SFWR ENG 2GA3
Computer Architecture
Jan 2026

INSTRUCTOR:
Dr. Ryan Leduc
Office: ITB/247, Ext. 27962, E-mail: leduc@mcmaster.ca
Web: http://www.cas.mcmaster.ca/~leduc/
Office Hours: Fridays 15:30-16:20.
Term: 2

LECTURES:

- Location: BSB B135.
- Time: Tuesday, Thursday, Friday: 14:30-15:20.

Note: Announcements will be posted to the course's Avenue to Learn page. It's your responsibility to check the page regularly.

MIDTERM: TBA.

TUTORIALS: Start of first tutorial is TBA. The start date will be announced in class and in A2L.

TEACHING ASSISTANTS: The TA names and contact information will be posted on the course's Avenue page.

CALENDAR DESCRIPTION:

Instruction-set architecture, computer arithmetic, datapath and control, pipelining, memory hierarchies, I/O systems, multiprocessor systems, measures of performance. Introduction to assembly programming.

GRADING SCHEME:

- Assignments 15%
- Midterm 35%
- Final Exam 50%

(All work on assignments is to be done individually.)

TEXT:

1. David A. Patterson, and John L. Hennessy, *Computer Organization and Design: The Hardware Software Interface: ARM Edition*, Morgan Kaufmann, 2016. Cost is $130.53 at Amazon.ca for paperback. Website shop.elsevier.com ebook copy for $52.49 USD (as of Jan 5, 2026).

Academic Dishonesty

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: Grade of F assigned for academic dishonesty), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy (https://secretariat.mcmaster.ca/app/uploads/Academic-Integrity-Policy-1-1.pdf), located at https://secretariat.mcmaster.ca/university-policies-procedures- guidelines/

The following illustrates only a few forms of academic dishonesty:

1. Plagiarism, e.g. the submission of work that is not ones own or for which other credit has been obtained.
2. Improper collaboration in group work.
3. Copying or using unauthorized aids in tests and examinations.
4. Giving a copy of old assignments, midterms, or solutions to other students.
5. Allowing another student to look at or copy your assignment.
6. Using assignment solutions from previous years, other courses, from the internet or the textbook solution manual.
7. Using midterm or exam solutions from previous years that are not given to you by the current instructor.
8. Discussing specifics of how to solve an assignment question with people other than the instructor or the TAs.

Authenticity/Plagiarism Detection

Some courses may use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, other software, etc.). For more details about McMasters use of Turnitin.com please go to www.mcmaster.ca/academicintegrity.

Courses With an On-line Element

Some courses may use on-line elements (e.g. e-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

Online Proctoring

Some courses may use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

Conduct Expectations

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the Code of Student Rights & Responsibilities (the Code: https://secretariat.mcmaster.ca/app/uploads/Code-of-Student-Rights-and-Responsibilities.pdf). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, whether in person or online.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students access to these platforms.

Academic Accommodation of Students With Disabilities

Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS: https://sas.mcmaster.ca/) at 905-525-9140 ext. 28652 or sas@mcmaster.ca to make arrangements with a Program Coordinator. For further information, consult McMaster Universitys Academic Accommodation of Students with Disabilities policy (https://secretariat.mcmaster.ca/app/uploads/Academic-Accommodations-Policy.pdf).

Requests for Relief For Missed Academic Term Work

McMaster Student Absence Form (MSAF): In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar Requests for Relief for Missed Academic Term Work.

Academic Accommodation for Religious, Indigenous or Spiritual Obersvances (RISO)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy (https://secretariat.mcmaster.ca/app/uploads/2019/02/Academic-Accommodation-for-Religious-Indigenous-and-Spiritual-Observances-Policy-on.pdf). Students should submit their request to their Faculty Office normally within 10 working days of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

Copyright and Recording

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, including lectures by University instructors.

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

Extreme Circumstances

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.

Learning Objectives

Precondition: Students are expected to have achieved the following learning objectives before taking this course:

1. Students should know and understand
    - the basic idea of imperative programming
    - the basic data types and their corresponding literals, and operations on the data types, the notion of data encoding
    - the notion of variable and storage, notion of the main memory
    - expressions, assignments, control statements including loops
    - the notion of flow of control
    - functions/methods, local/global variables, function/method call, parameters/arguments
2. Students should be able to
    - solve simple algorithmic problems
    - design and implement programs in the programming language of COMP SCI 1MD3 / ENG 1D04
    - debug and test their own programs; execute programs and manipulate their output for testing purposes
    - read and understand simple programs designed and implemented by other people
    - provide reasonable documentation embedded in the source program in the form of comments

Postcondition: Students are expected to achieve the following learning objectives at the end of this course:

1. Students should know and understand
    - representation of numeric data: signed and unsigned arithmetic, floating-point arithmetic
    - instruction set architecture (ISA): functionality and use of resources (registers and memory) of a machine-level instruction
    - the instruction classes for data movement, arithmetic/logical operations, and flow control
    - processor and system performance
    - performance enhancement through instruction pipelining
    - memory hierarchies, caches, and virtual memory
    - I/O fundamentals
    - basic assembly programming

2. Students should be able to

   - identify the trade-offs in designing an ISA
   - represent numeric data in finite bit-length
   - measure the performance of components in a CPU system
   - use and modify the design of an ISA
   - read and modify a pipelined implementation of an ISA
   - make design decisions for memory organization
   - be able to write basic assembly programs including array access and function calls