# Western University, Faculty of Science
# Department of Computer Science

## COMPSCI 3350A, FALL 2024
## Computer Organization
## Syllabus

# Course Information

## Overview

The course is designed to give students an understanding of hardware, its design, its implementation, and the impact 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, and RISC.

## Prerequisite Requirements
COMPSCI 2208A/B, COMPSCI 2210A/B, COMPSCI 2211A/B, and either COMPSCI 2209A/B or COMPSCI 2101A/B
**Antirequisite:** ECE 3375A/B

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 if you are dropped from a course for failing to have the necessary prerequisites.

## Teaching Staff + Office Hours
Iqra Batool

**Office Hours:** Monday: 11:30-1:30 in person and zoom as well (All zoom links will be added on owl)

## Teaching Assistants

| Name | Email |
|---|---|
| Wei Wang | wwang828@uwo.ca |
| Darwin Liao | dliao7@uwo.ca |
| Haoze Yuan | hyuan46@uwo.ca |

## Class Schedule

| Wednesday | 9:30-11:30 am |
|-----------|---------------|
| Friday    | 9:30-10:30 am |

## Special Dates

Sept. 5          Classes begin

Sept. 13         Last day to add a full-course or a first-term half course or drop a course
                 without showing WDN

Sept. 30         National Day for Truth and Reconciliation (observed at
Western).         No classes. Oct. 12-20  Fall Reading Week (including
Thanksgiving, Oct. 14)

Dec. 2           Last day to withdraw from a first-term half course or full-year course
                 without academic penalty *(extended from Sat. Nov. 30)*

Dec. 6           Last Day of classes of
the Fall term Dec. 7-8   Study Days

Dec. 9-22        December examination period

See https://www.westerncalendar.uwo.ca/SessionalDates.cfm for a **complete** list of sessional dates.

## Course Materials

  Students are required to have access to a computer with a reliable internet connection.
 All course material will be posted to OWL: https://westernu.brightspace.com/

Students are responsible for checking the course OWL site (https://westernu.brightspace.com/) regularly for news and updates. This is the primary method by which information will be disseminated to all students in the class.

There is no required textbook for this course. However, the suggested reading material is <mark>Computer Architecture: A Quantitative Approach by Hennessy and Patterson</mark>. Another fine textbook is <mark>Computer Organization and Design by Patterson and Hennessy</mark>—at least the 4th edition of each.

If students need assistance with the course OWL site, they can seek support on the [OWL Brightspace Help](#) page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

## Forums and Email Contact

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

<mark>Don't forget to Include "CS3350" in your email subject</mark>. Otherwise, you may not receive a reply to your email.

## Course Topics + Schedule

- Introductions, Hardware Abstractions (0.5 weeks)
- **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 week)**
  - Clocks, signals, and waveforms
  - Flip-flops: D, T, SR, JK; Registers
  - Finite state machines
- **CPU data path, Instruction Set Architecture (2 weeks)**
  - Typical 5-stage data path
  - 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 synchronisation
  - Modern parallel architectures, GPU architectures

# Evaluation and Tentative Schedule

| Assignments | Schedule (Open and close date) | Percentage |
|---|---|---|
| | September 20- 5 October | 50% |
| | October 10- October 25 | |
| | November 1- November 15 | |
| | November 17- December 2 | |
| **Quizzes** | **Schedule** | **Percentage** |
| | 1$^{st}$ Quiz, October 23,2024 | 7.5% |
| | 2$^{nd}$ Quiz,   November 20, 2024 | 7.5% |
| **Final Exam** | TBD | 35% |

## 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 grade.

- Assignments will be released at least two weeks before the due date. Extensions may be made on due dates depending on progression through the course material.
- All Assignments carry equal weights (each assignment marks are **12.5**)
- Assignments are to be submitted on Owl. Details are available on the OWL site. Assignments 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 and assignments may be addressed to the instructor or Tas through email.

## Quiz and Exam Regulations
- Plagiarism is unacceptable.
- Quizzes will be available on OWL, opening at 12:00am and closing at 11:55pm (24 hrs). Each quiz will be 15 minutes in length and will be in a multiple-choice format.
- 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.

- If you missed the first quiz please let the instructor know for within 2 weeks to arrange makeup quiz.
- 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 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 office of the registrar will schedule the Final exam later.
- If you miss the Final Exam, please get in touch with the Academic Counselling office of your Faculty of Registration as soon as possible. They will assess your writing eligibility and the Special Examination (the name the University gives 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 two exams in 23 hours, more than three exams in 47 hours).

**General information about missed coursework**
Students must familiarize themselves with the University Policy on Academic Consideration – Undergraduate Students in First Entry Programs posted on the Academic Calendar:
https://www.uwo.ca/univsec/pdf/academic_policies/appeals/academic_consideration_Sep24.pdf

This policy does not apply to requests for Academic Consideration submitted for attempted or completed work, whether online or in person.

The policy also does not apply to students experiencing longer-term impacts on their academic responsibilities. These students should consult Accessible Education.

For procedures on how to submit Academic Consideration requests, please see the information posted on the Office of the Registrar's webpage:
https://registrar.uwo.ca/academics/academic_considerations/
All requests for Academic Consideration must be made within 48 hours after the assessment date or submission deadline.

All Academic Consideration requests must include supporting documentation; however, recognizing that formal documentation may not be available in some extenuating circumstances, the policy allows students to make one Academic Consideration request without supporting documentation in this course.
**Coursework with Assessment Flexibility**
- There are two quizzes and please read the "quiz and exam regulation" mention in above section.  You have 24 hours for the quiz but once you will start your quiz after 15 minutes it will automatically submit. So, you have 15 minutes to submit a quiz
- There is total four assignments please read the section "Assignment Regulations" carefully to avoid any kind of penalties
- During exam any kind of electronic devices such as mobile phone, smart watch, calculators are not allowed during exam


# Mental Health
Mental and emotional well-being is paramount 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
https://www.uwo.ca/health/crisis.html.

## Religious Accommodation

Students should consult the university's list of recognized religious holidays and give reasonable notice in writing to the instructor and an academic counsellor before the holiday if their course requirements are affected by a religious observance. Western's Diversity Calendar for religious accommodation - https://www.edi.uwo.ca/resources/ (look under Inclusive Campus Resources)

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 any other arrangements to make this course more accessible to you. You may also wish to contact Student Accessibility Services (http://www.sdc.uwo.ca/ssd/ )via their website or at (519)-661-2147 if you have any questions regarding accommodation.

# Ethical Conduct

Academic offences are taken seriously, and students are directed to read the appropriate policy on this website, specifically, the definition of a Scholastic Offence. 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 to detect plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement 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 ( http://www.sdc.uwo.ca/ )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. The University Students' Council also provides other services.

## Registration Services

Students should refer to the Registrar's website for registration information and services. The website for Registrar Services is https://www.registrar.uwo.ca/.

**Scholastic offences** are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf