COSC 211 – Machine Architecture
Winter 2022 – Term 2

Instructor Dr. Abdallah Mohamed
abdallah.mohamed@ubc.ca (must include course code COSC211 and your student ID in email)

Office hours
Mon 11:00AM-12:00PM, Wed 11:00AM-11:30AM In-person, SCI-108
Thu 02:30PM-03:20PM Online, Zoom
OR by appointment

Lectures Tue/Thu 03:30 PM-05:00 PM Zoom: 756 276 1523 (password given on Canvas)

Labs

L01	Fri	08:00 AM-10:00 AM	SCI 234	TA: Khuntia,Meghana
L02	Tue	08:00 AM-10:00 AM	ASC 165	TA: Abrahamyan,Davit
L03	Fri	12:00 PM-02:00 PM	EME 2205	TA:
L04	Wed	12:00 PM-02:00 PM	ASC 165	TA: Pinno,Elias
L05	Mon	04:00 PM-06:00 PM	SCI 234	TA:
L06	Wed	04:00 PM-06:00 PM	SCI 234	TA: Khuntia,Meghana
L07	Wed	02:00 PM-04:00 PM	SCI 234	TA: Acic,Andela
L08	Fri	02:00 PM-04:00 PM	ASC 165	TA: Acic,Andela

Course Description

Academic Calendar Entry: Organization and design of computer systems and their impact on the practice of software development. Instruction set architecture and assembly programming languages, design of central processing units (CPU), memory hierarchy and cache organization, input and output programming. [3-2-0]

More details: This course introduces students to the organization and design of computer systems. The focus is on how the different components of a modern computer system work together and how the design of these components affects the performance of computer programs. The discussion is based on the MIPS architecture, using the MARS simulator as the environment for assembly language programming. Assembly languages are commonly used in the development of Real Time Systems and in the extreme optimization of algorithms. The underlying concept of learning an assembly language is to use it as a perfect tool to help grasp how a computer works. Topics include computer systems and computer organization, number systems and arithmetic, MIPS instruction set architecture and memory addressing modes, MIPS assembly language programming and the implementation of subroutines, digital logic and processor design, performance and pipeline basics, memory hierarchy and cache organization, and input/output programming.

Prerequisites: **COSC 121**.
Students who lack the prerequisites should not be registered for this course and will receive a failing grade if they remain in it. Any exceptions must be brought to the attention of the instructor immediately.

Course URL: https://canvas.ubc.ca
https://people.ok.ubc.ca/abdalmoh/teaching/211

Assessment

- Lecture Quizzes 10 % (clickers + canvas, full mark if you get 80% or more)
- Lab Assignments 20 %
- Exams
  - Two Quizzes 10 % (25 minutes each, **as Canvas Quizzes during scheduled lecture time**)
  - Midterm Exam 20 % (75 minutes, **as Canvas Quiz during scheduled lecture time**)
  - Final Exam 40 % (cumulative, **IN-PERSON**, on paper)

Passing criteria: to pass the course, a student must receive: (1) an overall course grade of at least 50%, and (2) at least 50% on weighted sum of all exams (2 quizzes, midterm and final). Failure to do so will result in a 45% grade, or the resulting grade, whichever is the lower. Students will not be able to receive a passing grade if they are not registered to the required lab section.

Final Grade: Final grades will be based on the evaluations listed above, and the final grade will be assigned according to the standardized grading system outlined in the UBC Okanagan Calendar.

Grievances and Complaints: A student who has a complaint related to this course should follow this procedure: The student should attempt to resolve the matter with the instructor first. Students may talk first to someone other than the instructor if they do not feel, for whatever reason, that they can directly approach the instructor. If the complaint is not resolved to the student's satisfaction, the student should e-mail the Associate Head of Subject Dr. Yves Lucet at yves.lucet@ubc.ca or the Department Head Dr. John Braun at cmps.depthead@ubc.ca

Course Format

This course uses Hybrid mode that is a mix of online and in-person teaching:

- **Online:** two weekly lectures, two quizzes, one midterm
- **In-person:** weekly labs, final exam.

Lectures

We will use a partially flipped teaching mode. There are two lectures every week, **both are given on Zoom**:

1) Regular lecture:

- New material is taught and discussed.

