

Course Code & Title: EECS2021 4.00 – Computer Organization

Term: Winter 2025–2026

Sections: M

Instructor: Dr. James Andrew Smith (*in collaboration with Dr. Hicham H. Hallal in Sections N & Z*)

Delivery Formats: In-person lectures & labs (web and mobile tools via course page)

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1. Course Description

Introduction to computer organization and instruction set architecture, covering assembly language, machine language and encoding, addressing modes, single-/multi-cycle datapaths (including functional units and controls), performance issues, pipelining, and memory hierarchy. If time permits, the course will conclude with a brief discussion on how computer organization is evolving through specialized technologies such as GPUs, TPUs, and NPUs.

1.1. Course Prerequisites:

- Cumulative GPA ≥ 4.50 in EECS major courses (without second digit "5")
- One of the following:
LE/EECS 1021 3.00, LE/EECS 1022 3.00, LE/EECS 1720 3.00, LE/EECS 1030 3.00

1.2. Course Cross-listed as:

Previously offered under the codes: LE/CSE 2021 4.00, SC/CSE 2021 4.00

2. Course Learning Outcomes

By the end of the course, students will be able to:

1. Translate high-level code into assembly language and machine code.
2. Represent data in machine-readable form and describe how it's stored in memory and manipulated by a CPU.
3. Describe the hardware design of a simple processor and test assembly code on it.
4. Evaluate computer performance and compare different architectures and designs.
5. Describe and critique CPU operation, pipelining, and memory hierarchy.

3. Course Logistics

3.1. Lecture & Instructor Schedule

Section	Days & Time	Location	Instructor	Contact email
M	M/W 14:30-15:50	VC 135	Dr. H. H. Hallal	hkhallal@yorku.ca
N	T/R 10:00-11:20	LAS B	Dr. H. H. Hallal	hkhallal@yorku.ca
Z	M/W 11:30-12:50	DB 0016	Dr. J. A. Smith	james.smith@lassonde.yorku.ca

All times are Eastern (Time zone: Toronto)

Section Z reserved for engineering students

First Lecture Dates

- Sections M, Z $\rightarrow$ Monday, Jan. 5
- Sections N $\rightarrow$ Tuesday, Jan. 6

3.2. Course Materials

Lecture notes, labs, and other resources will be made available on the *course's web page*. Additionally, online quizzes and subject matter tests (if applicable), as well as lab submissions, will be administered using the *course web page*. Students should actively check the *course web page* course site regularly for posted course slides and other content and should read announcements mailed to their registered email accounts to stay updated.

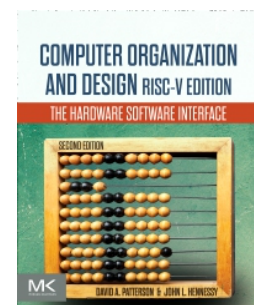
Required Course Textbooks and Learning Materials

- Patterson, David A., and John L. Hennessy. Computer Organization and Design RISC-V Edition: The Hardware Software Interface. Morgan Kaufmann, 1st Ed. April 27, 2017. ISBN: 978-0128122754
<https://www.elsevier.com/books-and-journals/book-companion/9780128122754>



This edition focuses on the more advanced 64-bit RISC-V architecture. The course lectures, tests, labs T1 and A-D, and the corresponding quizzes are based on this edition. The RISC-V Visual Simulator (RVS) used in the labs is also based on the 64-bit architecture.

- Patterson, David A., and John L. Hennessy. Computer Organization and Design RISC-V Edition: The Hardware Software Interface. Morgan Kaufmann, 2nd Ed. Dec 31, 2020. ISBN: 978-0-12-820331-6
<https://www.elsevier.com/books/computer-organization-and-design-risc-v-edition/patterson/978-0-12-820331-6>



This edition focuses on the 32-bit RISC-V architecture, which is more suitable for embedded systems and applies to labs T2 and K-N in this course. Those labs utilize 32-bit RISC-V circuit boards for hands-on experience and to keep the cost of the required hardware down.

- All lab materials and further details will be shared on the *course web page*.

3.3. Course Content Schedule (Tentative)

Chapter	Sections	Weekly schedule (tentative, so may change)
1	1.1 to 1.8, 1.11, 1.12; Binary Number Systems	1
2	2.1 to 2.14	2-4
3	3.1 to 3.5; 1.6 (Performance analysis)	5-6*
READING WEEK		
Appendix-A	Introduction to Digital Logic and Circuit Design	7; Review – Midterms; Midterm part A - Labtest (tentative);
4	4.1 to 4.11	8-10; Midterm part B – written test (tentative)
5	5.1 to 5.4	11-12 (Final exam review)
*For some of the terms, week 6 may be spread across the start and end of the reading week.		

