

San José State University
Computer Science
CS 147 Computer Architecture (Sect. 02),
Spring 2016

Course and Contact Information

Instructor:	Dr. Juan Gomez
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Office Hours:	Thursday 5:00-6:00pm
Class Days/Time:	MoWe 7:30-8:45pm (01/28/2016-05/16/2016)
Classroom:	DH 450
Prerequisites:	CS 47 Introduction to Computer Systems or CMPE 102 Assembly Language Programming with C- or better.

Course Description

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

Faculty Web Page and MYSJSU Messaging

Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on my class web page in [Canvas](https://sjsu.instructure.com) (<https://sjsu.instructure.com>). You are responsible for regularly checking with the messaging system to learn any updates.

Learning Outcomes:

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

- SLO 1 Understand the role of each major hardware component of a computer system and their synergistic interaction with each other and software.
- SLO 2 Analyze and perform tradeoffs between the cost, performance, and reliability of alternative computer architectures.
- SLO 3 Understand, analyze, and design digital logic structures for the basic combinational and sequential circuits.
- SLO 4 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.
- SLO 5 Be able to perform basic mathematical operations (add, multiply) in the various Boolean number representation schemes.
- SLO 6 Understand the operation of, and be able to analyze from a cost/performance standpoint, certain optimized hardware structures.
- SLO 7 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.
- SLO 8 Understand and emulate the various mapping, replacement, and dynamic memory allocation algorithms for cache and virtual memory management.
- SLO 9 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.
- SLO 10 Understand how pipelining and parallel processing are cost-effective methods of increasing hardware performance.
- SLO 11 Appreciate how computer-aided design tools and hardware description languages can be used to verify and measure the performance of hardware designs.

Course Learning Objectives (CLO)

- CLO1 Review the basic Boolean number representation schemes, digital logic gates, and basic combinatorial and sequential circuit structures..
- CLO2 Introduction to the basic roles and responsibilities for each of the major hardware components of a computer.
- CLO3 Review the need to use a memory hierarchy, perform memory management, and to explain to them the various memory management techniques and their tradeoffs.
- CLO4 Review implementation of the fundamental mathematical operations such as addition, subtraction, multiplication, and division and optimization with Boolean operands.
- CLO5 Review tradeoffs between complex instruction set computers (CISC) and reduced instruction set computers (RISC).
- CLO6 Review non-classical architectures such as parallel processors and pipelined machines which are used to accelerate hardware performance without impacting legacy sequential software programming languages or techniques.
- CLO7 Introduction to computer-aided design tools and hardware description languages useful to computer architects in performing functional verification and performance measurements of digital systems.
- CLO8 Review operation of hardware and software working synergistically together.

Required Texts/Readings

Textbook

David A Patterson and John L. Hennessy
5th Edition, Publisher: MK/Elsevier
ISBN 978-0124077263

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](http://www.sjsu.edu/senate/docs/S12-3.pdf) at <http://www.sjsu.edu/senate/docs/S12-3.pdf>.

NOTE that University policy F69-24, “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 Policy

- 1.-Quizzes / Homework (~ bi-Weekly) 40%
- 2.-Midterm (Wednesday 03/23/2016, during class time) 25%
- 3.-Final Exam (Wednesday 05/18/2016 @ 19:45-22:00) 35%

(See [Final Exam Schedule](http://info.sjsu.edu/static/schedules/final-exam-schedule-spring.html) at <http://info.sjsu.edu/static/schedules/final-exam-schedule-spring.html>)

No make-ups exams except in case of verifiable emergency circumstances; once you are back in school, you need to take the exam within a week assuming that you provide documents to justify your absent and it is for a short time. No credit for any late turnings.

Grades will be assigned as described below in a system where the maximum grade is 100 points.

- A+: [97, 100]
- A: [93, 97)
- A-: [90, 93)
- B+: [82, 90)
- B: [75, 82)
- B-: [65, 75)
- C+: [60, 65)
- C: [55, 60)
- C-: [50, 55)
- D+: [42, 50)
- D: [35, 42)
- D- : [25, 35)
- F: [0, 25)

Important: As an example, a student with a final grade of 96 / 100 will have a letter grade of A (not A+). I.e. no special handling of border situations will be performed and the grading scale above will be followed strictly.

“A minimum aggregate GPA of 2.0 SJSU Studies (R, S, & V) shall be required of all students as a graduation requirement.” To see full text, review [University Policy S11-3](http://www.sjsu.edu/senate/docs/S11-3.pdf) at <http://www.sjsu.edu/senate/docs/S11-3.pdf>.

