# San José State University

# College of Science/Department of Compute Science

# CS 147-s2 (41771) Computer Architecture

# Fall 2022

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| Instructor(s): | Dr. Chung-Wen (Albert) Tsao |
| Office Location: | Duncan Hall Room 282 |
| Telephone: | N/A |
| Email: | chung-wen.tsao@sjsu.edu (Once the class starts, use Canvas Inbox) |
| Class Days/Time: | M/W 10:30 – 11:45 am |
| Classroom: | URL: <https://sjsu.zoom.us/j/86807776366>) |
| [Office](http://www.sjsu.edu/senate/docs/S12-1.pdf) Hours: | M/W 1:20 – 1:50 pm (on ZOOM URL: <https://sjsu.zoom.us/j/86807776366>)  T/Th 1:20 – 1:50 pm (Duncan Hall Room 282) |
| Office Location: | Zoom meeting using the same link for the live lectures. |
| [Prerequisites](https://www.sjsu.edu/cs/docs/pdfs/Prerequisite%20Chart-June%202020.pdf): | CS 47 or CMPE 102 or equivalent (with a grade of "C-" or better) |
| Class Meeting Dates | Aug 19, 2022 – Dec 6, 2022 |
| Units: | 3 |

**Class Format**

Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on Canvas at http://sjsu.instructure.com. You are responsible for regularly checking the most updated messages and uploaded materials there.

## Course [Description](http://info.sjsu.edu/web-dbgen/splash/catalog.html)

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

**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 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.

**Assignments:**

* + **No late assignments will be accepted without advanced arrangement with the instructor.**
  + 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.

**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](https://www.respondus.com/products/lockdown-browser/student-movie.shtml) brief video to get a basic understanding of LockDown browser and the webcam feature. Download and install LockDown browser from [here](https://download.respondus.com/lockdown/download.php?id=967937270).

**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**

* Pop quizzes 10%
* Homework 20%
* Project 1 10%
* Project 2 10%
* Midterm 1 15%
* Midterm 2 15%
* Final Exam 20%

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

No incomplete grades will be given.

The grading scale is as follows:

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| --- | --- | --- | --- | --- | --- |
| [Grading Scale](https://catalog.sjsu.edu/content.php?catoid=12&navoid=4099#grading-system) | | | | | |
| 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.

**Classroom Protocol and Other Notes**

* **Missing the first two lectures and quizzes may be dropped out from the class by the instructor.**
* **No late assignments will be accepted without advanced arrangement with 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.

**Attendance**

* 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.

**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: 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. Course material 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.

**University Policies**

Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. will be available on Office of Graduate and Undergraduate Programs’ Syllabus Information web page at http://www.sjsu.edu/gup/syllabusinfo/”

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

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| **Week** | **Date** | page5image22159232**Topics, Readings, Assignments, Deadlines** |
| 1 | 8/22,8/24 | page5image11657280Introduction |
| 2  page5image11859072 | 8/29,8/31 | page5image11860992MIPS Instructions |
| 3 | 9/5, 9/7 | page5image11659392MIPS Instructions |
| 4 | 9/12, 9/14 | Arithmetic for Computers |
| 5 | 9/19, 9/21 | Arithmetic for Computers |
| 6  page5image11581696 | 9/26,9/28 | page5image11626816Logic Design |
| 7 | 10/03, 10/05 | page5image11659200Logic Design, Midterm 1  page5image11617792 |
| 8 | 10/10, 10/12 | page5image11621824The Processor |
| 9 | 10/17, 10/19 | The Processor  page5image11629504 |
| 10 | 10/24,10/26 | page5image11631616 Memory Hierarchy |
| 11  page5image11602368 | 10/31-11/2 | Review, Midterm 2 |
| 12 | 11/7, 11/9 | Memory Hierarchy |
| 13 | 11/14, 11/16 | Memory Hierarchy |
| 14 | 11/21, 11/23 | Memory Hierarchy, Thanksgiving Holiday |
| 15  page6image12031424 | 11/28, 11/30 | page6image12033728Virtual Memory |
| 16 | 12/5 | Review |
| [**Final exam**](https://www.sjsu.edu/classes/final-exam-schedule/fall-2022.php)**,** | 12/12 | 09:45-12:00am, Monday  page6image22128704 |

SJSU ACADEMIC YEAR [CALENDAR 2022/23](https://www.sjsu.edu/classes/calendar/2022-2023.php)