Course Syllabus

Course Information

CS/SE 2340.503 Computer Architecture

Term:	Fall 2023
Days & Time and Location:	Tue, Thu 7:00pm – 8:15pm @ ECSS 2.311

Professor Contact Information

Yi Zhao, Ph.D.
https://cs.utdallas.edu/people/faculty/zhao-yi/
Phone: 972 883 2693
Email: yi.zhao@utdallas.edu (the best way to reach me)
Office hours: Monday - Thursday 5:30pm – 6:45pm
Office: ECSN 2.916

Grader Information

TBA

Class Participation

Regular class participation is expected regardless of course modality. Students who fail to participate in class regularly are inviting scholastic difficulty. A portion of the grade for this course is directly tied to your participation in this class. It also includes engaging in group or other activities during class that solicit your feedback on homework assignments, readings, or materials covered in the lectures (and/or labs). Successful participation is defined as consistently adhering to university requirements, as presented in this syllabus. Failure to comply with these University requirements is a violation of the Student Code of Conduct.

Class Recordings

The instructor may record meetings of this course. Any recordings will be available to all students registered for this class as they are intended to supplement the classroom experience. Students are expected to follow appropriate University policies and maintain the security of passwords used to access recorded lectures. Unless the Office of Student Accessibility has approved the student to record the instruction, students are expressly prohibited from recording any part of this course. Recordings may not be published, reproduced, or shared with those not in the class, or uploaded to other online environments except to implement an approved Office of Student Accessibility accommodation. If the instructor or a UTD school/department/office plans any other uses for the recordings, consent of the students identifiable in the recordings is required prior to such use unless an exception is allowed by law. Failure to comply with these University requirements is a violation of the Student Code of Conduct.

Class Materials

The instructor may provide class materials that will be made available to all students registered for this class as they are intended to supplement the classroom experience. These materials may be downloaded during the course; however, these materials are for registered students' use only. Classroom materials may not be reproduced or shared with those not in class or uploaded to other online environments except to implement an approved Office of Student Accessibility accommodation. Failure to comply with these University requirements is a violation of the Student Code of Conduct.

Course Pre-requisites, Co-requisites, and/or Other Restrictions

CE/CS 1337 or equivalent, and CE/CS 2305 or equivalent.

Course Description

This course introduces the concepts of computer architecture by going through multiple levels of abstraction, and the numbering systems and their basic computations. It focuses on the instruction-set architecture of the MIPS machine, including MIPS assembly programming, translation between MIPS and C, and between MIPS and machine code. General topics include performance calculation, processor datapath, pipelining, and memory hierarchy. Credit cannot be received for both courses, (CS 2340 or SE 2340) and (CE 4304 or EE 4304). Prerequisites: (CE 1337 or CS 1337) with a grade of C or better or equivalent and (CE 2305 or CS 2305) with a grade of C or better. (Same as SE 2340) (3-0).

Student Learning Objectives/Outcomes

1. Be able to write a fully functional, stand-alone medium size assembly language program.
2. Have an ability to represent numbers in and convert between decimal, binary, and hexadecimal and perform calculations using 2's complement arithmetic.
3. Understand the basic model of a computer including the datapath, control, memory, and I/O components.
4. Be able to program efficiently in an assembly level instruction set, including the use of addressing modes and data types.
5. Understand the role of compilers, assemblers, and linkers and how programs are translated into machine language and executed.
6. Be able to demonstrate comprehension of a pipelined architectures including datapaths and hazards.
7. Be able to demonstrate comprehension of computer performance measures and their estimation.
8. Understand the memory hierarchy including caches and virtual memory.

Required Textbooks and Materials

"**Computer Organization and Design - The Hardware/Software Interface – 6th Edition**", Patterson and Hennessey, Morgan-Kaufmann, 2021. ISBN-978-0-12-820109-1.

Required Course Materials

This course uses the MARS MIPS assembler and simulator. MARS is available, free, for download from the Internet through the site: http://courses.missouristate.edu/kenvollmar/mars/.

Assignments & Academic Calendar

Exams:
There will be three exams: two midterm exams and one final exam. The exam will be open note. Final exam is comprehensive.

Assignments:
There will be regular homework assignments. Classroom exercises will be scheduled regularly to assess student engagement.

Projects:
There are projects that require students to code programs in MIPS assembler language.

Each programming assignment must contain:

1. A copy of the final working assembly language source code with comments and documentation. The file should be "text-only" and the extension must be ".s" or ".asm".
2. A screenshot showing keyboard input and displayed output from the console.