2) Flipped lecture:

- Based on a pre-recorded video that you should watch before the lecture time.
- We will use the scheduled lecture time to go over the practice questions and do exercises related to the lecture, discuss issues related to the lecture, and answer questions or doubts related to the recording. I will not repeat the lecture during this time.

Lecture Quizzes

We will have MCQ questions in almost every lecture (regular or flipped):

- **Regular lectures**:
  - MCQs displayed **during lecture;** can only be answered using **iClickers; counted** towards your grade.
  - You may discuss questions with your classmates, but each one must submit a solution.
  - **Create an iClicker Cloud account**: https://lthub.ubc.ca/guides/iclicker-cloud-student-guide. You **must link your iClicker account to Canvas**. You can submit your responses using web interface (must sign-in to your iClicker account) or phone app (search for iClicker Reef on play/app store).
- **Flipped lectures**:
  - Embedded questions in the videos; these questions do ***not*** count towards your grade.
  - Same questions will be posted as Canvas quizzes that **will be counted** towards your grade. You must finish these quizzes **before posted deadline**.

Labs

- Offered in-person as indicated on page 1 of this syllabus.
- Each student **must be registered in one lab** for their assignments to be accepted.

Exams

- **Platform and Invigilation:**
  - **Midterm Exams**: Offered online as **Canvas Quizzes** that are available only during the exam time. Invigilated using Zoom. Your **webcam** must be turned on all the time. Several invigilators will be available. Session will be recorded
  - **Final Exam**: **in-person, written on paper**. Invigilated in-person.
- **Format:** All examinations are **closed-book**, so you are NOT permitted to access any of the course materials, including your notes, during the exam. You are NOT to use any search engines or other programs except for the program required to complete the exam. You are also NOT to communicate with anyone about the exam during the scheduled write time or after the examination – you are to work independently. Communication with other students (written, text, verbal, etc.) is not permitted and will constitute Academic Misconduct.
- **Cheat-sheet:** The only exception to the above is that I may allow a cheat-sheet during the exam (more details are given before the exam).
- **Technical issues during midterms:** For all midterms, it is the responsibility of the student to ensure that any technical issues are reported to the instructor immediately. If you cannot connect with the instructor, please document the issue or technical concern via a screenshot. This is the only circumstance in which it is appropriate to document (i.e., screenshot) exam material. Failing to report technical issues in a timely manner, may result in the issue not being resolved and may negatively impact your grade.

Expectations

It is my best day when all my students pass the course, receive good grades, and feel the course was useful. For that to happen, help me by putting enough effort for the course. I expect that you will attend all classes and participate in class discussions, read the lecture notes before the lecture, attend all labs, finish all your assignments on time, and practice on the course materials. I also expect that you will spend (in average) at least 7 hours per week in out-of-class relevant activities (homework, preparation, practicing).

Required Equipment

- ***Midterms*:** all students must have access to **computers** with **reliable internet** + **microphone** + **webcam**. You must also have access to a **quiet room** with no one around you during the exams.
- ***Lectures***: students are required to have a computer and a stable Internet connection. Students are encouraged to check out this link: https://keeplearning.ubc.ca/setting-up.
- ***Class exercises*:** all students are expected to have an **iClicker Cloud** account (instructions here).

Missed Graded Work

Missed exams**:** If a student misses an exam without acceptable excuse according the UBC Okanagan's policy on excused absences from examinations, the mark received will be zero. If an acceptable excuse is provided to the instructor, then for:

- **Midterm exams**, the grade will be combined with the marks of the final exam so that the exams are still worth **70 %** of the total grade.
- **Final exam**, the student may take a make-up final exam with the permission of the Dean's office. Note that a make-up exam may have a question format different from the regular exam.

Late assignments**:** Except for extreme situations (e.g., illness, childbirth, or bereavement supported by a written proof such as a doctor's note), the following policy is applied to late assignments:

- **0 to 24 hours late**: 25% mark deduction (e.g., if an assignment is worth 20 marks, then 5 marks will be deducted regardless of the mark you get in the assignment; no negative marks will be given).
- **24 to 48 hours late**: 50% mark deduction
- **More than 48 hours**: no mark.

