
CMPUT 379 – Operating System Concepts: Fall 2019

Course Outline

General Information

Term: Fall 2019

Location: VVC 2 215

Times: Monday, Wednesday and Friday, 12:00 – 12:50 PM.

Labs:

ETLC E1003: Tuesday, 5:00 – 7:50 PM.

CAB 311: Thursday, 2:00 – 4:50 PM.

Instructor:

Omid Ardakanian (oardakan@ualberta.ca), Athabasca Hall 3-20

Office hours: by appointment only

Contact Policy:

If your question or concern can be raised on the eClass forum, then we insist that you do that.

If your concern cannot be raised on the forum (*e.g.*, you want to ask about a code snippet you wrote for an assignment or it contains some personal details you would rather not share) then use the general contact email: cmput-379-fl19@googlegroups.com.

Contact the instructor or individual TAs only if your concern is specific to that person. Always use the prefix **CMPUT 379** on the subject line of your email. Only emails sent from a University of Alberta address are guaranteed to receive attention.

Teaching Assistants:

Aidan Bush (bush1@ualberta.ca)

Max Ellis (mjellis@ualberta.ca)

Peiran Yao (peiran@ualberta.ca)

Tianyu Zhang (tzhang6@ualberta.ca)

Lab Attendance:

Lab attendance is not mandatory, but it is highly recommended that you attend all of the labs because many helpful hints about the assignments and exams will be made there.

Labs will start from the third week of classes.

Course Policies

CMPUT 379 is subject to the [Department of Computing Science Policies](#). In particular, pay attention to these [Computing Science Course Policies](#) especially, as they relate to collaboration.

Overview

This course covers the design and implementation of operating systems, and operating systems concepts that appear in other distributed systems. We will discuss various concepts of operating systems, UNIX programming, networked and distributed systems, and storage systems, including kernel and user modes; process state transitions; operations on processes; interrupt processing; parallel processing; multiprocessor considerations; resource allocation; critical sections and events; semaphores; deadlock: avoidance, detection, and recovery; memory management; virtual memory; paging and segmentation; page replacement strategies; working sets; demand paging; scheduling: levels, objectives, and criteria; scheduling algorithms; file system functions; file organization; space allocation; elements of operating systems security.

Objectives

Upon successful completion of the course, you will have knowledge and skills in developing programs that utilize advanced features of modern operating systems and the Internet. The programs may be single threaded, or have a higher degree of concurrency, with inter-process communication implemented using signals, pipes, and UDP/TCP sockets. You will also develop understanding of basic architectures and mechanisms employed in modern operating system components, including virtual memory, process scheduling, file systems, and protection mechanisms.

Pre-requisites

CMPUT 201 and 204 or 275; one of CMPUT 229, EE 380 or ECE 212. This means, in particular, that you need to know C/C++, data structures, algorithms, and be familiar with assembly language programming and computer architecture.

Course Topics

This course is structured to present fundamental operating systems concepts from the following list, as time permits:

- Introduction to operating system design and implementation
- Processes
- Interprocess communication
- Threads and concurrency
- CPU scheduling
- Process synchronization
- Deadlocks
- Main memory and virtual memory management
- Storage structure
- File system
- Virtual machines
- Case studies

Other concepts and topics may be introduced on demand as they become necessary to do the assignments.

Course Materials

1. A. Silberschatz, P. Galvin, and G. Gagne, *Operating System Concepts*, 10th Edition, John Wiley, 2018 (**required**).
2. W. Stevens, and S. Rago, *Advanced Programming in the Unix Environment*, 3rd Edition, Addison-Wesley, 2013 (**highly recommended, available online through the library:** <https://www.oreilly.com/library/view/advanced-programming-in/9780321638014/>).
3. R. H. Arpaci-Dusseau, and A. C. Arpaci-Dusseau, *Operating Systems: Three Easy Pieces*, 1st Edition, Arpaci-Dusseau Books, 2018 (**highly recommended, available for free online:** <http://pages.cs.wisc.edu/~remzi/OSTEP/>).

In addition to these textbooks a variety of resources will provided on eClass.

Course Work and Evaluation

Course Work	Schedule / Due Dates	Weight
Assignment 1	See the eClass course schedule	15%
Assignment 2	See the eClass course schedule	15%
Assignment 3	See the eClass course schedule	15%
Midterm Exam	Monday, 4 November (during the class time)	20%
Final Exam	See university schedule	35%

There is no particular distribution, or formula used for mapping the term marks (out of 100%) to final letter grades. For more information, refer to the Grading System section of the [Department Course Policies](#). Grades are unofficial until approved by the Department and/or Faculty offering the course.

Assignments

(Collaboration Policy = Solo Effort)

There are three assignments that must be completed **individually** without consultation with anyone besides the instructor and TAs. All assignments need to be completed in C/C++ and are due at 11:59:59PM Mountain Time on the day listed on eclass. We will be working on aspects of the assignments in class. In fact, assignments will be used to motivate the material we examine in class: this is the key idea in a problem-based approach to learning. **Important remark:** we use an automated system for detecting plagiarism. It performs a pairwise comparison of all submissions for this class, for prior semester classes, and for various online repositories.

Late Policy

Assignments submitted within 24 hours after the deadline are subject to a 20% penalty. No submissions will be accepted after 24 hours past the deadline. Medical excuses will be considered.

Missed Assignments

A student who cannot complete a term assignment due to incapacitating illness, severe domestic affliction or other compelling reasons should contact the instructors as soon as possible. Situations will be handled on a case-by-case basis.

Exams

Final and midterm exams are closed book. No cellphones, computers, books, notes, or any other aids are allowed.

Deferred Final Examination

A student who cannot write the final examination due to incapacitating illness, severe domestic affliction or other compelling reasons can apply for a deferred final examination. Such an application must be made to the student's Faculty office within two working days of the missed examination and must be supported by a Statutory Declaration or other appropriate documentation (Calendar section 23.5.6). Deferral of an assignment or final exam is a privilege and not a right; there is no guarantee that a deferral will be granted. Misrepresentation of Facts to gain a deferral is a serious breach of the Code of Student Behaviour.

Academic Integrity

The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Code of Student Behaviour ([online here](#)) and avoid any behaviour which could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University. (GFC 29 SEP 2003)

For a more detailed description of plagiarism, cheating, and misrepresentation of the facts, consult the university's "[Don't Cheatsheet](#)".

Student Support Services

STUDENTS ELIGIBLE FOR ACCESSIBILITY-RELATED ACCOMMODATIONS (students registered with Student Accessibility Service - SAS)

Eligible students have both rights and responsibilities with regard to accessibility-related accommodations. Consequently, scheduling exam accommodations in accordance with SSDS deadlines and procedures is essential. Please note adherence to procedures and deadlines is required for U of A to provide accommodations. Contact SSDS (www.ssds.ualberta.ca) for further information.

STUDENT SUCCESS CENTRE

Students who require additional help in developing strategies for better time management, study skills or examination skills should contact the [Student Success Centre](#) (2-300 Students' Union Building).