

MECH 0014 - FABRICATION TECHNIQUES

Catalog Description

Formerly known as CIE 14

Advisory: Concurrent enrollment in MECH 10

Hours: 72 (18 lecture, 54 laboratory)

Description: Introductory course covering the function and construction of electronic projects and equipment. Includes design and fabrication of enclosures, single and double-sided printed circuit boards, safe use of power and hand tools, through-hole, point-to-point and surface-mount soldering, rework techniques, and wiring. Research component vendors and develop a spreadsheet-based Bill Of Materials. (CSU)

Course Student Learning Outcomes

- CSLO #1: Construct precision sheet-metal assemblies.
- CSLO #2: Demonstrate ability to utilize precision measurement tools.
- CSLO #3: Design and validate functional printed circuit boards from schematic diagrams.

Effective Term

Fall 2022

Course Type

Credit - Degree-applicable

Contact Hours

72

Outside of Class Hours

36

Total Student Learning Hours

108

Course Objectives

Lecture Objectives:

1. Develop a basic design and develop working drawings for electronic chassis, panels, and assemblies commonly used in the electronics industry.
2. Identify proper application of soldering and wiring techniques.
3. Analyze a schematic diagram and formulate and plan to implement a matching printed circuit board layout.
4. Research PC Board manufacturing vendor requirements for project.

Laboratory Objectives:

1. Construct electronic chassis, panels, and assemblies commonly used in the electronics industry using a variety of tools and techniques.
2. Construct functional circuits through proper application of soldering and wiring techniques of point-to-point, through-hole and surface-mount circuit boards.
3. Design a printed circuit board layout using standard PC based CAD software.
4. Research PC Board manufacturing vendor requirements for project; test delivered PC Boards.

5. Build and test project; troubleshoot any problem areas.

6. Research component vendors and develop a spreadsheet-based Bill of Materials.

General Education Information

- Approved College Associate Degree GE Applicability
- CSU GE Applicability (Recommended-requires CSU approval)
- 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 a comprehensive final exam that includes determining the proper hole size for a defined fastener. Standard Grading.
- Problem Solving Examinations
 - Example: Students are required to calculate pre-bend dimensions of a metal plate to produce proper post-bend dimensions. Grading based on industry standards.
- Projects
 - Example: Students are required to analyze, design and construct a working linear power supply.
- Skill Demonstrations
 - Example: Students are required to apply the use of a sheet-metal brake to bend metal within defined tolerances. Grading based on industry standards.

Repeatable

No

Methods of Instruction

- Laboratory
- Lecture/Discussion
- Distance Learning

Lab:

1. Following an instructor presentation on linear power supply, students construct and test a working linear power supply.

Lecture:

1. Students are presented with theory and example calculations for metal band allowance through instructor lecture and discussion. Students are expected to participate in the discussion.

Distance Learning

1. Students will design a printed circuit board layout using industry-standard online design tools. Instruction will be delivered by detailed instructions posted in the Course Management System as well as an accompanying video where the instructor demonstrates the design tool. Instructor will review the student's design and suggest any needed changes such as proper spacing for manufacturability.

Typical Out of Class Assignments

Reading Assignments

1. Research the design of a single sided PCB as it applies to the assigned class term project. Students should prepare to discuss the topic during the next class session.

Writing, Problem Solving or Performance

1. Diagram and dimension the project chassis taking into account bend allowance. 2. Using the provided CAD package, design and diagram the project PCB. Provide photo ready artwork as well as a full description of the working circuit.

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

As part of the class each student will complete an assigned electronic term project including the design of the PCB and chassis. A full written report will also be required describing the project. Furthermore, the students must research potential vendors for all components and develop a spreadsheet-based Bill of Materials.

Required Materials

- Electronic Techniques
 - Author: Villanucci
 - Publisher: Prentice-Hal
 - Publication Date: 2001
 - Text Edition: 7th
 - Classic Textbook?:
 - OER Link:
 - OER:
- The Makerspace Workbench: Tools, Technologies, and Techniques for Making
 - Author: Adam Kemp
 - Publisher: Maker Media, Inc.
 - Publication Date: 2013
 - Text Edition: 1st
 - Classic Textbook?:
 - OER Link:
 - OER:
- Practical Electronics for Inventors
 - Author: Scherz, Paul and Simon, Mark
 - Publisher: McGraw-Hill
 - Publication Date: 2016
 - Text Edition: 4th
 - Classic Textbook?:
 - OER Link:
 - OER:
- Lessons in Electric Circuits
 - Author: Kuphaldt, Tony
 - Publisher: www.allaboutcircuits.com - Design Science License
 - Publication Date:
 - Text Edition:
 - Classic Textbook?:

- OER Link:
- OER:

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