Missed clicker questions**:** no answers will be accepted except those provided during the lecture time using your own clicker device (remember that you get full mark for answering at least 80% of the questions).

One-time Extension Policy

- Everyone can get a one-time extension for **3 days** for any assignment of their choice. Use this extension wisely as I will give no additional extensions unless in very very extreme situations (e.g. admission to hospital, death in family). If you used this extension then asked for another one due to having too many exams/assignments, travelling, etc. you will not get a second extension.
- This policy applies to all assignments **EXCEPT** the last assignment.
- **You do not have to ask for permission to use the 3-day extension**. Just inform your TA directly (no need to email the professor, but you must inform your TA)

Textbook and Reference Materials

- Course website and discussion forum on Canvas
- Lecture Notes (available electronically).
- Text book: D. Patterson and J. Hennessy, "Computer Organization and Design: the hardware/software interface (5th Ed.)", ISBN: 0124077269
    - If you wish, you can order a physical copy online, e.g., from publisher's website, Amazon, etc.
    - EBook format can be obtained through VitalSource. https://www.vitalsource.com

Course Discussion Forum

The course discussion forum is used for exchanging ideas, asking questions, and receiving answers related to the course from other students. If you don't understand something, you may ask on the forum so that everyone can benefit from the answer. If you are not clear about an answer that was given, don't create a new thread. Just add a reply to the original thread asking for clarification. In all cases, respectful and academic atmosphere must be maintained. You should not post private information on the discussion forum. You must not share answers to assignments with anyone, on the forum or anywhere else.

Important Dates

http://www.calendar.ubc.ca/okanagan

Course Schedule (*Tentative*):

The course schedule contains the most up-to-date information and important dates for main events such as assignments due dates and tests. These dates and topics are subject to change. Any change will be announced to students. "Wk" in the table header below refers to the week number, and "L" to lecture number. All assignments and lab work should be done on **individual** basis (no group work). Due dates are usually **1 or 2weeks from YOUR LAB day. All due dates are at 11:59 pm**. The due dates are written in the form: "**due in W_n**". For example, **A1 is "due in W4"** means that A1 is due in Week 4.

Wk	Day	Topics	Regular	Flipped	Readings based on 5th Edition	Labs
1	Tue 10/1	**L1:** Course Overview Intro to machine architecture, intro to C	x		1.1, 1.2, 1.4	No labs during first two weeks
	Thu 12/1	**L2:** Number systems, singed numbers		x	2.4 pp. 81-82, 106, 107	
2	Tue 17/1	**L3:** Binary system: signed numbers (part2), Math/Logic ops, Encoding characters	x		2.4 pp. 81-82, 106, 107	
	Thu 19/1	**L4:** Intro Assembly language MARS simulator, First program in MIPS		x	2.1, 2.2, A.1, A.2	
3	Tue 24/1	**L5:** MIPS Arithmetic & Logical Operations	x		2.3, 2.4, 2.9	**A1:** *terminology, binary, MARS* ***due in W4***
	Thu 26/1	**L6:** MIPS registers, memory & addressing modes		x	2.3, A.5	
4	Tue 31/1	**L7:** MIPS System Call and I/O Practice quiz (no grade) - to get familiar with online exams	x		p. A-43, A-44	**A2:** *assembly basics* ***due in W5***
	Thu 2/2	**L8:** MIPS Flow control: if-else, loops		x	2.7	
5	Tue 7/2	**QUIZ #1 (on L1-L6):** as Canvas quiz. You must join zoom and have **webcam** and **mic** turned on	x			**A3:** *memory access, syscall* ***due in W6***
	Tue 9/2	**L9:** MIPS Flow control: boundaries, switch Array Access by pointers		x	2.7, 2.14	
6	Tue 14/2	**L10:** MIPS Procedures, using the stack **Midterm Overview**	x	-	2.8, A.6	**A4:** *flow control* ***due in W8***
	Thu 16/2	**L11:** Nested procedures and recursion		x		
7	Tue 21/2 Thu 23/2	**No class: Midterm Break**				**No Labs: Midterm Break**
8	Tue 28/2	**L12:** MIPS Instruction format	x			**A5:** *procedures, format* ***due in W10***
	Thu 2/3	**Midterm (on L1-L11):** as Canvas quiz	x		2.5, 2.10	
9	Tue 7/3	**L13:** Basics of Logic Design	x		B.1, B.2	*Continue A5*
	Thu 9/3	**L14:** Logic Circuits		x		
10	Tue 14/3	**L15:** ALU Design	x	-	B.5, 3.3-3.4	**A6:** *basics of logic design* ***due in W11***
	Thu 16/3	**L16:** ALU: Multiplication and Division		x	4.2, B.7	
11	Tue 21/3	**L17:** Sequential Logic	x	-		Q/A session: TAs available in labs to answer questions.
	Thu 23/3	**L18:** Processor Design: Datapath		x	4.1 – 4.5	
12	Tue 28/3	**QUIZ #2 (on L12-L17):** as Canvas quiz	x			Q/A session: TAs available in labs to answer questions.
	Thu 30/3	**L19:** Processor Design: Control Unit	x	-	4.1 – 4.5	
13	Tue 4/4	**L21:** Performance	x	.	A7, pp. 325-327	**A7:** *proc. design, performance* ***due on Tue, Apr 11*** *Students in Friday labs are welcome to join other labs*
	Thu 6/4	**L20:** Processor Design: Pipelining		x	1.6	
14	Tue 11/4	**L22:** Memory Hierarchy and Caches	x		5.1,5.3(till p. 395) pp. 402 - 408	**Revision**: TAs available to answer your questions. *Students in Monday labs are welcome to join other labs*
	Thu 13/4	*L23: Exceptions and Interrupts (tentative)* *Input/Output, Other Processors (tentative)* **Course Summary and Final Overview**		x	A7, A8	

