ESYST 111 - Electromechanical Systems

Approval Date:  Effective Term:

Department: ELECTRONIC SYSTEMS TECHNOLOGY
Division: Career Technical Education
Units: 4.00
Grading Option: Letter Grade
Transferability: CSU Transferable
Course is: AA/AS Degree

Discipline/Minimum Qualifications:
Electronic Technology, Electronics, Industrial Technology

Catalog Description:
Presents the theory and application of mechanical devices and their control circuits, including component recognition, electrical schematic diagrams, hydraulics, pneumatics, AC and DC motors, stepping motors, mechanical drive systems, and servomechanisms.

Schedule Description:
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Student Learning Outcome:
Lecture

1. Design or reverse engineer a small scale electromechanical system.

Lab

1. Construct and troubleshoot a small scale electromechanical system.

Course Objectives:
Lecture

1. Evaluate the various applications of mechanical devices and their control circuits.
2. Evaluate applicable maintenance procedures and troubleshooting techniques for a given electromechanical system.
3. Define terms associated with motors, motor control servo systems, fluid power systems, pneumatic power systems, and mechanical drives.
4. Design a stepper motor control system.
5. Design a fluid power system.
6. Design a pneumatic power system.

Lab

1. Work safely around and with industrial equipment.
2. Identify and use basic hand and mechanical tool sets of the electromechanical industry.
3. Interpret a diagram, assemble and disassemble systems and subsystems to perform maintenance, troubleshoot, and repair.
4. Construct a stepper motor control system.
5. Construct a fluid power system.
6. Construct a pneumatic power system.

Course Content Outline:

Lecture

1. Electromechanical terminology and definitions.
2. Electromechanical system, subsystem and component identification.
   1. PCB - Printed Circuit Board
   2. Controllers
   3. Component Connectors
3. Electromechanical hand and power tool sets.
   1. Multimeters
   2. Oscilloscopes
   3. Pressure Indicators
   4. Power Supplies.
4. Relays, Contactors, and Motor Starters.
   1. Overload Relays.
   2. The Control Transformer.
   3. Timing Relays.
   4. Pressure Switches and Sensors.
   5. Float Switches.
   7. Limit Switches.
   8. Phase Failure Relays.
5. Sensors
   1. Temperature Sensing Devices.
3. Hall Effect Sensors.
4. Proximity Detectors.
5. Photodetectors.
   1. Solid-State DC Drives.
   2. Stepping Motors.
   3. The Motor and Starting Methods.
   4. Resistor and Reactor Starting for AC Motors.
   5. Autotransformer Starting.
   7. Part Winding Starters.
   8. Consequent Pole Motors.
   12. Synchronous Motors.
7. Motor Installation.
   1. Positioning transducers.
   2. Mechanical drives.
8. Fluid power systems.
   1. Fluid power components.
   2. Electronic and electrical controls of fluid power systems.
9. Pneumatic power systems.
   1. Pneumatic power components.
   2. Electronic and electrical controls of pneumatic power systems.
10. Electronic board schematics.
11. Electronic test equipment.
   1. Handheld.
   2. Powered
12. Equipment maintenance.
   1. Preventive Maintenance.
13. Equipment troubleshooting.
   1. Measures of System Performance.
   2. Devices for Data Conversion.
   3. Transducers and Signal Conditioning.

Lab

1. Using basic hand and mechanical tool sets of the electromechanical industry.
2. Demonstrating basic safety techniques around electricity and industrial equipment.
3. Reading a manufacturers manual and included schematics.
4. Operating and maintaining a functioning electromechanical system.
Methods of Instruction:
Lab, Lecture:

Methods of Evaluation:
Exams/Tests/Quizzes
Problem Solving
Skill Demonstrations

Exams

Typical Assignments:

Reading:
Technical specifications for electromechanical systems Schematics for electronic circuits Text Readings

Writing, Problem Solving or Performance:
Design a fluid power system. Construct a fluid power system.

Other:

Required Materials Examples:
Book 1
Author: James R. Daines 
Publication Date: 2009
Edition: 1st
Title: Fluid Power: Hydraulics and Pneumatics Publisher: Goodheart-Wilcox

Book 2
Author: Stephen Herman 
Publication Date: 2010
Edition: 6th
Title: Industrial Motor Control Publisher: Delmar Cengage Learning

Book 3
Author: Devdas Shetty, Richard A. Kolk 
Publication Date: 2011
Edition: 2nd
Title: Mechatronics System Design Publisher: Delmar Cengage Learning

Course Preparation:
Prerequisite(s): None
ESYST 101
Co-Requisite(s): CMPELC 130
Recommended: None