

# CSC368H1 S LEC0101 20251:Computer Architecture

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 Edit

This syllabus is still a work-in-progress and is subject to change.

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## Communication

### Announcements

All course announcements are posted on Quercus. You are responsible for reading all announcements made by the teaching team in a timely manner. And we highly recommend enabling notifications for Quercus announcements.

### Email

If you have a personal question (i.e., the answer is only useful to you or contains personal details), email [csc368-2025-01@cs.toronto.edu](mailto:csc368-2025-01@cs.toronto.edu) (<mailto:csc368-2025-01@cs.toronto.edu>). Please ensure that you share your UTORid in the body of your message. and allow 24-72 hours for response during regular business hours. We recommend reviewing our course policies (below) before sending an email.

We strongly recommend using your mail.utoronto.ca email address for all course-related communication. Please do not use Quercus' built-in communication tool (called "Inbox"). We do not monitor our Quercus inbox, so your message may never be seen.

### Discussion forum

If you have a question related to course content, please use Piazza. As a courtesy to others (and the teaching team), please search to see if your question has already been posted. This is especially true closer to deadlines, where you may find many earlier Piazza answers helpful to you.

### Office hours

Throughout the term, the instructor hosts in-person office hours. The time and location of office hours will vary from week to week. Details will be posted on Quercus.

# Course overview

This term, we learn about how the design of processors and computer systems has evolved over time in response to various trends in technology, applications, and market forces. As budding computer scientists, understanding the design trade-offs of computer hardware will enable you to make informed decisions in software.

The majority of the course focuses on the central processing unit (CPU). But many of these concepts connect with the more specialized processors we cover toward the end of the course, including graphics processing units (GPUs) and other accelerators. And the course concepts are a great complement to other upper-year courses in computer systems, like Operating Systems, Parallel Programming, and Compilers and Interpreters.

## Lectures

Lectures introduce, build on, or reinforce fundamental computer architecture concepts. You are expected to prepare for each lecture ahead of time by completing a preparation module and quiz. And, while lecture attendance is not mandatory, we highly recommend you attend.

All lectures take place in MP203 on Fridays, 11:00 AM to 1:00 PM. A more detailed lecture schedule, with a tentative sequencing of topics, is shown in the table below.

Lecture	Date	Topic(s)
Lecture 1	January 10th	Instruction set architectures
Lecture 2	January 17th	Pipelined processors
Lecture 3	January 24th	Hardware caches
Lecture 4	January 31st	Instruction scheduling
Lecture 5	February 7th	Speculation
Lecture 6	February 14th	Parallel processors
No lecture (reading week)		
Lecture 7	February 28th	TBD
Lecture 8	March 7th	Memory consistency
Lecture 9	March 14th	Cache coherence
Lecture 10	March 21st	Graphics processing units

Lecture	Date	Topic(s)
Lecture 11	March 28th	Accelerators
Lecture 12	April 4th	Conclusion

If the lecture hall supports it, lecture recordings will be made available on Quercus. This is not a guarantee, and you should not rely on recordings in case they are not available (e.g., due to technical issues). Please see below for our policy on lecture recordings.

Technology can support student learning, but it can also become a distraction. Research indicates that multi-tasking during class time can have a negative impact on learning. Out of respect for your fellow students in this class, please refrain from using laptops or mobile phones for purposes unrelated to the class. Do not display any material on a laptop which may be distracting or offensive to your fellow students.

## Tutorials

You complete tutorials with a partner in a computer lab. The tutorials expose you to a simulator oft-used in academia (and, in some cases, industry). With the simulator, you conduct guided experiments to establish the skills needed to quantitatively evaluate hardware and software. While the tutorials themselves are not graded, completing them is important for succeeding in the assignments. Logistics are shown in the table below.

Section	Day and time	Room
TUT0101	Tuesday, 11:00 AM to 12:00 PM	BA3175
TUT0102	Tuesday, 11:00 AM to 12:00 PM	BA3185
TUT0201	Tuesday, 12:00 PM to 1:00 PM	BA3175
TUT0202	Tuesday, 12:00 PM to 1:00 PM	BA3185

The tutorial schedule is shown in the table below. The schedule includes term tests because they happen during tutorial time. Please keep an eye out for announcements on term test logistics closer to their date.