Other Course Policies

Academic Integrity: The academic enterprise is founded on honesty, civility, and integrity. As members of this enterprise, all students are expected to know, understand, and follow the codes of conduct regarding academic integrity. At the most basic level, this means submitting only original work done by you and acknowledging all sources of information or ideas and attributing them to others as required. This also means you should not cheat, copy, or mislead others about what is your work. Violations of academic integrity (i.e., misconduct) lead to the breakdown of the academic enterprise, and therefore serious consequences arise and harsh sanctions are imposed. For example, incidences of plagiarism or cheating usually result in a failing grade or mark of zero on the assignment or in the course. Careful records are kept to monitor and prevent recidivism. **The use of artificial intelligence (AI) assistance for any assessed portions of this course is not permitted.**

A more detailed description of academic integrity, including the University's policies and procedures, may be found in the Academic Calendar at: http://www.calendar.ubc.ca/okanagan/index.cfm?tree=3,54,111,0

Cooperation vs. Cheating: Working with others on assignments is a good way to learn the material and we encourage it. However, there are limits to the degree of cooperation that we will permit. Any level of cooperation beyond what is permitted is considered cheating. When working on programming assignments, you must work only with others whose understanding of the material is approximately equal to yours. In this situation, working together to find a good approach for solving a programming problem is cooperation; listening while someone dictates a solution is cheating. You must limit collaboration to a high-level discussion of solution strategies, and stop short of actually writing down a group answer. Anything that you hand in, whether it is a written problem or a computer program, must be written by you, from scratch, in your own words/code. If you base your solution on any other written solution, you are cheating. If you provide your solution for others to use, you are also cheating.

Class time: Lectures will involve, besides explaining course materials, working on design examples and in class exercises. Class attendance and taking notes are expected, and students are responsible for all material covered in class. You are also expected to respect the other members of the class as well as the instructor. Inappropriate class behavior is not allowed (e.g., talking on cell phones, engaging in non-class activities, sleeping, using disrespectful language, etc.).

