



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

Credits/Hours

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 use 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

This material can be made available in alternative formats by contacting the Academic Support Center at 507-389-7222.