Both homework and project assignments should be submitted using your eLearning account.

Plagiarism of homework and/or project answers found on the Internet is not permitted. Upon discovery, some or all the points will be deducted.

Tentative Class Schedule

Session	*Date*	*Topic*	*Material Covered*	*Assignments*	*Due*
1	Aug 22	Introduction			
2	Aug 24	Intro to computer organization	Ch 1		
3	Aug 29	Performance evaluation, Amdahl's law	Ch 1.6 - 1.9	HW #1	
4	Aug 31	Assembly Ops: Load/Store/Add/Sub/etc.	Ch 2.2 – 2.3		
5	Sep 5	Introduction of MARS and MIPS programming	Appendix A	PRJ #1	HW #1
6	Sep 7	Data Representations, Bin/Oct/Hex			
7	Sep 12	Number Representations: signed, floating point	Ch.2.4		
8	Sep 14	Instructions Representation	Ch 2.5		
9	Sep 19	Bits and bytes manipulation & other instructions	Ch 2.6	HW #2	PRJ #1
10	Sep 21	Comparing, Branching and Looping	Ch 2.7		

11	Sep 26	Subroutines in Assembly language	Ch 2.8, A.6		HW #2
12	Sep 28	*Exam I review*			
13	**Oct 3**	**Exam I (5pm – 9pm)**			
14	Oct 5	Addressing modes & System software	Ch 2.10, 2.12		
15	Oct 10	Writing a full assembly language program	Ch 2.13	PRJ #2	
16	Oct 12	Comparing ISAs	Ch. 2.16-18		
17	Oct 17	Integer Arithmetic	Ch 3.1-3.4	HW #3	
18	Oct 19	Floating Point Arithmetic	Ch 3.5		
19	Oct 24	Processor: Datapath	Ch 4.1-3		HW #3
20	Oct 26	*Exam II review*			PRJ #2
21	**Oct 31**	**Exam II (5pm – 9pm)**			
22	Nov 2	Processor: Datapath Control	Ch 4.4	PRJ #3	
23	Nov 7	Processor: Pipelining	Ch 4.5	HW #4	
24	Nov 9	Processor: Pipelined Datapath	Ch 4.6		
25	Nov 14	Introduction to memory hierarchy	Ch 5.1-3		HW #4
26	Nov 16	Memory hierarchy and Virtual Memory	Ch 5.4-6	HW #5	PRJ #3
27	Nov 21	No Class (Fall Break/Thanksgiving Holidays)			
28	Nov 23	No Class (Fall Break/Thanksgiving Holidays)			
29	Nov 28	Virtual Memory	Ch 5.7		
30	Nov 30	Input & Output			HW #5
31	Dec 5	*Exam III Review*			
32	Dec 7	TBD			
33	**Dec 13**	**Exam III (8:30am – 1:30pm)**			

Grading Policy

The grade each student will earn from this class will be based on a weighted score calculated by using the following table:

Exam I	20%
Exam II	20%
Exam III	20%
Homework	20%
Programming Projects	15%
Participation	5%
	100%

Grades will be assigned according to the scale below:

Weighted Score	Grade
93.0 - 100	A
90.0 - 92.9	A-
87.0 - 89.9	B+
83.0 - 86.9	B
80.0 - 82.9	B-
77.0 - 79.9	C+
73.0 - 76.9	C
70.0 - 72.9	C-
67.0 - 69.9	D+
60.0 - 66.9	D
Below 60.0	F

Programming assignments grading:

Code Development	30%	(compile w/o error)
Program Execution	20%	(run successfully)
Program Design	25%	(conform to spec)
Documentation	15%	(program, comments)
Coding Style	10%	(clear, efficient)

Course & Instructor Policies

- Attendance policy: missing four in-class exercises leads to one letter grade drop, missing five in-class exercises leads to an F grade.
- There will be *no makeup exams* under normal circumstances.
- *No late homework or assignment submission* will be accepted!
- Use my UTD e-mail account for any communications.

Comet Creed

This creed was voted on by the UT Dallas student body in 2014. It is a standard that Comets choose to live by and encourage others to do the same:
"As a Comet, I pledge honesty, integrity, and service in all that I do."

Academic Support Resources

The information contained in the following link lists the University's academic support resources for all students.
Please see http://go.utdallas.edu/academic-support-resources.

UT Dallas Syllabus Policies and Procedures

The information contained in the following link constitutes the University's policies and procedures segment of the course syllabus.

Please go to http://go.utdallas.edu/syllabus-policies for these policies.

These descriptions and timelines are subject to change at the discretion of the Professor.