San José State University
Computer Science Department
CS 147, Computer Architecture, Section 1, Spring 2021

Course and Contact Information

Instructor:	Dr. Faramarz Mortezaie
Email:	faramarz.mortezaie@sjsu.edu
Office Hours:	Tuesday at 12:00 PM to 12:50 PM or By Appointment – Online
	Zoom Link: https://sjsu.zoom.us/j/89240693065
Class Days/Time:	MW 7:30 - 8:45 AM
Classroom:	Zoom Meeting (Online)
Prerequisite:	CS 47 or CMPE 102 or equivalent (with a grade of "C-" or better)

Faculty Web Page and MYSJSU Messaging

Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on Canvas Leaning Management System course login website at http://sjsu.instructure.com. You are responsible for regularly checking with the messaging system through MySJSU at http://my.sjsu.edu (or other communication system as indicated by the instructor) to learn of any updates.

Course Description

Introduction to the basic concepts of computer hardware structure and design, including processors and arithmetic logic units, pipelining, and memory hierarchy.

Course Learning Objectives (CLO)

Course Learning Outcomes (CLO)

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

- Understand the role of each major hardware component of a computer system and their synergistic interaction with each other and software.
- Analyze and perform tradeoffs between the cost, performance, and reliability of alternative computer architectures.
- Understand, analyze, and design digital logic structures for the basic combinational and sequential circuits.
- Understand the alternative binary internal representation of information (such as sign-magnitude, one's complement, two's complement, and floating point) along with their optimizations and tradeoffs.
- Be able to perform basic mathematical operations (add, multiply) in the various Boolean number representation schemes.
- Understand the operation of, and be able to analyze from a cost/performance standpoint, certain optimized hardware structures.
- Appreciate the need to use a memory hierarchy and understand how locality of memory referencing in typical programs can be leveraged to perform effective memory architecture management.
- Understand and emulate the various mapping, replacement, and dynamic memory allocation algorithms for cache and virtual memory management.
- Understand the rationale and philosophy behind both complex instruction set computers (CISC) and reduced instruction set computers (RISC), and the tradeoffs between the two architectures.
- Understand how pipelining and parallel processing are cost-effective methods of increasing hardware performance.
- Appreciate how computer-aided design tools and hardware description languages can be used to verify and measure the performance of hardware design

Required Texts/Readings Textbook

COMPUTER ORGANIZATION and DESIGN – The Hardware/Software Interface |
*David A Patterson and John L. Hennessy **ARM Edition**, Publisher: MK/Elsevier*

ISBN 978-0-12-801733-3

Other Readings

Assembly Language for x86 processor, Kip Irvine 7th Edition
Publisher: Pearso

Course Requirements and Assignments

SJSU classes are designed such that in order to be successful, it is expected that students will spend a minimum of forty-

five hours for each unit of credit (normally three hours per unit per week), including preparing for class, participating in course activities, completing assignments, and so on. More details about student workload can be found in University Policy S12-3 at http://www.sjsu.edu/senate/docs/S12-3.pdf.

Homework, Midterm and Final exam are expected for this class. Homework is due on Canvas by class starting time on the due date. Each assigned problem requires a solution and an explanation (or work) detailing how you arrived at your solution. Cite any outside sources used to solve a problem. When grading an assignment, I may ask for additional information.

NOTE that University policy F69-24 at http://www.sjsu.edu/senate/docs/F69-24.pdf states that "Students should attend all meetings of their classes, not only because they are responsible for material discussed therein, but because active participation is frequently essential to insure maximum benefit for all members of the class. Attendance per se shall not be used as a criterion for grading."

Grading

Homework, Weekly Quiz, discussion and project	25%
Exam-1	25%
Exam-2	25%
Comprehensive Final Exam	25%

The final and exams have fixed dates and can only be taken in the classroom during class time. Makeup exams will only be given in cases of illness (with signed documentation from a medical facility – original copy). Exams are closed book, closed notes, closed neighbor and comprehensive. The final exam is cumulative. No late homework or discussion is accepted.

Course Grading Standards

A+	98 – 100%
A	93 – 97%
A-	90 – 92%
B+	88 – 89%
B	83 – 87%
B-	80 – 82%

C+   78 – 79%
C   73 – 77%
C-   70 – 72%

D+   68 – 69%
D   63 – 67%
D-   60 – 62%

F   59% and less

Note that "All students have the right, within a reasonable time, to know their academic scores, to review their grade-dependent work, and to be provided with explanations for the determination of their course grades." See University Policy F13-1 at http://www.sjsu.edu/senate/docs/F13-1.pdf for more details.

