Columbia College
Vancouver, Canada

Course Outline			
Term: Fall 2024	Course No: CSCI 250	Course Credits: 3	
Instructor: Jetic Gū	Course Section No: 19	Total Hours: 65	Total Weeks: 13
Instructor Office: Room No. 544 Main Campus	Course Title: Introduction to Computer Architecture	Main Campus Room 420	
Instructor Email: jgu@columbiacollege.ca			
Class Meeting Days/Time: TF 18:00-20:25			
Instructor Office Hours: Tuesday 13:00-16:00	Course Format: In person delivery		
Course Prerequisites Computer Science 150 and 12 credits, and English 099	Course Corequisites		
Transferability to: visit bctransferguide.ca			

Course Description:

Describe the general organisation and architecture of computers. Identify computer's major components and study their functions. Topics will include: processor organisation; control logic design; memory systems; instruction set architecture, and architectural support for operating systems and programming languages. A hardware description language will be used as a tool to express and work with design concepts.

Additional Course Details:

Course Topics:

- Overview of the general organisation and architecture of computers. Review of combinational logic circuits and design.
- Review of sequential circuits and design.
- Processor architecture:
    - A closer look at instruction set architecture
    - Integer arithmetic
    - Floating-point arithmetic

    - Pipelining
- Design of control logic
- Memory Organisation:
    - Registers
    - Cache memory
    - Main memory
    - Rigid disks
    - Virtual memory
- Input / Output Interfaces:
    - Bus concepts
    - Interrupts
    - Serial and parallel I/Os
    - Direct memory access
- Modelling with a hardware description language.

Required Texts/Readings/Learning Resources:

Textbook:

Logic and Computer Design Fundamentals, 5th edition, M. Morris Mano, Charles R. Kime, Tom Martin, Pearson, 2016.

Computer Organization and Design: The Hardware/Software Interface, (5th Edition), David A. Patterson and John L. Hennessy, Morgan Kaufmann, 2014

Recommended:
LogicWorks5, Capilano Computing Systems Ltd, Addison-Wesley, Manual & software used for digital hardware simulation.

Course Learning Outcomes: Upon successful completion of this course the student will be able to:

1. Understand the vocabulary of computer organisation, e.g. DRAM, cache, virtual memory, bus;
2. Understand the factors that determine performance of an application;
3. Understand the interface between hardware and software, namely compiler and operating Understand;
4. Understand how hardware runs a given high-level lines of code, e.g. application written in C;
5. Understand how hardware performs arithmetic operations (e.g. add, subtract, divide, and multiply) for integer and real numbers;
6. Understand memory hierarchy organisations and techniques to improve/optimise the design;
7. Understand two processor organisation: single-cycle and pipeline.

Course Content/Schedule*

Week	Topic(s)	Readings	Assessments	Briefly describe list (via number) the outcomes linked to the assessments.

1	Lecture 1: Beyond Integer Arithmetics Part 1: Theory	Lecture notes		- Integer Addition and Subtraction Review - Integer Multiplication and Division - Float Numbers and Float arithmetics
2	Lecture 1: Beyond Integer Arithmetics Part 2: VHDL and Labs	Lecture notes	Lab 1 due;	- Basic VHDL - Implement Integer Multiplication and Division - Implement Float arithmetics
3	Lecture 2: Computer Memory	Lecture notes	Quiz 1	- Von Neumann architecture review - Register Review - Introduction to Memory and Cache
4	Lecture 2: Computer Memory	Lecture notes	Lab 2 due;	- 8bit Register Array implementation - 8bit Memory implementation - Memory Organisation
5	Lecture 3: CPU Architecture	Lecture notes	Quiz 2	- What is an instruction - The journey of an instruction: from memory to CPU to execution - ALU implementation
6	Lecture 3: CPU Architecture	Lecture notes	Lab 3 due	- Modern Storage Devices and Memory - ALU implementation
7	Lecture 3: CPU Architecture	Lecture notes	Quiz 3	- Virtual Harddisk implementation - ALU implementation
8	Review; Midterm	Lecture notes	Midterm	
9	Lecture 4: Programme Counter	Lecture notes		- Programme counter - Pipeline Processors
10	Lecture 4: Programme Counter	Lecture notes	Lab 4 due	- Design programme counter - Programme in assembly
11	Lecture 5: Introduction to Compilers	Lecture notes	Quiz 4	- CPU assembled - Simple assembler in C
12	Lecture 5: Introduction to Compilers	Lecture notes		- CPU assembled - Simple compiler in C
13	Lecture 5: Introduction to Compilers	Lecture notes	Lab 5 due	- CPU assembled - Simple compiler in C
14	FINAL EXAM			

*Timing subject to change

Evaluation Criteria

Evaluation Methods	**%**	**Comments**
Labs	30	
Quiz	20	
Midterm	20	
Final	30	

Total	**100%**	

Classroom Code of Conduct:

Students will be prepared for any appointments with the instructor or other students – this means logging in and getting out paper, pens, necessary texts and so on before the appointment starts.

1. Students will communicate respectfully when interacting with the instructor or classmates.
2. Students will respectfully communicate with the instructor and classmates in discussion groups, office hours, and in any type of electronic communication.
3. Students will respond to messages/emails from the instructor or other classmates in a timely manner.

Late Submissions/Resubmission Policy:

If you are affected by personal issues such as sickness, injuries, the passing of a relative, or other traumatising experiences, you should contact an advisor and seek professional help and I'll try to accommodate as much as possible. Otherwise, late submissions and resubmission are not allowed. I can give you one unconditional late submission/resubmission for up to 7 days from the original due date, but only once. Outside of this, here is a list of NOT-GONNA-WORK excuses:

1. I don't have a laptop/computer;
2. I have to work / I forgot;
3. I have too many courses;
4. I am travelling;
5. I am not happy with my grade;
6. My mum doesn't want me to study and beats me if I do.

Cheating and Plagiarism Policy:

I expect all students to uphold the principle of academic honesty. Cheating and plagiarism (presenting another person's words or ideas as one's own) are not acceptable behaviour at anywhere. Depending on the severity of the offence such acts can result in a grade of zero on the test or assignment, a failing grade (F) in the course, or expulsion. In all cases, the circumstances and the penalty are recorded in the student's file. **Do not share your files with others. Do not let others copy or mimic your files. You may take inspiration, but any work you do must be original.** Failure to comply will result in plagiarism charges to both the party providing assistances, as well as the party receiving.

Academic misconduct not covered in the College's Cheating and Plagiarism Policy, is covered under Academic Policy 2.6 Academic Misconduct. It can be found at the following link: https://www.columbiacollege.ca/about/college-policies/ . You are expected to familiarise yourself with this policy, as it covers serious issues including uploading copyright material, submission of falsified records and other strategies to gain unfair academic advantage. If you are unclear on the contents, please ask for clarification.

Course-Specific Policies: (***If any, optional)***

Grading System

Grade Percentage	Grade Points	Rating
A+ 90-100	4.3	Excellent
A 85-89	4.0	
A - 80-84	3.7	Very Good
B+ 76-79	3.3	
B 72-75	3.0	
B - 68-71	2.7	Good
C+ 64-67	2.3	
C 60-63	2.0	Satisfactory
C- 55-59	1.7	
D 50-54	1.0	Marginal Pass
F 0-49	0.0	Fail
N Below 50	0.0	Failure for non-completion or non-attendance

Please see the college calendar for more information about grading and related policies.