MECH 0001 - THE SCIENCE OF ELECTRONICS

Catalog Description

Formerly known as CIE 1
Hours: 54 lecture
Description: Survey of electronics technology presented in the context of the principles of science. Application of the scientific method to topics ranging from basic circuits to microprocessors, including electronic music, robotics, electric vehicles, fiber optics, semiconductors, and medical imaging. Scientific, historical, political, and economic connections to electronics technology. (CSU)

Course Student Learning Outcomes

- CSLO #1: Distinguish components of an electrochemical cell and construct a working cell.
- CSLO #2: Analyze and demonstrate relationship between electric current, voltage and resistance.
- CSLO #3: Construct functional electronic circuits using soldering.

Effective Term

Fall 2022

Course Type

Credit - Degree-applicable

Contact Hours

54

Outside of Class Hours

108

Total Student Learning Hours

162

Course Objectives

Through projects, objective exams, assigned reading, assigned writing and in-class discussions:
1. Evaluate the origin, principle of operation and application of electronic devices and circuits.
2. Evaluate electronic circuits utilizing mathematical analysis to verify laws and device characteristics.
3. Distinguish devices and circuits in schematic diagrams and analyze function and purpose.
4. Assess the impact electronics technology has had in the fields of medicine, industry, culture and communications.
5. Evaluate the discoveries and contributions made by the early scientists and engineers.

General Education Information

- Approved College Associate Degree GE Applicability
  - AA/AS - Physical Sciences
- CSU GE Applicability (Recommended-requires CSU approval)
  - CSUGE - B1 Physical Science
- Cal-GETC Applicability (Recommended - Requires External Approval)
- IGETC Applicability (Recommended-requires CSU/UC approval)

Articulation Information

- CSU Transferable

Methods of Evaluation

- Objective Examinations
  - Example: Students are given several quizzes covering selected topics throughout the semester. Example Question: Describe the difference between conductors, semiconductors and insulators. Standard grading.
- Problem Solving Examinations
  - Example: Students will identify the relevant specifications on a motor and calculate the efficiency of the motor. Students are evaluated based on industry standard.
- Projects
  - Example: Students will identify the components of and construct a working electrochemical cell. Students will be evaluated based on a rubric provided to the students.
- Reports
  - Example: Students will write a research report on an approved topic of the science of electronics. Appropriate topics include the biography of a person who made a significant contribution to the science of electronics, a specific discovery or device or a projected future application of an emerging technology. Graded using a rubric on the basis of form, content and style.

Repeatable

No

Methods of Instruction

- Lecture/Discussion
- Distance Learning

Lecture:

1. Lecture and hands-on demonstration on the principles and applications of Ohm's Law. Students will connect an electronics source and load, calculate expected current, then verify current by measurement. Instructor will guide student on proper method for current measurement.
2. Lecture and hands-on demonstration on the origin, theory, principles, and applications of magnetism and electromagnetism. Students will wind wire around a permeable core, apply a voltage source, then confirm existence and polarity of magnetism. Instructor will explain and demonstrate right-hand rule used to determine magnetic polarity.

Distance Learning

1. Instructor will lecture on the discovery of the response of silicon atoms to the presence of electric fields and students will complete a quiz. The course material will be posted on the LMS and provide links to external resources.

Typical Out of Class Assignments
Reading Assignments

1. Read the text pages related to the advantages of AC power over DC power distribution systems and prepared to discuss in class. 2. Read the text pages about the mathematical relationship between voltage, current, and resistance and be prepared to discuss in class.

Writing, Problem Solving or Performance

1. Calculate the values of voltage, current, power and resistance in a complete circuit. 2. Review the topical material related to the operation of basic semiconductors and answer the quiz questions.

Other (Term projects, research papers, portfolios, etc.)

1. Research and write a term paper related to an approved topic in the science of electronics, e.g. biography of electronics inventor such as Nikola Tesla, discovery of a device such as the transistor, or application of emerging technology such as self-driving cars.

Required Materials

- The Art of Electronics
  - Author: Paul Horowitz
  - Publisher: Cambridge Univ. Press
  - Publication Date: 2015
  - Text Edition: 3rd
  - Classic Textbook?:
  - OER Link:
  - OER:
- Getting Started in Electronics
  - Author: Mims, Forrest
  - Publisher: Master Publishing, Inc.
  - Publication Date: 2020
  - Text Edition:
  - Classic Textbook?:
  - OER Link:
  - OER:

Other materials and-or supplies required of students that contribute to the cost of the course.