Classroom Protocol

Attendance
Students are expected to attend zoom meetings and participate in the discussion.
Instructors may drop students from class if they fail to attend respond to instructor email.

Use of Camera in Class

Using camera during lecture is optional. But during the exams and weekly quizzes, you must turn on your webcam. If you there are any issues, please let me know in advance.

Recording of Zoom Classes

It is strongly recommended that you attend all the zoom meetings. Just in case you cannot attend a zoom lecture, zoom lectures will be recorded and recordings will be posted on Canvas. If there are technical issues with zoom recordings, the topics discussed will be posted.

Students are not allowed to record without instructor permission
Students are prohibited from recording class activities (including class lectures, office hours, advising sessions, etc.), distributing class recordings, or posting class recordings. Materials created by the instructor for the course (syllabi, lectures and lecture notes, presentations, etc.) are copyrighted by the instructor. This university policy (S12--7) is in place to protect the privacy of students in the course, aswell as to maintain academic integrity through reducing the instances of cheating. Students who record, distribute, or post these materials will be referred to the Student Conduct and Ethical Development office. Unauthorized recording may violate university and state law. It is the responsibility of students that require special accommodations or assistive technology due to a disability to notify the instructor.

Proctoring Software and Exams

Exams will be proctored in this course through Respondus Monitor and LockDown Browser. Please note it is the instructor's discretion to determine the method of proctoring. If cheating is suspected the proctored videos may be used for further inspection and may become part of the student's disciplinary record. Note that the proctoring software does not determine whether academic misconduct occurred, but does determine whether something irregular occurred that may require further investigation. Students are encouraged to contact the instructor if unexpected interruptions occur during an exam.

Technical difficulties Internet connection issues

Canvas AutoSaves responses a few times per minute as long as there is an internet connection. If your internet connection is lost, Canvas will warn you but allow you to continue working on your exam. A brief loss of internet connection is unlikely to cause you to lose your work. However, a longer loss of connectivity or weak/unstable connection may jeopardize your exam. Other technical difficulties: Immediately email the instructor a current copy of the state of your exam and explain the problem you are facing. Your instructor may not be able to respond immediately or provide technical support. However, the copy of your exam and email will provide a record of the situation.

Contact the SJSU technical support for Canvas:

> Technical Support for Canvas
> Email: ecampus@sjsu.edu
> Phone: (408) 924--2337
> https://www.sjsu.edu/ecampus/support/

If possible, complete your exam in the remaining allotted time, offline if necessary. Email your exam to your instructor within the allotted time or soon after.

Zoom Classroom Etiquette
- Mute Your Microphone: To help keep background noise to a minimum, make sure you mute your microphone when you are not speaking.
- Be Mindful of Background Noise and Distractions: Find a quiet place to "attend" class, to the greatest extent possible.
  - Avoid video setups where people may be walking behind you, people talking/making noise, etc.
  - Avoid activities that could create additional noise, such as shuffling papers, listening to music in the background, etc.
- Position Your Camera Properly: Be sure your webcam is in a stable position and focused at eye level.
- Limit Your Distractions/Avoid Multitasking: You can make it easier to focus on the meeting by turning off notifications, closing or minimizing running apps, and putting your smartphone away (unless you are using it to access Zoom).
- Use Appropriate Virtual Backgrounds: If using a virtual background, it should be appropriate and professional and should NOT suggest or include content that is objectively offensive or demeaning.

University Policies

General Expectations, Rights and Responsibilities of the Student

As members of the academic community, students accept both the rights and responsibilities incumbent upon all members of the institution. Students are encouraged to familiarize themselves with SJSU's policies and practices pertaining to the procedures to follow if and when questions or concerns about a class arises. See University Policy S90–5 at http://www.sjsu.edu/senate/docs/S90-5.pdf. More detailed information on a variety of related topics is available in the SJSU catalog, at http://info.sjsu.edu/web-dbgen/narr/catalog/rec-12234.12506.html. In general, it is recommended that students begin by seeking clarification or discussing concerns with their instructor. If such conversation is not possible, or if it does not serve to address the issue, it is recommended that the student contact the Department Chair as a next step.

Dropping and Adding

Students are responsible for understanding the policies and procedures about add/drop, grade forgiveness, etc.

