

COMP3350B, Winter 2023

Computer Organization

Syllabus

Course Information

Overview

The course is designed to give students an appreciation of hardware, its design, its implementation, and the impact of all of this on how software runs on the hardware. We will look at the general topics:

- Hardware Abstractions
- Qualitative Measures and Performance Metrics
- Memory Hierarchies and Organization
- Logical Circuits
- Instruction Set Architectures (MIPS)
- CPU data path and Pipelining
- Multi-core architectures, parallelism

Calendar Description

Topics include: semiconductor technologies, gates and circuits, buses, semiconductor memories, peripheral interfaces, I/O techniques, A/D conversion, standards, RISC.

Prerequisite Requirements

COMP 2208, COMP 2210, COMP 2211, and either COMP 2209 or COMP 2101

Antirequisite: ECE 3375

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

Teaching Staff + Office Hours

Alex Brandt

abrandt5@uwo.ca

MC 369, Mondays 14:30 - 15:30

Teaching Assistants

TBA

Class Schedule

Mondays, 10:30 - 12:30, MC 110

Wednesdays, 10:30 - 11:30, SSC 2050

Special Dates

Classes begin: January 9

Reading Week: February 18–26, inclusive

Classes end: April 10

In the event of a COVID-19 resurgence which requires moving away from in-class teaching, lectures will proceed synchronously via Zoom. Details to be announced, if required. The grading scheme will not change. Any remaining assessments will also be conducted online.

Course Materials

Students are required to have access to a computer with reliable internet connection. For proctoring, this includes also having a working microphone and webcam.

All course materials will be posted to OWL: <http://owl.uwo.ca>. This includes course notes, supplementary materials, and recorded lectures (if online).

Students should check OWL (<http://owl.uwo.ca>) on a regular basis for news, announcements, and forum posts. This is the primary method by which information will be disseminated to all students in the class. Students are responsible for checking OWL on a regular basis.

There is no required textbook for this course. However, a suggested reading material is *Computer Architecture: A Quantitative Approach*, by Hennessy and Patterson. Another fine textbook is *Computer Organization and Design*, by Patterson and Hennessy. At least 4th edition of each.

If students need assistance, they can seek support on the [OWL Help page](#). Alternatively, they can contact the Western Technology Services Helpdesk at 519-661-3800.

Forums and Email Contact

Students should post all questions about course content on the OWL site's forums. This includes any question about lectures, assignments, or quizzes. Please check existing questions and answers on the forums first before submitting a new question. Emails (from your uwo.ca account) should be used only for personal and private matters only. If your forum question goes unanswered for a day or two, a friendly email reminder to the TAs or the instructor is okay.

Include “CS3350” in your email subject. Otherwise, you may not receive a reply to your email.

Course Topics + Schedule

- Introductions, Hardware Abstractions (0.5 week)
- CPU and Memory (3 weeks)
 - CPU performance metrics
 - Memory hierarchy
 - Cache memories
 - Impact of cache on CPU performance
- Stateless Circuits (1 week)
 - Simple gates, switches, truth tables
 - Functional completeness
 - Boolean algebra, simplification, canonical forms
 - Combinational logic blocks: multiplexer, ALU, n-bit arithmetic
- Synchronous Circuits/State Circuits (1 weeks)
 - Clocks, signals, and waveforms
 - Flip-flops: D, T, SR, JK; Registers
 - Finite state machines
- CPU datapath, Instruction Set Architecture (2 weeks)
 - Typical 5-stage datapath
 - Single cycle vs Multi-cycle
 - MIPS
- Instruction-level Parallelism (3 weeks)
 - Single-cycle vs Multi-cycle
 - Pipelining
 - Performance metrics
 - Multi-issue processors: VLIW, superscalar
 - Hazards: data, control, structural
- Multi-core Processors (2 weeks)
 - Parallelism for performance
 - Cache coherency, MESI protocol
 - Thread-level parallelism and synchronization
 - Modern parallel architectures, GPU architectures