Tutorial	Date
Tutorial 1	January 14th
Tutorial 2	January 21st

<b>Tutorial</b>	<b>Date</b>
Test 1	January 28th
Tutorial 3	February 4th
Tutorial 4	February 11th
No tutorial (reading week)	
Test 2	February 25th
Tutorial 5	March 4th
Tutorial 6	March 11th
Tutorial 7	March 18th
Test 3	March 25th

## Assessments

You can assess your learning in the course through a variety of ways. A summary of graded assessments is shown below, followed by more information about each assessment category. In addition to the graded assessments, you can assess your learning by completing the ungraded tutorials and problem sets made available throughout the term.

<b>Assessment category</b>	<b>Count</b>	<b>Weight</b>	<b>Deadline(s)</b>	<b>Submission method</b>
Preparations	12	12% (1% each)	Fridays before 11 AM	Quercus quiz
Assignments	2	18% (9% each)	Thursdays before 3 PM	Quercus upload
Tests	3	30% (10% each)	Tuesdays during enrolled tutorial section	In-person
Final exam	1	40%	To-be-scheduled by Arts & Science	In-person

### Preparations

Preparations are tasks you must complete before lecture, such as watching a video or reading a paper, and are assessed through a Quercus quiz.

**Late policy:** While you may submit the quiz one week late without penalty, the lecture content expects that you have completed the preparation and are familiar with its content. Quizzes may not be submitted more than one week after the due date.

## Assignments

You complete assignments in groups of three to four students. Each assignment gives you the opportunity to complete a quantitative evaluation of hardware and software through simulation. This is similar to the evaluations you complete in tutorials, but larger in scope. While these are not programming assignments, a fundamental understanding of programming, compiling, scripting, and the command line is expected.

**Late policy:** Assignments may be submitted up to one week after the deadline. However, this incurs a penalty of 5% per day (including weekends and holidays), up to a maximum of 35%. We do not accept submissions more than one week after the due date. Please note that:

- We round up to the next day. For example, if you are 0.5 days late, then this rounds up to 1 day with a 5% penalty. If you are 1.3 days late, then this rounds up to two days with a 10% penalty.
- Due to Quercus limitations (the late penalty policy is a global setting), the late penalty may not show up under the "Grades" user interface in a nice way

## Tests

There are three term tests throughout the term. These are in-person tests and you must attend the term test for the tutorial section you are enrolled in. The best way to prepare for these tests is to solve (and understand the solution to) the ungraded problem sets.

If you will miss (or have missed) a test, you should email us **as soon as possible**. We also recommend reviewing our course policies below.

## Final examination

A final examination will be scheduled by the Faculty of Arts and Science during the final assessment period (i.e., between April 9th and April 30th). It is worth 40% of your overall grade and covers all the course content. Please note that we (the teaching team) do not handle any accommodations related to the final exam. Please contact your college registrar, instead.

# Policies and statements

## Grading errors

If you believe there is a mistake in your grade, you can email us for clarification ([csc368-2025-01@cs.toronto.edu](mailto:csc368-2025-01@cs.toronto.edu)) within two weeks of the grade being

released to you. Your email should clearly and concisely describe why you believe your assessment was incorrectly graded. Please note that your inquiry may increase the original grade, leave it as is, or decrease the original grade, depending on the grading error or errors found.

## Academic Integrity

All suspected cases of academic dishonesty will be investigated following procedures outlined in the [Code of Behaviour on Academic Matters](https://governingcouncil.utoronto.ca/secretariat/policies/code-behaviour-academic-matters-july-1-2019) (<https://governingcouncil.utoronto.ca/secretariat/policies/code-behaviour-academic-matters-july-1-2019>). If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, please reach out to the course email address. Note that you are expected to seek out additional information on academic integrity from your instructor or from other institutional resources. For example, to learn more about how to cite and use source material appropriately and for other writing support, see the [U of T writing support website](http://www.writing.utoronto.ca/) (<http://www.writing.utoronto.ca/>). Consult the Code of Behaviour on Academic Matters for a complete outline of the University's policy and expectations. For more information, please see [A&S Student Academic Integrity](https://www.artsci.utoronto.ca/current/academic-advising-and-support/student-academic-integrity) (<https://www.artsci.utoronto.ca/current/academic-advising-and-support/student-academic-integrity>) and the [University of Toronto Website on Academic Integrity](https://www.academicintegrity.utoronto.ca/) (<https://www.academicintegrity.utoronto.ca/>).