Final Examinations: You can find the Senate-approved term and examination dates here. Except in the case of examination clashes and hardships (three or more formal examinations scheduled within a 27-hour period) or unforeseen events, students will be permitted to apply for out-of-time final examinations only if they are representing the University, the province, or the country in a competition or performance; serving in the Canadian military; observing a religious rite; working to support themselves or their family; or caring for a family member. Unforeseen events include (but may not be limited to) the following: ill health or other personal challenges that arise during a term and changes in the requirements of an ongoing job. Further information on Academic Concession can be found under Policies and Regulation in the Okanagan Academic Calendar http://www.calendar.ubc.ca/okanagan/index.cfm?tree=3,48,0,0

Grading Practices: Faculties, departments, and schools reserve the right to scale grades in order to maintain equity among sections and conformity to University, faculty, department, or school norms. Students should therefore note that an unofficial grade given by an instructor might be changed by the faculty, department, or school. Grades are not official until they appear on a student's academic record: http://www.calendar.ubc.ca/okanagan/index.cfm?tree=3,41,90,1014

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http://www.calendar.ubc.ca/okanagan/index.cfm?tree=3,41,90,1014

Resources to Support Student Success:

UBC Okanagan Disability Resource Centre: The DRC facilitates disability-related accommodations and programming initiatives to remove barriers for students with disabilities and ongoing medical conditions. If you require academic accommodations to achieve the objectives of a course please contact the DRC at:
UNC 215 250.807.8053
Email: drc.questions@ubc.ca
Web: www.students.ok.ubc.ca/drc

UBC Okanagan Equity and Inclusion Office: Through leadership, vision, and collaborative action, the Equity & Inclusion Office (EIO) develops action strategies in support of efforts to embed equity and inclusion in the daily operations across the campus. The EIO provides education and training from cultivating respectful, inclusive spaces and communities to understanding unconscious/implicit bias and its operation within in campus environments. UBC Policy 3 prohibits discrimination and harassment on the basis of BC's Human Rights Code. If you require assistance related to an issue of equity, educational programs, discrimination or harassment please contact the EIO.
UNC 325H 250.807.9291
Email: equity.ubco@ubc.ca
Web: www.equity.ok.ubc.ca

Student Wellness: At UBC Okanagan health services to students are provided by Student Wellness. Nurses, physicians and counsellors provide health care and counselling related to physical health, emotional/mental health and sexual/reproductive health concerns. As well, health promotion, education and research activities are provided to the campus community. If you require assistance with your health, please contact Student Wellness for more information or to book an appointment.
UNC 337 250.807.9270
Email: healthwellness.okanagan@ubc.ca
Web: www.students.ok.ubc.ca/health-wellness

Office of the Ombudperson: The Office of the Ombudsperson for Students is an independent, confidential and impartial resource to ensure students are treated fairly. The Ombuds Office helps students navigate campus-related fairness concerns. They work with UBC community members individually and at the systemic level to ensure students are treated fairly and can learn, work and live in a fair, equitable and respectful environment. Ombuds helps students gain clarity on UBC policies and procedures, explore options, identify next steps, recommend resources, plan strategies and receive objective feedback to promote constructive problem solving. If you require assistance, please feel free to reach out for more information or to arrange an appointment.
UNC 328 250.807.9818
Email: ombuds.office.ok@ubc.ca
Web: www.ombudsoffice.ubc.ca

Student Learning Hub: The Student Learning Hub is your go-to resource for free math, science, writing, and language learning support. The Hub welcomes undergraduate students from all disciplines and year levels to access a range of supports that include tutoring in math, sciences, languages, and writing, as well as help with study skills and learning strategies. Students are encouraged to visit often and early to build the skills, strategies and behaviors that are essential to being a confident and independent learner. For more information, please visit the Hub's website.
LIB 237 250.807.8491
Email: learning.hub@ubc.ca
Web: www.students.ok.ubc.ca/slh

The Global Engagement Office: The Global Engagement Office provides advising and resources to assist International students in navigating immigration, health insurance, and settlement matters, as well as opportunities for intercultural learning, and resources for Go Global experiences available to all UBC Okanagan students, and more.

Safewalk: Don't want to walk alone at night? Not too sure how to get somewhere on campus? Call Safewalk at 250-807-8076. For more information, see: www.security.ok.ubc.ca

Sexual Violence Prevention and Response Office (SVPRO): A safe and confidential place for UBC students, staff and faculty who have experienced sexual violence regardless of when or where it took place. Just want to talk? We are here to listen and help you explore your options. We can help you find a safe place to stay, explain your reporting options (UBC or police), accompany you to the hospital, or support you with academic accommodations. You have the right to choose what happens next. We support your decision, whatever you decide.
Visit svpro.ok.ubc.ca or call us at 250-807-9640

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