

MECH 0025 - COMPUTERS FOR ROBOTICS AND AUTOMATION

Catalog Description

Formerly known as CIE 25/CIS 25/CST 25

Hours: 108 (54 lecture, 54 laboratory)

Description: Concentrated study of computer hardware and software as applied to industrial automation and robotics. Includes hardware and software installation, configuration, upgrading, diagnostics, troubleshooting, and repair. Topics include communication protocols, basic input/output system (BIOS), power-on self test (POST) procedures, disk operating system (DOS), Windows, Linux, and local area network (LAN) fundamentals. Industrial applications include data acquisition, and robotic control. (CSU)

Course Student Learning Outcomes

- CSLO #1: Construct an electro-mechanical system using a personal computer as the control device.
- CSLO #2: Construct functional electronic circuits built using solder.
- CSLO #3: Apply computer interface techniques to use a computer system as a data acquisition device.

Effective Term

Fall 2021

Course Type

Credit - Degree-applicable

Contact Hours

108

Outside of Class Hours

108

Total Student Learning Hours

216

Course Objectives

Lecture Objectives:

1. Evaluate and analyze the cause of an inoperative or unresponsive computer then formulate and execute a repair.
2. Identify and analyze personal computer hardware such as memory, expansion cards, drives, and power supplies.
3. Configure UEFI and BIOS setup and operating system optimal performance.
4. Apply and configure computer peripherals employed to support industrial automation and robotics operation.
5. Identify the fundamental elements of computer external architecture and explain the role each element plays in the support of the system.
6. Describe CPU functionality in a personal computer.

Laboratory Objectives:

1. Execute a repair of an inoperative or unresponsive computer.

2. Install computer components such as memory, expansion cards, drives, and power supplies.
3. Configure firmware setup and operating system for optimal performance.
4. Select, install, and configure a computer to control a robotic device.
5. Remove and replace a computer's CPU, employing proper ESD techniques and thermal compound between the CPU and heatsink fan assembly.

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: Quizzes that require students to choose the best answer for each item. Standard Grading. Quiz Example: DDR type memory is optimally configured: a. single channel b. dual channel c. in the BIOS Setup d. manually on the motherboard
- Projects
 - Example: Evaluation of a required student multimedia delivery demonstrating the ability to research, outline, develop and present a computer related oral and visual presentation to the class. Project example: Each student will prepare a summary of their term project presentation. Copies of the summary will be distributed to the class at the time of the project presentation.
- Reports
 - Example: Lab reports that require students to provide a summary of the lab in the context of its applicability to the generic personal computer configuration, repair, and troubleshooting. Report summary: For the lab on operating system installation, summarize the unique configuration required to install the OS on the class drive so that it does not conflict with the internal drive.
- Skill Demonstrations
 - Example: 1. Skill demonstrations that require students to configure and deploy resources necessary to program a robotic arm. Grading based on ability to demonstrate the robotic arm successfully performing a pick and place task. Example: Refer to the motherboard manual documentation. Install the adapter bracket that provides a serial COM port and a parallel LPT port. 2. Skill demonstrations that require students to locate and deploy resources necessary to configure, repair, and troubleshoot a personal computer. Grading based on ability to properly trouble shoot and repair to operational condition. Example: Refer to the motherboard manual documentation. Install the adapter bracket that provides two USB ports and POST test LED array.

Repeatable

No

Methods of Instruction

- Laboratory
- Lecture/Discussion
- Distance Learning

Lab:

1. The Instructor will lecture on the purpose of the power supply in a PC and demonstrate ways to test/evaluate performance and diagnose failures. Students will document the connectivity of the laboratory PC. Following proper electrostatic discharge (ESD) procedures, the power supply will be removed and tested using a dummy load, digital multi-meter, and an oscilloscope. Measured values will be compared with acceptable tolerances.
2. The instructor will lecture on RAID array systems and the process of deciding what type would serve the application, reasons they are used and how to create and administer in a PC environment. Students will install and configure a specific disk drive RAID array. An operating system will be installed along with benchmarking utilities. Students are required to measure the performance metrics of a conventional drive system, performance metrics of the RAID, and evaluate the advantages and disadvantages of each system.

Lecture:

1. The instructor will present and discuss an overview of malware types and the common vector for infection followed by an in-class discussion where students can share their experiences of malware infections and the processes of mitigation.
2. The instructor will present and discuss the vital role the PC power supply plays in the operation of the computer hardware. The switch-mode power supply technique is presented. The common output voltages and their application is discussed.

Distance Learning

1. Instructor will provide a video lecture on computer benchmarking and system troubleshooting providing a path for problem-solving with difficult symptoms such as random BSOD's or intermittent lockups and unstable operation conditions. Students will download & install diagnostic software from the internet to run various tests on a PC system. Instructor will review results and student analysis of the PC system report and discuss solutions and upgrade potentials.

Typical Out of Class Assignments

Reading Assignments

1. Read the chapter that covers BIOS setup options and procedures. Analyze the BIOS setup screen for the classroom computer and select the options that will optimize performance. Document and submit to the instructor the settings with rationale for the chosen option.
2. Read the chapter in the text and research on the internet the installed video card. Download and install the current device driver specific to the card. Enter the configuration screen(s) and configure the card for optimum performance.

Writing, Problem Solving or Performance

1. Research and prepare a report on the features of the installed motherboard. Contrast this board with ones currently available.
2. In

writing, contrast the features of the computer used at home and/or office with the laboratory PC.

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

1. Each week, each student must complete an outside research assignment on the current topics, perform the assigned lab in class, and write an analysis of the procedures followed indicating corrective action taken to resolve any problems.

Required Materials

- Upgrading and Repairing PCs
 - Author: Scott Mueller
 - Publisher: Que Publishing
 - Publication Date: 2015
 - Text Edition: 22nd
 - Classic Textbook?:
 - OER Link:
 - OER:

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