating Systems

Das Sumitabha, Your Unix/Linux: the ultimate guide, 3rd ed, McGraw-Hill, 2013

SKILLS & BACKGROUND REQUIRED OR EXPECTED

Programming skills in a high-level programming language, such as Java

COURSE FORMAT

The course consists of lecture, presentation, demonstration, programming projects, and discussion for projects.

STUDENT WORKLOAD

Spend an average of at least 2–3 hours studying for every class, 1-2 hours for each lab, and 2-3 weeks for programming project.

GRADING SYSTEM/EVALUATION METHODOLOGIES

Course Requirements	Percent (%)
Attendance	10%
Homework	15%
Presentation	15%
Projects	15%
Midterm Exam	20%
Final Exam	25%
Total	100%

Letter grades will be assigned per the UOG Catalog:

A	90 – 100%
B	80 – 89%
C	70 – 79%
D	60 – 69%
F	0 – 59%

Homework

Reading assignment and/or problem sets will be given from the textbook and other instructional materials.

Presentation

Students form groups of 2 to 3 members and present group assignments.

Projects

1~2 projects will be given, and projects will be a team or individual projects.

Midterm Exam: Comprehensive

Final Exam: Comprehensive

COURSE TOPIC/EXAM SCHEDULE

Week	Topic	
1-2	**Chapter 1: Introduction**	
3	**Chapter 2: Operating System Structure**	
4-5	**Chapter 3: Processes**	
6	**Chapter 4: Threads**	
7-8	**Chapter 5: Process Synchronization**	**Midterm Exam**
9	**Fall Break**	
10	**Chapter 6: CPU Scheduling**	
11-12	**Chapter 7: Deadlocks**	
13-14	**Chapter 8: Main Memory** **Chapter 9: Virtual Memory**	
15-16	**Chapter 10 : Mass-Storage Structure**	
17	**Chapter 11 : File System Interface**	
18		**Final Exam**

CS 385 Student Learning Outcomes (SLOs)

This course covers the following ACM/IEEE CC2013 Body of Knowledge student learning outcomes:

- OS/Overview of Operating Systems
- OS/Operating System Principles
- OS/Scheduling and Dispatch
- OS/Concurrency
- OS/Memory Management
- OS/File Systems
- OS/Virtual Machines
- OS/Security and Protection

Maps to Program Learning Outcomes and Institutional Learning Outcomes

CS 385 Student Learning Outcomes (SLO)	Program Learning Outcomes (PLO)*	Institutional Learning Outcomes (ILO)*	Activities/Assessments
1, 4, 6, 11	1	1	Homework, Programming Project
2, 4, 8e, 8i, 11, 13b	2	1	Homework Programming project
6, 12	3	3	Documentation/presentation of programming project
5	1	1	Homework
15	5	4	Team project, Participation in discussion
7	6	1	Homework Programming project

CS 385 Student Learning Outcomes (SLOs) : Upon the completion of the course successfully, Students will be able to

SLO-1. Analyze the tradeoffs inherent in operating system design. [Usage]

SLO-2. Articulate the need for protection and security in an OS (cross-reference IAS/Security Architecture and Systems Administration/Investigating Operating Systems Security for various systems). [Assessment]

SLO-3. Carry out simple system administration tasks according to a security policy, for example creating accounts, setting permissions, applying patches, and arranging for regular backups (cross-reference IAS/Security Architecture and Systems Administration). [Usage

SLO-4. Compare and contrast

a. different approaches to file organization, recognizing the strengths and weaknesses of each. [Usage]

b. static and dynamic approaches to real-time scheduling. [Usage]

c. 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. [Usage]

d. kernel and user mode in an operating system. [Usage]

SLO-5. Create state and transition diagrams for simple problem domains. [Usage

SLO-6. Defend the different ways of allocating memory to tasks, citing the relative merits of each. [Assessment]

SLO-7. Demonstrate the potential run-time problems arising from the concurrent operation of many separate tasks. [Usage]

