Toronto Metropolitan University

Department of Electrical, Computer, & Biomedical Engineering
Faculty of Engineering & Architectural Science

Course Outline (W2024)

COE628: Operating Systems

Instructor(s)	Dr. Rasha Kashef [Coordinator] Office: ENG329 Phone: (416) 979-5000 x 556484 Email: rkashef@torontomu.ca Office Hours: Virtual By Appointment
Calendar Description	Topics include: Operating systems basic concepts. Hardware and software features required for operating systems. Process management; scheduling, inter-process communication and synchronization, process starvation, deadlocks. Memory management, virtual memory, and file systems. The major lab project will involve developing operating system modules. (Formerly COE 518).
Prerequisites	CEN 199 and COE 318 and COE 428
Antirequisites	None
Corequisites	None
Compulsory Text(s):	1. Operating Systems: Internals and Design Principles, William Stallings, Prentice Hall, 9th Edition 2017 (Primary text) 2. Modern Operating Systems, Andrew S. Tanenbaum, Prentice Hall, 5th Edition 2016
Reference Text(s):	
Learning Objectives (Indicators)	At the end of this course, the successful student will be able to: 1. Uses technical knowledge, design methodology, and appropriate design tools and related resources. Produces a design strategy and uses it to guide a design. Understand the features and differences between various operating systems (including Microsoft OSes, UNIX (and POSIX) based OSes and mobile and cloud-based OSes. Understand the pitfalls and solutions involved in concurrent computing. (**4a**) 2. Understand and use the features of memory management and virtual memory. Integrates generated ideas into design plan, generates ideas creatively. (**4b**) **NOTE:** *Numbers in parentheses refer to the graduate attributes required by the Canadian Engineering Accreditation Board (CEAB).*
Course Organization	3.0 hours of lecture per week for 13 weeks 2.0 hours of lab per week for 12 weeks 0.0 hours of tutorial per week for 12 weeks

Teaching Assistants	TBA

Course Evaluation	<table><tr><td colspan="2">Theory</td></tr><tr><td>Midterm Exam</td><td>30 %</td></tr><tr><td>Weekly Quizzes</td><td>10 %</td></tr><tr><td>Final Exam</td><td>35 %</td></tr><tr><td colspan="2">Laboratory</td></tr><tr><td>Lab Deliverables</td><td>25 %</td></tr><tr><td>TOTAL:</td><td>100 %</td></tr></table> **Note:** In order for a student to pass a course, a minimum overall course mark of 50% must be obtained. In addition, for courses that have both **"Theory and Laboratory"** components, the student must pass the Laboratory and Theory portions separately by achieving a minimum of 50% in the combined Laboratory components and 50% in the combined Theory components. Please refer to the **"Course Evaluation"** section above for details on the Theory and Laboratory components (if applicable).
Examinations	1) There will be 10 weekly virtual in-class quizzes (No Quiz in Week 1, reading week, nor in the week of the midterm exam) 2) Midterm exam is in Week 8 (Exact date will be posted on D2L), the exam is closed book Virtual Online exam (covers weeks 1-7). The midterm exam is an in-class Online Exam through D2L. 3) The Final exam will be scheduled during exam period, Virtual Exam, two hours, closed-book (covers weeks 1-13).
Other Evaluation Information	IMPORTANT: Students must achieve passing grades in both the theoretical and the laboratory components of the course in order to pass the course. That means the student must pass 50% of the theory components and 50% of the Lab components All the Labs have to be done individually. Labs will be weekly and will start from Week 2. Labs are In-person (Attendance is Mandatory) Lab due dates will be announced on D2L. Late lab assignments will not be accepted and will receive a mark of 0. Two week labs carry double weight than one week labs.
Teaching Methods	Lectures will be virtual Online through Zoom. Lectures will be delivered as a mix of synchronous and asynchronous delivery. Labs are In-Person (Attendance is Mandatory). You will receive a zero mark if you are not attending your lab in-person (unless accommodation is provided and approved)
Other Information	None

Course Content

Week	Hours	Chapters / Section	Topic, description
1	2		Introduction to computing systems and operating systems. (Chapters 1 and 2)
1-2	2		Process Description and Control. (Chapter 3)
2-3	2		Processes threads and microkernels. (Chapter 4)
3-4	6		Mutual exclusion and synchronization (Chapter 5)
4-6	6		Deadlock and Starvation (Chapter 6)
6-8	6		Virtual memory and memory management (Chapters 7 and 8)
8-10	6		Scheduling algorithms (Chapter 9)
10-13	6		I/O Management Disk scheduling and File Management (Chapter 11)

Laboratory(L)/Tutorials(T)/Activity(A) Schedule

Week	L/T/A	Description
2	-	Lab 1: Review C Programming

3	-	Lab 2: Shell Programming
4	-	Lab 3: Process Management
5	-	Lab 4: Inter Process Communication
7	-	Lab 5: Threads
8	-	Lab 6: Synchronization
9	-	Lab 7: Multi-threading (Monitors)
10	-	Lab 8: Producer Consumer Topics
12	-	Lab 9: Dining Philosophers

University Policies & Important Information

Students are reminded that they are required to adhere to all relevant university policies found in their online course shell in D2L and/or on the Senate website

Refer to the Departmental FAQ page for furhter information on common questions.

