Course Syllabus

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Welcome to CSC369H: Operating Systems. The course covers principles of operating systems with a focus on systems programming in C.

In this course, you will gain:

- Experience working with systems code written in C.
- Theoretical knowledge of and practical experience with:
 - Processes and Threads (address spaces, system calls, scheduling)
 - Synchronization (algorithms and structures like locks, condition variables and semaphores)
 - Virtual Memory (paging, page tables, eviction, segmentation)
 - File Systems (the file abstraction, directory structures, and disk I/O)

This material is core CS. Past students have indicated that the assignments in this course provided them with examples for interviews and that OS concepts featured prominently in interview problems. CSC369 is structured around a series of programming assignments covering key topics: threads, synchronization, virtual memory, and file systems. The lectures provide a historical and theoretical context for the assignments. However, they are not traditional lectures; while some material will be presented, some class time will also be spent in small group activities. The tutorial time will be used to reinforce the theoretical content through exercise, but will frequently be used to help you work on components of the assignments. We (your instructors), and your classmates, will expect you to be an active participant; to do so, *you must keep up with the readings and begin the assignments promptly*. There is solid evidence that starting early on assignments is correlated with success in the course (not to mention less stress), and higher than average grades. **None of the assignments can be completed if you start less than 3-4 days before the deadline.**

Course Information

Instructor:

Name: Kuei (Jack) Sun

Office: BA 4231

Office Hours: Fridays 12-2pm, between Jan 17 and Apr 4th

Meetings may be scheduled outside of regular office hours by request.

Communications:

Course Email: csc369-2025-01@cs.toronto.edu (mailto:csc369-2025-01@cs.toronto.edu)

Please use email for personal issues and Piazza for all other course-related questions. We will try to respond to email by the end of the next day. However, due to volume, it may take longer, especially on weekends. (We are often not able to answer email more than once on the weekend.)

Lectures:

All lectures will be held in-person at the locations indicated.

Morning Section L0101	Day Section L0201
Monday 10-11am, <u>BA 1130</u>	Monday 1-2pm, <u>MP 102</u>
(<u>https://map.utoronto.ca/?id=1809#!m/982031?</u>	(<u>https://map.utoronto.ca/?id=1809#!m/494490?</u>
share)	share)
Wednesday 10-11am, <u>KP 108</u>	Wednesday 1-2pm, <u>MP 102</u>
(<u>https://map.utoronto.ca/?id=1809#!m/494488?</u>	(<u>https://map.utoronto.ca/?id=1809#!m/494490?</u>
<u>share)</u>	<u>share)</u>

Format and Preparation for lectures:

You will regularly be assigned readings and/or short videos. They should be reviewed before the lectures so that we can spend more time in class working through some of the details. You will also be working on exercises. Lectures will be recorded and one of the two recordings will be posted as soon as possible, for asynchronous viewing. However, students are expected to attend the lectures in person and complete the exercises during, or shortly after, the lectures.

Course videos and materials belong to your instructors, the University, and/or other sources depending on the specific facts of each situation, and are protected by copyright. In this course, you are permitted to download videos and materials for your own academic use, but you should not copy, share, or use them for any other purpose without the explicit permission of the instructors.

For questions about recording and use of videos in which you appear please contact your instructors.

Tutorials:

Tutorials are hosted at the following times, in room BA3175, BA3185, BA3195, and BA2200.

Morning Section L0101	Day Section L0201
Wednesday 11am -12pm	Wednesday 2pm to 3pm

https://q.utoronto.ca/courses/380124/assignments/syllabus

Please refer to Tutorial Schedule for more information.

The purpose of the tutorials is to help you understand the lab material. During tutorial times, TAs will be available for questions on the course content.

TA Office Hours:

TAs are available to help students with assignments and tutorials during TA office hours. See Office Hour Schedule for more information.

Textbook(s):

We will be using a free text quite extensively <u>Operating Systems: Three Easy Pieces</u> (<u>http://pages.cs.wisc.edu/~remzi/OSTEP/)</u> by Remzi H. Arpaci-Dusseau and Andrea C. Arpaci-Dusseau.

You may also find the following traditional text useful, but it is not required: <u>Modern Operating Systems</u> (<u>4th Ed.) (http://www.pearsonhighered.com/educator/product/Modern-Operating-</u> <u>Systems/9780133591620.page)</u> by Tanenbaum and Bos.

You will also want a good C reference, such as <u>C Programming: A Modern Approach (2nd Ed.)</u> (<u>http://knking.com/books/c2/index.html</u>)_ by King, or <u>C: A Reference Manual (5th Ed.)</u> (<u>https://www.pearson.com/us/higher-education/program/Harbison-C-A-Reference-Manual-5th-Edition/PGM220244.html</u>)_ by Harbison and Steele.

Website and Discussion Board:

You will be able to find all course materials from this Quercus site. The Piazza discussion board is required reading. Please use Piazza to ask general questions, and remember to search to check if someone else has already answered the question. The instructor and/or TAs will be monitoring it daily.

