Introduction to Computers and Computer Systems Winter 2025

CS 230

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Class Schedule

Course	Meet Days	Meet Time	Location	Instructor(s)
CS 230 001 [LEC]	**Tue, Thu** *Jan 6 - Apr 4*	08:30AM - 09:50AM	MC 1085	P. Roh proh@uwaterloo.ca (... S. Graham sandy.graham@uwate...
CS 230 002 [LEC]	**Tue, Thu** *Jan 6 - Apr 4*	10:00AM - 11:20AM	MC 2065	P. Roh proh@uwaterloo.ca (... S. Graham sandy.graham@uwate...
CS 230 101 [TUT]	**Mondays** *Jan 6 - Apr 4*	10:30AM - 11:20AM	MC 4045	
CS 230 102 [TUT]	**Mondays** *Jan 6 - Apr 4*	11:30AM - 12:20PM	MC 2017	
CS 230 103 [TUT]	**Mondays** *Jan 6 - Apr 4*	01:30PM - 02:20PM	MC 2035	

schedule data automatically refreshed daily

Instructor & TA (Teaching Assistant) Information

Instructor

Name	Contact	Office Hours
Sandy Graham	sandy.graham@uwaterloo.ca	Tuesdays and Thursdays: 11:45 a.m. - 1:15 p.m. **MC6228**

Instructional Support Coordinator (ISC)

Name	Contact
Patrick Roh	proh@uwaterloo.ca Contact for questions regarding verification of illness or other documents, enrollment, alternative arrangements, or other administrative questions. Please include what course you are communicating about in your emails.

Instructional Apprentices (IA)

Name	Contact and Office Hours Information
TBA	Posted on LEARN (https://learn.uwaterloo.ca/d2l/le/content/1098198/viewContent/5784869/View) cs230@uwaterloo.ca
TBA	
TBA	

Course Description

> *Calendar Description for CS 230:*
>
> Basic computer architecture, organization, system services, and software. Typology of processors, memory, I/O devices, and their performance.
>
> View requirements for CS 230 (https://acal.fast.uwaterloo.ca/course/1251/CS/230)

Course Description

An introduction to hardware and software concepts used in computer systems. Specific topics include machine-level programming, memory organization, and basic I/O mechanisms.

Course Overview

The course content is delivered in the following 6 modules

- Arithmetic, Hardware, Data
- Assembly Language
- Machine Internals
- Build and Execute
- Multiprocessing
- Operating Systems (if time allows)

Learning Outcomes

By the end of this course students should be able to:

Understand machine level arithmetic, basic hardware principles, and internal data representation
Program in assembly language
Understand the basics of machine internals
Understand the basic elements of the compilation cycle
Understand the basic principles of multiprocessing

Tentative Course Schedule

The course is divided into five modules. Supplementary slides will be released one module at a time on LEARN (https://learn.uwaterloo.ca/d2l/le/content/1098198/Home?itemIdentifier=D2L.LE.Content.ContentObject.ModuleCO-5784866) .

The twice, weekly lectures will follow the outline provided by the posted slides. (Note that the provided slides are NOT meant to replace in-person lectures. Attendance of all in-person lectures is expected.)

There will be weekly tutorials that provide an opportunity to practice and review related to previous lecture material via problem sets.

There will be weekly online quizzes on LEARN (https://learn.uwaterloo.ca/d2l/lms/quizzing/admin/quizzes_manage.d2l?ou=1098198) . Quizzes will be made available at 12:00 a.m. (Waterloo, ON time) on the scheduled date. They must be completed by 11:59 p.m. (Waterloo, ON time) on the scheduled date. The quizzes will be timed. They must be completed within 1 hour of the start time.

	Quiz Date	**Coverage (up to and including)**
Quiz 01	January 15	Tutorial 01
Quiz 02	January 22	Tutorial 02
Quiz 03	January 29	Tutorial 03
Quiz 04	February 5	Tutorial 04
Quiz 05	February 12	Tutorial 05
Quiz 06	February 26	Tutorial 06
Quiz 07	March 5	Tutorial 07
Quiz 08	March 12	Tutorial 08
Quiz 09	March 19	Tutorial 09
Quiz 10	March 26	Tutorial 10
Quiz 11	April 2	Tutorial 11

There will be six assignments scheduled during the term.

