

COS 250: Computer Organization

Department of Computer Science
Spring 2024

Instructor Info

Dr. Xin Zhang

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Office: Rm C282, Dubyak Center, Portland

Student Hours: Tu 3:30 PM-4:30 PM

Th 12:30 PM-1:30PM

or by appointment

Course Meetings

Luther Bonney 524, Portland

Tu/Th 2:00 PM-3:15 PM



[Student Services and Policies Hub](#)¹.

1. Course Information

1A. Course Description

This course explores fundamental concepts integral to computer architecture. Topics include information representation, Boolean algebra, logic gates, and both combinational and sequential circuits. The course covers programming language hierarchy, assembly language, memory systems, including virtual memory, and delves into instruction set architecture (ISA) and CPU functionality. It also investigates input/output mechanisms (I/O). Through theoretical study and practical exercises, students gain insights into the intricate layers of modern computing systems, enabling a comprehensive understanding of computer organization and functionality.

1B. Course Materials & Books

Recommend

- "Computer Systems - A Programmer's Perspective, 3rd Edition" by Randal E. Bryant and David R. O'Hallaron (**CA** for short in the following)
- "Computer Systems, 5th Edition" By J. Stanley Warford (**CS** for short in the following)

¹ <https://mycampus.maine.edu/group/usm/student->

[services-and-policies-hub](#)

1C. Course Learning Outcomes

By the conclusion of this course, participants will be able to:

1. Understand the basics of information representation and Boolean algebra in computer systems.
2. Explain the functioning of logic gates and their role in digital systems.
3. Analyze and design simple combinational and sequential circuits.
4. Describe the programming language hierarchy and its relevance in computing.
5. Demonstrate a foundational understanding of assembly language programming.
6. Explain the concepts underlying memory hierarchy and the significance of virtual memory.
7. Identify and comprehend the essentials of instruction set architecture (ISA) and CPU operations.

1D. Prerequisites

COS 161 Algorithms in Programming. Or getting permissions from the instructor.

1E. Reminder

If you have registered for this course, please ensure that you are also enrolled in COS 255, the lab section corresponding to COS 250. This is a mandatory requirement.

2. Coursework & Grading

2A. Course Assessment

Assessment Name	Value
Class attendance	10%
2 Quizzes	10%
8 Assignments	40%
Mid-term Exam	15%
Final Exam	25%

Assessment Name	Value
Total:	100%

2B. Attendance

Active participation in class sessions enhances learning and provides valuable insights, so I encourage all students to attend regularly.

2C. Quizzes

Quizzes will be given in class by paper. These will be announced at least one class prior as well as posted on Brightspace. There will be two quizzes in this course, each carrying equal weight (5% each).

2D. Assignments

Assignment should complete individually. Homework assignments will be due on the day by 11:59PM. For example, assuming that the first homework due is Feb. 14th, which means you should submit your work before Feb. 14th 11:59PM. All assignments will be submitted and graded through Brightspace. There are totally eight assignments, each of them are weighted equally (5% each). Penalties for late submissions will be enforced.

2E. Exams

The mid-term exam, with a weight of 15%, will be held before the spring break, conducted online. The final exam, scheduled between Apr 27 and May 3, will also be administered online and holds a weight of 25%.

2F. Bonus

Bonus points will be available in this course; however, the maximum achievable score remains capped at 100.

3. Class Schedule

3A. Course Schedule

Week	Date	Topics	Readings	Start	Due
1	Jan 16	Introduction to Computer Organization			
	Jan 18	Information representation: hex, decimal, binary and their conversion	CA2.1.1		
2	Jan 23	Data size, integer, floating point	CA2.1.2, 2.2, 2.3, 2.4	A1	
	Jan 25	Boolean algebra: properties, definition, completeness	CA2.1.6		
3	Jan 30	Boolean expressions, Logic gates, truth table, logical diagram	CA4.2.1~4.2.3		A1
	Feb 1	Combinational circuit, hardware description language	CS10.1.1~10.1.4	A2	
4	Feb 6	k-map, NAND	CS10.2, CS10.3		
	Feb 8	Sequential circuit	CS11.1~11.3		A2
5	Feb 13	Quantum Computer	Handout	A3	
	Feb 15	Programming language: concept, hierarchy	CS5		
6	Feb 20	Assembly language: introduction, concept, execution	CS5,CS6		A3
	Feb 22	Assembly language: keyword, register, syntax	CS5,CS6	A4	
7	Feb 27	Assembly language: I/O			
	Feb 29	Wrap-up: software	Handout		A4
8	Mar 5	Review class		A5	
	Mar 7	Mid-term Exam			
9	Mar 12	Spring Break			
	Mar 14				
10	Mar 19	von Neumann Machines	CS4.3		A5
	Mar 21	Memory: concept, RAM, storage, SSD	CA6.1.1~6.1.3	A6	

11	Mar 26	Cache, memory hierarchy	CA6.3, CA6.4		
	Mar 28	Virtual memory	CA9		A6
12	Apr 2	Computer bus: concept, types, history	CS11.3	A7	
	Apr 4	Instruction set: architecture, types, register, address	CA4.1		
13	Apr 9	CISC vs RISC, Pipelining of instruction set	CA4.4		A7
	Apr 11	CPU and GPU	Handout	A8	
14	Apr 16	I/O: concept, devices	CA10		
	Apr 18	Network and communication	CA11		A8
15	Apr 23	Wrap-up: hardware	Handout		
	Apr 25	Review class	Handout		

A = Assignment. For the **readings** column, CA stands for “Computer Systems - A Programmer’s Perspective, 3rd Edition”, and CS stands for “Computer Systems, 5th Edition”.

4. Course-Specific Policies

4A. Late Assignments

Late assignments will be marked down 5% per day that they are late, and assignments submitted after three days will not be accepted (except under special circumstances such as illness or other unanticipated impediments).

4B. Plagiarism

Plagiarism is turning in work that is not your own. Searching the internet for answers or using answers created by others is plagiarism and may result in failing the course as well as appropriate disciplinary action. It is your responsibility to not leave your work where others might copy it.

4C. Getting Help

I am committed to everyone achieving success. Please do not hesitate to seek assistance when necessary. You can:

- Use the discussion board in Brightspace.
- Join student hours (or by appointment).

5. Academic Services & Policies

Below you'll find a brief list highlighting some of the most crucial student services and supports.

- **Request disability accommodations** | (207) 780-4706 | dsc-usm@maine.edu
- **Report Interpersonal violence** | (207) 780-5767 | usm.titleix@maine.edu
- **Report on-campus emergencies and safety concerns** | (207) 780-5211 or your local police agency.
- **Get academic help** | mycampus.maine.edu/group/usm/learning-commons
- **Get technology help** | usm.maine.edu/computing/helpdesk
- **Meet with an academic advisor** | usm.maine.edu/advising

For USM's most complete and current information on services available to students, as well as academic policies, use the QR Code to go to the [Student Services and Policies Hub webpage](#)².



² <https://mycampus.maine.edu/group/usm/student-services-and-policies-hub>