3.4. Lab Schedule

Section	Lab	Day & Time	Location
M	01	T 10:00-12:50	LAS 1006
	02	R 13:00-15:50	LAS 1006
N	01	W 8:30-10:50	LAS 1006
	02	F 13:00-15:50	LAS 1006
Z	01	R 16:00-18:50	LAS 1006
	02	F 16:00-18:50	LAS 1006

3.5. Lab Materials, Submission and Demonstration:

Details for each lab will be posted approximately five days (or earlier) before they are due. Each lab will have a PDF that you are expected to have read prior to the lab. The lab will contain both the lab examples as well as lab exercises. **Only lab exercises must be submitted/demonstrated as scheduled.** TAs are available to help you. Of course, you are strongly encouraged to start attempting (or even complete) your lab exercises before the lab sessions. **Your work can be demonstrated to a TA before the lab session time ends. Note that to grade students fairly, TAs also ask questions based on the labs for the session to ensure that students know the material and are submitting their own work on the course web page.** For that, it is essential that you sign in to your officially enrolled lab and attend it in person. **The lab files must be submitted/demonstrated to course web page/TA not later than the time when your respective lab session ends.** Additional time for submission to course web page may be provided for self-accommodations in case of unexpected delays, communication problems, and/or other difficulties. **No further extensions or accommodations can be provided.** Besides solving the lab problems by giving a programming solution, students are also required to provide step-by-step documentation/demonstration for their work. **Also, note that part of your grade in each assembly lab is a mini quiz that is due 30 minutes after your lab session's start time.** That quiz is meant to test if you have read and understood the description of the lab tasks and whether you reviewed the relevant course topics.

Students repeating this course are expected to redo all lab exercises from scratch. Reusing work from a previous offering of the course (even if it is your own work) or any other source is a violation of the [Senate Policy on Academic Honesty](#). Please note that any communication related to labs and lab policies should be directed to the course TAs, not the instructor.

3.6. Obtaining an EECS Account to Access the EECS Lab Machine

You must obtain an EECS account if enrolled in the EECS course.

- Students who do not have an account will not be able to log in to the system and use EECS lab machines during the lab session and the lab test.
 - **Remember that you cannot log in if you do not have an EECS account.**
- Check the instructions below to obtain an EECS account if you do not have one yet.
 - If you are a student presently enrolled in an EECS course and do not have an EECS account, please create your account here: <https://webapp.eecs.yorku.ca/activ8>
 - **If you enter an invalid password five times, your account will be banned from the system for half an hour.** If you have forgotten your password, please use this link to reset your password: <https://webapp.eecs.yorku.ca/changePASS>
- Any problems or questions should be directed to the EECS Technical Support team - tech@eecs.yorku.ca.

4. Course Assessment Tools

Component	Weeks	Weight (%)	Notes
Labs A–D (programming + quiz)	Weeks 3–6	12% (3% each)	In-lab quiz in first 30 mins; no submission extensions
Labtest (Midterm A)	Week 6/7	16%	In-lab, supervised, no deferrals (see Section 6 for policy)
Labs K–N	Weeks 9–12	12% (3% each)	Similar format to early labs
Midterm B (Written Test)	Week 7/8	20%	Held during lecture time
Final Exam	Exam Period	40%	3-hour cumulative examination
Total		100%	All assessments are mandatory; no extra credit or curve

Course Weight Summary

- Labs + Labtest (Midterm A) = 40%
- Midterm B = 20%
- Final Exam = 40%

Overall, there are 8 labs, 1 written test (Midterm B), 1 lab test (Midterm A), 4 lab quizzes, and a final exam. **All the assessments are mandatory.** Skipping any of the assessments (i.e., coursework) will affect your final course grades. Check Section 6 of this document for detailed course policies.

4.1. Lab Grade Details

Lab	Grade
Lab A	(3%) (Programming exercises 2% + Quiz 1%)
Lab B	(3%) (Programming exercises 2% + Quiz 1%)
Lab C	(3%) (Programming exercises 2% + Quiz 1%)
Lab D	(3%) (Programming exercises 2% + Quiz 1%)
Midterm A	Labtest (16%) (Programming problems)
Lab K	(3%) (Programming exercises)
Lab L	(3%) (Programming exercises)
Lab M	(3%) (Programming exercises)
Lab N	(3%) (Programming exercises)

4.2. Lab Test, Written Test and the Final Exam are held in person.

Due to enrollment size and academic integrity, no exception will be made or accepted.

- For the programming lab test, students need to use an EECS lab machine to write their test during their official lab hours, as seen above.
 - ***Students with accommodation should contact the instructor at least one week before the lab test to arrange their accommodation during the lab test.***
- For the written test and the final exam, students with accommodation letters should arrange with the Office of Students Accessibility Services far in advance to conduct the exam in person on scheduled dates and times.

4.3. Grading Scheme

The grading scheme for the course conforms to the 9-point grading system used in undergraduate programs at York.