Marking Scheme

Overview

ITEM	WEIGHT
Participation (3/3)	1 %
Lecture Exercises (20/23)	2 %
Tutorial Exercises (9/11)	9 %
Programming Assignments (4)	36 %

ITEM	WEIGHT
Midterm (1)	17 %
Final Exam	35 %

Detailed Description

Participation (1%):

This course includes participation in three short research surveys aimed at evaluating the effectiveness of a new exam study platform. Each survey is worth 0.33% of your final grade.

However, you have the option to opt out of having your responses included in the research study. If you choose to opt out, your data will not be used for research purposes, but you will still receive the participation points for completing the survey.

Your feedback is invaluable in shaping tools that support student learning, and all responses will remain confidential. Opting out will not affect your grade or standing in the course.

Lecture Exercises (2%):

There will be in-class exercises associated with the lectures during most classes. These will typically take the form of quizzes on Quercus or small auto-checked exercises on MarkUs and will be graded on best effort. In other words, you will get full marks for an exercise if we can tell that you have made a serious attempt at it. You may not get credit for the exercise if you do nothing and just submit. We will take the best *n*-3 out of *n* scores. We expect that *n* will be 23 so that each completed lecture exercise is worth 0.1%. We strongly encourage you to do these exercises in class to get a clearer understanding of the material. We welcome questions about these activities during the synchronous lectures. All lecture exercises for the week will be due on Sunday at the end of the day (11:59 p.m.) for both lecture sections, with the following exceptions:

• Exercises for the first four lectures are all due on Sunday, January 26 at 11:59 p.m., to allow waitlisted students to complete them.

No grace periods may be used for the lecture exercises.

Tutorial Exercises (9%):

For each tutorial, you will be asked to turn in a small piece of work or to work on an activity during the tutorial. These exercises will be auto-graded and should be completed individually. Where possible, you will be allowed to resubmit and we will take your final score. Many of these will be directly related to the

assignments. We will take the best 9 out of 11 scores (1% each). There will be no tutorial exercises assigned in weeks when there are no tutorials.

Tutorial exercises are due on Sunday at the end of the day (11:59 p.m.) for both lecture sections, with the following exception:

• T1 and T2 will be due on Sunday, January 26 at 11:59 p.m., to allow waitlisted students to complete them.

No grace periods may be used for the tutorial exercises.

Programming Assignments (36%):

Over the term, you will complete 4 assignments that require you to write C code to implement some subsystem or solve some problem, related to operating system concepts. **All assignments must be completed individually**. Each assignment is worth 9% of your course grade. All assignments must be submitted by checking your work into your MarkUs repository.

Midterm Test (17%):

There will be a 50-minute test on Wednesday February 26th, held during your tutorial time slot (the lecture hour before the midterm is not canceled). The midterm will cover material from lectures 1 to 12 and may include content from exercises, tutorials, or assignments due before the midterm date. **You must attend your own lecture section for the midterm**.

LEC0101	Wednesday 11am - 12pm , February 26th, room TBA
LEC0201	Wednesday 2pm - 3pm , February 26th, room TBA

The midterm will be closed book. You may only bring a non-programmable calculator and a self-made, one-sided, letter-sized physical reference sheet (minimum font size of 10pt, printed or hand written). If you cannot write the Midterm test due to extraordinary circumstances beyond your control, please submit this form (https://forms.office.com/r/yKmeYQu0sU) with the supporting documentation to request a special consideration as soon as possible. Special consideration requests will be evaluated on a case-by-case basis.

Final Exam (35%):

The Final Exam is scheduled by the Faculty of Arts & Sciences sometime during November. It will cover all course material, including topics that were tested on the midterm test and questions about the assignments. The final exam will be closed book. You may only bring a non-programmable calculator and a self-made, two-sided reference sheet (minimum font size of 10pt). A minimum grade of **25% on the final exam is required to pass this course**.

Policies

Minimum Standards for Submitted Work:

For your assignment to be graded, it must meet the minimum standards of a professional computer scientist. **All** files required to build the program must be submitted, and the program **must** compile cleanly, without errors or warnings on the teach.cs lab machines. Last-minute difficulties with git can easily be avoided by ensuring all files are added to the repository well before the deadline, and that you know how to commit and push them. Compiling and testing your work on the teaching lab machines at intermediate stages will avoid last-minute problems as well. **Submissions that are missing files or do not compile will receive a grade of 0.**

Late Work:

All assignments must be submitted electronically by **11:59:59 p.m. sharp** on the due date. Each student is allotted **seven 1-day grace tokens** for the semester, which can be distributed across assignments however you choose. For example, you could use all seven tokens on a single assignment to gain a one-week extension or spread them across multiple assignments. Submitting an assignment even one second late will automatically use one grace token. Once your tokens are exhausted, late submissions will not be accepted unless under exceptional circumstances. If you find yourself in a serious medical or emergency situation where use of grace tokens is not sufficient, you will have the opportunity to submit this form ⇒ (https://forms.office.com/r/Xssn1HHjDe) to explain your circumstances and your specific special consideration request. Special consideration requests will be evaluated on a case-by-case basis. *Grace tokens may not be used for tutorials or exercises*.