SLO-8. Describe

a. how computing resources are used by application software and managed by system software. [Familiarity]

b. reasons for using interrupts, dispatching, and context switching to support concurrency in an operating system. [Familiarity]

c. relationships between scheduling algorithms and application domains. [Familiarity]

d. the choices to be made in designing file systems. [Familiarity]

e. the difference between processes and threads. [Usage]

f. the functions of a contemporary operating system with respect to convenience, efficiency, and the ability to evolve. [Familiarity]

g. the need for concurrency within the framework of an operating system. [Familiarity]

h. the reason for and use of cache memory (performance and proximity, different dimension of how caches complicate isolation and VM abstraction). [Familiarity]

i. the value of APIs and middleware. [Assessment]

SLO-9. Differentiate emulation and isolation. [Familiarity]

SLO-10. Discuss

a. hypervisors and the need for them in conjunction with different types of hypervisors. [Usage

b. networked, client-server, distributed operating systems and how they differ from single user operating systems. [Familiarity]

c. the advantages and disadvantages of using interrupt processing. [Familiarity]

d. the concept of thrashing, both in terms of the reasons it occurs and the techniques used to recognize and manage the problem. [Familiarity

e. the need for preemption and deadline scheduling. [Familiarity]

f. the types of processor scheduling such as short-term, medium-term, long-term, and I/O. [Familiarity]

SLO-11. Evaluate

a. the trade-offs in terms of memory size (main memory, cache memory, auxiliary memory) and processor speed. [Assessment]

b. virtualization trade-offs. [Assessment]

SLO-12. Explain

a. memory hierarchy and cost-performance trade-offs. [Familiarity]

b. the benefits of building abstract layers in hierarchical fashion. [Familiarity]

c. the concept of a logical layer. [Familiarity]

d. the concept of virtual memory and how it is realized in hardware and software. [Familiarity]

e. the different states that a task may pass through and the data structures needed to support the management of many tasks. [Familiarity]

f. the mechanisms available in an OS to control access to resources (cross-reference IAS/Security Architecture and Systems Administration/Access Control/Configuring systems to operate securely as an IT system). [Familiarity]

g. the objectives and functions of modern operating systems. [Familiarity]

h. the use of a device list and driver I/O queue. [Familiarity

SLO-13. Identify

a. potential threats to operating systems and the security features design to guard against them. [Familiarity

b. ways that the logic embodied in scheduling algorithms are applicable to other domains, such as disk I/O, network scheduling, project scheduling, and problems beyond computing. [Usage

SLO-14. Summarize

a. how hardware developments have led to changes in the priorities for the design and the management of file systems. [Familiarity]

b. techniques for achieving synchronization in an operating system (e.g., describe how to implement a semaphore using OS primitives). [Familiarity]

c. the features and limitations of an operating system used to provide protection and security (cross-reference IAS/Security Architecture and Systems Administration). [Familiarity]

d. the principles of virtual memory as applied to caching and paging. [Familiarity]

e. the range of mechanisms that can be employed at the operating system level to realize concurrent systems and describe the benefits of each. [Familiarity]

f. the use of journaling and how log-structured file systems enhance fault tolerance. [Familiarity

SLO-15. Develop teamwork and communication skills through team project and collaborative learning for assignments e.g. homework

CS Program Learning Outcomes (PLOs)

PLO-1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.

PLO-2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.

PLO-3. Communicate effectively in a variety of professional contexts.

PLO-4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.

PLO-5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.

PLO-6. Apply computer science theory and software development fundamentals to produce computing-based solutions.

UOG Institutional Student Learning Outcomes (ILOs)

ILO-1. Critical thinking and problem solving

ILO-2. Mastery of quantitative analysis

ILO-3. Effective oral and written communication

ILO-4. Understanding and appreciation of culturally diverse people, ideas and values a democratic context

ILO-5. Responsible use of knowledge, natural resources, and technology

ILO-6. An appreciation of the arts and sciences

ILO-7. An interest in personal development and lifelong learning

COURSE POLICIES

Assignment

- Late labs and homework assignments with receive late penalties.

