IMPERIAL VALLEY COLLEGE

Basic Course Information

Semester:	**Fall 2021**	Instructor Name:	**Octavio Ortiz**
Course Title & #:	**ENGR 100**	Email:	**octavio.ortiz@imperial.edu**
CRN #:	**10978**	Webpage (optional):	**Canvas**
Classroom:	**2731**	Office #:	**2767.1**
Class Dates:	**8/16/21 – 12/11/21**	Office Hours:	**MW: 9:40 – 10:10 AM 6:00 – 6:30 PM T/TR: 9:10 – 10:10 AM**
Class Days:	**Tuesday/Thursday**	Office Phone #:	**760-355-5706**
Class Times:	**10:15 AM – 12:45 PM**	Emergency Contact:	**Silvia Murray: 760-355-6201**
Units:	**3**	Class Format:	**Face-to-Face**

Course Description

This course is designed for students to gain hands-on engineering experience in electrical and computer engineering through projects in team building environments. Topics include circuit theory, assembly, systems programming and debugging, transducer mechanisms and interfacing transducers, signals and system theory, digital processing, modular design techniques and robotics/control.

Course Prerequisite(s) and/or Corequisite(s)

None

Student Learning Outcomes

Upon course completion, the successful student will have acquired new skills, knowledge, and or attitudes as demonstrated by being able to:

1. Demonstrate problem solving strategies by identifying an appropriate method to solve a given problem, correctly set up the problem, perform the appropriate analysis and computation, and share their interpretation of the conclusion or the outcome, using correct grammar or in an oral presentation. Students will be assigned a final project where they are to display their results and discuss their thought processes. (ILO1, ILO2)

Course Objectives

Upon satisfactory completion of the course, students will be able to:

1. learn how to work and make Arduino circuitry communicate with basic sensors and LEDs;
2. learn the fundamentals of digital signal processing by working with a one-dimensional audio signal and how to manipulate these signals with software tools such as MATLAB;
3. gain a general understanding of how a system can be modeled and how mathematical control concepts can be implemented into a micro-controller;
4. learn the digital representation of RGB and Greyscale images, filtering and special image effects;
5. demonstrate knowledge of CAD software in order to design circuits for use in controlling and manipulating control circuits.

6. understand the difference between time and frequency domains, and are exposed to various types of filters;
7. learn the use of LED and a photo-resistor in a simple communication device as are used in building robots and other moving computer aided devices;
8. demonstrate knowledge in using implementing Infrared communication devices as used in robotics;
9. learn about timers and frequency, when programming infrared (IR) protocols into programmable devices;
10. demonstrate how an IR remote is able to send data to Arduino devices and how to decode these IR signals which are hex values;
11. learn how to use basic laboratory equipment such as power supplies, function generators, oscilloscopes, soldiering irons, and other electrical equipment.
12. work as a team to piece together various circuits, code, an Arduino, motor shield and cart chassis with motors.

Textbooks & Other Resources or Links

None

Course Requirements and Instructional Methods

Students will be exposed to various instructional methods. Lectures will introduce engineering topics to students. Students will then apply what they learn in lectures to hands-on activities. Guidance and modeling will be provided during these hands-on activities.

A total of five labs, that involve Arduino manipulation, programming, computer aided design (CAD) modeling, and presentation and communication skills, will make up the vast majority of the semester. Students will then work on a final project where they will rely on what they have learned throughout the semester to create an application of their own. Quizzes on various topics will be administered throughout the semester to assess students' knowledge base.

Course Grading Based on Course Objectives

ASSIGNMENT	POINTS
Lab Assignments	**40%**
Lab 0	
Lab 1	
Lab 2	
Lab 3	
Lab 4 & Peer Evaluation	
Skills & Tools	**20%**
CAD, Programming: C, MATLAB, PCB	
Quizzes	**10%**
Final Project	**30%**
Total	**100%**

Score	Letter Grade
≥ 90%	**A**
≥ 80%	**B**
≥ 70%	**C**
≥ 60%	**D**
< 60%	**F**

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Course Policies

Attendance:

Students are expected to attend every class meeting. Lectures will preview lab activities. Labs will be completed collaboratively. Failing to attend class will result in incomplete labs or failed quizzes.

