CS 465 – Computer Systems Architecture (Fall 2025)
Department of Computer Science
George Mason University

COURSE INFORMATION

Course Number and Title: CS 465 – Computer Systems Architecture
Section Number and CRN: Section 002 – CRN 80174
Class Duration: August 25, 2025, to December 15, 2025
Class Meeting Time: 12:00pm to 1:15pm on Monday and Wednesday
Class Location: James Buchanan Hall Room D023, Fairfax Campus

***Important Notice*:** Course syllabus, gradebook, exercises, quizzes, and projects will be hosted on Canvas. If the campus closes, or if a class meeting needs to be canceled or adjusted due to weather or other concern, students should check Canvas for updates on how to continue learning.

GENERAL INFORMATION

Instructor: Angkul Kongmunvattana, Ph.D. (Dr. K)
E-mail address: akongmun@gmu.edu (start your "Subject" line with [CS465])
Office Location: ENGR 4428, Fairfax Campus
Office Hours: By appointments only (must be scheduled via GMU email at least 24 hours in advance)

TEXT AND RESOURCES

Recommended Textbooks:

- David Patterson and John Hennessy, *Computer Organization and Design (MIPS Edition): The Hardware/Software Interface*, Fifth Edition, MKP, 2014.
- John Hennessy and David Patterson, *Computer Architecture: A Quantitative Approach*, Fifth Edition, MKP, 2012.

COURSE CATALOG DESCRIPTION

Computer subsystems and instruction set architectures. Single-cycle, multiple-cycle, and pipeline architectures. Memory hierarchy, cache memory, and virtual memory input-output processing. Offered by Computer Science. Limited to two attempts.

Credit hours: 3
Prerequisite: CS 367 with a grade of C or higher.

COURSE OUTCOMES

- Students will be able to analyze and compare performance characteristics of a computer.
- Students will be able to demonstrate knowledge of instruction set architectures; be able to show how instructions are represented at both the machine level and in the context of a symbolic assembler; be able to read and write small assembly programs.
- Students will be able to manipulate low-level data representations and understand the implementation of computer arithmetic operations.
- Students will be able to explain how an instruction is executed; be able to explain the role of data path and control; be able to explain pipelining and the relevant improvement technologies.
- Students will be able to understand the effect and implementation of memory hierarchy, in particular, the role of cache and virtual memory.
- Students will become familiar with advanced topics and the latest evolvement in computer architecture.

TOPICS

Digital Logic Circuit Analysis and Design
Computer Arithmetic
Computer Organization and Design
Instruction Set Architecture
Instruction Level Parallelism (Pipelining, Data and Control Hazards, VLIW, Superscalar, Branch Prediction, Out-of-order Execution, Scoreboard, Tomasulo, etc.)
Thread Level Parallelism
Memory Hierarchy
Cache Organization
Cache Coherence Protocols
Memory Consistency Models
Interconnection Networks (Bus, Ring, Mesh, Torus, Hypercube, Butterfly, Omega, etc.)
Contemporary Issues in Computer Architecture

EVALUATION METHODS

Exercises	6%
Quizzes	24%
Projects	10%
Midterm Exam	20%
Final Exam	40%

COURSE GRADING

Grade	Cut-Off	Grade	Cut-Off	Grade	Cut-Off	Grade	Cut-Off
A+	98%	B+	88%	C+	78%	D	60%
A	92%	B	82%	C	72%	F	0%
A-	90%	B-	80%	C-	70%		

COURSE CONTENT AND CALENDAR (tentative)

Session	Date	Topic
1	August 25	Class Administration and Overview
2	August 27	Digital Logic Circuit Analysis and Design (1)
	September 1	Labor Day – University Closed
3	September 3	Digital Logic Circuit Analysis and Design (2)
4	September 8	Digital Logic Circuit Analysis and Design (3)
5	September 10	Computer Arithmetic
6	September 15	Computer Organization and Design
7	September 17	Instruction Set Architecture (1)
8	September 22	Instruction Set Architecture (2)
9	September 24	Instruction Level Parallelism (1)
10	September 29	Instruction Level Parallelism (2)
11	October 1	Instruction Level Parallelism (3)
12	October 6	Midterm Review
13	October 8 (12:00pm to 1:15pm)	Midterm Exam
	October 13	Fall Break – Classes Do Not Meet
14	October 15	Midterm Recap

