ELEC A103: COMPUTER HARDWARE CONFIGURATION & DIAGNOSTICS

Item	Value
Curriculum Committee Approval Date	12/20/2020
Top Code	093410 - Computer Electronics
Units	3 Total Units
Hours	90 Total Hours (Lecture Hours 36; Lab Hours 54)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	No
Basic Skills	Not Basic Skills (N)
Repeatable	No
Grading Policy	Standard Letter (S)

Course Description

This course covers computer design, components, and assembly. Students will learn to assemble working computers, install an operating system, find and install drivers, and connect the computers to the internet. Students will learn to install and troubleshoot both Windows and Linux operating systems. This course will also cover troubleshooting of common hardware, operating system, and software issues as well as recovery of data from non-functional computers. Finally, students will learn to image computers for quick recovery in the event of corruption. Transfer Credit: CSU.

Course Level Student Learning Outcome(s)

1. Students will be able to design, specify, build, and commission a computer from scratch.
2. Students will be able to diagnose and resolve hardware, software, and operating system problems.
3. Students will be able to communicate system specifications and costing in writing using industry standard report formats.

Course Objectives

- 1. Design a computer with standard peripherals: monitor, printer, modem, keyboard, and mouse.
- 2. Perform upgrades to memory, disk drives, printers, and displays.
- 3. Identify internal computer components.
- 4. Identify external computer components.
- 5. Demonstrate proper technique for assembling a computer.
- 6. Demonstrate proper technique for replacing components.
- 7. Demonstrate the ability to install operating systems.
- 8. Demonstrate the ability to install drivers.
- 9. Demonstrate the ability to install software.
- 10. Demonstrate the ability to perform system backups and imaging.

Lecture Content

Project Management Project reporting Technical reporting and portfolio Coursework accounting/objective self-evaluation General Safety Procedures Electric shock High voltage Fuses Proper lifting mechanics/ lifting heavy objects External Computer Hardware Peripherals Monitors/ Displays Keyboard/Mouse Docking Stations Speakers Types of connections and Cables Internal Computer Components Chassis Form Factors Connectors and Cable Management Motherboard Processor Memory Storage Power Supply Graphics Card Optical Drives > Component Compatibility Assembly ESD Precautions Mechanical Assembly Cable routing and management Heat flow considerations Commissioning Bios Operating Systems Networking Power Supplies Power Budget Noise Redundancy Motherboards 3 Bus Architecture Central Processing Unit (CPU) Form Factors Upgrades Hard Drives Interface Types Naming Conventions Specifications Format Partitions Drive Configurations Tool Maintenance Techniques Installing Operating Systems p> System Requirements Operating System Installation Driver Installation System Restore Partitioning Tools Dual Boot Graphics Cards Interfaces Specifications Uses and capabilities Network Interfaces Computer Communications Network Interface Card (NIC) Types of Interfaces- WiFi, LAN, WAN, WOL Cyber Security Computer System Design Specifying Requirements based on client needs Comparing systems and cost analysis Documentation and Bill of Materials Service Manual Data Sheets Configuration Commissioning Backup Image Troubleshooting Issues Identifying Root Cause Software Issues Driver Issues Operating System Issues Hardware Issues

