San José State University
Charles W. Davidson College of Engineering

DEPARTMENT OF ELECTRICAL ENGINEERING
EE 120L - Microprocessor Based System Design
Laboratory Section 5 (Fall 2017)

Coordinator: Prof. Youngsoo Kim
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Office Hours: TBD
Lab Day/Time: Wednesday, 6:00PM – 8:45PM
Lab room: Engineering Building, room 307
Prerequisites: EE 118 with grade C or better
EE 120 (lecture to be taken concurrently)
Knowledge in computer programming and software development
Good skills in C/C++ programming
Advanced knowledge in number systems and basic logic components

Course Description
EE 120 Laboratory is part of the EE 120 course. Students taking EE 120 are required to register for one lecture section and one laboratory section. At the end of the semester, laboratory work will be integrated with the lecture one to determine EE 120 course grade. There will be no grade/pass/non-pass for the laboratory but students must complete the laboratory in order to complete EE 120 course. Major activities of EE120 laboratory are listed as below:
- Use of the software development tool to explore microprocessor architecture, addressing modes, instruction set, memory, I/O and interrupt system.
- Implement digital circuits and perform timing analysis of their signals using logic analyzer.
- Develop C/C++ programs for an embedded microprocessor-based system
- Design and implement circuits to interface a computer and an embedded microprocessor-based system

Required Lab Manual
Laboratory handouts and documents will be distributed as hard-copies and/or soft-copies (for students to download.)
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Laboratory Protocol, Assignments and Grading Policy

Laboratory Protocol

- You are required to attend each and every lab meeting and your attendance is mandatory for full length of lab meeting unless you have personal emergency.
- If you are not going to present in any of lab than you should co-ordinate with TA.
- If you fail to attend any lab meeting than you won’t be allowed to submit report on that particular lab.

Lab Computers

- The computers in room ENGR307 will be used for many lab sections and data disks may be re-formatted at any time, DO NOT store your files on the lab computers.
- You will be assigned your PC and a seat in the first lab session. DO NOT use other student’s computer throughout the semester.
- Each time you login to a new computer, an environment will be built for you on that particular computer. So, each student should use one particular computer throughout the semester
- To organize and save your data on the lab computer, create your own parent folder by your name (example, Clint_Easwood) and save all your data in this parent folder
- You shall be responsible for the costs of repairing damage caused. You should make reasonable efforts to use laboratory instruments including your microprocessor and extension boards carefully.

Boards and Experiments

Students will use a board to learn and demonstrate the microprocessor-based system. The board is SAM D20 Xplained Pro evaluation kit developed by Atmel. The SAM D20 Xplained Pro evaluation kit is a hardware platform that includes ATSAMD20J18A microcontroller and several peripheral components. The ATSAMD20J18A microcontroller is a microprocessor-based (ARM Cortex-M0+ processor) system. Other components on the board include memory system, I/O interfaces, and on-board embedded debugger. We can upload a binary code of a program on the on-board program memory and execute the code via on-board embedded debugger. The PC with software development environment installed is for users to develop and compile the program and to upload the code on the board.

Laboratory Exercise Reports

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 not be accepted.
Final Lab Report and Demo

The final lab report must be prepared neatly and professionally. The technical contents, format, completeness, and appearance of the report all contribute to the report's grade. Students are responsible to include all requested and necessary information in your reports. The report must have sections in order as listed below. Each section must start with the new page.

- A cover page which includes course number, instructor name, student name, semester, project title, and the due date.
- An "Introduction" section to introduce the project to the readers.
- A "Summary and Conclusion" section to emphasize the most important results and information of the entire project.
- The main body of the report, which includes many sub-sections such as experiment setup, list of instruments and/or equipment, block and/or circuit diagrams, data output, graphs, program flowcharts, program sources, discussion, analysis, answers to additional questions, etc.
- A "References" section to list all references. Reference numbers must be cited in the text with square brackets such as [#].
- An "Appendices" section to attach any documents, copies, etc. that support your report.

Note that each section must start on the new page. Figures and tables must be labeled separately and clearly. Report must be condensed but completed, clear, firm, and prepared with care. Please keep in mind that report will be graded for its technical contents, format, completeness, and appearance. Each student must turn-in and individually demo his/her final lab project in-person. Final lab demonstration includes answering questions (individually) from your lab instructor. Final lab demonstration is an important part of your lab project.

Laboratory Grading

The lab exercises and the final project together with the lecture exams and homework assignments make-up EE 120 course grade. The weights of the lab assignments are listed as below:

- Seven (7) laboratory exercises with reports and demos: 15%
- Final lab project implementation, demo, and report: 10%
- Final lab project written test: 05%

Detailed information about the final lab project is described in the final project handout that will be distributed to students on the date as shown on the lab schedule section at the end of the syllabus.