All assignments are due at 11:59 p.m. (Waterloo, ON time).

	Due Date *	**Weight**	**Coverage (up to Lecture)**
Assignment 1	January 17	5%	January 14
Assignment 2	January 31	7%	January 23
Assignment 3	February 14	7%	February 6
Assignment 4	March 7	7%	February 27
Assignment 5	March 21	7%	March 13
Assignment 6	April 4	7%	March 27

- Due date may be adjusted to a later date if necessary based on lecture timing.

Texts / Materials

Note: Any prices provided in course outlines are best estimates based on recent online prices and do not include shipping or taxes. Prices may vary between retailers.

Title / Name	**Notes / Comments**	**Required**	**Price (CAD)**

Title / Name	Notes / Comments	Required	Price (CAD)
	No required textbook	No	

Student Assessment

Component	Value
Weekly Quizzes (11 quizzes worth 2% each)	22
Linux Quiz	3
Assignments	40
Final Exam	35

In order to pass the course:

1. A student must pass the weighted average of the weekly quizzes (not including the Linux Quiz) and the final exam in order to pass the course. (ie. The contribution to the final grade from weekly quizzes and the final exam is worth 22%+35%=57% of the final grade. The student's final grade must include at least 50% of this, which is at least 50%*57%=28.5%.)
2. Get a final grade of at least 50%.

Weekly quizzes will be completed online in LEARN (https://learn.uwaterloo.ca/d2l/lms/quizzing/admin/quizzes_manage.d2l?ou=1098198) . (Note: There is no dropping of the lowest quiz grade. The quizzes are meant to replace having a midterm.)

Assignments will be posted on LEARN (https://learn.uwaterloo.ca/d2l/le/content/1098198/Home?itemIdentifier=D2L.LE.Content.ContentObject.ModuleCO-5784864) and submitted to CS230 MarkUs (https://www.student.cs.uwaterloo.ca/~cs230/w25/markus.shtml) .

The final exam will be scheduled by the Registrar's Office.

More details about the dates and policies of course components is found on LEARN (https://learn.uwaterloo.ca/d2l/le/content/1098198/Home?itemIdentifier=D2L.LE.Content.ContentObject.ModuleCO-5784865) .

Assignment Screening

MOSS (Measure of Software Similarities)

MOSS is used in this course as a means of comparing students' assignments to ensure academic integrity. We will report suspicious activity, and penalties for plagiarism/cheating are severe. Please read the available information about academic integrity very carefully.

Note: Submissions for programming questions should only use code and concepts taught during lectures. Use of code or advanced concepts not taught in the course will be viewed as a possible violation of Academic Integrity for passing off someone else's work as your own. Code identified as generated from AI will also be viewed as a possible vioaltion of Academic Integrity (see below).

Administrative Policy

Due Date Policy

- Assignments and quizzes are due on the due-date at the time specified above in the Evaluation section. Note that

if the deadline gives a time such as 11:59pm, that means 11:59pm and ZERO seconds.
- No late quizzes will be accepted.
- The assignments have a flexible late-day system detailed here:
    - Each student begins the term with three (3) 24-hour assignment extensions (called Grace Periods on MarkUs) to use as they wish. These cannot be used on quizzes.
    - You can only use a maximum of two assignment extensions on any single assignment.
    - There is no way to get any more assignment extensions.
    - Assignment extensions can be used all together on one assignment, or split across different assignments.
    - You do not need a reason to use assignment extensions, you may use them as you please.
    - If you are using assignment extensions, you must use a whole number of them on an assignment. (Example: you cannot use 1.5 assignment extensions, you must use 2 extensions if you are 30-hours late).
    - If an assignment is not handed in by the due date (plus any used assignment extensions), it will be assigned a grade of zero and will not be marked.
    - No extension may be used on the last assignment.
    - This policy replaces the university policy on Short-Term Absences. Students will not be granted extensions for an assignment by taking a short-term absence on Quest unless they use their assignment extensions.
- Be aware that assignments are submitted via MarkUs. This system is maintained on the CS teaching servers. These servers are shared with all other CS courses. As a result, server loads may cause MarkUs to take an extended period of time to accept your assignment. Student are advised to submit to MarkUs early and often to ensure their work is accepted before any deadline.
- For all other circumstances, formal documentation is required. Note that a circumstance covering a day or two is not sufficient reason for missing an assessment. Students are expected to start assignments early in case something unexpected occurs closer to the deadline. If sufficient documentation is supplied to the Instructional Support Coordinator and assignment extensions are exhausted then the weight of that assessment is moved to the other course components (to be determined by the course staff). See the CS 230 Accommodations (https://www.student.cs.uwaterloo.ca/~cs230/w25/accommodations.shtml) page for acceptable forms of documentation and for procedures to get accommodations.