Refer to the current semester's [Catalog Policies](#) section at http://info.sjsu.edu/static/catalog/policies.html. Add/drop deadlines can be found on the current academic year calendars document on the [Academic Calendars webpage](#) at http://www.sjsu.edu/provost/services/academic_calendars/. The [Late Drop Policy](#) is available at http://www.sjsu.edu/aars/policies/latedrops/policy/. Students should be aware of the current deadlines and penalties for dropping classes.

Information about the latest changes and news is available at the [Advising Hub](#) at http://www.sjsu.edu/advising/.

Consent for Recording of Class and Public Sharing of Instructor Material

[University Policy S12-7](#), http://www.sjsu.edu/senate/docs/S12-7.pdf, requires students to obtain instructor's permission to record the course and the following items to be included in the syllabus:

- "Common courtesy and professional behavior dictate that you notify someone when you are recording him/her. You must obtain the instructor's permission to make audio or video recordings in this class. Such permission allows the recordings to be used for your private, study purposes only. The recordings are the intellectual property of the instructor; you have not been given any rights to reproduce or distribute the material."
  - It is suggested that the greensheet include the instructor's process for granting permission, whether in writing or orally and whether for the whole semester or on a class by class basis.
  - In classes where active participation of students or guests may be on the recording, permission of those students or guests should be obtained as well.
- "Course material developed by the instructor is the intellectual property of the instructor and cannot be shared publicly without his/her approval. You may not publicly share or upload instructor generated material for this course such as exam questions, lecture notes, or homework solutions without instructor consent."

Academic integrity

Your commitment, as a student, to learning is evidenced by your enrollment at San Jose State University. The [University Academic Integrity Policy S07-2](#) at http://www.sjsu.edu/senate/docs/S07-2.pdf requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the office of Student Conduct and Ethical Development. The [Student Conduct and Ethical Development website](#) is available at http://www.sjsu.edu/studentconduct/.

Campus Policy in Compliance with the American Disabilities Act

If you need course adaptations or accommodations because of a disability, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. [Presidential Directive 97-03](#) at http://www.sjsu.edu/president/docs/directives/PD_1997-03.pdf requires that students with disabilities requesting accommodations must register with the [Accessible Education Center](#) (AEC) at http://www.sjsu.edu/aec to establish a record of their disability.

CS147 / Computer Architecture, Spring 2021, Course Schedule

This schedule is subject to change. Any change will be communicated via Canvas with fair notice.

Course Schedule

Week	Date	Topics	Chapters	
1	01/27	Introduction – Review of basic concepts	Class Notes	
2	02/01 02/03	Computer Abstractions and Technology Computer Abstractions and Technology	Chapter-1 Class Notes	
3	02/08 02/10	Instructions: Language of the Computer Instructions: Language of the Computer	Chapter-2 Class Notes	
4	02/15 02/17	Instructions: Language of the Computer Instructions: Language of the Computer	Chapter-2 Class Notes	
5	02/22 02/24	Instructions: Language of the Computer Instructions: Language of the Computer	Chapter-2 Class Notes	
6	03/01 03/03	CISC vs. RISC Exam-1 (Using Lockdown Browser)	Class Notes	
7	03/08 03/10	Adders and Carry Look ahead adders Multipliers and Dividers	Chapter-3 Class Notes	
8	03/15 03/17	Floating Points and Floating Points instructions Floating Points and Floating Points instructions	Chapter-3 Class Notes	
9	03/22 03/24	Combinational circuit and VHDL Combinational circuit and VHDL	Chapter-3 Appendix-A	
	03/29 03/31	SPRING RECESS SPRING RECESS		
10	04/05 04/07	Building a Datapath Building a Datapath	Chapter-4	
11	04/12 04/14	Pipelining and parallelism The processor and Processor Design	Chapter-4	
12	04/19 04/21	Review Exam-2 (Using Lockdown Browser)		
13	04/26 04/28	The processor and Processor Design The processor and Processor Design	Chapter-4 Class Notes	
14	05/03 05/05	Memory Hierarchy: Direct Mapped Cache Set associative and Fully Associative	Chapters 5 Homework-10	
15	05/10 05/12	Memory Hierarchy: Virtual Memory Management Memory Hierarchy: Virtual Memory Management	Chapter-5 Homework-11	
16	05/17	Parallel Processors	Chapter-6	
Final Exam	05/24	Final Exam (Using Lockdown Browser)	7:15 – 9:30 AM Monday	