

Computer Architecture Section 81

CS 147

Spring 2023 3 Unit(s) 01/25/2023 to 05/15/2023 Modified 01/23/2023

Contact Information

Instructor(s):	Dr. Chung-Wen (Albert) Tsao
Office Location:	Duncan Hall Room 282
Email:	chung-wen.tsao@sjsu.edu (Once the class starts, use Canvas Inbox)
Class Days/Time:	M/W 1:30PM - 2:45PM
Classroom:	URL: https://sjsu.zoom.us/j/86807776366
<u>Office</u> Hours:	M/W 1:00 – 1:30pm (on ZOOM at https://sjsu.zoom.us/j/87620744697) M/W 3:00 – 3:30pm (on ZOOM at the same URL link above) T/Th 3:00 – 3:30pm (on ZOOM at th same URL link above) T/Th 3:30 – 4:00pm (Duncan Hall Room 282)

Instructor: Dr Chung-Wen Albert Tsao

Email: chung-wen.tsao@sjsu.edu

Office: DH 282

Phone: N/A

chung-wen.tsao@sjsu.edu (Once the class starts, use Canvas Inbox)

Course Description and Requisites

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

Prerequisite(s): CS 47 or CMPE 102 (with a grade of "C-" or better), Computer Science, Applied and Computational Math, Forensic Science: Digital Evidence, or Software Engineering majors only; or instructor consent.

Letter Graded

* Classroom Protocols

Classroom Protocol and Other Notes

- **Missing the first two lectures and quizzes may be dropped out from the class by the instructor.**
- Do not ask for special treatment. The rules for this course apply to everyone equally.
- Cheating will not be tolerable; a ZERO will be given to any cheated assignment/exams, and it will be reported to the Department and the University.
- Do NOT share/post online any course materials, PPT slides, or homework solutions.
- Use of electronic devices during exams is NOT allowed unless stated otherwise.
- You are required to check Canvas for reading/assignments.
- The information on this syllabus is subject to change; changes, if any, will be clearly explained in class, and it is your responsibility to become aware of them.
- Once the class starts, use Canvas Inbox to email me for a faster response. I check the Canvas Inbox emails much more often than my school emails.

Program Information

Diversity Statement - At SJSU, it is important to create a safe learning environment where we can explore, learn, and grow together. We strive to build a diverse, equitable, inclusive culture that values, encourages, and supports students from all backgrounds and experiences.

Course Learning Outcomes (CLOs)

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.

Course Materials

Required Textbooks

Computer Organization and Design – The Hardware/Software Interface, 5th Edition

Authors: David A. Patterson, John L. Hennessy

ISBN: 9780124077263

Publication Date: 10/10/2013

Publisher: Elsevier

Other Readings

Computer Architecture, 5th Edition

Author: John L. Hennessy

ISBN: 9780123838728

Publication Date: 09/29/2011

Publisher: Elsevier

Logic & Computer Design Fundamentals, 5th Edition

Author: Mano & Kime

ISBN: 9780131989269

Publication Date: 06/15/2007

Publisher: PEARSON

Computer Organization and Architecture, 10th Edition

Author: Stallings

ISBN: 9780134101613

Publication Date: 01/12/2015

Publisher: Pearson

The C Programming Language, 2nd Edition

Author: Kernighan And Ritchie ("K&R"),

ISBN: 0131103628

Publication Date: 01/01/2012

Publisher: Prentice Hall

Course Requirements and Assignments

LockDown Browser + Webcam Requirement:

This course requires the use of LockDown Browser and a webcam for online quizzes. The webcam can be the type that's built into your computer or one that plugs in with a USB cable. Watch [this](#) brief video to get a basic understanding of LockDown browser and the webcam feature. Download and install LockDown browser from [here](#).

Assignments:

- No late assignments will be accepted without advanced arrangement with the instructor.
 - No late submissions will be accepted. However, everyone has two passes to waive the penalty for
 - two submissions that are turned in within 24 hours after the due date, or
 - one submission that are turned in within 48 hours after the due date.
- All homework must clearly indicate each student's name, course, and assignment number.
- Students are allowed (and actively encouraged) to form study groups.
- You may discuss solutions, but you **MUST** write up the answers independently.
- If you use a website or reference book, you must cite it.
- If there are multiple similar submissions not exhibiting independent thought, or with words obviously lifted from a book or

website, ALL such submissions will receive scores of 0.

Pop Quizzes:

Pop quizzes locked with passcode may be given anytime during class. They are usually explained in class and due on the end of the lecture day. The purpose of pop quizzes is to encourage you to study and review the concepts and materials we discussed in the lecture.

Midterm and Final Examinations:

There will be two midterm examinations, and a cumulative final exam.

- Exams may NOT be taken before or after the scheduled time for any reason. All the students need to attend synchronously.
- No make-up exams for anyone except for the medical emergency with the official medical proof.
- Use of electronic devices during exams is NOT allowed unless stated otherwise.
- All exams include quizzes (closed book) and written test (open book)
- All exams will remain with the instructor.

✓ Grading Information

Breakdown

Grading Information

- Participation 5%
- Pop quizzes 15%
- Homework 20%
- Project 15%
- Midterm 1 15%
- Midterm 2 15%
- Final Exam 15%

Final grades will not be adjusted in any way - so an 89.99% is still a B+.

No incomplete grades will be given.

Criteria

Grading Scale					
A+	97%	A	93%	A-	90%
B+	87%	B	83%	B-	80%
C+	77%	C	73%	C-	70%
D+	67%	D	63%	D-	60%
F	below 60.0%				

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.

University Policies

Per [University Policy S16-9](http://www.sjsu.edu/senate/docs/S16-9.pdf) (<http://www.sjsu.edu/senate/docs/S16-9.pdf>), relevant university policy concerning all courses, such as student responsibilities, academic integrity, accommodations, dropping and adding, consent for recording of class, etc. and available student services (e.g. learning assistance, counseling, and other resources) are listed on [Syllabus Information web page](https://www.sjsu.edu/curriculum/courses/syllabus-info.php) (<https://www.sjsu.edu/curriculum/courses/syllabus-info.php>) (<https://www.sjsu.edu/curriculum/courses/syllabus-info.php>). Make sure to visit this page to review and be aware of these university policies and resources.

Course Schedule

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

Week	Date	Topics, Readings, Assignments, Deadlines
1	1/25	Introduction
2	1/30,2/1	MIPS Instructions
3	2/6, 2/8	MIPS Instructions
4	2/13, 2/16	Arithmetic for Computers
5	2/20, 2/22	Arithmetic for Computers
6	2/27,3/1	Logic Design
7	3/6, 3/8	Logic Design, Midterm 1
8	3/13, 3/15	The Processor
9	3/20, 3/22	The Processor
10	3/27,3/29	Spring Recess - no classes
11	4/2-4/4	Memory Hierarchy
12	4/9, 4/11	Review, Midterm 2
13	4/16, 4/18	Memory Hierarchy

14	4/23, 4/25	Memory Hierarchy		
15	4/30, 12/1	Memory Hierarchy, Thanksgiving Holiday		
16	5/2, 5/4	Virtual Memory		
17	5/9, 5/11	Review		
Final exam	5/23	<table border="1"> <tr> <td>12:15-2:30pm, Tuesday, May 23</td> <td>12:15-2:30 PM</td> </tr> </table>	12:15-2:30pm, Tuesday, May 23	12:15-2:30 PM
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SJSU ACADEMIC YEAR [CALENDAR 2022/23](#)