



Course Syllabus

Course Information

CS/SE 2340.501 – Computer Architecture

Term: **Spring 2022**
Days & Time and Location: TTh 5:30PM-6:45PM @ ECSW 1.355 &
Synchronous remote via MS Teams

Instructor Contact Information

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Office hours: TTh 10:00AM – 11:00AM, **also** by appointment
using MS-Teams

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

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

Course Description

This course introduces the concepts of computer architecture by going through multiple levels of abstraction, 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. Students that have credit for CS 2310 or CS/SE4340 cannot receive credit for this course (3 semester hours).

Student Learning Objectives/Outcomes

After successful completion of this course, the student should

- be able to write a fully functional, stand-alone medium size assembly language program (e.g. a basic Telnet client)
- have an ability to represent numbers in and convert between decimal, binary, and hexadecimal and perform calculations using 2's complement arithmetic
- understand the basic model of a computer including the datapath, control, memory, and I/O components
- be able to program efficiently in an assembly level instruction set, including the use of addressing modes and data types
- understand the role of compilers, assemblers, and linkers and how programs are translated into machine language and executed

- be able to demonstrate comprehension of a pipelined architectures including datapaths and hazards
- understand the memory hierarchy including caches and virtual memory
- be able to demonstrate comprehension of computer performance measures and their estimation

Required Textbook:

"Computer Organization and Design - The Hardware/Software Interface – 6th Edition", Patterson and Hennessey, Morgan-Kaufmann, 2021. ISBN-13: 978-012820109-1. **Note: there are several editions of the same title, make sure that you get the correct edition (for MIPS).**

Required Course Materials:*RISC ASSEMBLER/SIMULATOR*

It is assumed you are familiar with the PC environment, can create and edit text files, run programs, etc. The programs will be in assembly language for the MIPS processor. 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/>.

The MARS simulator can assemble MIPS assembly language source files, load and run them with a users console window for input/output, and debug them if they do not work properly.

Assignments & Academic Calendar

Exams: There will be three exams during the course: two midterms and a final exam. The exams will be open notes: notes taken during the sessions can be used in the exams but no books or slides are allowed. The midterm exams will be limited to material covered during the immediate unit but the final exam (Exam 3) is comprehensive. Test material will be taken mainly from classroom lectures.

Assignments: There will be regularly assigned reading and homework. Reading assignments should be done before the class session. Homework will require the student to spend time programming a computer outside of class. It includes a program to demonstrate the correct operation of the assigned tasks.

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.

Project: A team programming project will be assigned. Details will be announced in the class.

Tentative Class Schedule

Week	Date	Topic	Reading Assignment	Assignments	Due/Note
1	Jan 18	Introduction			Synchronous remote
	Jan 20	Intro to computer organization	Ch 1		Synchronous remote
2	Jan 25	Introduction to Assembly Language Programming	Appendix A	HW #1	Synchronous remote
	Jan 27	Performance evaluation, Amdahl's law	Ch 1.6,1.11		Synchronous remote
3	Feb 1	Data Representations, Bin/Hex	Ch.2.3		HW #1 Synchronous remote
	Feb 3	Number Representations: signed, floating point	Ch.2.4, Ch.3.5	HW #2	Synchronous remote
4	Feb 8	Instructions Representation	Ch 2.5		
	Feb 10	Assembly Ops: Load/Store/Add/Sub/etc	Ch 2.2		HW #2
5	Feb 15	Comparing, Branching and Looping	Ch 2.7	HW #3	
	Feb 17	Bits and bytes manipulation & other instructions	Ch 2.6		
6	Feb 22	Subroutines in Assembly language	Ch 2.8, A.6		HW #3
	Feb 24	Exam I review		HW #4	
7	Mar 1	Exam I			
	Mar 3	Comparing ISAs	Ch. 2.16-19		HW #4
8	Mar 8	Addressing modes & System software	Ch 2.10, 2.12-13, App. A	HW #5	
	Mar 10	Integer Arithmetic	Ch 3.1-3.4		
9	<i>Mar 14-20</i>	<i>Spring Break</i>			
10	Mar 22	Floating Point Arithmetic	Ch 3.5		HW #5
	Mar 24	Input & Output		HW #6	
11	Mar 29	Interrupts and Exceptions	Ch 4.10, A.7		
	Mar 31	Exam II review			HW #6
12	Apr 5	Exam II			
	Apr 7	Processor: Datapath & Control	Ch 4.1-5	HW #7	
13	Apr 12	Processor: Pipelining	Ch 4.6		
	Apr 14	Processor: Pipelined Datapath	Ch 4.7-9		HW #7
14	Apr 19	Advanced Instruction Level Parallelism	Ch 4.11		
	Apr 21	Introduction to memory hierarchy	Ch 5.1-3		
15	Apr 26	Virtual Memory	Ch 5.7		
	Apr 28	Contingency			Project
16	May 3	Exam III Review			
	May 5	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	10%
Exam II	15%
Exam III	30%
Assignments	20%
Project	25%
	100%

Grades will be assigned according to the scale on the right:

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 **three or four** in-class exercises leads to **one letter grade drop**, missing **five** in-class exercises leads to **an F grade**.
- All exams will be at the Testing Center and **seat reservation is required**. Seat reservations must be made for each exam and should be done at the beginning of the semester. If you do not reserve your seat you will not be able to take the exam and I cannot do anything about it, so **do not email me if you cannot take an exam because you did not reserve your seat**.
- There will be no makeup exams under normal circumstances.
- No late assignment will be accepted!
- I do not read e-Learning e-mails. Please use my UTD e-mail account above for any communications.
- Emails **must** include class/section numbers in the subject to help me locate you (I have multiple classes/sections in the semester.) **Emails without class/section information will be silently ignored.**

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 AccessAbility accommodation. Failure to comply with these University requirements is a violation of the [Student Code of Conduct](#).

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 to the extent allowed by state governance. Texas Governor Greg Abbott's Executive Order [GA-38](#) prohibits us from mandating vaccines and face coverings for UT Dallas employees, students, and members of the public on campus. However, we strongly encourage all Comets to get vaccinated and wear face coverings as recommended by the CDC. Check the [Comets United: Latest Updates webpage](#) for the latest guidance on the University's public health measures. Comets are expected to carry out [Student Safety](#) protocols in adherence to the Comet Commitment. Unvaccinated Comets will be expected to complete the [Required Daily Health Screening](#). Those students who do not comply will be referred to the Office of Community Standards and Conduct for disciplinary action under the [Student Code of Conduct – UTSP5003](#).

Class Attendance

The University's attendance policy requirement is that individual faculty set their course attendance requirements. Regular and punctual class attendance is expected. Students who fail to attend class regularly are inviting scholastic difficulty. In some courses, instructors may have special attendance requirements; these should be made known to students during the first week of classes.

Class Participation

Regular class participation is expected. 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). Class participation is documented by faculty. 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

Students are expected to follow appropriate University policies and maintain the security of passwords used to access recorded lectures. Unless the Office of Student AccessAbility 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 AccessAbility accommodation. Failure to comply with these University requirements is a violation of the [Student Code of Conduct](#).

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 review the catalog sections regarding the credit/no credit or pass/fail grading option and withdrawal from class.

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