Course Outline
Introduction to Computer Systems   COMP 273   (Winter 2020)

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Course Web Page: `mycourses2.mcgill.ca`
Course Times: (001): M/W: 14:35 - 15:55, Stuart Biology S1/4
Course Times: (002): M/W: 08:35 - 09:55, Stuart Biology N2/2

Instructor Office Hours: As posted under "announcements", on a weekly basis.

Teaching Assistants and Office Hours: As posted under "content".

Introduction

This course provides a bottom up view of how a computer works. It begins with an overview of digital logic, and then builds up the main architectural and system elements of a typical modern computer. We use a specific RISC computer architecture and assembly language, MIPS, to illustrate the main concepts.

List of Topics (subject to minor alterations)

1. Digital Logic   (5 lectures)

   - Number representations
     - binary, twos complement, floating point, hexadecimal
   - Combinational logic
     - truth tables, gates, adders, encoders, decoders, multiplexors, ROM
   - Sequential logic
     - latches, flop flops, registers, integer multiplication and division.

2. MIPS assembly language   (8 lectures)

   - arithmetic and memory
   - decisions
   - logical operations
   - instruction representation
   - floating point operations
   - procedures
   - linking

3. MIPS CPU architecture (3 lectures)

   - datapath and control
   - fetch-execute
   - exceptions and the kernel

4. Memory   (3 lectures)

   - RAM
   - virtual memory
   - cache

5. I/O   (2 lectures)

   - interrupts and exceptions
   - memory mapped I/0, direct memory access

6. Finite State Machines   (3 lectures)

   - flip-flops and next state equations
   - Moore and Mealy Machines with Design Examples

Lecture Notes and Lecture Recordings

All material covered in the lectures will be made available in electronic form on the mycourses web page. Programming examples will also be added, when we cover them. The lectures will not, in general, be recorded. There will be plenty of office hours between the several TAs and the instructors. Students are highly encouraged to attend office hours to review work on assignments, or to discuss course material. There are two sections of the course, but these will be merged on a single mycourses page.

Reference Textbooks

There is no required textbook for the course, but the Patterson and Hennesey text is recommended. If you wish to do further background reading the text is also available on *two hour reserve in the Schulich Library*. Call Numbers can be found from the McGill libraries website (see MUSE, Course Reserves). Either editions 4 or 5 would be fine.

For further details on MIPS, see:

- "Computer organization and design: the hardware/software interface" by David A. Patterson and John L. Hennesey.

- "See MIPS run", by D. Sweetman

Co-requisites

- COMP 250 *Introduction to Computer Science* (unofficial, but strongly recommended)

- COMP 206 *Introduction to Software Systems* (official)

If you have not taken 206 or you are not taking it currently, then you should not take COMP 273. The only exception would be if you have some prior experience with C or C++ programming.

Evaluation

In the event of extraordinary circumstances beyond the Universitys control, the evaluation scheme in a Course is subject to change, provided that there be timely communications to the students regarding the change.

- 25 % Assignments: There will be 4 assignments in total. The second two assignments will require more work than the first two, and therefore will carry more weight. The material in this class builds up quickly. (A1: 5%, A2: 5%, A3: 7.5%, A4: 7.5%).

- 15 % Mandatory mid-term to be held on Wednesday Feb 19th, 6:00pm to 8:00pm. There will be no class on that day.

- 60 % Final exam (during the final examination period in April). It will cover the whole course.

In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or in French any written work that is to be graded.

Policy on collaboration

You may discuss the assignment problems with one another, but this discussion must not go so far that you are revealing the solutions to each other, or sharing code. Try to follow a simple guideline: any discussion you have about an assignment should be *open*, in the sense that you would be 100% comfortable if anyone else including the instructor were listening in. Be aware that we will be using Moss, a system for detecting software similarity (`https://theory.stanford.edu/~aiken/moss/`) for assignments involving MIPs programs. Moss is able to look at code structure, while ignoring comments, changes to variable names and re-ordering of lines. It provides comprehensive HTML pages listing pairs of programs with similar code. Moss also highlights individual passages in programs that appear the same, making it easy to quickly compare files. All cases of suspected code copying will be reported to an appropriate disciplinary officer.

McGill policy on academic integrity

McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offenses under the Code of Student Conduct and Disciplinary Procedures. See `http://www.mcgill.ca/students/srr/honest/` *and See* `http://www.mcgill.ca/integrity` *for more information*

Diversity and Inclusion

COMP 273 is meant to be an introductory course to a fundamental area in CS, which is the interface between hardware and software. Our goal is to make this content equally accessible to students of all backgrounds. We shall work to pro-actively acknowledge and address any bias that may occur during the term. Equal treatment of students from every gender, race and orientation is a top priority. We openly welcome suggestions on how to improve inclusion, by contacting the TAs or the instructors, either with your name or anonymously. Please feel free to meet us in person to discuss any particular challenges you are facing. Those facing unforeseen challenges such as issues related to physical, mental or emotional health, are encouraged to register with OSD, to receive special consideration when taking examinations, and tolerance at other times.

MyCourses Discussion Board

The instructors and the TAs will moderate the discussion board. Please obey the following rules. Postings that do not conform will be deleted.

- Be clear: Make sure that what you have written makes sense. Be polite.

- If you would like your posting to be deleted, just add a request within the thread. No problem.

- Choose a suitable subject line.

- If you have multiple questions that are unrelated, then use multiple threads.

- Use the search feature to see if your question has been asked before.

- Do not email us with a technical question about the course material. Instead, post the question on the discussion board so that everyone can benefit from the correspondence. Also, this way the TAs can respond quickly as well.

- Keep clutter down. e.g. "Thank you" notes should be sent privately.

Miscellaneous Policies

Final grade: There are many factors that determine your grades including how hard you work, how talented you are in this area, how much time you have available because of other commitments, what your academic background is, what your health situation or family situation is, etc. However, in fairness to all the students when we assign your final course grade, we will not take these other factors into account. We will assign the final grade only based on your assignment and exam scores.

Additional Work: Students with grades of D, F or J will *not* be given the opportunity to complete additional work to upgrade their grade.

Supplemental Exam: One will be offered and it will cover the same material as the Final Exam and your mark on it will replace the Final Exam grade. In other words, its is a 60% supplemental. Your assignment and midterm marks will still count. For information on Supplemental Exams, see `http://www.mcgill.ca/exams/dates/supdefer`.