Midterm and Final Exam

- There are no make-up exams, unless with the consent of the instructor.

Attendance: Class attendance is mandatory.

Regular and punctual class attendance is expected of all students. Student must accept the consequences of failure to attend. Instructor will drop a student from the course for excessive absences. "Excessive absences" means failure to attend 70% of scheduled class meetings. A student missed more than 30% of scheduled classes will be dropped from the course and will receive a failing grade F. A student so dropped may appeal through the college's Due Process.

Note: Student who arrives after the instructor starts a class will be considered as tardy. 3 tardy will be counted as 1 unexcused absence.

A course for which a student registers and does not attend and is not officially dropped will be recorded as an "F" grade on the student's record. All students (including those who enroll in classes late) are responsible for the work covered and assigned from the first meeting of a class.

ACADEMIC DISHONESTY

Academic Integrity is about performing in your role as a student in ways that are honest, trustworthy, respectful, responsible, and fair (see www.academicintegrity.org for more information). As a student, you will complete your academic assignments in the manner expected by the instructor. Academic dishonesty, including but not limited to cheating and plagiarism may result in suspension or expulsion from the University. Refer to the UOG Student Handbook and Code of Conduct for more information.

Professional and ethical conduct is expected at all times. Unethical conduct includes any form of cheating, including plagiarism. The term "**cheating**" includes, but is not limited to: (1) use of any unauthorized assistance in taking quizzes, tests, or examinations, e.g., looking at other students' answers, using crib notes (including electronic), getting information from another person via any kind of communication; (2) dependence upon the aid of sources beyond those authorized by the instructor in writing papers, preparing reports, solving problems, or carrying out other assignments; or (3) the acquisition, without permission, of tests or other academic material belonging to a member of the University faculty or staff. If you need to use an electronic translator, you must discuss this with me in advance. All assignments and tests must be your own work. Answers you write on the tests must come only from in your head or the information supplied in the test papers; anything else is cheating. Any evidence of cheating will result in a "0" for that assignments and/or exam or possibly an "F" for the entire course – final decision to be determined by me, the course instructor.

FAMILY EDUCATIONAL RIGHTS AND PRIVACY ACT (FERPA)

The Family Educational Rights and Privacy Act (FERPA) affords students certain rights with respect to their education records. These rights for students, parents and school officials can be viewed at: **http://www2.ed.gov/policy/gen/guid/fpco/ferpa/index.html**

UOG DISABILITIES POLICY

In accordance with the Americans with Disabilities Act (ADA) of 1990 and the Rehabilitation Act of 1973, the University of Guam does not discriminate against students and applicants on the basis of disability in the administration of its educational and other programs. The University offers reasonable accommodations for a student or applicant who is otherwise qualified, if the accommodation is reasonable, effective and will not alter a fundamental aspect of the University's program nor will otherwise impose an undue hardship on the University, and/or there are not equivalent alternatives. Students are expected to make timely requests for accommodation, using the procedure below.

ADA Accommodation Services

For individuals covered under the ADA (Americans with Disabilities Act), if you are a student with a disability requiring academic accommodation(s), please contact the Disability Support Services Office to discuss your confidential request. A Faculty Notification letter from the Disability Support Services counselor will be provided to me. To register for academic accommodations, please contact or visit Sallie S. Sablan, DSS counselor in the School of Education, office 110, disabilitysupport@triton.uog.edu or telephone/TDD 671-735-2460.

TOBACCO-FREE/SMOKE-FREE/VAPING FREECAMPUS

UOG is a tobacco-free/smoke-free, vaping/e-cigarette free campus. Thank you for not using tobacco products on campus, and for helping make UOG a healthy learning and living environment. For more information visit: http://www.uog.edu/smoke-free-uog