Revised 01/2023

NOVA COLLEGE-WIDE COURSE CONTENT SUMMARY
MEC 230 – MECHATRONICS PROCESS CONTROL (3 CR.)

Course Description

Studies systems integrating mechanical components with electrical components and logic devices used to control manufacturing operations. Surveys electromechanical actuators, sensors, digital to analog conversion, and methods of computer control as related to the managing and monitoring of manufacturing processes. Lecture 2 hours. Laboratory 2 hours. Total 4 hours per week.

General Course Purpose

This course is designed to teach students the basics of machine process control designed for industrial environments and machinery. Students will apply fundamentals of industrial controls to operate valves, actuators, solenoids, and machinery, P&ID (Piping and Instrumentation Diagrams), and PID Controllers (Proportional Integral and Derivate Controllers). Students will design industrial control diagrams and operate machinery that involve, but not exclusive to: Analog Process Control, Pressure Process Control, and Thermal Process Control.

Course Prerequisites/Corequisites

Prerequisites: MEC 140 and ELE 150.

Course Objectives

Upon completing the course, the student will be able to:

- Explain Industrial Process Control Symbols.
- Explain the concepts of a PI&D and Feedback Control.
- Describe the differences between open- and closed-loop systems.
- List the factors that affect the dynamic response of a closed-loop system.
- Identify the schematic diagrams, describe the operations, and calculate the outputs of the comparator, inverting, summing, noninverting, and difference operational amplifiers (op. amps).
- Explain Industrial Feedback Control Systems.
- Explain the characteristics and the operation of SCR, UJTs, Diacs, Triacs, and IGBTs.
- Calculate the proportional gain of controllers.
- Discuss the differences between sensors and actuators.
- Explain the difference between volumetric flow rate and mass flow rate.
- Design Piping and Instrumentation Diagrams.
- Identify measuring devices and their operations.
- Explain the different types of instrumentation.
- Name the different types of standard electronic and pneumatic transmission signals and determine their numeral ranges.
- Discuss the framework of PLC and its application to Process Control.

Major Topics to be Included

- Industrial control systems
- Interfacing devices
- Thyristors—SCR, UJT, Diac, Triac and IGBT
- DC, AC and servo motors
- Variable speed drives
- Process control symbols and tags
- Pressure and level control systems
- Flow control

- Industrial techniques and instrumentation
- Instrumentation symbology
- Motion control