COMPSCI 3SH3

Computer Science Practice and Experience: Operating Systems

Term 2, Winter 2021

Instructor
Dr. Bojan Nokovic, P.Eng.
nokovib@mcmaster.ca or (nokovib@gmail.com)

Teaching assistants:

Rohan Patel	Ge Chen	Christian Mavely
pater58@mcmaster.ca	cheng54@mcmaster.ca	mavelyc@mcmaster.ca

COURSE WBSITE: `http://avenue.mcmaster.ca/`

LECTURES:
Virtual Classroom: MS Teams - COMPSCI 3SH3 W2021 Time: WeTh 1:30PM - 2:20PM

TUTORIALS & LABS:
Lab Location: Virtual Classroom (Note: these may change from current timetable!)

Section	Lab Time	TA
1	Mo 9:30AM - 10:20AM, Tu 10:30AM-11:20PM	Patel, Chen, Mavely
2	Mo, Th 12:30PM - 1:20PM	Patel, Chen, Mavely

Tutorial, Virtual Classroom: Mo 1:30PM - 2:20PM (T02), Tu: 11:30AM - 12:20PM (T01)

Lab start date: Mo. Jan. 18th
Tutorial start date: Mo. Jan. 11th

TESTS:
Midterm 1 - Wednesday, Feb. 24, 2021; 1:30 PM TO 2:20 PM

Midterm 2 - Wednesday, March 24, 2021; 1:30 PM TO 2:20 PM

DESCRIPTION:
The goal of this course is to provide an introduction to the principles on which operating systems are based. It covers process and thread synchronization, file system, memory management, resource protection, and layering structure.

GRADING SCHEME:

Assignments: (3 Assignments) 15%
Labs (5 Labs) 15%
Midterm exam1 (Online, 40 min) 0% or 30% (see Missed Midterm section)
Midterm exam2 (Online, 40 min) 0% or 30%
Final exam (Online, 2 hours) 40%

Note:
The instructor reserves the right to conduct deferred examinations orally.

Bonus marks:
At the discretion of the instructor, a student will receive 1 to 2 *bonus marks* for being the first person to point out a technical error in the lecture slides or other course related material or providing a particularly useful course resource.

PREREQUISITES:

One of COMPSCI 3SD3, SFWRENG 3BB4, one of COMPSCI 2C03, SFWRENG 2C03, and one of COMPSCI 2GA3, SFWRENG 2GA3, 3GA3.
Basic knowledge of C/C++ and Java programming

TEXT:

1 Abraham Silberschatz, Greg Gagne, Peter B. Galvin — **Operating System Concepts**, 10th Edition, Wiley, ISBN: 978-1-119-32091-3, 2018

ADDITIONAL REFERENCES:

2 William Stallings — **Operating Systems: Internals and Design Principles**, 9th Edition, Pearson, ISBN: 978-0-134-67095-9, 2017

3 Course website: http://avenue.mcmaster.ca/

Calculator

Only the McMaster Standard Calculator will be permitted in tests and examinations. This is available at the McMaster Bookstore.

Announcements & Updates

Announcements, updates and other important information will be done in class and via the course website. You may be informed of announcements via your McMaster email account. You are expected to attend classes, tutorials and labs where these announcements will be made. If you miss a class, lecture or lab, it is your responsibility to check these resources and stay informed!

Missed Lab Work

Lab work missed due to illness or personal circumstances may be made up. You must submit appropriate documentation (e.g. note from physician) to your Faculty/Program office. It is your responsibility to follow-up with the lab supervisor. No mark will be entered for the missed work unless the Faculty/Program office gives its approval.

Missed Midterm

We have two midterm exams. Student must take at least one (no MSAF for both). If student takes both, the better midterm will worth 30% of the final grade.

Missed Assignment

The grade for the missed assignment due to illness or personal circumstances will be calculated as an average between another two assignments. For instance if student gets 90% on assignment 1 (A_1=0.9), missed assignment 2 and 70% on assignment 3 (A_3=0.7), the grade for assignment 2 is calculated according to the formula

$$A_2 = (A_1 + A_3)/2 = (0.9 + 0.7)/2 = 0.8\%$$

Academic Integrity

You are expected to exhibit honesty and use ethical behavior in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. **It is your responsibility to understand what constitutes academic dishonesty.**
Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behavior can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university. It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at `https://secretariat.mcmaster.ca/university-policies-proceduresguidelines/`
The following illustrates only three forms of academic dishonesty:

- Plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
- Improper collaboration in group work.
- Copying or using unauthorized aids in tests and examinations.

In case of discrepancy between the online and handout version of the course outline, the handout version shall be taken as correct.

