DALHOUSIE UNIVERSITY
Faculty of Computer Science

THERE WILL BE NO CONVERTING OF FINAL GRADES TO PASS/ILL THIS SEMESTER.
ALL LETTER GRADES WILL BE FINAL!

CSCI 3120: Operating Systems

Course Syllabus

Instructor Information

Instructor:	Qiang Ye	**Office:**	Goldberg 318
E-mail:	qye@cs.dal.ca	**Office Hours:**	TBA
Class Time:	Section 1: M/W 10:05-11:25 Section 2: M/W 08:35-09:55		
Class Room:	Goldberg 127		
Course Homepage:	dal.brightspace.com		
Course Mail List:	TBA		
Course TA:	TBA		

Important Dates

- Last day to drop fall term courses with no financial implications: Sept. 19
- Last day to drop fall term courses without a "W": Nov. 2
- Fall Study Break: Nov. 13-17
- Assignment Deadlines: 4:00pm on Sept. 22, Oct. 6, Oct. 20, Nov. 3, and Nov. 24.
- Midterm Exam: TBA
- Final Exam: TBA on Oct. 1 (note that the final exam period is from Dec. 8 to Dec. 19)

Course Description

This course will discuss operating system concepts, services, and implementations. The topics to be covered include Evolution of Operating Systems, Operating System Structure, Processes, Threads, Process Synchronization, Scheduling, Deadlocks, Main Memory, Virtual Memory and Paging, Files and Directories, File System Implementation, and I/O Systems.

Learning Outcomes

- Identify the roles and components of an operating system.
- Explain what the "file" abstraction is.
- Describe how files are organized and managed in modern operating systems.
- Describe some of the problems that memory management must solve.
- Describe the structure and operation of the Unix File System.
- Describe the mutual exclusion problem and various mechanisms for solving it.
- Explain how demand paging is implemented.
- Explain what deadlocks are and suggest ways of dealing with them.
- Explain what interrupts are and how they are used by an operating system.
- Formulate solutions to various synchronization problems.
- Compare and contrast various approaches to dealing with deadlock.
- Compare and contrast various page replacement algorithms.
- Design software components that are safe to use in a multithreaded environment.
- Explain what a process is and how processes are created.
- Explain what happens in the course of an interrupt or a system call.

- Explain what virtual memory is, why it is useful, and how it can be implemented.
- Compare and contrast various inter-process communication paradigms.
- Compare and contrast various process scheduling algorithms.
- Describe what resource an operating system must manage and protect.
- Write multithreaded programs.

Course Rationale

Typically, a computer system is composed of three layers: computer hardware, operating system, and application programs. Being the middle layer in the three-layer structure, operating system interacts with computer hardware and provides services to application programs. After knowing how to write an application program, you will learn how operating system works in this course. At the end of this course, you will have a deeper understanding of the three-layer structure. You will also be able to write application programs involving sophisticated operating system support.

Class Format and Course Communication

- Content will be delivered via lectures.
- Students must ask the instructor permission before recording class lectures.
- Course announcements will be posted to the course mail list, which comprises the instructor's and students' Dal emails. It is the student's responsibility to check their Dal e-mail on a daily basis. To access your Dal e-mail, please see: https://www.dal.ca/dept/its/o365/services/email.html

Evaluation Criteria

- Assignments (30%)
  - Five assignments, which are due at 4:00pm on Sept. 22, Oct. 6, Oct. 20, Nov. 3, and Nov. 24 respectively.
  - Late Submission: Assignments submitted within 24 hours of the deadline will lose 10% of the original mark. After the 24-hour time window, no assignment will be accepted.
  - Assignments need to be submitted electronically via Brightspace.
  - All assignments will be checked with plagiarism detection software.
- Midterm (25% or 0%)
  - The exam date will be determined later.
  - The midterm is optional. Specifically, if you choose not to (or cannot) write the midterm or do better on the final exam, then the midterm will be worth 0% and your final exam will be worth 70%; otherwise, the midterm will be worth 25%.
- Final Exam (45% or 70%)
  - The exam date will be determined by the university.
  - The final exam covers the whole course.
  - As mentioned previously, if you choose not to (or cannot) write the midterm or do better on the final exam, then the final exam will be worth 70%; otherwise, the final exam will be worth 45%.

Notes

- A minimum grade of C is required in this course if it is core to your FCS degree, or if it will be used as a prerequisite for a subsequent CSCI course.
- As of 2019, students who receive a grade lower than C in the same required CS course twice, will be dismissed.
- The grade conversion scale in Section 17.1 of the Academic Regulations, Undergraduate Calendar will be used.
- A student must pass (50%) the exam component in order to pass the course. Namely, the total of your midterm and final exam should be at least 35 points.