Evaluation and Tentative Schedule

Assignments		40%
	February 2	10%
	February 16	10%
	March 16	10%
	April 5	10%
In-Class Quizzes		24%
	February 1	6%
	February 15	6%
	March 15	6%
	March 29	6%
Final Exam	TBD	36%

Assignment Regulations

- Assignments are due at 23:55 on the due date. Late assignments will be handled as follows.
0-24 hours late: you make the instructor sad,
24-48 hours late: -20%,
48-72 hours late: -50%,
>72 hours late: submissions are no longer accepted, you will receive 0.
- Assignments will be released at least two weeks before the due date. Extensions may be made on due dates depending on progression through course material.
- Assignments are to be submitted on *Gradescope*. Details available on the OWL site. They should be typeset or **legible, scanned** copies of hand-written work. If the TA cannot read your handwriting, it will be marked as incorrect.
- Plagiarism is unacceptable. It is reasonable to assume that students discuss assignments and possible solutions, however all assignments shall be independent.
- Any concerns with assignment marking must be addressed *within one week* of the assessment being returned. No adjustments will be made after this time. Concerns about quizzes may be addressed to the instructor. Concerns about the assignment should be made through gradescope using the regrade request feature.

Quiz and Exam Regulations

- Plagiarism is unacceptable.
- Quizzes and exams are closed book. Any required information, numerical constants, formulas, etc. will be given in the quiz/exam/question.
- No electronic devices other than a simple scientific calculator may be in the possession of students during quizzes and the Final Exam.
- Any concerns with quiz marking must be addressed *within one week* of the assessment being returned. No adjustments will be made after this time. Concerns about quizzes will be addressed to the instructor.

- If you miss one quiz, the weight will be re-assigned to the other three quizzes. Contact the instructor to confirm your absence is recorded.
- If you miss more than one quiz, you must receive academic accommodation from the Academic Counselling office of your Faculty of Registration. Handling of the missed quizzes will be on a case by case basis.
- The Final exam will be scheduled by the office of the registrar at a later date.
- If you miss the Final Exam, please contact the Academic Counselling office of your Faculty of Registration as soon as you are able to do so. They will assess your eligibility to write the Special Examination (the name given by the University to a makeup Final Exam). You may also be eligible to write the Special Exam if you are in a “Multiple Exam Situation” (e.g., more than 2 exams in 23-hour period, more than 3 exams in a 47-hour period).

Policies, Accommodation, Accessibility

Physical Health

Students should also note that individual instructors are not permitted to receive documentation directly from a student, whether in support of an application for consideration on medical grounds, or for other reasons. All documentation required for absences must be submitted to the Academic Counselling office of a student’s Home Faculty

For the policy on Accommodation for Medical Illness - Undergraduate Students, see: https://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf and for the Student Medical Certificate (SMC), see: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf

Mental Health

Mental and emotional well-being is highly important and should not be treated lightly. Students who are in emotional/mental distress should refer to Health and Wellness at Western for a complete list of options about how to obtain help. Students in immediate distress should contact Student Health Services, Campus Police, or Psychological Services whose contact information can be found here.

Religious Accommodation

Students should consult the University’s list of recognized religious holidays, and should give reasonable notice in writing, prior to the holiday, to the Instructor and an Academic Counsellor if their course requirements will be affected by a religious observance. Additional information is given in the Western Multicultural Calendar: <https://multiculturalcalendar.com/ecal/index.php?s=c-univwo>

Accessibility

Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Student Accessibility Services via their website or at (519)-661-2147 if you have any questions regarding accommodations.

Ethical Conduct

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at this web site.

All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com Computer-marked multiple-choice tests and/or exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

Student Support

Western University is committed to a thriving campus as we deliver our courses in the mixed model of both virtual and face-to-face formats. We encourage you to check out the [Digital Student Experience](#) website to manage your academics and well-being.

Learning-skills counsellors at the [Student Development Centre](#) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exams, textbook reading, and more. Support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round via individual counselling.

Other services are also provided by the University Students' Council

Registration Services

Students should refer to the Registrar's website for registration information and services.