Assignment/Quiz Return

Assignments are returned through MarkUs (https://www.student.cs.uwaterloo.ca/~cs230/w25/markus.shtml) .

Quizzes are returned on LEARN (https://learn.uwaterloo.ca/d2l/lms/quizzing/admin/quizzes_manage.d2l?ou=1098198) .

Remarking Policy

Requests for remarking an assignment may be submitted to the IA (cs230@uwaterloo.ca) at up to one week after the assignment is returned in MarkUs, except for possibly the last assignment where a shorter time period may be given.

No remark requests will be accepted for quizzes.

Rules for Group Work

Unless otherwise stated in the assignment, assignments are to be done individually.

Quizzes are to be done individually.

Territorial Acknowledgement: The University of Waterloo acknowledges that much of our work takes place on the traditional territory of the Neutral, Anishinaabeg and Haudenosaunee peoples. Our main campus is situated on the Haldimand Tract, the land granted to the Six Nations that includes six miles on each side of the Grand River. Our active work toward reconciliation takes place across our campuses through research, learning, teaching, and community building, and is centralized within the Office of Indigenous Relations (https://uwaterloo.ca/indigenous)

Mental Health

If you or anyone you know experiences any academic stress, difficult life events, or feelings like anxiety or depression, we strongly encourage you to seek support.

On-campus Resources (availability may vary due to world events)

- Campus Wellness https://uwaterloo.ca/campus-wellness/ (https://uwaterloo.ca/campus-wellness/)
- Counselling Services: counselling.services@uwaterloo.ca, 519-888-4567 ext 32655, Needles Hall North 2nd floor, (NH 2401)
- MATES: one-to-one peer support program offered by Federation of Students (FEDS) and Counselling Services: mates@uwaterloo.ca
- Health Services service: located across the creek from Student Life Centre, 519-888-4096

Off-campus Resources

- Good2Talk (24/7): Free confidential help line for post-secondary students. Phone: 1-866-925-5454
- Here 24/7: Mental Health and Crisis Service Team. Phone: 1-844-437-3247
- OK2BME: set of support services for lesbian, gay, bisexual, transgender or questioning teens in Waterloo. Phone: 519-884-0000 extension 213

Diversity

It is our intent that students from all diverse backgrounds and perspectives be well served by this course, and that students' learning needs be addressed both in and out of class. We recognize the immense value of the diversity in identities, perspectives, and contributions that students bring, and the benefit it has on our educational environment. Your suggestions are encouraged and appreciated. Please let us know ways to improve the effectiveness of the course for you personally or for other students or student groups. In particular:

- We will gladly honour your request to address you by an alternate/preferred name or gender pronoun. Please advise us of this preference early in the semester so we may make appropriate changes to our records.
- We will honour your religious holidays and celebrations. Please inform of us these at the start of the course.
- We will follow AccessAbility Services guidelines and protocols on how to best support students with different learning needs.

Intellectual Property

Students should be aware that this course contains the intellectual property of their instructor, TA, and/or the University of Waterloo. Intellectual property includes items such as:

- Lecture content, spoken and written (and any audio/video recording thereof);
- Lecture handouts, presentations, and other materials prepared for the course (e.g., PowerPoint slides);
- Questions or solution sets from various types of assessments (e.g., assignments, quizzes, tests, final exams); and
- Work protected by copyright (e.g., any work authored by the instructor or TA or used by the instructor or TA with permission of the copyright owner).

Course materials and the intellectual property contained therein, are used to enhance a student's educational experience. However, sharing this intellectual property without the intellectual property owner's permission is a violation of intellectual property rights. For this reason, it is necessary to ask the instructor, TA and/or the University of Waterloo for permission before uploading and sharing the intellectual property of others online (e.g., to an online repository).

