

Course Code: ELT 231

Course Title: Programmable Controllers

Department: Applied Sciences and Technologies

Effective Date: Summer 2026

PCS Code: 1.2 - Occupational/Technical Instruction

CIP Code: 15.0499

Repeatability: 0

Credit Hours

Catalog Notation: 2-2-3

Credit Hour Distribution:

Lecture: 2

Lab: 2

Clinical: 0

Total: 3

General Course Information

Catalog Description

Programmable logic controllers with emphasis on creating application programs to solve control problems. Course includes an overview of PLC systems, number systems, I/O modules, basic and advanced instructions, system configuration, and troubleshooting.

General Course Objectives

Demonstrate the ability to connect, configure, and communicate with a PLC; verify its proper operation; and create application programs.

Minimum Placement Levels

English

None

Reading

None

Math

None

Prerequisites

Credit in ELT 179

Methods of Evaluation

Minimum of 6 quizzes, midterm and final exams. Minimum of 10 labs. In-class and/or homework assignments recommended.

Instructional Materials and Additional Supplies

Introduction to Programmable Logic Controllers, 9780073373843

Safety glasses

Course Content

General Learning Outcomes (GLOs)

- Technology: Students will demonstrate the ability to evaluate, select, and appropriately use current and emerging tools.

Course Segments and Student Learning Outcomes

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Course Introduction, Safety and Overview of PLCs	1. Identify safety equipment in the lab and describe proper procedures for working with industrial machinery and electricity. 2. Compare and contrast PLCs vs. other types of control systems and computers. 3. Define and describe PLC system architecture, memory, and I/O systems.	4	0	0
PLC Hardware Components	1. Define and describe PLC system components. 2. Connect, configure, and test PLC system components.	2	2	0
Number Systems and Codes	1. Identify and convert between different number systems and codes. 2. Perform binary arithmetic; explain and calculate complemented and signed binary numbers. 3. Identify PLC terminal connections based on different octal and hex numbering systems.	2	2	0
Fundamentals of Logic	1. Identify and describe basic logic functions and convert between logic symbols, truth tables, and ladder logic diagrams.	2	2	0
Basics of PLC Programming	1. Define and identify the functions of a PLC memory map. 2. Describe and identify I/O tables and data file types. 3. Describe scanning, operational modes, fault conditions, internal relay functions, PLC programming language options, tags, and scope. 4. Configure the PLC for communications and I/O; download and run basic programs.	2	2	0
Developing Fundamental PLC Wiring Diagrams and Ladder Logic Programs	1. Identify schematic symbols and describe their control functions within a ladder diagram. 2. Locate components on ladder and wiring diagrams. 3. Create PLC ladder programs from electromechanical ladder and wiring diagrams.	2	2	0
Programming Timers and Counters	1. Identify and describe the function of schematic timing and counting symbols, timing diagrams, and load symbols. 2. Create programs using timer and counter instructions to solve control problems.	2	2	0
Program Control Instructions	1. Identify and describe program control instructions. 2. Create programs using subroutines, branching, and conditional statements.	2	4	0
Data Manipulation Instructions	1. Identify and describe instructions for data manipulation; bit, byte, and word moves; masking; and data copy. 2. Create programs to solve specific control applications.	2	2	0
Math Instructions	1. Identify and describe mathematic instructions. 2. Create programs to solve specific control applications.	2	2	0
Sequencer and Shift Register Instructions	1. Identify and describe instructions for shift registers and sequencers. 2. Create programs to solve specific control applications.	2	4	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
PLC Installation Practices, Editing, and Troubleshooting	1. Describe proper installation techniques, grounding, bleeder resistors, and static discharge. 2. Demonstrate proper technique for removal and installation of system components and modules.	2	0	0
Process Control and Data Acquisition systems	1. Describe various control modes and methods. 2. Connect and verify operation of A/D and D/A module. 3. Create programs to collect and output analog data.	2	4	0
Computer-Controlled Machines and Processes	1. Create programs to solve typical machine processes.	2	2	0

Total Contact Hours

Lecture Hours	Lab Hours	Clinical Hours
30	30	0