GRADE	GRADE POINT	PER CENT RANGE	DESCRIPTION
A+	9	90-100	Exceptional
A	8	80-89	Excellent
B+	7	75-79	Very Good
B	6	70-74	Good
C+	5	65-69	Competent
C	4	60-64	Fairly Competent
D+	3	55-59	Passing
D	2	50-54	Marginally Passing
E	1	45-49	Marginally Failing
F	0	(below 45%)	Failing

Assignments and tests will bear either a letter grade designation or a corresponding number grade (e.g. A+ = 90 to 100, A = 80 to 89, B+ = 75 to 79, etc.)

(For a full description of the York grading system, see the York University Undergraduate Calendar - <https://calendars.students.yorku.ca/2025-2026/grades-and-grading-schemes>)

5. Course Management & Workload Expectations

Weekly Student Commitment

- Estimated *12–16 hours per week* total for a 4-credit course
 - 3 hours of lectures (**attendance is mandatory**)
 - 10–12 hours self-study (lab prep, exercises, code)
 - Aim for **2 hrs programming + 1 hr problem solving** daily

Instruction & Lab Format

- Lectures apply a problem-based approach.
- Labs are in-person**, supervised by TAs; lab materials are posted a few days before the lab is to occur (or earlier)
- Students should complete the pre-lab reading before attending.
- Labs include programming and step-by-step documentation in Assembly.
- TAs may ask students questions to authenticate student work.

Academic Integrity Notice

- Students must produce independent work, especially for repeated offerings—reusing prior work violates the [Senate Policy on Academic Honesty](#).
- Network traffic, anti-cheat tools, and test versions are some of the tools used to uphold fairness.

6. Policies & Student Support

Email & Communication

- Use the course page to look for information before emailing instructors—emails should include: i) "EECS2021", "LAB01" or "LAB02", and the topic in the Subject, and ii) your full name, Passport York ID, EECS ID, and student number.
- Avoid email slang; professional tone required.
- Expect two to three day response times; may not respond during evenings/weekends or duplicate questions.

Course Web Page & Emailed Announcements

- Course materials, quizzes, and discussions are managed via the course web page.
- Check announcements via email regularly; failure to do so is not an excuse.

Academic Honesty

- Plagiarism, unauthorized collaboration, impersonation, and similar violations are strictly prohibited.
- Violations may result in grade adjustments or course failure even post-completion.

Accessibility & Accommodations

- York University offers SAS support for students with disabilities—register early for accommodations.
- Religious observance accommodations should be requested within the timeline set by Senate (<https://tinyurl.com/mw8rkx5v>) while also adhering to the details provided by the Registrar (<https://registrar.yorku.ca/enrol/dates/religious-accommodation-resource-2025-2026>). Depending on the assessment, Senate policy states that this generally requires between 14 and 21 days notice.
- Extended deferrals follow university guidelines and deadlines.

Health & Well-being

- Students may step away from class or labs as needed—well-being prioritized.
- If feeling unwell, leave quietly and seek health resources.

Mental Health Resources

- Good2Talk: 24/7 confidential support – Call 1-866-925-5454 or text **GOOD2TALKON** to 686868
- Keep.meSafe: Online mental health support at <https://www.keeptmesafe.org/>

Code of Conduct (Classroom & Online)

- Maintain respectful, courteous behavior in all interactions.
- Use this forum to pose/answer questions or comment on any topic related to this course. Before posting a new topic, search the forum (top right of the screen) to see if your topic has already been posted.
- **When adding a new topic, use a clear, informative subject line** (e.g., "Assignment 2: how to open a file", "Week1 lecture: Number Representation", instead of "Question").
- Be respectful. Do not post material that might be offensive or under copyright.
- Forum posts must remain on-topic and relevant. Insults, profanity, or quiz content solicitation, etc., may be removed.
 - **Do not post answers to labs, quizzes, tests or other assessments even after the lab or test is due!**
- Uphold copyright: materials are for educational use only; unauthorized distribution may result in failing the course. Do not share, distribute, upload any of the course content material. Do not input any of the course documents into any online large language model or artificial intelligence system.

Platforms & Privacy

- Some Zoom sessions may be hosted on U.S. servers—if privacy is a concern please discuss the issue with the instructor.
- The course page is hosted on a Canadian (York University) server and requires York University authentication. As such, interaction with it is considered secure and private.
- The course page uses authentication to serve documents to students. These documents contain student information in the form of IP addresses and username in watermarks embedded in the document. As long as the student does not release those documents then privacy will be maintained.

Assessment Policy Highlights:

- **Lab quizzes cannot be deferred, and there are no make-ups for lab quizzes**
- **There is no make-up for the lab test and the written test, with exceptions handled case-by-case at the course director's discretion**
- Deferred final exams follow departmental timelines (usually last two days of exam period). Deadlines for petitions apply.
- Individual grades are not negotiable (to be fair and consistent with regard to the entire class as well as all the other sections).
- Marks will not be "rounded" or "bell-curved".