

San José State University
Department of Computer Science
CS147, Computer Architecture, Section 1, Fall, 2016

Course and Contact Information

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| Instructor: | Fabio Di Troia |
| Office Location: | DH282 |
| Telephone: | |
| Email: | fabio.ditroia@sjsu.edu |
| Office Hours: | Friday, 11:00 – 13:00 |
| Class Days/Time: | Monday/Wednesday, 7:30 – 8:45 a.m. |
| Classroom: | Science Building 164 |
| Prerequisites: | CS 47 or CMPE 102 or equivalent (with a grade of "C-" or better) |

Course Format

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](http://my.sjsu.edu) at <http://sjsu.instructure.com>. You are responsible for regularly checking with the messaging system through [MySJSU](http://my.sjsu.edu) 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 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 | Edition: 5th
 Authors: David A. Patterson, John L. Hennessy
 ISBN: 9780124077263
 Publication Date: 10/10/2013
 Publisher: ELSEVIER

Other Readings

COMPUTER ARCHITECTURE | Edition: 5th
 Author: John L. Hennessy
 ISBN: 9780123838728
 Publication Date: 09/29/2011
 Publisher: ELSEVIER

COMPUTER ORGANIZATION and ARCHITECTURE | Edition: 10th
 Author: Stallings
 ISBN: 9780134101613
 Publication Date: 01/12/2015
 Publisher: PEARSON

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>.

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](http://www.sjsu.edu/senate/docs/F69-24.pdf) 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."

Final Examination or Evaluation

The final examination occurs in class and will be published on Canvas. If you cannot use a laptop to access Canvas, you can ask for a paper version.

Grading Information

- Homework, 100 points.
- Midterm, 100 points.
- Final, 100 points

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.

Determination of Grades

Semester grade will be computed as a weighted average of the 3 scores listed above.

No make-up tests or quizzes will be given and no late homework (or other work) will be accepted. Also, in-class work must be completed in the section that you are enrolled in.

Nominal Grading Scale:

| Percentage | Grade |
|--------------|-------|
| 92 and above | A |
| 90 – 91 | A- |
| 88 – 89 | B+ |
| 82 – 87 | B |

| | |
|--------------|----|
| 80 – 81 | B- |
| 78 – 79 | C+ |
| 72 – 77 | C |
| 70 – 71 | C- |
| 68 – 69 | D+ |
| 62 – 67 | D |
| 60 - 61 | D- |
| 59 and below | F |

Classroom Protocol

- **Cheating** will not be tolerated.
- Student must be respectful of the instructor and other students. For example, No disruptive or annoying talking.
- Turn off cell phones
- Class begins on time
- Valid picture ID required at all times

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](http://www.sjsu.edu/gup/syllabusinfo/) at <http://www.sjsu.edu/gup/syllabusinfo/>

CS147 / Computer Architecture, Spring 2016, Course Schedule

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

Course Schedule

| Week | Date | Topics, Readings, Assignments, Deadlines |
|------|------|--|
| 1 | 8/24 | Computer Abstractions and Technology |
| 1 | 8/29 | Computer Abstractions and Technology |
| 2 | 8/31 | Instructions: Language of the Computer |
| 2 | 9/7 | Instructions: Language of the Computer |
| 3 | 9/12 | Instructions: Language of the Computer |
| 3 | 9/14 | Instructions: Language of the Computer |

| Week | Date | Topics, Readings, Assignments, Deadlines |
|-------------|-------------|---|
| 4 | 9/19 | Arithmetic for Computers |
| 4 | 9/21 | Arithmetic for Computers |
| 5 | 9/26 | Arithmetic for Computers |
| 5 | 9/28 | Arithmetic for Computers |
| 6 | 10/3 | Arithmetic for Computers |
| 6 | 10/5 | Arithmetic for Computers |
| 7 | 10/10 | MIDTERM |
| 7 | 10/12 | The Processor |
| 8 | 10/17 | The Processor |
| 8 | 10/19 | The Processor |
| 9 | 10/24 | The Processor |
| 9 | 10/26 | The Processor |
| 10 | 10/31 | Large and Fast: Exploiting Memory Hierarchy |
| 10 | 11/2 | Large and Fast: Exploiting Memory Hierarchy |
| 11 | 11/7 | Large and Fast: Exploiting Memory Hierarchy |
| 11 | 11/9 | Large and Fast: Exploiting Memory Hierarchy |
| 12 | 11/14 | Large and Fast: Exploiting Memory Hierarchy |
| 12 | 11/16 | Large and Fast: Exploiting Memory Hierarchy |
| 13 | 11/21 | Parallel Processors from Client to Cloud |
| 13 | 11/28 | Parallel Processors from Client to Cloud |
| 14 | 11/30 | Parallel Processors from Client to Cloud |
| 14 | 12/5 | Parallel Processors from Client to Cloud |
| 15 | 12/7 | Parallel Processors from Client to Cloud |
| 15 | 12/12 | Wrap-up |
| Final Exam | 12/20 | Science Building 164, 07:15-09:30 AM |