San José State University  
Charles W. Davidson College of Engineering  
DEPARTMENT OF ELECTRICAL ENGINEERING  
EE 120 – Microprocessor-Based System Design (Spring 2019)

Course and Contact Information

Instructor: Dr. Tri Caohuu  
Office Location: Engineering Building, Room 375  
Telephone: (408) 623-8412  
Email: Tri.caohuu@sjsu.edu  
Office Hours: Monday & Wednesday (15:00-16:00)  
Class Days/Time: Monday & Wednesday, 13:30 – 14:45  
Classroom: Engineering Building 345  
Prerequisites: EE 118 (with grade C or better)  
EE 120L (to be taken concurrently)  
Knowledge in computer programming and software development  
Good skills in C programming  
Advanced knowledge in number systems and basic logic components

Faculty Web Page and MYSJSU Messaging

Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on the website on CANVAS. You are responsible for regularly checking with your official email address (email address stored on your MySJSU account) and the messaging system through your MySJSU at http://my.sjsu.edu to learn of any updates from the course instructor.

Course Description

This course covers both software and hardware aspects of ARM microcomputer system, including the microprocessor structure, its operation and control, the organization and interface requirements for a microcomputer system, the structures and operations of standard hardware components associated with a microcomputer system, microprocessor and standard buses, assembly language programming and structure of the machine codes. Lab experiments associated with this course involve software/hardware development tools, assembly and C/C++ programming and digital circuit design and testing.

Student Learning Objectives

Upon successful completion of this course, students will be able to:
LO1. Demonstrate an understanding of the microprocessor architecture, its instructions and addressing modes  
LO2. Analyze a microprocessor program and develop an assembly language programs for applications  
LO3. Demonstrate an understanding of the microprocessor signals, bus cycles and timing  
LO4. Design a memory system and I/O circuit interface and interface them to a microprocessor  
LO5. Use programmable interface controllers and programmable timers in a digital circuit  
LO6. Design a system using an interrupt interface for a microprocessor  
LO7. Use development tool for exploring microprocessor architecture, software and hardware development  
LO8. Use logic analyzer for understanding timing, hardware development, and for exploring the relationship between hardware and software of a microprocessor system
Lo9. Analyze experimental data and prepare technical reports and documents

**Required Text and Laboratory Manual**

**Required Textbooks**

**Reference Textbooks**
- *The Definitive Guide to ARM® Cortex®-M0 and Cortex-M0+ Processors, Second Edition*, Joseph Yiu,
Publication Date: July 9, 2015, ISBN-10: 0128032774

**Required Lab Manual**
Laboratory handouts and documents will be distributed as soft-copies (for students to download).

**Course Requirements and Assignments**

**Lectures**
The course will follow the selected subjects as listed on the course description. Additional theory and examples will be given and discussed in class as much as time permits.
- Please note that lecture materials are NOT solely based on the required text and so students are responsible for following up the lecture in order to prepare themselves for the exams
- Students are responsible for the reading the text, handouts, lecture presentations, etc.
- Students are responsible for following up and keeping track of the in-class lecture materials.
- Students are responsible for finding and reading additional books, papers, examples, etc. in order to gain more understanding of the materials discussed in the lectures.
- Students are responsible for self-learning and tools for assigned homework problems, lab exercises, projects, and for lecture discussions.

**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 section at [http://info.sjsu.edu/static/catalog/policies.html](http://info.sjsu.edu/static/catalog/policies.html). Add/drop deadlines can be found on the current academic calendar web page located at [http://www.sjsu.edu/calendars/](http://www.sjsu.edu/calendars/). The Late Drop Policy is available at [http://www.sjsu.edu/aars/policies/latedrops/policy/](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 at [http://www.sjsu.edu/advising/](http://www.sjsu.edu/advising/).

**Midterm and Final Exams and Design Project**
There will be quizzes, two midterm exams & a comprehensive final exam. The exams (Final exam date is posted by the university). Since make-up exams will NOT be given, please make sure that you are able to attend all exams at the indicated scheduled dates and times (from the beginning of the semester) in order to register for the course.

- All exams are closed-book exams.
  - One sheet (double-side 8.5x11) of hand-written notes is allowed for each midterm exam and two sheets of hand-written notes are allowed for the final exam.
  - Only basic calculators are allowed.

- There will be no make-up exams
Homework Assignments and Lab Exercises

- Homework assignments and/or lab exercises will be given with due dates
- Only one side of page must be used in the HWs. (No HW sending through an email will be accepted.)
- HW should be clean, legible, stapled on top left corner and proper paper should be used.

- If unreasonable or out of common sense behavior happens in the class, one will be asked to leave from the class and will be given “F” grade. (No feet on a table or chair, taking hat off, no cellphone use or web surfing, no talking with neighbors). And I will drop you from the class if the class is disturbed unreasonably.
- No food is allowed (Water is ok). All the exams and quizzes are done in the class and only allowed to use pencil, eraser (no pen) and calculator.
- Homework must be submitted in class on time.
- Do NOT submit HW via email. Submit HWs in class as hard-copies (paper) only
- Late submission will NOT be accepted (absolutely!).
- There is no make-up homework/lab. To get credit for your homework/lab assignments, submissions must be neat, clean, and must be done professionally and seriously. Your official name (not nickname), course #, and homework # must be visibly shown on each assignment.

