South Central College

MECA 2110  Sensors and Control

Course Outcome Summary

Course Information

Description
This course will provide students with the principles of measurement and control systems. The student will gain an understanding of different sensor technologies used to measure and detect physical properties used in a variety of electro mechanical, electro hydraulic and electro pneumatic systems. The student, through lab work, will also learn how to use and troubleshoot sensors used in open and closed loop control systems. Technical writing skills and safety procedures will be implemented throughout the course. This course assumes the student understands basic electrical, mechanical, and programming concepts. (Prerequisites: MECA 1120 or MECA 1122 and MECA 1125 and MECA 1130)

Total Credits 3
Total Hours 64

Types of Instruction

Instruction Type
Lecture
Lab

Pre/Corequisites
MECA 1120 or MECA 1122 and MECA 1125
MECA 1130

Institutional Core Competencies

Communication - Students will be able to demonstrate appropriate and effective interactions with others to achieve their personal, academic, and professional objectives.

Critical and Creative Thinking - Students will be able to demonstrate purposeful thinking with the goal of using a creative process for developing and building upon ideas and/or the goal of using a critical process for the analyzing and evaluating of ideas.

Course Competencies

1. Explain Measurement Tools

Learning Objectives
Explain tools used to obtain dimensional measurements
Explain diameter and roundness measurements
Explain tools used to measure physical location
Explain tools used to measure hardness
Obtain an understanding of the performance specifications used in measurement tools and sensors
Attain ability to use tools

2. **Explain Position Sensors and Switches**
   
   **Learning Objectives**
   
   Explain the physical principles used to measure position
   Explain potentiometers
   Explain Linear Variable Differential Transformers (LVDT)
   Explain magnetostrictive devices
   Explain Hall effect devices
   Explain the use of rotary position sensors

3. **Construct Open and Closed Loop Position Controls**
   
   **Learning Objectives**
   
   Attain an understanding of when to apply closed loop control
   Attain an ability to tune a PID control loop
   Attain an understanding of closed loop control stability
   Compare the performance differences between the open loop and closed loop system

4. **Explain Velocity Sensors**
   
   **Learning Objectives**
   
   Explain the physical properties used in velocity control
   Explain the use of Variable Reluctance speed sensors
   Explain the use of Hall effect speed sensors

5. **Construct Open and Closed Loop Velocity Controls**
   
   **Learning Objectives**
   
   Attain an understanding of open and closed loop velocity control
   Identify how errors in the velocity control loop are generated
   Compare the performance differences between the open loop and closed loop system

6. **Explain Accelerometer Sensors**
   
   **Learning Objectives**
   
   Explain the physical properties used to measure acceleration
   Explain strain gauges

7. **Explain Load Cells**
   
   **Learning Objectives**
   
   Explain the physical properties used to measure force
   Examine how a load cell is manufactured
   Attain an ability to install and use a strain gauge

8. **Construct Open and Closed Loop Force Controls**
   
   **Learning Objectives**
   
   Attain an understanding of how to control force
   Explain the limitations associated with this type of control
   Create a means to weigh an item using strain gauges
   Compare the performance differences between the open loop and closed loop system

9. **Explain Pressure Sensors and Switches**
   
   **Learning Objectives**
   
   Explain the physical properties used in pressure sensors and switches
   Calibrate a pressure transducer to understand calibration techniques

10. **Construct Open and Closed Loop Pressure Controls**
Learning Objectives
Create a open loop pressure control
Create a closed loop pressure control
Compare the performance differences between the open loop and closed loop system

11. Explain Vision Systems
Learning Objectives
Explain vision system uses
Attain an understanding of vision system performance
Acknowledge vision system limitations
Qualify performance through set-up and calibration

12. Explain Temperature Sensors
Learning Objectives
Explain the physical principles use to measure temperature
Identify temperature sensor uses
Identify temperature sensor measurement devices
Calibrate temperature sensor

13. Explain Current Sensors and Control
Learning Objectives
Explain the physical principles use to measure current
Monitor current using sensor

14. Identify calibration techniques for sensors and measuring tools
Learning Objectives
Review the Standards used by the National Institute of Standards and Technology (NIST)
Review the NIST Calibration Program

15. Discuss Variety of Other Sensors Used to Measure Physical Properties
Learning Objectives
Explain the use of Gauss Meters to measure magnetic field
Explain Surface Texture measurement tools
Explain Flow Meters
Explore vibration with the use of sound and strobe light

SCC Accessibility Statement
South Central College strives to make all learning experiences as accessible as possible. If you have a disability and need accommodations for access to this class, contact the Academic Support Center to request and discuss accommodations. North Mankato: Room B-132, (507) 389-7222; Faribault: Room A-116, (507) 332-7222.

Additional information and forms can be found at: www.southcentral.edu/disability

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