Student Declaration of Absence

The Student Declaration of Absence policy shall apply. Namely, if you experience a short-term absence that is no longer than three consecutive days, you must:

- Notify your instructor by email prior to the academic deadline or scheduled time.
- Download and complete the Student Declaration Form
- Send the completed form to the instructor by email within three days following your last day of absence

The details about the form can be found here:
https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/academic-policies/student-absence.html

Please note you can only submit a maximum of two separate Student Declaration of Absence forms per course during a term.

Midterm and Final Exam Requirements

- Photo ID is required
- Closed book
- No dictionaries, notes, calculators, cell phones, PDAs, talking slide rulers, or other electronic aids allowed.

Academic Standards

Failure to properly attribute sources in your work will be treated as an academic standards issue and points may be deducted for not following citation requirements. For example, forgetting to quote text taken from other sources, failure to include in-text citations, or a failure to include required information in the citations or references. Please see the resources on proper citation provided by the Dalhousie Writing Center (https://dal.ca.libguides.com/c.php?g=257176&p=5001261).

Please note that if it appears that the error was made with intent to claim other people's work as your own such as a lack of both citations and references, an allegation of plagiarism will be submitted to the Faculty Academic Integrity Officer, which could result in consequences such as a course failure.

Required Texts and Resources

- The text for the course is "Operating System Concepts", 10th Edition, by Abraham Silberschatz, Greg Gagne, Peter B. Galvin. The book is available here: https://www.wiley.com/en-ca/Operating+System+Concepts%2C+10th+Edition-p-9781119320913
- The lecture slides will be posted on the learning management system (i.e. Brightspace).

Prerequisites

CSCI 2110, (CSCI 2121 or CSCI 2122), and (CSCI 2132 or CSCI 2134)

Tentative List of Topics

- Operating Systems
  - Evolution of Operating Systems
  - OS structure
- Process Management
  - Processes
  - Threads
  - Process synchronization

- Scheduling
- Deadlocks

- Memory Management
  - Main memory
  - Virtual memory and paging
- File Systems
  - Files and directories
  - File system implementation
- I/O Systems
- Advanced Topics (subject to time availability)

Responsible Computing Policy

Usage of all computing resources in the Faculty of Computer Science must be within the Dalhousie Acceptable Use Policies (https://www.dal.ca/dept/university_secretariat/policies/information-management-and-technology/acceptable-use-policy-.html) and the Faculty of Computer Science Responsible Computing Policy. For more information please see https://www.dal.ca/content/dam/dalhousie/pdf/faculty/computerscience/policies-procedures/fcs_policy_local.pdf

Use of Plagiarism Detection Software

All submitted code may be passed through a plagiarism detection software, such as the plagiarism detector embedded in Codio, the Moss (https://theory.stanford.edu/~aiken/moss/) Software Similarity Detection System, or similar systems. If a student does not wish to have their assignments passed through plagiarism detection software, they should contact the instructor for an alternative. Please note, that code not passed through plagiarism detection software will necessarily receive closer scrutiny. https://cdn.dal.ca/content/dam/dalhousie/pdf/dept/university_secretariat/policy-repository/OriginalitySoftwarePolicy.pdf

Use of Artificial Intelligence Tools

You may use Al-driven tools to assist your learning, but you may not use them to produce work to be submitted for either formative or summative evaluations. Due to the nature of this course, it would be impractical and more difficult to assess students properly if Al tools were allowed. For this reason, and even if these tools will be valuable tool in your career, their use is restricted so that your learning may be assessed. Using Al-driven tools when producing submitted work constitutes an academic offence.

Student Health and Wellness

Taking care of your health is important. As a Dalhousie student, you have access to a wide range of resources to support your health and wellbeing. Students looking to access physical or mental health & wellness services at Dalhousie can go to the Student Health & Wellness Centre in the LeMarchant Building. The team includes: registered nurses, doctors, counsellors and a social worker. Visit **dal.ca/studenthealth** to learn more and book an appointment today.

Students also have access to a variety of online mental health resources, including telephone/texting counselling and workshops/training programs. Learn more and access these resources at d**al.ca/mentalhealth**.

Culture of Respect[1]

Every person has a right to respect and safety. We believe inclusiveness is fundamental to education and learning. Misogyny and other disrespectful behaviour in our classrooms, on our campus, on social media, and in our community is unacceptable. As a community, we must stand for equality and hold ourselves to a higher standard.