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](http://www.sjsu.edu/senate/docs/F13-1.pdf) at <http://www.sjsu.edu/senate/docs/F13-1.pdf> for more details

Classroom Protocol

See class policies to be posted in the class website.

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](http://www.sjsu.edu/president/docs/directives/PD_1997-03.pdf) 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](http://www.sjsu.edu/aec) (AEC) at <http://www.sjsu.edu/aec> to establish a record of their disability.

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](http://www.sjsu.edu/senate/docs/S90-5.pdf) 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](http://info.sjsu.edu/web-dbgen/narr/catalog/rec-12234.12506.html), 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](http://info.sjsu.edu/static/catalog/policies.html) 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](http://www.sjsu.edu/provost/services/academic_calendars/) at http://www.sjsu.edu/provost/services/academic_calendars/. The [Late Drop Policy](http://www.sjsu.edu/aars/policies/latedrops/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](http://www.sjsu.edu/advising/) 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), <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 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](http://www.sjsu.edu/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.

Student Technology Resources

Computer labs for student use are available in the [Academic Success Center](#) at <http://www.sjsu.edu/at/asc/> located on the 1st floor of Clark Hall and in the Associated Students Lab on the 2nd floor of the Student Union. Additional computer labs may be available in your department/college. Computers are also available in the Martin Luther King Library.

A wide variety of audio-visual equipment is available for student checkout from Media Services located in IRC 112. These items include DV and HD digital camcorders; digital still cameras; video, slide and overhead projectors; DVD, CD, and audiotape players; sound systems, wireless microphones, projection screens and monitors.

SJSU Peer Connections

Peer Connections, a campus-wide resource for mentoring and tutoring, strives to inspire students to develop their potential as independent learners while they learn to successfully navigate through their university experience. You are encouraged to take advantage of their services which include course-content based tutoring, enhanced study and time management skills, more effective critical thinking strategies, decision making and problem-solving abilities, and campus resource referrals.

In addition to offering small group, individual, and drop-in tutoring for a number of undergraduate courses, consultation with mentors is available on a drop-in or by appointment basis. Workshops are offered on a wide variety of topics including preparing for the Writing Skills Test (WST), improving your learning and memory, alleviating procrastination, surviving your first semester at SJSU, and other related topics. A computer lab and study space are also available for student use in Room 600 of Student Services Center (SSC).

Peer Connections is located in three locations: SSC, Room 600 (10th Street Garage on the corner of 10th and San Fernando Street), at the 1st floor entrance of Clark Hall, and in the Living Learning Center (LLC) in Campus Village Housing Building B. Visit [Peer Connections website](#) at <http://peerconnections.sjsu.edu> for more information.

SJSU Writing Center

The SJSU Writing Center is located in Clark Hall, Suite 126. All Writing Specialists have gone through a rigorous hiring process, and they are well trained to assist all students at all levels within all disciplines to become better writers. In addition to one-on-one tutoring services, the Writing Center also offers workshops every semester on a variety of writing topics. To make an appointment or to refer to the numerous online resources offered through the Writing Center, visit the [Writing Center website](http://www.sjsu.edu/writingcenter) at <http://www.sjsu.edu/writingcenter>. For additional resources and updated information, follow the Writing Center on Twitter and become a fan of the SJSU Writing Center on



Facebook. (Note: You need to have a QR Reader to scan this code.)

SJSU Counseling Services

The SJSU Counseling Services is located on the corner of 7th Street and San Fernando Street, in Room 201, Administration Building. Professional psychologists, social workers, and counselors are available to provide consultations on issues of student mental health, campus climate or psychological and academic issues on an individual, couple, or group basis. To schedule an appointment or learn more information, visit [Counseling Services website](http://www.sjsu.edu/counseling) at <http://www.sjsu.edu/counseling>.

CS 147 / Computer Architecture / Spring 2016, Course Schedule

(schedule is subject to change with fair notice via the class website).

Date	Topic	Textbook Chapter
02/01/2016	Administrative	
02/03/2016	Computer Abstraction and Technology	Chapter 1
02/15/2016	Instructions: Language of the Computer	Chapter 2
03/07/2016	Arithmetic for Computers	Chapter 3
03/21/2016	The Processor	Chapter 4
03/23/2016	Midterm Exam	
04/11/2016	Large and Fast: Exploiting Memory Hierarchy	Chapter 5
04/25/2016	Parallel Processors from Client to Cloud	Chapter 6
05/18/2016	Final Exam	19:45-22:00

Important NOTE:

In rare occasions, the instructor may decide to administer evaluations where students are allowed to use their “paper notes”-(NO BOOK OR ELECTRONIC COPIES), so it is in your best interest to attend to class and take good notes; they may be handy in such situations.