University Policies

Academic integrity

Your commitment as a student to learning is evidenced by your enrollment at San Jose State University. The University’s Academic Integrity policy, located at http://www.sjsu.edu/senate/policies/pol_plagiarism_acad_integrity/index.html, 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/

Instances of academic dishonesty will not be tolerated. Cheating on exams or plagiarism (presenting the work of another as your own, or the use of another person’s ideas without giving proper credit) will result in a failing grade and sanctions by the University. For this class, all assignments are to be completed by the individual student unless otherwise specified. If you would like to include your assignment or any material you have submitted, or plan to submit for another class, please note that SJSU’s Academic Policy S07-2 requires approval of instructors.

**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 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.

**EE Honor Code - Honesty and Respect for Others and Public Property**

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
- Use information, programs/codes from other students for my lab/project reports
- Allow someone else to do lab and/or project for me
- Give other students my lab information, data, programs/codes, reports, or do the labs/project for other students
- 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.
**Laboratory Schedule (tentative)**

*Schedule and the content of lab assignments are subject to change with fair notice by email and class announcement*

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Activities</th>
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| 1    | 08/30/2017 | **Lecture**: Microsoft Virtual C++ Tutorial  
Handout laboratory syllabus  
Discuss lab rules, reports, exams, projects, etc.  
**Handout**: Laboratory assignment #1 (in Canvas) |
| 2    | 09/06/2017 | **Lecture**: C Bitwise Operations Tutorial  
Work on laboratory assignment #1  
**Turn in** laboratory report #1  
**Handout**: Laboratory assignment #2 (in Canvas) |
| 3    | 09/13/2017 | **Lecture**: Instruction on C Struct and Pointer  
Work on laboratory assignment #2  
**Handout**: Laboratory assignment #3 Part 1 (in Canvas) |
| 4    | 09/20/2017 | **Turn in** laboratory report #2  
**Lecture**: ATMEL Studio, and SAMD20 Introduction  
Work on laboratory assignment #3 Part 1  
**Handout**: Laboratory assignment #3 Part 2 (in Canvas) |
| 5    | 09/27/2017 | **Turn-in** laboratory report #3 Part 1  
**Lecture**: Instruction on laboratory assignment #3 Part 2  
Work on laboratory assignment #3 Part 2  
**Handout**: Laboratory assignment #4 Part 1 (in Canvas) |
| 6    | 10/04/2017 | **Turn-in** laboratory report #3 Part 2  
**Lecture**: Instruction on laboratory assignment #4 Part 1  
Work on laboratory assignment #4 Part 1 (State Machine) |
| 7    | 10/11/2017 | **Turn-in** laboratory report #4 Part 1  
**Lecture**: Instruction on laboratory assignment #4 Part 2  
Work on laboratory assignment #4 Part 2 (De-bouncing) |
| 8   | 10/18/2017 | Turn-in laboratory report #4 Part 2  
Lecture: Instruction on laboratory assignment #5 Part 1  
Work on laboratory assignment #5 Part 1 |
|-----|------------|---------------------------------------------------------------------------------|
| 9   | 10/25/2017 | Turn-in laboratory report #5 Part 1  
Lecture: Instruction on laboratory assignment #5 Part 2  
Work on laboratory assignment #5 Part 2  
Handout: Laboratory assignment #6 (Assembly coding with ARM MDK) (in Canvas) |
| 10  | 11/01/2017 | Turn-in laboratory report #5 Part 2  
Lecture: ARM MDK  
Work on laboratory assignment #6 Assembly coding  
Handout: Laboratory assignment #7 (Advanced Assembly coding with ARM MDK) (in Canvas) |
| 11  | 11/08/2017 | Turn-in laboratory report #6  
Lecture: Mixed Assembly and C coding with ARM MDK  
Work on laboratory assignment #7 Advanced Assembly coding  
Handout: Final Lab Project Assignment (in Canvas) |
| 12  | 11/15/2017 | Turn-in laboratory report #7  
Lecture: Final Lab Project  
Work on final laboratory assignment |
| 13  | 11/22/2017 | Work on Final Lab Project |
| 14  | Extra Lab will be scheduled by TA (TBD) | Work on Final Lab Project |
| 15  | TBD        | 1) Final Project Test: 12:15 – 12:45 (ENGR 345)  
2) Final Project Demo & Project Report Submission: 12:45 – 14:30 |