Permission from an instructor, TA or the University is also necessary before sharing the intellectual property of others from completed courses with students taking the same/similar courses in subsequent terms/years. In many cases, instructors might be happy to allow distribution of certain materials. However, doing so without expressed permission is considered a violation of intellectual property rights.

Please alert the instructor if you become aware of intellectual property belonging to others (past or present) circulating, either through the student body or online. The intellectual property rights owner deserves to know (and may have already given their consent).

Generative AI

This course includes the independent development and practice of specific skills. Therefore, the use of Generative artificial intelligence (GenAI) trained using large language models (LLM) or other methods to produce text, images, music, or code, like Chat GPT, DALL-E, or GitHub CoPilot, is not permitted in this class. Unauthorized use in this course, such as running course materials through GenAI or using GenAI to complete a course assessment is considered a violation of Policy 71 (https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-71) (plagiarism or unauthorized aids or assistance). Work produced with the assistance of AI tools does not represent the author's original work and is

therefore in violation of the fundamental values of academic integrity including honesty, trust, respect, fairness, responsibility and courage (ICAI (https://academicintegrity.org/images/pdfs/20019_ICAI-Fundamental-Values_R12.pdf) , n.d.).

You should be prepared to show your work. To demonstrate your learning, you should keep your rough notes, including research notes, brainstorming, and drafting notes. You may be asked to submit these notes along with earlier drafts of their work, either through saved drafts or saved versions of a document. If the use of GenAI is suspected where not permitted, you may be asked to meet with your instructor or TA to provide explanations to support the submitted material as being your original work. Through this process, if you have not sufficiently supported your work, academic misconduct allegations may be brought to the Associate Dean.

In addition, you should be aware that the legal/copyright status of generative AI inputs and outputs is unclear. More information is available from the Copyright Advisory Committee: https://uwaterloo.ca/copyright-at-waterloo/teaching/generative-artificial-intelligence (https://uwaterloo.ca/copyright-at-waterloo/teaching/generative-artificial-intelligence)

Students are encouraged to reach out to campus supports if they need help with their coursework including:

- Student Success Office (https://uwaterloo.ca/student-success/resources) for help with skills like notetaking and time management
- Writing and Communication Centre (https://uwaterloo.ca/writing-and-communication-centre/services-0/services-undergraduate-students) for assignments with writing or presentations
- AccessAbility Services (https://uwaterloo.ca/accessability-services/students) for documented accommodations
- Library (https://uwaterloo.ca/library/research-supports/quick-start-guide) for research-based assignments

University Policy

Academic integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. [Check the Office of Academic Integrity (https://uwaterloo.ca/academic-integrity/) for more information.]

Grievance: A student who believes that a decision affecting some aspect of their university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70, Student Petitions and Grievances, Section 4 (https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-70) . When in doubt, please be certain to contact the department's administrative assistant who will provide further assistance.

Discipline: A student is expected to know what constitutes academic integrity to avoid committing an academic offence, and to take responsibility for their actions. [Check the Office of Academic Integrity (https://uwaterloo.ca/academic-integrity/) for more information.] A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate associate dean. For information on categories of offences and types of penalties, students should refer to Policy 71, Student Discipline (https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-71) . For typical penalties, check Guidelines for the Assessment of Penalties (https://uwaterloo.ca/secretariat/guidelines/guidelines-assessment-penalties) .

Appeals: A decision made or penalty imposed under Policy 70, Student Petitions and Grievances (https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-70) (other than a petition) or Policy 71, Student Discipline (https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-71) may be appealed if there is a ground. A student who believes they have a ground for an appeal should refer to Policy 72, Student Appeals (https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-72) .

Note for students with disabilities: AccessAbility Services (https://uwaterloo.ca/accessability-services/) , located in Needles Hall, Room 1401, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with AccessAbility Services at the beginning of each academic term.

Turnitin.com: Text matching software (Turnitin®) may be used to screen assignments in this course. Turnitin® is used to verify that all materials and sources in assignments are documented. Students' submissions are stored on a U.S. server,

therefore students must be given an alternative (e.g., scaffolded assignment or annotated bibliography), if they are concerned about their privacy and/or security. Students will be given due notice, in the first week of the term and/or at the time assignment details are provided, about arrangements and alternatives for the use of Turnitin in this course.

It is the responsibility of the student to notify the instructor if they, in the first week of term or at the time assignment details are provided, wish to submit alternate assignment.