McGill University
School of Computer Science

Course Outline

Course Name: Operating Systems
COMP-310 & ECSE-427 Winter 2019

Instructor: Joseph Vybihal

Contact Information:

Office:	ENGMC 323
Office Hours:	M & W 14:00-15:00, F 14:00-16:00
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Course Objectives: This is an introductory course in computer operating systems. In this course we will study the theoretical and practical concepts behind modern operating systems. We will study the basic structure of an operating system, its components, design strategies, algorithms and schemes used to design and implement different components of an operating system. Major components to be studied include: processes, inter-process communication, scheduling, memory management, virtual memory, storage management, network management, and security.

Primary learning outcome: To get a clear understanding of the major principles & algorithms that underlie an operating system and how they interplay with it and the hardware.

Secondary learning outcomes: After taking this course, you should be able to: (1) identify the core functions of operating systems and how they are architected to support these functions, (2) explain the algorithms and principles on which the core functions are built on, (3) explain the major performance issues with regard to each core function, and (4) discuss the operating system features required for a particular target application.

Pre-requisites: ECSE 322 or COMP 273

Text: Tenenbaum and H. Bos, Modern Operating Systems, 4th Edition, Pearson, 2015.

Evaluation:

Assignments	30%	4 Assignments (build on each other)
Test 1	10%	Online
Test 2	10%	Online
Final Exam	50%	Comprehensive, formal, written

Notes: Note #1: Final grades may be assigned on a curve.

Note #2: The programming language for this course is C.

"McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism, and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see www.mcgill.ca/integrity for more information)."

Tentative Course Outline:

WEEK	TOPIC	DETAILS	CHAPTERS	WORK
What is an Operating System?				
1	Introduction	OS Concepts and the command-line	Ch 1	
What is a Process?				
2	The Process and communication	The process concept, process scheduling, and cooperative processes, inter-process & Client-Server programming.	Ch 2.1, 2.3	Ass1 – Shell
3	Threads	Multi-threading models/ issues/ and implementation studies.	Ch 2.2	
4	Process Management	CPU Scheduling and Process Synchronization, Critical section problem, Peterson's solution, synchronization hardware, mutex, semaphores, monitors, well-known problems in synchronization	Ch 2.3-2.5	Ass 2 - Process
5	Deadlocks	Models, characterization, prevention, avoidance, detection, recovery	Ch 6 (varia)	Test 1
What is Computer Memory?				
6	Memory Management	RAM, Secondary Storage, swapping, memory allocation, segmentation, paging	Ch 3.1, 3.2, 3.7	
7	Virtual Memory	Demand paging, copyon-write, page replacement, allocation of frames, thrashing	Ch 3.4, 3.5, 3.6	Ass 3 - Memory
8	File Systems	Methods and implementations	Ch 4 (varia)	
9	I/O Systems & Disk Drives	Hardware issues (varia)	Ch 5 (varia)	Test 2
Advanced topics				
10	Virtualization & Clouds	Virtualization requirements, hypervisors, memory virtualization, I/O virtualization, clouds	Ch 7 (varia)	Ass 4 – Files
11	Protection Issues	Domain, Access, Rights and implementation methods	Ch 9.1-9.5	
12	Security Issues (if time)	Threats and Management	Ch 9.6-9.10	

Teaching Method: The course will consist of three hours of instructor led classes per week together with a maximum of one hour of tutorial per week taken by the TAs. The class time will be devoted to the presentation and development of new concepts and the application of these concepts to examples and problems, while the tutorials will discuss solutions to the programming projects and written assignments. The primary focus of the tutorials is to provide sufficient "how-to" knowledge through the discussion of the assignments to help in the development of the programming project series.

Late Policy: You will be notified in advance of assignment due dates. All assignments are due on WebCT at the indicated time and date. Late assignments will lose 5% of its grade per day late. Assignments beyond 2 days late will not be accepted. You may not submit assignments via e-mail without the permission of the instructor.

Exam Policy: Students are responsible for all materials for the tests and exams. Exams will be a combination of all types of questions based on all sources, and students may be required to integrate theoretical concepts from the text to substantiate their arguments. Crib sheets, calculators, dictionaries are not permitted during an exam or test.

Grading Policy: No make-up tests or make-up assignments are allowed in this course. If you are not satisfied with the grading of an assignment or test, you may request a review within 7 days of return. Indicate in writing or during a meeting with the TA where and why you feel the marks are unjustified and give it back to your TA for re-grading. Note that the entire assignment or mid-term test will be re-graded, and your grade can go up or down (or stay the same) accordingly. The TA may forward the issue to the instructor.

Additional Information: The course slides are not meant as a complete set of notes or a substitute for a textbook, but simply constitute the focus of the lecture. Important gaps are left in the slides that are filled in during class, thus **l**ecture attendance should be considered essential.

The material covered in the classroom will be used to supplement textbook readings.

Every chapter should be read twice. The first reading should be done prior to attending class and the second reading should be done after the class discussion of the chapter. The questions at the back of each chapter follow directly from the reading. Students should be able to answer these questions after a thorough reading of the material.

Academic Integrity: *Code of Student Conduct*

McGill University values academic integrity. Therefore all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see www.mcgill.ca/integrity for more information).

L'université McGill attache une haute importance à l'honnêteté académique. Il incombe par conséquent à tous les étudiants de comprendre ce que l'on entend par tricherie, plagiat et autres infractions académiques, ainsi que les conséquences que peuvent avoir de telles actions, selon le Code de conduite de l'étudiant et des procédures disciplinaires (pour de plus amples reseignements, veuillez consulter le site www.mcgill.ca/integrity).

Final Exam Policy: *Regulations*
Students should not make other commitments during the final exam period. Vacation plans do not constitute valid grounds for the deferral or the rescheduling of examinations. See the Centre Calendar for the regulations governing Examinations:
http://www.mcgill.ca/conted-students/exams/regulations/
Students are required to present their I.D. Card (with photo) for entrance to their examination.

Conflicts
If you are unable to write your final examination due to scheduling conflicts, you must submit a Final Exam Conflict Form with supporting documentation at least **one month** before the start of the final examination period. Late submissions will not be accepted. For details, see
http://www.mcgill.ca/conted-students/exams/conflicts/

Exam Timetable
Examination schedules are posted at the Centre and on the following page approximately 6-8 weeks before the examination period commences
http://www.mcgill.ca/conted-cms/exams/
The Centre cannot provide examination dates over the telephone.

Classroom Rules: All electronic devices (cell phones and beepers) must be turned off during class time.

Assignments Pickup: All assignments are submitted to and picked-up from WebCT.

Email Policy: E-mail is one of the official means of communication between McGill University and its students. As with all official University communications, it is the student's responsibility to ensure that time-critical e-mail is accessed, read, and acted upon in a timely fashion. If a student chooses to forward University e-mail to another e-mail mailbox, it is that student's responsibility to ensure that the alternate account is viable.

Please note that to protect the privacy of the students, the University will only reply to the students on their McGill e-mail account.

Students Rights and Responsibilities:

Regulations and policies governing students at McGill University can be downloaded from the website:
http://www.mcgill.ca/deanofstudents/rights/

Students Services and Resources:

Various services and resources, such as email access, walksafe, library access, etc., are available to Continuing Education students:
http://www.mcgill.ca/conted-students/services/

Minerva for Students: http://www.mcgill.ca/minerva-students/