## Equity, diversity, and inclusion

The University of Toronto is committed to equity, human rights and respect for diversity. All members of the learning environment in this course should strive to create an atmosphere of mutual respect where all members of our community can express themselves, engage with each other, and respect one another's differences. The University of Toronto does not condone discrimination or harassment against any persons or communities.

## Students with disabilities or accommodation requirements

Students with diverse learning styles and needs are welcome in this course. If you have an acute or ongoing disability issue or accommodation need, you should register with Accessibility Services (AS) at the beginning of the academic year by visiting the [AS website](https://studentlife.utoronto.ca/departments/accessibility-services/) (<https://studentlife.utoronto.ca/departments/accessibility-services/>). Without registration, you will not be able to verify your situation with your instructors, and instructors will not be advised about your accommodation needs. AS will assess your situation, develop an accommodation plan with you, and support you in requesting accommodation for your course work. Remember that the process of accommodation is private: AS will not share details of your needs or condition with any instructor, and your instructors will not reveal that you are registered with AS.

## Accommodation for specific medical circumstances


If you become ill and it affects your ability to do your academic work, email us right away. Normally, we will ask you for documentation in support of your specific medical circumstances. This documentation can be an Absence Declaration (via ACORN) or the University's Verification of Student Illness or Injury (VOI) form. 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). For more information on the VOI, please see

<http://www.illnessverification.utoronto.ca> (<http://www.illnessverification.utoronto.ca/>). For information on Absence Declaration Tool for A&S students, please see <https://www.artsci.utoronto.ca/absence> (<https://www.artsci.utoronto.ca/absence>). If you get a concussion, break your hand, or suffer some other acute injury, you should register with Accessibility Services as soon as possible.


## Accommodation for personal reasons

There may be times when you are unable to complete course work on time due to non-medical reasons. If you have concerns, email us or an advisor in your College Registrar's office; they can help you to decide if you want to request an extension or other forms of academic consideration. They may be able to email your instructors directly to provide a College Registrar's letter of support and connect you with other helpful resources on campus.

## Mental health and well-being

Your mental health is important. Throughout university life, there are many experiences that can impact your mental health and well-being. As a University of Toronto student, you can access free mental health and wellbeing services at [Health & Wellness](https://studentlife.utoronto.ca/departments/health-wellness/) (<https://studentlife.utoronto.ca/departments/health-wellness/>) such as same day counselling, brief counselling, medical care, skill-building workshops, and drop-in peer support. You can also meet with a Wellness Navigation Advisor who can connect you with other campus and community services and support. Call the mental health clinic at 416-978-8030 ext. 5 to book an appointment or visit <https://uoft.me/mentalhealthcare>  (<https://uoft.me/mentalhealthcare>) to learn about the services available to you.

You can also visit your College Registrar to learn about the resources and supports available: <https://www.artsci.utoronto.ca/current/academic-advising-and-support/college-registrars-offices> (<https://www.artsci.utoronto.ca/current/academic-advising-and-support/college-registrars-offices>)

If you're in distress, you can access immediate support: <https://uoft.me/feelingdistressed>  (<https://uoft.me/feelingdistressed>)

## Quercus information

This Course uses the University's learning management system, Quercus, to post information about the course. This includes posting readings and other materials required to complete class activities and course assignments, as well as sharing important announcements and updates. New information and resources will be posted regularly as we move through the term. To access the course website, go to the U of T Quercus log-in page at <https://q.utoronto.ca>.

**SPECIAL NOTE ABOUT GRADES POSTED ONLINE:** Please also note that any grades posted are for your information only, so you can view and track your progress through the course. No grades are considered official, including any posted in Quercus at any point in the term, until they have been formally approved and posted on ACORN at the end of the course. Please contact me as soon as possible if you think there is an error in any grade posted on Quercus.

## Course materials

Course materials are provided for the exclusive use of enrolled students. These materials should not be reposted, shared, put in the public domain, or otherwise distributed without the explicit permission of the instructor. These materials belong to your instructor, the University, and/or other sources depending on the specific facts of each situation and are protected by copyright. Students violating these policies will be subject to disciplinary actions under the Code of Student Conduct.




## Video recording and sharing

This course, including your participation, will be recorded on video and will be available to students in the course for viewing remotely and after each session.

Course videos and materials belong to your instructor, 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 session 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 instructor.