Important Resources Available at Toronto Metropolitan University

- The Library provides research workshops and individual assistance. If the University is open, there is a Research Help desk on the second floor of the library, or students can use the Library's virtual research help service to speak with a librarian.
- Student Life and Learning Support offers group-based and individual help with writing, math, study skills, and transition support, as well as resources and checklists to support students as online learners.

- You can submit an Academic Consideration Request when an extenuating circumstance has occurred that has significantly impacted your ability to fulfill an academic requirement. You may always visit the Senate website and select the blue radio button on the top right hand side entitled: **Academic Consideration Request (ACR)** to submit this request.

  For Extenuating Circumstances, Policy 167: Academic Consideration allows for a once per semester ACR request without supporting documentation if the absence is less than 3 days in duration and is not for a final exam/final assessment. Absences more than 3 days in duration and those that involve a final exam/final assessment, require documentation. Students must notify their instructor once a request for academic consideration is submitted. See Senate Policy 167: Academic Consideration.

- If a student is requesting accommodation due to a religious, Aboriginal and/or spiritual observance, they must submit their request via the online Academic Consideration Request (ACR) system **within the first two weeks of the class or, for a final examination, within two weeks of the posting of the examination schedule**. If the required absence occurs within the first

two weeks of classes, or the dates are not known well in advance as they are linked to other conditions, these requests should be submitted with as much lead time as possible in advance of the required absence.
- If taking a remote course, familiarize yourself with the tools you will need to use for remote learning. The [Remote Learning Guide](#) for students includes guides to completing quizzes or exams in D2L Brightspace, with or without [Respondus LockDown Browser and Monitor, using D2L Brightspace,](#) joining online meetings or lectures, and collaborating with the Google Suite.
- Information on Copyright for [Faculty](#) and [students](#).

Accessibility

- Similar to an [accessibility statement,](#) use this section to describe your commitment to making this course accessible to students with disabilities. Improving the accessibility of your course helps minimize the need for accommodation.
- Outline any technologies used in this course and any known accessibility features or barriers (if applicable).
- Describe how a student should contact you if they discover an accessibility barrier with any course materials or technologies.

Academic Accommodation Support

Academic Accommodation Support (AAS) is the university's disability services office. AAS works directly with incoming and returning students looking for help with their academic accommodations. AAS works with any student who requires academic accommodation regardless of program or course load.

- Learn more about [Academic Accommodation Support](#).
- Learn [how to register with AAS](#).

Academic Accommodations (for students with disabilities) and Academic Consideration (for students faced with extenuating circumstances that can include short-term health issues) are governed by two different university policies. Learn more about [Academic Accommodations versus Academic Consideration and how to access each](#).

Wellbeing Support

At Toronto Metropolitan University, we recognize that things can come up throughout the term that may interfere with a student's ability to succeed in their coursework. These circumstances are outside of one's control and can have a serious impact on physical and mental well-being. Seeking help can be a challenge, especially in those times of crisis.

If you are experiencing a mental health crisis, please call 911 and go to the nearest hospital emergency room. You can also access these outside resources at anytime:

- **Distress Line:** 24/7 line for if you are in crisis, feeling suicidal or in need of emotional support (phone: 416-408-4357)
- **Good2Talk:** 24/7-hour line for postsecondary students (phone: 1-866-925-5454)
- **Keep.meSAFE:** 24/7 access to confidential support through counsellors via [My SSP app](#) or 1-844-451-9700

If non-crisis support is needed, you can access these campus resources:

- **Centre for Student Development and Counselling:** 416-979-5195 or email csdc@torontomu.ca
- **Consent Comes First - Office of Sexual Violence Support and Education:** 416-919-5000 ext 3596 or email osvse@torontomu.ca
- **Medical Centre:** call (416) 979-5070 to book an appointment

We encourage all Toronto Metropolitan University community members to access available resources to ensure support is reachable. You can find more resources available through the [Toronto Metropolitan University Mental Health and Wellbeing](#) website.