San José State University
Computer Science Department

CS147 Computer Architecture – Section 2, Fall 2020

Course and Contact Information

Instructor:	William "Bill" Andreopoulos
Office Location:	Online (former MacQuarrie Hall 416)
Email:	Please use Canvas Messaging and the Discussion Forum
Class Days/Time:	MW 1:30-2:45 pm
Classroom:	Online
Office Hours:	F 4:00-5:00 pm
Prerequisites:	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 Learning Management System course login website at http://sjsu.instructure.com. You are responsible for regularly checking with the Canvas messaging system to learn of any updates. You should modify the Canvas settings for notifications of announcements and discussion forum postings to be sent to you.

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 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.

Required Texts/Readings

We will be using the zyBook SJSUCS147AndreopoulosFall2020.
Subscription instructions are provided on Canvas.
The zyBook comes with a MIPS simulator. You can download the chapters of the book as PDF files by clicking on the "Print chapter" button. It is based on the following textbook:

COMPUTER ORGANIZATION and DESIGN – The Hardware/Software Interface |
Edition: 5th Authors: David A. Patterson, John L. Hennessy
ISBN: 9780124077263
Publication Date: 10/10/2013
Publisher: ELSEVIER

Other Readings

•   Handouts through Canvas.

Other technology requirements / equipment / material

MIPS simulator provided through zyBooks. We will also use zyBooks as reading material and for the worksheet exercises and assignments. You can follow 3 steps to subscribe, as described on Canvas.

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.

Reading assignments: Readings will regularly be assigned for the next class (see schedule). Slides will be posted under the Canvas modules before the next class.

Worksheets: A worksheet will be due weekly. Worksheets are based on zyBooks participation activities. Please refer to instructions and deadline on Canvas for details. Due dates will be posted on Canvas. You need to submit the worksheets by their closing time on the due date. No makeup on worksheets. No worksheet will be re-opened after its closing date. As this is a challenging course, it is essential that you submit the worksheets in a timely fashion in order to keep up with the course.

Examples of worksheet activities will include short coding exercises, short answer questions, as well as true/false or multiple choice questions.

We will take time at the beginning of each class to discuss any difficulties students have in completing the worksheets from previous classes.

Homework assignments: Assignments will be assigned for each chapter of the textbook. The assignments will be similar to worksheets. All assignments should be submitted on the corresponding assignment page in Canvas by 11:59 P.M. on the due date. The programming assignments cumulatively will be worth 40% of your grade.

More information will be given at the time of the first assignment. Penalty for late submission 5% for every 3 days up to 15 days; after 15 days no submission will be accepted and the submission page will be closed. Never email your assignments, always upload to Canvas.

Students are encouraged to work in groups of two and discuss the worksheet or assignment solutions with a partner. If two students form a group, the pair of both group members will get the same grade for any worksheet/assignment they submit together. Only one group member should submit a worksheet/assignment (to avoid double grading). If you form a group, you should indicate both your group members' names in a spreadsheet that will be given. Students are free to leave a group, or work on their own if they prefer. Note it is optional to form a group and work with a partner.

All assignment solutions that you submit must be completely your own or your group's original work (i.e., your solution cannot be copied in part or in full from any other source, such as other students, the internet, etc.). While it is fine to discuss the worksheet/assignment solutions with your partner within your group, solutions submitted on Canvas should reflect your own group's efforts. Oral examination might be requested. All homework should be submitted on Canvas, not by e-mail.

iClicker participation during class: The iClicker questions are in the form of multiple choice and true-false questions. All students are expected to participate with iClicker. Credit is given for participation and it is not necessary to get the correct answer to get credit. Please install iClicker on your phone (app) or laptop (iclicker.com) following these instructions: http://www.sjsu.edu/ecampus/teaching-tools/iclicker/

Midterm exams: There will be two Midterm exams during the semester.

Final exam: One final cumulative exam.

The exams will contain multiple choice questions, true/false and short answer questions. Exams are open book, open notes, and comprehensive. The exams should

be done individually and are not group work. No make-up exams except in case of verifiable emergency circumstances.

Discussion Forum on Canvas

We will be using the Discussion Forum on Canvas for class discussion. The system is highly catered to getting you help fast and efficiently from classmates, the TA, and myself. Rather than emailing questions to the teaching staff, I encourage you to post your questions on the Discussion Forum on Canvas.