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

## Course Summary:

Date	Details	Due
Fri Jan 10, 2025	 <a href="https://q.utoronto.ca/courses/374379/assignments/1373171">W01 Prep</a> ( <a href="https://q.utoronto.ca/courses/374379/assignments/1373171">https://q.utoronto.ca/courses/374379/assignments/1373171</a> )	due by 11am
Fri Jan 17, 2025	 <a href="https://q.utoronto.ca/courses/374379/assignments/1373168">W02 Prep</a> ( <a href="https://q.utoronto.ca/courses/374379/assignments/1373168">https://q.utoronto.ca/courses/374379/assignments/1373168</a> )	due by 11am
Fri Jan 24, 2025	 <a href="https://q.utoronto.ca/courses/374379/assignments/1373164">W03 Prep</a> ( <a href="https://q.utoronto.ca/courses/374379/assignments/1373164">https://q.utoronto.ca/courses/374379/assignments/1373164</a> )	due by 11am



Date	Details	Due
Tue Jan 28, 2025	 <a href="#">Test 1</a> ( <a href="https://q.utoronto.ca/courses/374379/assignments/1373175">https://q.utoronto.ca/courses/374379/assignments/1373175</a> )	due by 1pm
Fri Jan 31, 2025	 <a href="#">W04 Prep</a> ( <a href="https://q.utoronto.ca/courses/374379/assignments/1373165">https://q.utoronto.ca/courses/374379/assignments/1373165</a> )	due by 11am
Fri Feb 7, 2025	 <a href="#">W05 Prep</a> ( <a href="https://q.utoronto.ca/courses/374379/assignments/1373162">https://q.utoronto.ca/courses/374379/assignments/1373162</a> )	due by 11am
Thu Feb 13, 2025	 <a href="#">Assignment 1</a> ( <a href="https://q.utoronto.ca/courses/374379/assignments/1373172">https://q.utoronto.ca/courses/374379/assignments/1373172</a> )	due by 3pm
Fri Feb 14, 2025	 <a href="#">W06 Prep</a> ( <a href="https://q.utoronto.ca/courses/374379/assignments/1373170">https://q.utoronto.ca/courses/374379/assignments/1373170</a> )	due by 11am
Tue Feb 25, 2025	 <a href="#">Test 2</a> ( <a href="https://q.utoronto.ca/courses/374379/assignments/1373176">https://q.utoronto.ca/courses/374379/assignments/1373176</a> )	due by 1pm
Fri Feb 28, 2025	 <a href="#">W07 Prep</a> ( <a href="https://q.utoronto.ca/courses/374379/assignments/1373169">https://q.utoronto.ca/courses/374379/assignments/1373169</a> )	due by 11am
Fri Mar 7, 2025	 <a href="#">W08 Prep</a> ( <a href="https://q.utoronto.ca/courses/374379/assignments/1373167">https://q.utoronto.ca/courses/374379/assignments/1373167</a> )	due by 11am
Thu Mar 13, 2025	 <a href="#">Assignment 2</a> ( <a href="https://q.utoronto.ca/courses/374379/assignments/1373173">https://q.utoronto.ca/courses/374379/assignments/1373173</a> )	due by 3pm
Fri Mar 14, 2025	 <a href="#">W09 Prep</a> ( <a href="https://q.utoronto.ca/courses/374379/assignments/1373166">https://q.utoronto.ca/courses/374379/assignments/1373166</a> )	due by 11am
Fri Mar 21, 2025	 <a href="#">W10 Prep</a> ( <a href="https://q.utoronto.ca/courses/374379/assignments/1373160">https://q.utoronto.ca/courses/374379/assignments/1373160</a> )	due by 11am
Tue Mar 25, 2025	 <a href="#">Test 3</a> ( <a href="https://q.utoronto.ca/courses/374379/assignments/1373177">https://q.utoronto.ca/courses/374379/assignments/1373177</a> )	due by 1pm
Fri Mar 28, 2025	 <a href="#">W11 Prep</a> ( <a href="https://q.utoronto.ca/courses/374379/assignments/1373161">https://q.utoronto.ca/courses/374379/assignments/1373161</a> )	due by 11am
Fri Apr 4, 2025	 <a href="#">W12 Prep</a> ( <a href="https://q.utoronto.ca/courses/374379/assignments/1373163">https://q.utoronto.ca/courses/374379/assignments/1373163</a> )	due by 11am