Sonoma State University
Engineering Science
Course Syllabus – Spring 2019

Course: **EE 310/310L: Microprocessors & System Design**
Lecture & Lab: Salazar 2001
T/Th 9:00AM - 11:50AM/ Labs are on Tuesdays

Instructor:
Dr. Farid Farahmand
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Office Hours: See web page. I am not available on Fridays.

Textbooks: Required: PIC Microcontroller by Muhammad Ali Mazidi, Rolin McKinlay, and Danny Causey. (available on pdf.)

References: Applying PIC18 Microcontrollers: Architecture, Programming, and Interfacing using C and Assembly By B.B Bery

Fundamentals of Microcontrollers And Applications in Embedded Systems With PIC

Required Material:
Hardware for your projects and labs - see this
Scientific Calculator
Folder & Flash Drive

Prerequisites:
ES 210: Digital Circuit & Logic Design
ES 230: Electronics I
ES 220/221: Electric Circuits

Grading Plan:

Lecture (EE 310)

Exams / Class Evaluation	30%
Quiz / Practical Quiz / Article	30%
Labs/HW	35%
Final Project / Final Poster	05%

Lab (EE 310L)

Labs	80%
Exam	20%

Grading:

95 - 100 A	70 – 73 C-
90 – 93 A-	77 – 79 C+
87 – 89 B+	67 – 69 D+
84 – 86 B	64 – 66 D
80 – 83 B-	60 – 63 D-
74 – 76 C	< 60 F

Reminder:
EE 310/310L is a 4 credit hour course requiring an average of 12 hours of study per

Note 1:

- 15 points deduction / day for each late assignment / Incomplete programs are not accepted.
- For each unexcused absence in the lab your *final* grade will be dropped by *three* points.

Course outline
Chapter 1 - Microprocessor and Microcontroller Fundamentals
Chapter 2 - Microcontroller Architecture—PIC18F Family
Chapter 3 - PIC18F Programming Model and Its Instruction Set
Chapter 4 - Programming and Problem Solving
Chapter 5 - Introduction to Data Copy (Move), Arithmetic, and Branch Instructions
Chapter 6 - Introduction to Logic, Bit Manipulation, and Multiply-Divide Operations
Chapter 7 - Stack and Subroutines
Chapter 8 - Application Programs and Software Design
Chapter 9 - Input/Output (I/O) Ports and Interfacing
Chapter 10 - Interrupts
Chapter 11 - Timers
Chapter 12 - Data Converters
Chapter 13 - Serial I/O 401
Tools and Software • MicrochipMPLAB® • PIC18 Simulator IDE • Visio for block diagraming (https://www.lucidchart.com/) • Fritzing: http://fritzing.org/home/ or EasyEDA easyeda.com

POLICIES

CLASSROOM CONDUCTS: In order to create an appropriate environment for teaching and learning, students must show respect for their instructor and fellow students. Listed below are a few guidelines for classroom behavior. Students are expected to follow these rules to ensure that the learning environment is not compromised.

1. **Class Participation**: You are expected to be in class the entire class time. Please do not enter late or leave early. Rare exceptions may be made, particularly in emergency situations. Your participation in the class and lab and the discussions are very important and would help me understand how much you follow the material.
2. **Absences**: Inform the instructor in advance, if you know you are going to miss a class. Also, take responsibility for getting missed assignments from other students. Your instructor is not responsible for re-teaching the material you missed due to an absence or being late.
3. **Conversation**: Do not carry on side conversations in class.
4. **Sleep**: Do not sleep in class.
5. **Internet browsing**: Please turn off all monitors/laptops and listen to lectures. Check your emails before coming to class!
6. **Attitude:** You are expected to maintain a civil attitude in class. You may not use inappropriate or offensive commentary or body language toward the instructor or fellow students.
7. **Cell phones:** You may not use your cell phone during class. Please turn off your cell phone upon entering the classroom.
8. **Warnings:** In the event a student is failing the course, he/she will receive a formal warning from the instructor. The warning form will be submitted to the Department Chair and will be included in student's records.