15	October 20	Instruction Level Parallelism (4)
16	October 22	Instruction Level Parallelism (5)
17	October 27	Thread-Level Parallelism
18	October 29	Memory Hierarchy
19	November 3	Cache Organization
20	November 5	Cache Coherence Protocols (1)
21	November 10	Cache Coherence Protocols (2)
22	November 12	Cache Coherence Protocols (3)
23	November 17	Memory Consistency Models
24	November 19	Interconnection Networks (1)
25	November 24	Interconnection Networks (2)
	November 26	Thanksgiving Recess – University Closed
26	December 1	Contemporary Issues in Computer Architecture (1)
27	December 3	Contemporary Issues in Computer Architecture (2)
28	December 8	Final Review
29	December 15 (10:30am to 1:15pm)	Final Examination (Cumulative)

COURSE POLICIES

Exercise Policy

Exercises are given on Canvas, covering materials on each topic. Exercises are designed to check and to reinforce the learning of materials. Exercises can be taken multiple times. A score from the highest attempt will be recorded. When submitting/resubmitting the exercises after the due date, Canvas will automatically assign a late penalty. The instructor will remove the late penalty of these exercises manually as soon as possible (Do NOT email the instructor). A due date for exercise is there as a marker for students to keep pace with class lectures as well as the quizzes and exams that come after the exercises. Exercises cannot be completed after the last day of class (12/15/2025).

Quiz Policy

Quizzes are also given on Canvas and can be attempted only once. There are no make-up quizzes. A quiz is assigned when substantial topics have been covered in class and practiced through exercises. Each quiz is 30 to 60 minutes in duration, depending on the complexity of the topics. When assigned, quizzes are released at 6:00pm on Monday with a due date at 6pm on Sunday of the same week. While quizzes will remain open after their due dates for studies and reviews, late quizzes will get a zero grade. A grade of zero will be assigned for the missed quiz without an excused absence (e.g., illness, unforeseen emergency, etc.). If the instructor deems the absence is excused, then the final exam grade will also be used for the missed quiz.

Project Policy

A programming project will be assigned during the week after the midterm exam. A list of possible projects will be given. Students will use C and Intel x86 assembly as the language of implementation. The submitted codes must be able to compile and execute via command-line on Zeus. Other project requirements, milestones, due dates, and grading rubrics will be given in the project handout.

Midterm Exam Policy
Midterm exam is in-person using pencil/pen and paper. It is scheduled for the week before fall break. A grade of zero will be assigned for the missed exam without an excused absence (e.g., illness, unforeseen emergency, etc.). If the instructor deems the absence is excused, then the final exam grade will also be used for the missed midterm exam.

Final Exam Policy
Final exam is also in-person using pencil/pen and paper. It covers all materials. The Registrar Office has scheduled our final exam for Monday December 15th, 2025, from 10:30am to 1:15pm. According to the University Policy (AP.3.10.1), absences from final exam will not be excused by the instructor except for sickness on the day of the exam.

Grade Contesting Policy
You have one week after grades are released to contact the instructor with a grading issue. After this one-week period, no grades will be changed.

There are no extra-credit exercises, quizzes, assignments and/or projects.

COURSE POLICY ADDENDUM

Students are expected to refer to the Common Course Policies for the following information. Students will be held responsible for knowing this information.

- Academic Standards
- Accommodation for Students with Disabilities
- FERPA and Use of GMU Email Addresses for Course Communication
- Title IX Resources and Required Reporting

IMPORTANT DATES

Midterm Exam	October 8, 2025, during class period
Final Exam	December 15, 2025, 10:30am to 1:15pm

See Fall 2025 Academic Calendar for other important dates.

The syllabus may be adjusted if deemed necessary by the instructor.