Students should participate regularly in the course using the Canvas Discussion Forum. Every student should make a posting under each graded thread on the Discussion Forum over the duration of the course. There will be a graded thread opened by the instructor for each module of the course. You may ask questions that are assignment or worksheet related or anything related to the course. You may also answer other students' questions. Avoid asking questions that have already been asked or answer what was already answered. This participation component counts for 5% of your course grade.

Office hours

The instructor will be online on Zoom to offer assistance with the labs on Friday evening from 4-5pm.

Determination of Grades

Final Grade is based on:

40% Six Assignments
14% Weekly Worksheets
1%   iClicker participation
5%   Discussion Forum Participation
20% Two midterms
20% Final

Grade	Points	Percentage
A plus	960 to 1000	96 to 100%
A	930 to 959	93 to 95%
A minus	900 to 929	90 to 92%
B plus	860 to 899	86 to 89 %
B	830 to 859	83 to 85%
B minus	800 to 829	80 to 82%
C plus	760 to 799	76 to 79%
C	730 to 759	73 to 75%
C minus	700 to 729	70 to 72%
D plus	660 to 699	66 to 69%
D	630 to 659	63 to 65%
D minus	600 to 629	60 to 62%

Communication with the instructor

The course instructor receives a large volume of emails and he can not respond to every message received. Students should follow the correct channels for communication. Questions should preferably be done during the regular class meeting time via Zoom.

For course-related electronic communication you may post to the Discussion Forum, use Canvas messaging, and visit office hours:
1) Students should post questions on the Canvas Discussion Forum, where the entire class can read and benefit from the responses. The discussion forum postings may also be discussed in class.

2) Students should preferably use Canvas messaging rather than direct email, since this helps the instructor to organize and keep track of all course-related electronic communication. The instructor will often re-post Canvas messages and responses to the discussion forum.

3) Students are invited to join the office hours on Friday from 4-5pm via Zoom.

Private messages sent to the instructor's other email addresses will get delayed responses and may be lost due to the very large volume of emails received. The instructor does not write emails after normal business hours, on weekends or holidays.

Announcements that concern everyone, such as reminders about due dates or class policy, will be posted under Announcements on Canvas.

Reviewing code for the assignments and technical trouble-shooting should preferably be done during the regular class meeting time via Zoom. Instead of sending the instructor your entire code via email, come to class and discuss it there.

Graders/TAs

Siddartha Thentu
siddartha.thentu@sjsu.edu

Embedded Tutor

Sruthi Duvvuri
sruthi.duvvuri@sjsu.edu

Classroom Protocol

Attendance (via Zoom) is highly recommended. You are not allowed to publically share or upload material for this course such as exam questions, lecture notes, or solutions without the instructor's consent.

Regrading Procedure

Grades assigned are final, unless there was an error in the grading. In the event that a student wants to request a regrade of a homework or test, please follow the procedure described next. You should fill out the "Regrade request" form on Canvas. A request for a regrade is not a technique to drum up a few more points. If the course instructor thinks a component was scored too highly the first time, it may be lowered in a regrade. *The overall grade may increase, decrease, or stay the same after a regrade request*.

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/

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The schedule is subject to change with fair notice.

Course Schedule

Classes	Topic
08/19	Introduction
08/24	Introduction
08/26	MIPS Instructions
08/31	MIPS Instructions
09/02	MIPS Instructions
09/7	*Labor Day - Campus Closed*
09/9	MIPS Instructions
09/14	Arithmetic for Computers
09/16	Arithmetic for Computers

09/21	Arithmetic for Computers
09/23	Arithmetic for Computers
09/28	Wrap-up
09/30	**Midterm 1**
10/05	Logic Design
10/07	Logic Design
10/12	The Processor
10/14	The Processor
10/19	The Processor
10/21	The Processor
10/26	The Processor
10/28	Wrap-up
11/02	**Midterm 2**
11/04	Memory Hierarchy
11/09	Memory Hierarchy
11/11	*Veterans Day - Campus Closed*
11/16	Memory Hierarchy
11/18	Memory Hierarchy

11/23	Parallel Processors
11/25	*Non-Instructional Day*
11/30	Parallel Processors
12/02	Parallel Processors
12/07	Wrap-up
	Final exam - Tuesday, December 15, 12:15-14:30pm