ACADEMIC INTEGRITY: Students should be familiar with the University's Cheating and Plagiarism Policy. Your own commitment to learning, as evidenced by your enrollment at Sonoma State University and the University's policy, require you to be honest in all your academic course work. 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. In the event that a student has cheated or plagiarized the following form will be completed and submitted to the Student Conduct Administrator, 3rd Floor of the Student Center: http://senate.sonoma.edu/sites/senate/files/negotiated-resolution-s17.pdf

WITHDRAWAL: No student will be granted a withdrawal after the deadline unless under extreme circumstances. Policy regarding withdrawal is stated in the university catalog. Students are responsible for understanding the policies and procedures about add/drops, academic renewal, etc. How to Add a Class has step-by-step instructions has step-by-step instructions. Registration Information lists important deadlines and penalties for adding and dropping classes.

SPECIAL NEEDS: Any student who feels s/he may need an accommodation based on the impact of a disability should contact me privately to discuss his/her specific needs. If you are a student with a disability, and think you may need academic accommodations, please contact Disability Services for Students (DSS), located in Salazar Hall, Room 1049, Voice: (707) 664-2677, TTY/TDD: (707) 664-2958, as early as possible in order to avoid a delay in receiving accommodation services. Use of DSS services, including testing accommodations, requires prior authorization by DSS in compliance with university policies and procedures. See SSU's policy on Disability Access for Students.

WRITING SUPPORT: The SSU Learning and Academic Resource Center (LARK), located at Schulz 1103, helps SSU students become better writers and produce better written documents. The knowledgeable and friendly tutors can help you with a wide array of concerns, from generating good ideas and organizing papers more clearly to learning citation formats and using semi-colons correctly. Visit the Learning and Academic Resource Center (LARK) Homepage for more information on how to schedule time with a Writing Center tutor.

CANVAS: All assignments will be submitted through Canvas. Canvas is SSU's Learning Management System (LMS). Canvas is the place where you will find the course syllabus, read posted announcements, participate in online class discussions with classmates, submit your assignments online and view the materials for this course. To access the Canvas course use your SSU Seawolf ID and password to log into SSU's Online Services portal. Click on the **Canvas** link. When you get to the Canvas Dashboard, click on the course title you would like to access.

Visit the SSU Canvas Support Center to review frequently asked questions about using Canvas and also to view a list of technical recommendations.

Always Check Canvas for the Latest Assignments!
You are only responsible for what is on Canvas!
Submit all assignments in pdf format!

COURSE DESCRIPTION AND LEARNING OBJECTIVES

The primary goal of this course is to give you the fundamental skills needed to understand, use, and design microcontroller - based systems. This includes the following: (1) What is a microcontroller? (2) What can it do (and not do)? (3) How does one design (and program) a microcontroller-based system? The course focuses on 8-bit PIC architecture. You will be using PIC18F46J50 chip.

At the conclusion of this course, the successful student will be able to:

A. Gain a solid understanding of how microprocessors and microcontrollers operate.
B. Demonstrate a working knowledge of the necessary steps and methods used to interface a microcomputer system to devices such as stepper motors, sensors, etc.
C. Develop and demonstrate a structured assembly and C language program to accomplish a given task using a microcomputer.
D. Demonstrate the use of interrupts and other programming techniques related to micro-controllers. Complete the design, development, programming, and testing of a microcomputer based project.
E. Demonstrate a working knowledge of microcomputer busses and the flow of data within a microcomputer system.
F. Be able to write professional product report.
G. Be able to operate in team and work together towards a common goal. Become a more self-motivated and self-learner individual.
H. Be able to read the data sheets.

COURSE LEARNING OBJECTIVES (for ABET)

EE 310/310L: Microprocessors & System Design
Lecture & Lab: Salazar 2001

Contribution of Course to Meeting the Professional Component:
Engineering topics: 100%
Math & Basic Science: 10%
General Education: 15%

Updated Student Outcomes (SOs)	Course Objective	Support Level	Old SOs
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	B, F	3	a, e
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	B, E, F, G	4	c
3. an ability to communicate effectively with a range of audiences	B, F	5 (EE 310)	g
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	A, C, G	4	f, h, j
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	G	5 (EE 310L)	d
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	B,D, E, F, H	3	b
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies	G	4	i
Implied in 1, 2, 6	A-E	2	k

ASSIGNMENTS

HOMEWORK/LABS: All students are required to complete homework assignments. Homework assignments require familiarity with different software tools such as MS Word, Excel (avoid using Google, if possible), and VISIO, or Lucid Chart , etc. Homework assignments must be submitted via Canvas. Late submissions will receive 15 deduction points for each late day, including weekends. All assignments (hardcopy or soft copy) submissions must have a coversheet, otherwise they will *not* be accepted. When submitting hardcopies, please make sure you staple your assignment and avoid printing it when class starts! Unless specified in advance, no handwritten homework will be accepted.

