Course Syllabus

Course Information

CS/SE 2340.502 Computer Architecture

Term:	Fall 2021
Days & Time and Location:	Mon, Wed 5:30pm – 6:45pm @ GR 3.302

Professor Contact Information

Yi Zhao, Ph.D.
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Office hours: Mon, Wed 7:00pm – 8:00pm
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Grader Information

TBA

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).

Student Learning Objectives/Outcomes

1. Be able to write a fully functional, stand-alone medium size assembly language program (e.g., a basic Telnet client)
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

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Required Textbooks and Materials

"**Computer Organization and Design - The Hardware/Software Interface – 5th Edition**", Patterson and Hennessey, Morgan-Kaufmann, 2014. ISBN-13: 978-0124077263.

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 midterms and a final exam. The exams will be open notes. The final exam is comprehensive.

Assignments:
There will be regularly assigned reading and homework. Reading assignments should be done before the class session. Homework will require students to code programs in the MIPS assembler language.

There will be regularly assigned in-class exercises that will be used to assess student's participation.

Assignments should be submitted using your eLearning account. 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.

Tentative Class Schedule

Session	*Date*	*Topic*	*Reading*	*Assignments*	*Due*
1	Aug 23	Introduction			
2	Aug 25	Intro to computer organization	Ch 1		
3	Aug 30	Introduction to Assembly Language Programming	Appendix A	HW #1	
4	Sep 01	Performance evaluation, Amdahl's law	Ch 1.6,1.9		

5	Sep 06	No class (holiday)			
6	Sep 08	Data Representations, Bin/Oct/Hex	Ch.2.3		HW #1
7	Sep 13	Number Representations: signed, floating point	Ch.2.4	HW #2	
8	Sep 15	Instructions Representation	Ch 2.5		
9	Sep 20	Assembly Ops: Load/Store/Add/Sub/etc.	Ch 2.2		HW #2
10	Sep 22	Comparing, Branching and Looping	Ch 2.7	HW #3	
11	Sep 27	Bits and bytes manipulation & other instructions	Ch 2.6		
12	Sep 29	Subroutines in Assembly language	Ch 2.8, A.6		HW #3
13	Oct 04	*Exam I review*		HW #4	
14	**Oct 06**	**Exam I**			
15	Oct 11	Comparing ISAs	Ch. 2.16-17		HW #4
16	Oct 13	Addressing modes & System software	Ch 2.10, 2.12-13	HW #5	
17	Oct 18	Integer Arithmetic	Ch 3.1-3.4		
18	Oct 20	Floating Point Arithmetic	Ch 3.5		HW #5
19	Oct 25	Input & Output		HW #6	
20	Oct 27	Interrupts and Exceptions	Ch 4.9, A.7		
21	Nov 01	Processor: Datapath & Control	Ch 4.1-4		HW #6
22	Nov 03	*Exam II review*		HW #7	
23	**Nov 08**	**Exam II**			
24	Nov 10	Processor: Pipelining	Ch 4.5		HW #7
25	Nov 15	Processor: Pipelined Datapath	Ch 4.6-8	HW #8	
26	Nov 17	Advanced Instruction Level Parallelism	Ch 4.10		
27	Nov 22	No class (winter break and Thanksgiving Holiday)			
28	Nov 24	No class (winter break and Thanksgiving Holiday)			
29	Nov 29	Introduction to memory hierarchy	Ch 5.1-3		HW #8
30	Dec 01	Virtual Memory	Ch 5.4-7		
31	Dec 06	*Exam III Review*			
32	**Dec 08**	**Exam III**			

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	25%
Assignments	30%

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 will be accepted!
- Please use my UTD e-mail account above for any communications.

Classroom Conduct Requirements Related to Public Health Measures

UT Dallas will follow the public health and safety guidelines put forth by the Centers for Disease Control and Prevention (CDC), the Texas Department of State Health Services (DSHS), and local public health agencies that are in effect at that time during the Fall 2021 semester.

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.