Authenticity / Plagiarism Detection

Some courses may use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. **All submitted work is subject to normal verification that standards of academic integrity have been upheld** (e.g., on-line search, other software, etc.). For more details about McMaster's use of Turnitin.com please go to `www.mcmaster.ca/academicintegrity`

Courses With An On-Line Element

Some courses may use on-line elements (e.g. e-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

Online Proctoring

Some courses may use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

Conduct Expectations

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the Code of Student Rights & Responsibilities (the "Code") . All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, **whether in person or online**.
It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

Academic Accommodation of Students with Disabilities

Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) at 905-525-9140 ext. 28652 or sas@mcmaster.ca to make arrangements with a Program Coordinator. For further information, consult McMaster University's Academic Accommodation of Students with Disabilities policy.

Requests for Relief for Missed Academic Term Work

McMaster Student Absence Form (MSAF): In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar "Requests for Relief for Missed Academic Term Work".

Academic Accommodation for Religious, Indigenous or Spiritual Observances (RISO)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students should submit their request to their Faculty Office **normally within 10 working days** of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

Copyright And Recording

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, **including lectures** by University instructors.
The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

Extreme Circumstances

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.

Discrimination

The Faculty of Engineering is concerned with ensuring an environment that is free of all adverse discrimination. If there is a problem that cannot be resolved by discussion among the persons concerned, individuals are reminded that they should contact the Department Chair, the Sexual Harassment Office or the Human Rights Consultant, as soon as possible.

Use of Avenue

In this course we will be using "Avenue to Learn". Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

Format

- The class has lectures two times per week. Discussion is encouraged in class.
- Lab assignments are mandatory. Completing lab assignments requires presence in associated lab sessions.
- Assignments are 15% of grade. There will be three assignments/projects worth 5% each. Assignments are expected to be completed by due date. For every day the assignment is late after the assignment is due, 10% will be deducted from the assignment score.

- Hands-on tutorials will be every week. They are design to cover technical knowledge necessary for the labs that does not fit into the level of abstraction of the lecture.
- Discussion groups, links to resources, grading, lecture slides, lab handouts and other course related material will be available through the course website.
- Students will submit their source code and lab reports via a course subversion version control repository (or Git Hub) unless otherwise indicated.

Course Objectives

- Understand the basic architecture and implementation principles of operating systems.
- Have a good knowledge of threads & concurrency management, file system, memory management, and security and protection.
- Discuss the memory hierarchy, composing memory and cache mapping techniques.
- Be able to write a program in order to request service or resource from the operating system using C, C++, or Java.
- Understand main components of various operating systems: Windows, UNIX, Linux.

Tentative Course Outline: The following schedule of topics and labs is tentative. The instructor reserves the right to modify the schedule and lab topics depending up availability of equipment & progress of the class. Please be sure to check the course website regularly for updates.
Make up shall only be allowed if the missed lab is covered by MSAF

Table 1: Schedule

Week		Topic	Reference	Lab Exercise
#	Begins			
1	Jan. 11	• Intro, Eng. code of ethics • Background	[1] Ch 1.1 - 1.5; Lecture slides	
2	Jan. 18	• OS Structures	[1] Ch 2.1 - 2.3	Practice lab time
3	Jan. 25	• Processes • Threads	[1] Ch 3.1 - 3.6; 4.1 - 4.6	Lab 1 assignment
4	Feb. 01	• Synchronization	[1] Ch 6.1-6.8	A practice lab time
5	Feb. 08	• Synchronization	[1] Ch 7.1-7.5	Lab 2 assignment
6	Feb. 15	• Mid-term RECESS		
7	Feb. 22	• Midterm 1 • Deadlocks	[1] Ch 8.1 - Ch 8.8	A practice lab time
8	Mar. 01	• Deadlocks	[1] Ch 8.1 - Ch 8.8	Lab 3 assignment
9	Mar. 8	• CPU Scheduling	[1] Ch 5; [2] Ch 9, 10; Lecture slides	A practice lab time
10	Mar. 15	• Memory Management • Main Memory • Virtual Memeory	[1] Ch9, 10	Lab 4 assignment
11	Mar. 22	• I/O Systems • Mass Storage Management	[1] Ch 11, 12	A practice lab time
12	Mar. 29	• Midterm 2 • File System • Security	[1] Ch 13, 14, 15	Lab 5 assignment
13	Apr. 5	• Protection • *Guest Speaker*	[1] Ch 16; Lecture slides	Make up lab
14	Apr. 12	• Networks and distributed systems • Quantum Operating Systems	[1] Ch 19; Lecture slides	