DESIGN PROJECT: You are required to submit one final design project, which is 5 percent of your grade. All projects require prior approval from your instructor. Maximum of **two people per group** is allowed. It is encouraged to have a partner, however, each person must clearly identify what his/her contributions are. For each project you must submit an abstract at the time of presentation. The **abstract** must include group members (who is doing what), project idea, and objective of the project. The final design project must be functional and properly operate as intended. Here are some Design Project guidelines:

- All projects must include a slide presentation using a Tri-Fold.
- Each project must **include** the following: Abstract, Circuit schematics, high-level block diagram, test results, link to the YouTube video, what did you learn, and list of parts.
- Teams must create a 2-minute **YouTube video** presentations.
- All project documents (codes, presentations, YouTube video, etc.) must be submitted on a **Flash Drive**.
- Each project must have at least one complete **test case**. For example plot the measured and actual temperature values and show that your system accurately reports the temperature.
- In your project you must use at least **THREE** of the following features of the microcontroller: ADC/DAC/Communication ports / Interrupt / Watchdog / Feedback/EEROM / Display / SPI / I2C / Wireless communication / SD Card / EPROM / PWM /Power Saving Mode / (one or two LEDs **are not** considered as display!)

Please note that projects such as simple dice, flashing LED, single tone generator, are **NOT** considered as good projects. For some interesting projects refer to YouTube.

It is **strongly** suggested that you take full advantage of your Spring Break to complete your project! Incomplete projects do **NOT** receive grades! Graduate students enrolled in the course are required to do more comprehensive final project.

QUIZZES: There will be a quiz almost once a week. The quizzes will be based on practice/homework problems and labs (but not exactly the same). No make-ups are allowed. If you are late to class or stepped outside and missed a quiz, there will be no make-up. Note that all quizzes are limited to no longer than 10-15 minutes. Note that quizzes contain questions in the homework and labs. Students who are not taking the lab section are responsible to review lab materials.

PRACTICAL QUIZZES: There will be at least two in-class practical quizzes in which you are required to code in-class. This is aside from the practical part of the mid-term or final exam.

POP QUIZZES: There will be a pop quiz every time more than 20 percent of students are not present at the time we start the class.

LABS & PRE-LABS: Each student must submit a single lab report. Please note that for each unexcused absence in the lab your *final lab* grade will be dropped by three points. All pre-labs must be typed, dated, and include student's name and ID; you receive a zero otherwise. Pre-labs are ½ of the overall lab grades. Use the template to complete your lab.

EXAMS: Exams will consist of problems designed to test your understanding of the concepts covered in class and lab. Anyone missing an exam will receive a zero grade for that exam. **Each exam contains questions in the labs**. Make-up exams will only be given with a doctor's slip stating that you were too ill on the day of the exam to attend, or documented extraordinary circumstances. Please note that exams may include in-class programing assignment. **NOTE:** In order to be able to take the final exam you are required to bring a snapshot of your Moodle indicating that you have completed the **class evaluations**. You will not be allowed to take the final exam if you do not bring a proof that you have completed the class evaluation.

LECTURE SERIES: If you attend a minimum of SIX lecture series, you will receive full-grade in one additional quiz. Please return the signed form when you take your **final exam**.

ARTICLES: Each individual student is required to submit at least FOUR article summaries entries into Canvas. Each entry must describe the main point of the article/news along with proper citation. Four article submissions counts as one quiz grade. Each submission must include the following: your name, article's name, reference, when you retrieved the article, the author of the article, the date the article was written. Use IEEE style.

GRADING SUMMARY

Each student's final grade will be calculated according to the Grading Plan mentioned above. Please note the following:

1. All assignments must be submitted at the beginning of the class. They must have a coversheet.
2. Late assignments (hardcopy or softcopy), including lab, pre-lab, homework, etc., will receive 15 deduction points for each late day, including weekends.
3. There will be no curving (89.2 is still a B^+).
4. C- is a failing grade.
5. There will be no make-ups.
6. Quizzes will be given at the beginning of each class.
7. Pay attention to the grading policy!
8. Incomplete projects do **NOT** receive grades!

Please make sure you speak to me before you decide on dropping the class!

I will be available, if you are willing to learn!