



Course Name: ENR-241 Instrumentation and Control

Date Updated: 2/2022

Credit Hours/week: Lec. 2 hrs., Lab 1 hr./wk. – 3 cr.

BEGINNING: SPRING 2022

Catalog Description: This course is an introduction to the study of measuring systems and components, digital and analog signals, and their characteristics. Mechanical and electromechanical transducer elements are used to measure pressure, temperature, displacement, velocity, and acceleration. Static and dynamic performance of instruments, statistical analysis of experimental data are explored. A brief study of process controllers, programmable logic controllers and final control elements are also explored.

Prerequisite: ELT-201

Text: Introduction to Control System Technology L Robert N. Bateson Prentice Hall

Supplementary Material: Industrial Catalogs and Hand Books, Instrument Society of American Standards

Specialized equipment, supplies, facilities, for classes limited by enrollment or restricted by accreditation and/or equipment limitations: (Information will be used to determine differential funding category.)

Project activities are based on the utilization of multimeters, industrial process variable sensors, measuring instrumentation, process control set up, strain gauge instrumentation, robotic set up and programmable logic controllers.

Syllabus:

Topics
Principles of Open Loop and Closed Loop Automatic Control Systems
Types of Process Control, Including Analog, Digital, and Sequential
Operating Characteristics of Instruments
Wheatstone Bridge, Potentiometer Circuits, and Operational Amplifiers
Measurement Transducers and Sensors
Process Variable Measurements of Pressure, Liquid Level, Flow Rate, Temperature, and Specific Gravity
Final Control Elements, Including Switches, Valves, and Actuators
Discrete and Continuous Control, and Programmable Logic Controllers

Format for Offering this Course: Traditional

Students are expected to adhere to the policies of the County College of Morris. These can be accessed at: (insert link here)

Statement of Expected Course LEARNING OUTCOMES

- Explain the principles of open and closed loop control systems using block diagrams
- Analyze the output data of an instrument statistically to calculate the standard deviation
- Perform tests to determine the static characteristics of instruments and draw calibration curves
- Determine dynamic characteristics of temperature measuring instruments from step response curves drawn from test data
- Explain the principles of transducers to measure displacement using voltage output
- Use a Wheatstone bridge circuit to measure the output of linear resistance transducer devices
- Discuss the principles and application of Linear Differential Variable Transformers
- Explain the construction of strain gauges, measure strain from output, and perform stress calculations
- Perform experiments to determine specific gravity of liquids
- Discuss pressure, liquid level and flow measurement in systems using various transducers and instrumentation
- Explain temperature measurement and draw calibration curves of thermocouples, resistance thermometers and thermistors
- Discuss analog and digital process control systems and their control instrumentation
- Develop ladder logic to run programmable logic controllers
- Explain the principles of on-off, proportional and derivative control of systems

Statement of Relation to Curriculum(s):

A required course in mechanical Engineering Technology and Mechatronics