

ECE1010 Course Syllabus

ECE1010

Introduction to ECE Design (1-0-3-2)

CMPE Degree

This course is Elective for the CMPE degree.

EE Degree

This course is Elective for the EE degree.

Lab Hours

3 supervised lab hours and 0 unsupervised lab hours

Course Coordinator

Johnson, Kevin Toby

Prerequisites

None

Corequisites

None

Catalog Description

An introduction to basic concepts useful for all areas of Electrical and Computer Engineering. Focus on hands-on, team-based activities using robotics.

Textbook(s)

No Textbook Specified.

Course Outcomes

Upon successful completion of this course, students should be able to:

1. Recognize the effects of sampling interval, quantization/precision, and forms of numerical representation, on sampled signals.
2. Apply fundamental concepts of charge, voltage, and current flow to simple circuits
3. Recognize basic mechanisms of physical sensing (light, sound, touch) in electronic sensors
4. Apply basic concepts of computer program flow and organization to implement desired behavior in software
5. Demonstrate a basic understanding of DC motor control (PWM, power, speed, torque, and tradeoffs using gearing)
6. Describe the many subdisciplines of ECE
7. Modify the design of an autonomous robot to add behavior based on sensor inputs and using motors/actuators to accomplish simple tasks
8. Assess the factors affecting the reliability and repeatability of the programmed tasks (How consistently does it work? How well does it work? Why?)
9. Work in teams, including: a. Fair delegation of tasks b. Communicating with peers
10. Creating a realistic timeline for a project and sticking to it or assessing why it didn't work

11. Create engineering reports outlining a design strategy and assessing its strengths, weaknesses, and feasibility, and describing functional/technical specifications of the proposed design strategy

Student Outcomes

In the parentheses for each Student Outcome:

"P" for primary indicates the outcome is a major focus of the entire course.

"M" for moderate indicates the outcome is the focus of at least one component of the course, but not majority of course material.

"LN" for "little to none" indicates that the course does not contribute significantly to this outcome.

1. (M) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. (LN) 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
3. (LN) An ability to communicate effectively with a range of audiences
4. (LN) 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
5. (M) 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
6. (P) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. (P) An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Topical Outline

1. Electricity
 1. Charge, Current, Voltage
 2. Energy, Power
 3. Ohm's Law
 4. Basic Circuit Elements
2. Signals and Signal Processing
 1. Representing information using electronic signals
 2. Analog vs. digital signals
 3. Accuracy, precision, range, and resolution
 4. High-pass and low-pass filtering
3. Sensors and Actuators
 1. Theory of operation of various sensors such as light, sound, position, and movement
 2. Theory of operation of DC motors and stepper motors
4. Programming for Microcontrollers
 1. The Arduino family of microcontroller boards
 2. The Arduino programming environment
 3. Analog signal acquisition and processing
 4. Motor control
5. Engineering Project Management
 1. Time-management
 2. Teamwork and task delegation
 3. Effective technical communication
6. Engineering Design
 1. The design process

2. Debugging hardware and software systems