Laboratory Assignments

Each laboratory exercise report requires different format as described in the lab assignment. Each laboratory exercise report must be turned in as scheduled. Students may be asked to demonstrate their lab exercises anytime so please make sure that data and programs are always available. Each student is responsible for individual laboratory exercise reports and late reports will be subjected to a penalty of 20% per day.

Grading Information

The overall course grades (letter-grades) will be assigned based on a defined grading standard as shown below. The weights of the whole course work assignments are:

1. Homework assignments & Quizzes 10% (Quiz=HW)
2. Two midterm exams 35% (17.5% each)
3. One final exam 30%
4. 8 laboratory assignments 20%
5. Final Lab test: 5%

Note: 4, 5 are lab works.

And the overall course grade (letter-grade) will be assigned based on the distribution below:

Grading criteria (Example: 74% results in a grade of C+):

0<F<57<D-<60<D<64<D+<67<C-<70<C<74<C+<77<B-<80<B<84<B+<87<A-<90<A<100
**Classroom Protocol**
EE120 students understand that professional attitude is necessary to maintain a comfortable academic environment in the classroom. For examples:
 Students will put their cell phones in quiet/vibration mode during the lecture.
 Students understand that drinking water, juices, etc. during the lecture is acceptable but NOT eating.
 Students will not skip the lecture and then ask the instructor to summarize the lecture later on. Office hours are for students to have questions, not for the instructor to summarize the lecture for any specific student.
 Students will come to the class on time and leave the class at the end of the lecture.
 Students will consult the course syllabus for class policies and requirements before requesting the instructor for any special considerations and/or exceptions
 To minimize possible tension during the exams, students are requested to follow the exam rules closely.
 Students will work on the project and report by their own and will not share the work with other students
 Students understand that long-term learning is their responsibility and will always keep it up.

*If you need explanations on lecture materials, projects, homework assignments, exams, etc...., please see me in-person during my office hours. Do NOT email me for these matters. If you must send me an email, please clearly specify your full-name, course, section, etc. I will not respond to email that I do not know the author or emails that have no manners.*

**University Policies (Required)**
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/”

**EE Department Honor Code**
The Electrical Engineering Department will enforce the following Honor Code that must be read and accepted by all students.
“I have read the Honor Code and agree with its provisions. My continued enrollment in this course constitutes full acceptance of this code. I will NOT:
• Take an exam in place of someone else, or have someone take an exam in my place
• Give information or receive information from another person during an exam
• Use more reference material during an exam than is allowed by the instructor
• Obtain a copy of an exam prior to the time it is given
• Alter an exam after it has been graded and then return it to the instructor for re-grading
• Leave the exam room without returning the exam to the instructor.”

**Measures Dealing with Occurrences of Cheating**
• Department policy mandates that the student or students involved in cheating will receive an “F” on that evaluation instrument (paper, exam, project, homework, etc.) and will be reported to the Department and the University.
• A student’s second offense in any course will result in a Department recommendation of suspension from the University.
### Course Schedule

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<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topics, Readings, Assignments, Deadlines</th>
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| 1    | 2/4,6  | Introduction to EE120  
                C Language Introduction                                                     |
| 2    | 2/11,13| Review of Pointer and Structure  
                Introduction to SAMD                                                         |
| 3    | 2/18,20| Chap1, Computer and Assembly Language  
                Chap.2, Data Presentation                                                   |
| 4    | 2/25,27| Chap3, ARM Instruction Set Architecture                                       |
| 5    | 3/4,6  | Chap4, Arithmetic and Logic Instruction                                        |
| 6    | 3/11,13| Review & Exam #1                                                              |
| 7    | 3/18,20| Chap5, Data Transfer Instructions  
                Chap6, Control Transfer Instructions                                          |
<p>| 8    | 3/25,27| Chap7, Structure Programing in Assembly                                         |
| 9    | 4/1,4  | Spring Recess                                                                |
| 10   | 4/8,10 | Chap8, Subroutine Parameters Passing                                          |
| 11   | 4/15,17| Review &amp; Exam #2                                                             |
| 12   | 4/22,24| Chap11, Exceptions and Interruptions                                          |
| 13   | 4/29   | Chap10, Mixing C and Assembly                                                |</p>
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<tbody>
<tr>
<td>14</td>
<td>5/6,8</td>
<td>Chap12, Fixed Point &amp; Floating Point Arithmetic</td>
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<tr>
<td>15</td>
<td>5/13</td>
<td>Review</td>
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<tr>
<td>Final Exam</td>
<td>5/17</td>
<td>Wednesday, May 16th, 12:15 to 14:30</td>
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