- Although attendance is not explicitly factored into your grade, failing to complete labs and quizzes due to absences will negatively impact your grade.

Late Submissions:

Labs and quizzes are to be completed and submitted by the due date stated on Canvas. Late assignments will be accepted and penalized as follows:

- 90% maximum score if submitted within 24 hours past due date
- 80% maximum score if submitted within 48 hours past due date
- 70% maximum score if submitted within 72 hours past due date
- 50% maximum score if more than three days and less than a week past due date
- No credit will be given to assignments that are one week or more past due

Make-up Assignments:

There are no make-up assignments. Assignments that are a week or more past due will receive no credit.

Drop Policy

The instructor reserves the right to drop students who fail to attend the first-class session or fail to complete the first assignment by the assigned due date.

Other Course Information

Resources:

Arduino.cc – Arduino help and support

Mathworks.com – MATLAB support

mySolidWorks.com – SolidWorks support

Sparkfun.com – Maker hardware community & supplies

Adafruit.com – Maker hardware community & supplies

Instructables.com – Maker community & projects

Thingiverse.com / Grabcad.com – CAD files

Github.com / Stack Overflow – Code repository / Forum

Autodesk.com – Software (incl. EagleCAD), free for students

IVC Student Resources

IVC wants you to be successful in all aspects of your education. For help, resources, services, and an explanation of policies, visit http://www.imperial.edu/studentresources or click the heart icon in Canvas.

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Course Calendar

The semester calendar is meant to provide an overview of the topics that will be covered throughout the semester. Every effort will be made to adhere to the calendar, however, changes might be necessary.

Week	Date	Topic	Assignment
Week 1	8/17	• Intro to ECE 5 – Course Overview • Intro to Arduino Mega and Arduino C (Programming)	
	8/19	• Lecture: Intro to Circuits and Programming • Lab 0: Intro to Arduino	
Week 2	8/24	• Lecture: Basic Circuitry & Multimeters • Lab 0: Intro to Arduino (Continued)	
	8/26	• Lab 0: Extra Challenges • Wrap-Up and Review Lab 0	
Week 3	8/31	• Lecture: Circuits & Programming Review • Explore: Create your own circuit	
	9/2	• Lecture: Communication • Intro to Lab 1: Communication with IR	
Week 4	9/7	• Lab 1: Communication with IR	
	9/9	• Lab 1: Communication with IR • Wrap-Up and Review Lab 1	
Week 5	9/14	• PCB Design Workshop (EagleCAD)	
	9/16	• Lecture: Digital Signal Processing • Introduction to MATLAB	
Week 6	9/21	• Lab 2 part 1: Sampling with MATLAB	
	9/23	• Lab 2 part 1: Frequency Domain/FFT with MATLAB	
Week 7	9/28	• Lecture: Computer Vision • Lab 2 part 2: Image Processing	
	9/30	• Lab 2 part 2: Extra Challenges • Wrap-Up and Review Lab 2	
Week 8	10/5	• Lecture: Linear Algebra	
	10/7	• Lecture: Python vs MATLAB vs C vs Others • Lab 3 part 1: Intro to Python and Linear Algebra	
Week 9	10/12	• Lecture Machine Learning	
	10/14	• Lab 3 part 2: Machine Learning using Python	
Week 10	10/19	• Lab 3 part 2: Machine Learning using Python	
	10/21	• Wrap-Up and Review Lab 3	
Week 11	10/26	• Lecture: Teams and Design • Lab 4: SolidWorks – Computer Aided Design (CAD)	
	10/28	• Lab 4: SolidWorks – CAD, Imagination	
Week 12	11/2	• Lecture: Control and Robotic Systems • Lab 4: PID Controls	
	11/4	• Lab 4: PID Controls	

Week	Date	Topic	Assignment
Week 13	11/9	• Lecture: Technical Communication • Commence Final Projects	
	11/11	• Final Projects	
Week 14	11/16	• Final Projects	
	11/18	• Final Projects	
Thanksgiving Break			
Week 15	11/30	• Final Projects	
	12/2	• Final Projects	
Week 16	12/7	• Presentations	
	12/9	• Presentations	

*****Subject to change without prior notice*****