California State University Stanislaus
Department of Computer Science
Syllabus

Instructor: Dr. Xuejun Liang

My Office: DBH 282
Office Hours: MWF 1:00PM-2:00AM
Phone: (209) 667-3169, Email: xliang@cs.csustan.edu

Class Information:

Classroom: Bizzini 102
Class Date & Time: MWF 2:00PM-2:50PM
Class Website: https://www.cs.csustan.edu/~xliang/Courses2/CS3740-22F

Catalog Description:

CS3740: Computer Organization. (3 Units) Pre-requisites: CS 2700. Instruction set architecture design, digital logic techniques, cache memory, virtual memory, I/O architectures and devices, computer performance enhancements. Selected topics on embedded systems, parallel computer architecture and processing approaches.

Textbook:

The Essentials of Computer Organization and Architecture, Fifth Edition, by Linda Null and Julia Lobur, Jones & Bartlett Learning, 2019

Computer Architecture Simulator:

The Marie Computer Architecture Simulator Revision (MarieSimR)

References:

1. Computer Organization and Design: The Hardware/Software Interface, 4/e, David A. Patterson and John L. Hennessy, Morgan Kaufmann Publishers, 2008
2. Structured Computer Organization (6th Edition), Andrew S. Tanenbaum, Prentice Hall, 2012

Course Outcomes:

After successful completion of this course, students will be able to:

1. Describe the organizations of a computer, its major functional units, its instruction set, its instruction formats, its instruction execution, as well as interrupts and I/O operations, and translate assembly instructions into object codes.
2. Describe memory hierarchy, cache memory, and virtual memory, and compute the cache miss ratio and the effective memory access time for a simple program, and the physical address for a given virtual address.
3. Describe I/O architectures, I/O bus operations, magnetic disks, solid state drives, optical disks, magnetic tape, and redundant array of independent disks (RAID), and compute the disk capacity and performance.
4. Become familiar with the functions provided by operating systems and programming tools. Understand the role played by each software component in maintaining the integrity of a computer system and its data.

5. Understand Flynn's taxonomy and describe models, structures, and techniques used for organizations of parallel and multiprocessor architectures and interconnection networks.
6. Describe the processes and practices of embedded hardware design and understand key concepts and tools for embedded software development.
7. Evaluate computer performances by using quantitative approaches, including Amdahl's law, and describe common benchmarks and their limitations.

Course Outline* (Major Topics and Weekly Schedule)

Date	Topics Covered	Chapters
Week 1: 08/22, 08/24, 08/26	Introduction of class, syllabus, CPU Basics and Organization. The Bus. Clocks. The I/O Subsystem. Memory Organization and Addressing. Interrupts	Chapter 4
Week 2: 08/29, 08/31, 09/02	The MARIE Architecture. Instruction Processing. A Simple Program, A Discussion on Assemblers. Extending Our Instruction Set. Marie Architecture Simulator Revision (MarieSimR)	Chapter 4
Week 3: 09/07, 09/09	Programming using MarieSimR ISA Review: Instruction Formats, Instruction Types, Addressing, Instruction Pipelining	Chapter 5
Week 4: 09/12 09/14, 09/16	ISA Review: Instruction Pipelining Real-World Examples of ISAs	Chapter 5
Week 5: 09/19, 09/21, 09/23	Memory: Types of Memory, The Memory Hierarchy	Chapter 6
Week 6: 09/26, 09/28, 09/30	Cache Memory: Placement, Replacement, effective access time, cache access policy	Chapter 6
Week 7: 10/03, 10/05, 10/07	Virtual Memory: address translation, page table, TLB, segmentation, fragmentation, A Real-World Example	Chapter 6
Week 8: 10/10, 10/12, 10/14	Review for midterm exam Midterm Exam.	
Week 9: 10/17, 10/19, 10/21	I/O and Performance, Amdahl's Law, I/O Architectures, Data Transmission Modes, Disk Technology: Rigid Disk Drives, Solid State Drives.	Chapter 7
Week 10: 10/24, 10/26, 10/28	Optical Disks, Magnetic Tape, RAID, The Future of Data Storage.	Chapter 7
Week 11: 10/31, 11/02, 11/04	Operating Systems, Protected Environments, Programming Tools, Java: All of the Above	Chapter 8
Week 12: 11/07, 11/09	RISC Machines, Flynn's Taxonomy, Parallel and Multiprocessor Architectures. Alternative Parallel Processing Approaches, Quantum Computing.	Chapter 9
Week 13: 11/14, 11/16, 11/18	Overview Embedded Hardware, Overview Embedded Software.	Chapter 10
11/21-11/25	Thanksgiving break	

Week 14: 11/28, 11/30, 12/02	Computer Performance Equations, Mathematical Preliminaries, Benchmarking.	Chapter 11
Week 15: 12/05, 12/07, 12/09	CPU Performance Optimization, User code optimization, Disk Performance Review for the Final Exam.	Chapter 11
Week 16 12/12	Final Examination: Scheduled Time: 2:00 p.m.-4:00 p.m. Fall 2022 Finals Schedule https://www.csustan.edu/class-schedule/finals-schedule	

* It is subject to change.

Grading Scale:

Grading scale will be assigned on a standard scale as below

A	B	C	D	F
90-100	75-89	60-74	45-59	<45

Clustering of grades may cause the grading scale to be lowered (to your benefit), but it will not be raised.

Evaluation:

The overall course grade will be the weighted sum of the points earned in the following categories:

Participation	Homework	Quizzes	Midterm Exam	Final Exam
10%	20%	15%	25%	30%

Other Polices:

1. I will accept the late assignments for maximum three days (including holidays) with the point deduction 20% per day.
2. There will be no makeup exams except in a verified emergency with immediate notification.

Academic Honesty:

The work you do for this course will be your own, unless otherwise specified. You are not to submit other people's work and represent it as your own. I consider academic honesty to be at the core of the University's activities in education and research. Academic honesty is expected at all times in this course.

Accommodations for Students with Disabilities

Students with disabilities seeking academic accommodations must first register with the Disability Resource Services (DRS) program, located in MSR 210, ph. (209) 667-3159. Students are encouraged to talk with the instructor regarding their accommodation needs after registering with DRS.