What we all need to do:

1. **Be Ready to Act:** This starts with promising yourself to speak up to help prevent it from happening again. Whatever it takes, summon your courage to address the issue. Try to approach the issue with open-ended questions like "Why did you say that?" or "How did you develop that belief?"
2. **Identify the Behaviour:** Use reflective listening and avoid labeling, name-calling, or assigning blame to the person. Focus the conversation on the behaviour, not on the person. For example, "The comment you just made sounded racist, is that what you intended?" is a better approach than "You're a racist if you make comments like that."
3. A**ppeal to Principles:** This can work well if the person is known to you, like a friend, sibling, or co-worker. For example, "I have always thought of you as a fair-minded person, so it shocks me when I hear you say something like that."
4. **Set Limits:** You cannot control another person's actions, but you can control what happens in your space. Do not be afraid to ask someone "Please do not tell racist jokes in my presence anymore" or state "This classroom is not a place where I allow homophobia to occur." After you have set that expectation, make sure you consistently maintain it.
5. **Find or be an Ally:** Seek out like-minded people that support your views, and help support others in their challenges. Leading by example can be a powerful way to inspire others to do the same.
6. **Be Vigilant:** Change can happen slowly, but do not let this deter you. Stay prepared, keep speaking up, and do not let yourself be silenced.

University Statements

This course is governed by the academic rules and regulations set forth in the University Calendar and the Senate. https://academiccalendar.dal.ca/Catalog/ViewCatalog.aspx?pageid=viewcatalog&catalogid=117&loaduseredits=False

Territorial Acknowledgement

Dalhousie University is located in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq. We are all Treaty people.

Dalhousie acknowledges the histories, contributions, and legacies of the African Nova Scotia people and communities who have been here for over 400 years.

Internationalization

At Dalhousie, 'thinking and acting globally' enhances the quality and impact of education, supporting learning that is "interdisciplinary, cross-cultural, global in reach, and orientated toward solving problems that extend across national borders." https://www.dal.ca/about-dal/internationalization.html

[1] Source: Speak Up! © 2005 Southern Poverty Law Center. First Printing. This publication was produced by Teaching Tolerance, a project of the Southern Poverty Law Center. Full "Speak Up" document found at: http://www.dal.ca/dept/dalrespect.html. Revised by Susan Holmes from a document provided April 2015 by Lyndsay Anderson, Manager, Student Dispute Resolution, Dalhousie University, 902.494.4140, lyndsay.anderson@dal.ca www.dal.ca/think.

Academic Integrity

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect. As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity. (read more: http://www.dal.ca/dept/university_secretariat/academic-integrity.html)

Accessibility

The Student Accessibility Centre is Dalhousie's centre of expertise for matters related to student accessibility and accommodation. If there are aspects of the design, instruction, and/or experiences within this course (online or in-person) that result in barriers to your inclusion please contact: https://www.dal.ca/campus_life/academic-support/accessibility.html for all courses offered by Dalhousie with the exception of Truro.

Conduct in the Classroom — Culture of Respect

Substantial and constructive dialogue on challenging issues is an important part of academic inquiry and exchange. It requires willingness to listen and tolerance of opposing points of view. Consideration of individual differences and alternative viewpoints is required of all class members, towards each other, towards instructors, and towards guest speakers. While expressions of differing perspectives are welcome and encouraged, the words and language used should remain within acceptable bounds of civility and respect.

Diversity and Inclusion — Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness (Strategic Priority 5.2). (read more: http://www.dal.ca/cultureofrespect.html)

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner—perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution. (read more: https://cdn.dal.ca/content/dam/dalhousie/pdf/dept/university_secretariat/policy-repository/Code%20of%20Student%20Conduct%20rev%20Sept%202021.pdf)

Fair Dealing Policy

The Dalhousie University Fair Dealing Policy provides guidance for the limited use of copyright protected material without the risk of infringement and without having to seek the permission of copyright owners. It is intended to provide a balance between the rights of creators and the rights of users at Dalhousie. (read more: https://www.dal.ca/dept/university_secretariat/policies/academic/fair-dealing-policy-.html)

Originality Checking Software

The course instructor may use Dalhousie's approved originality checking software and Google to check the originality of any work submitted for credit, in accordance with the Student Submission of Assignments and Use of Originality Checking Software Policy. Students are free, without penalty of grade, to

choose an alternative method of attesting to the authenticity of their work, and must inform the instructor no later than the last day to add/drop classes of their intent to choose an alternate method. (read more: https://cdn.dal.ca/content/dam/dalhousie/pdf/dept/university_secretariat/policy-repository/OriginalitySoftwarePolicy.pdf)

Student Use of Course Materials

These course materials are designed for use as part of the CSCI courses at Dalhousie University and are the property of the instructor unless otherwise stated. Third party copyrighted materials (such as books, journal articles, music, videos, etc.) have either been licensed for use in this course or fall under an exception or limitation in Canadian Copyright law. Copying this course material for distribution (e.g. uploading material to a commercial third party website) may lead to a violation of Copyright law.

Learning and Support Resources

Please see https://www.dal.ca/campus_life/academic-support.html