The grace tokens are provided to help you deal with minor, unforeseen disruptions to your work schedule. However, instructional staff may not provide office hours or answer questions about the assignments after the deadline has passed. Make sure you start early and have a good understanding of the assignment requirements, even if you expect to use the grace period to complete your work.

Please note that a submission made at 12:00:00 a.m. after the due date will be considered late. You should ensure that your work is not submitted at the very last second. Since you will be using version control, it is very easy to commit regularly to avoid running into the deadline.

Religious Holidays:

If a religious holiday will keep you from completing any assigned work, please let us know as soon as possible (but no later than two weeks before the due date), and we will work out a mutually agreeable accommodation.

Emergencies:

In the event of an illness or other catastrophe that affects your ability to do your academic work, consult the course instructors right away. Normally, you will be asked for documentation in support of your specific circumstances. This documentation may take the following forms:

- Absence declaration via <u>ACORN (https://www.acorn.utoronto.ca/)</u>
 - The University has updated its policies on the use of the Absence Declaration, which can now only be used in case of (a) a health condition or personal injury, (b) a personal or family emergency, or (c) bereavement. Students may submit one absence declaration per academic term, to declare an absence for a maximum period of seven consecutive calendar days. The seven-day declaration period can be retroactive for up to six days in the past, or up to six days in the future, but it must cover the period in which the missed academic obligation occurred.
- <u>U of T Verification of Illness or Injury Form (VOI)</u>
 (<u>http://www.illnessverification.utoronto.ca/index.php)</u>
 - The VOI indicates the impact and severity of the illness, while protecting your privacy about the details of the nature of the illness. If you cannot submit a VOI due to limits on terms of use, you can submit a different form (like a letter from a doctor), as long as it is an original document, and it contains the same information as the VOI (including dates, academic impact, practitioner's signature, phone and registration number). To download a copy of the VOI, please see http://www.illnessverification.utoronto.ca/
- College Registrar's letter
- Letter of Academic Accommodation from Accessibility Services

For more information on documentation of absences for Arts and Science students, including limitations on the use of the Absence Declaration tool, refer to the <u>A&S Student Absences</u> (<u>http://www.artsci.utoronto.ca/absence</u>) page. It is always easier to make alternate arrangements before a due date, so please inform us as soon as you know that you will need accommodation. If you get a concussion, break your hand, or suffer some other acute injury, you should register with Accessibility Services as soon as possible.

Remark Requests:

If you believe there was an error in the grading of your assignment, you may submit a remark request through MarkUs. Your request must clearly state one of the following:

- 1. Marking error: Clearly and concisely describe the specific error you believe occurred in the grading.
- 2. **Minor submission issue:** Identify a minor problem in your submission that can be resolved with no more than one line of code, e.g., so that your code would compile again. If your request is accepted under this category, a 20% penalty will be applied.

Remark requests must be submitted within **one week** of the marks being released. Please note that remarking may result in an increased grade, no change, or a *decreased grade*.

Academic Integrity:

All of the work you submit must be done by you and your work must not be submitted by someone else. Plagiarism is academic fraud and is taken very seriously. The department uses software that compares programs for evidence of similar code. Please refer to the UofT <u>Academic Integrity website</u> (<u>https://www.academicintegrity.utoronto.ca/)</u> and read the <u>Code of Behaviour on Academic Matters</u> (<u>https://governingcouncil.utoronto.ca/secretariat/policies/code-behaviour-academic-matters-july-1-2019</u>). Here are a few guidelines to help you avoid plagiarism:

Never look at another student's or group's assignment solution or idea for a solution, whether it is on paper or on the computer screen, and don't allow your solution to be viewed by or come into the possession of another student. Maintain absolute control of your work, including notes and partial solutions, at all times.

We encourage you to discuss course concepts and to study for exams with other students, but any work that is submitted should be your own. The easiest way to avoid plagiarism is to only show work that is in preparation for submission, or submitted work, to a TA or instructor.

Important: An academic offence may significantly slow your progress through your degree. It is better to submit a partially completed assignment and receive a low mark than to face an academic offence on your record.

Important: Do not look for assignment solutions online. Places like public Github repositories may contain code that may be useful in your assignments. Using someone else's code and ideas without attribution, even if making some changes, is considered plagiarism. Keep in mind that our plagiarism detection software can detect such cases.

Important: The entire code must be written by yourself. Submitting code you find elsewhere or Al generated code (e.g., ChatGPT, Github Co-pilot) is strictly forbidden and any violation will be prosecuted with the fullest extent of the regulation.

Accessibility Needs:

The University of Toronto is committed to accessibility. If you require accommodations for a disability or have any accessibility concerns about the course, the classroom, or course materials, please contact <u>Accessibility Services (https://studentlife.utoronto.ca/department/accessibility-services/)</u> as soon as possible via email (<u>accessibility.services@utoronto.ca</u> (<u>mailto:accessibility.services@utoronto.ca</u>)) or phone (<u>416-978-8060 (tel:416-978-8060)</u>).