ME 133: Introduction to Mechatronics

Department of Mechanical Engineering
University of California, Riverside
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Lectures: T/Th 6:30–7:50pm
Winston Chung Hall 143

Labs: Th 2:00–4:50pm
Bourns Hall B213AA

Makerspace: Bourns Hall B160

Website: https://intra.engr.ucr.edu/~jrealmuto/courses/me133-w23/

Book: *Introduction of Mechatronics and Measurement Systems, 5^{th} Ed.*
David G. Alciatore

Course Description

This course consists of a series of introductory lectures and a series of lab activities centered on major topics in mechatronics with the aim of building basic professional competence.

Objectives

By the end of the course, you should be able to:

- Recognize and use basic electric circuits and components;
- Analyze basic analog and digital circuits;
- Understand the principles of semiconductor electronics and operational amplifiers;
- Interface electromechanical components;
- Use sensors and actuators;
- Design basic feedback controllers;
- Create Arduino scripts to solve logic and control problems;
- Interpret the frequency response of mechatronic components.

Coursework

There will be four main components:

I. **Homework.** Assigned weekly (typically), but not graded. Although the homework is not graded students are highly encourage to complete assignments to help prepare for the Midterms/Final.

II. Lab Reports. Each lab activity will require the completion of a Lab Report which will be assigned weekly with one week time to complete. Lab reports must be submitted through Canvas and be organized as follows:

(a) **Abstract.** A single paragraph summarizing the Lab Report, including a concise introduction, outline of the results, and summary of the conclusions.

(b) **Introduction.** This section should provide context for the Lab Assignment. What are the goals of the assignment? Why is it interesting?

(c) **Methods.** Here you should provide a detailed description of all the techniques used to generate your results. Include a detailed description of the circuits and code, including images when applicable (e.g., circuit and/or wiring diagram).

(d) **Results and Discussion.** Present and discuss the results of the Lab Assignment, including addressing any specific questions posed in the Assignment. Include figures to support your results when necessary.

(e) **Conclusion.** Restate the methods used, and your major findings. Contextualize your results in terms of what you've learned.

Your lab report must be in pdf format! Please do not turn in a word file (.doc) or any non .pdf file or you will receive a 10% grade penalty. Late lab reports will be accepted with a 10% grade penalty per day.

III. Final Project

The purpose of the course project is to apply the tools and concepts learned throughout the quarter. The goal is to design and build your own unique mechatronic system using your Arduino and components from the labs. You can use the 3D printers and other tools from the Department Makerspace too. We will spend more time discussing the project throughout the quarter. The deliverables for the project are the following:

(a) Project report using same format as the labs.

(b) All the code and design files for your system.

(c) A two minute video demonstrating your project.

IV. Midterms and Final. There will be two midterms (approximately weeks 5 & 10) and a final (cumulative) designed to test your knowledge of the course material.

Grading

Components

Labs:	40 %
Project:	15 %
Midterms:	30 %
Final:	15 %

Grading Scheme

A+	100 - 97%
A	< 97 - 94%
A-	< 94 - 90%
B+	< 90 - 87%
B	< 87 - 84%
B-	< 84 - 80%
C+	< 80 - 77%
C	< 77 - 74%
C-	< 74 - 70%
D+	< 70 - 67%
D	< 67 - 64%
D-	< 64 - 60%
F	< 60 - 0%

Final grade is determined by rounding to nearest integer value (no exceptions!).

Tentative schedule

Week	Topic	Chapter	Lab Assignment
1	Course overview; Basic electrical circuits	1 & 2	No Lab
2	Semiconductor electronics	3	Arduino 1
3	System response	4	Arduino 2
4	Analog signal processing	5	Arduino 3
5	Midterm;		Arduino 4
6	Digital circuits	6	Arduino 5
7	Data acquisition	8	Arduino 6
8	Actuators/Sensors	9 & 10	Arduino 7
9	Control intro	11	Project
10	Midterm; Review		Project
11	Final Exam		Project Due