

Course Description**ETS2673C | Programmable Logic Controls | 4.00 credits**

This course is intended for students majoring in Electronics Engineering Technology and Advanced Manufacturing. Students will learn the principals of PLC's including hardware, programming, and troubleshooting. Students will develop advanced working programs, and troubleshoot hardware and software communication problems. Prerequisite: CET1110C.

Course Competencies

Competency 1: The student will demonstrate an understanding of the building blocks of basic Boolean algebra by:

1. Applying basic number conversation to and from different numbers systems, such as: binary, decimal, hexadecimal, anecdotal
2. Describing and implementing basic logical operators such as: and, or and not
3. Simplifying Boolean functions using K-Maps
4. Converting Boolean functions into digital circuits and generating the corresponding truth tables
5. Describing and implementing the one's and two's complement binary notation

Competency 2: The student will demonstrate an understanding of basic programmable logic controller (PLC) technology and the industrial control devices used currently in automation by:

1. Defining and describing a PLC
2. Describing the functions of all the devices in a PLC system
3. Describing the differences and similarities among relay ladder logic and PLC ladder logic
4. Describing the differences between personal computers and PLCs
5. Designing and implementing basic ladder logic programs
6. Describing the electrical safety issues related to working with PLCs

Competency 3: The student will demonstrate an understanding of the basic operation of electro-mechanical input devices by:

1. Identifying and describing various manually operated switches typically used in PLCs such as: toggle, push button, selector, and push wheel
2. Identifying and describing the following output devices: solenoids, relays, contactors, and alarms
3. Interfacing basic input/output devices to a PLC system
4. Troubleshooting basic input/output devices in a PLC system

Competency 4: The student will demonstrate an understanding of the operation of basic electronic and mechanical timers by:

1. Describing the main differences among mechanical and electronic timing relays
2. Identifying and describing the operation of a mechanical timing relay
3. Identifying and describing the operation of timer -on delay (TON) and timer -of delay (TOF) timer instructions
4. Troubleshooting input/output modules with timer instructions

Competency 5: The student will demonstrate an understanding of the operation of basic electronic and mechanical counters by:

1. Describing the main differences between mechanical and electronic counters
2. Identifying and describing the operation of a mechanical counter
3. Designing and analyzing ladder diagrams for the up/down counter typically implemented in industrial automation
4. Designing and implementing, using a PLC system, the done bit, enable bit and overflow/underflow bit counters
5. Troubleshooting counters in a ladder logic design

Competency 6: The student will demonstrate an understanding of the operation and function of electromechanical sequencing devices by:

1. Identifying and describing the operation and function of electro-mechanical sequencing devices
2. Describing the basic PLC sequencer function
3. Designing and implementing the ladder logic diagram for the operation of a PLC sequencer with timing
4. Designing, describing and implementing the technique of cascading sequencers
5. Troubleshooting ladder logic rungs using sequencer instructions

Competency 7: The student will demonstrate an understanding of the operation and function of analog sensors by:

1. Describing the operation and function of analog devices such as temperature, pressure, flow and position sensors
2. Enumerating and describing the components of an infrared system and their operations
3. Explaining the general closed-loop block diagram and stating the purpose of each of the blocks
4. Describing and explaining the general characteristics that differ between effective and ineffective control systems
5. Troubleshooting basic input/output analog devices

Learning Outcomes:

- Use quantitative analytical skills to evaluate and process numerical data
- Solve problems using critical and creative thinking and scientific reasoning
- Use computer and emerging technologies effectively