Lab Content

Project 1- Safety Component Identification Students will disassemble a computer using proper techniques and inventory all components. Lifting Techniques Electrostatic Discharge External Component Identification Internal Component Identification Bill of Materials Project 2- 10 Minute Build Students will reassemble a computer with a target time of 10 minutes. This project tests knowledge of component interfaces. This project allows students to demonstrate skills in computer assembly. Project 3- Install Operating System New Install Upgrade Dual Boot System Driver Install Project 4- Software Install Students will install a suite of software. Students will create a Bill of Materials indicating installed software. Project 5- Backup and Imaging Students will ensure their system is fully up to date- All drivers functioning properly All software functioning properly Operating System Updates Current Students will create a restore point Students will create a system image Students will then format the hard drive and restore the system using the image. Project 6- Diagnostics RAM Test Hard Drive Health Benchmarking Project 7- Upgrading Internal Components Students will upgrade or replace an internal component at the direction of the instructor. Students will perform the swap using proper technique to demonstrate proficiency. Students will ensure the proper driver is installed to utilize the new device and test for proper operation. Project 8- Network Connectivity Students will connect their comp uter to a network and verify that it has connectivity. Students will be required to troubleshoot instructor induced networking faults such as: Driver failure Adapter configuration errors Faulty cabling Disconnected cabling at the switch/router Project 9- System Specification Design Client Specifications or Use Case Component Configuration Peripherals Price Comparison Documentation- Bill of Materials and Costing

Method(s) of Instruction

- Lecture (02)
- DE Live Online Lecture (02S)
- DE Online Lecture (02X)

- Lab (04)
- DE Live Online Lab (04S)
- DE Online Lab (04X)

Instructional Techniques

Lecture Detailed whiteboard lectures with opportunity for student engagement. Discussion of media provided and assigned via Canvas. Demonstration of skills and techniques. Lab Students design, build, and test computer systems. Students troubleshoot computers at the component level. Lab projects generate content that students use to generate reports and documentation, enhancing writing and critical thinking skills.

Reading Assignments

Students will spend approximately 1 hour a week reading instructor created materials provided via Canvas

Writing Assignments

Students will spend approximately 1 hour a week writing the following: Exams Technical Reports System Manuals Bill of Materials

Out-of-class Assignments

Students will spend approximately 1 hour a week completing assigned research assignments that require students to find components and prepare comparative reports.

Demonstration of Critical Thinking

Practical Exams Student demonstration of correct interfacing peripherals to the PC. Simple fault isolation using hardware and software troubleshooting techniques. Operating system installation and software installation. Weekly Homework Assigned reading Research assignments to familiarize students with PC component availability Prepare a service manual for a classroom computer Texts created by the instructor Prepare a service manual for a home PC Weekly Lab Installation of computer peripherals Software installation Simple fault isolation Installation of devices Operating system installation Diagnostic software tools

Required Writing, Problem Solving, Skills Demonstration

The students are required to keep a portfolio of lab projects. Students are required to keep research reports and comparative analysis reports in their portfolio. Each lab project requires a technical report consisting of the following. Bill of Materials List of Software Installed Location/List of Drivers Installed Location of System Image

Eligible Disciplines

Computer service technology: Any bachelors degree and two years of professional experience, or any associate degree and six years of professional experience. Electronic technology (radio, television, computer repair, avionics): Any bachelors degree and two years of professional experience, or any associate degree and six years of professional experience. Electronics: Any bachelors degree and two years of professional experience, or any associate degree and six years of professional experience. Engineering: Masters degree in any field of engineering OR bachelors degree in any of the above AND masters degree in mathematics, physics, computer science, chemistry, or geology OR the equivalent. (NOTE: A bachelors degree in any field of engineering with a professional engineers license is an alternative qualification for this discipline.) Masters degree required. Title 5, section 53410.1 Engineering technology: Masters degree in any field of engineering technology or engineering OR bachelors degree in either of the above AND masters degree in physics, mathematics, computer science, biological science, or chemistry, OR bachelors degree in industrial technology, engineering technology or engineering AND a professional engineers license OR the equivalent. Masters degree required. Robotics (computer integrated manufacturing): Any bachelors degree and two years of professional experience, or any associate degree and six years of professional experience. Telecommunication technology: Any bachelors degree and two years of professional experience, or any associate degree and six years of professional experience.

Textbooks Resources

1. Required Mueller, S.. Upgrading and Repairing PCs, 22nd or latest ed. Indianapolis, Indiana: Que Publishing, 2015 Rationale: -

Other Resources

1. Resources provided via LMS.