COURSE OUTLINE

Course Number	Course Title	Credits
EET 266	**Programmable Logic Controllers**	**4**

Hours: Lecture/Lab/Other	Pre-requisite	Implementation Semester & Year
3 Lecture/3 Lab	**EET 251**	**Spring 2022**

Catalog description:
Introduces the theory and practical concepts of programmable logic controllers and their applications within industrial or manufacturing environments. Topics include PLC components, digital logic, ladder logic design, and software programming. Corresponding labs reinforce lectures with practical hands-on programming of Allen-Bradley PLC units using RSLogix software.

General Education Category:
Not GenEd

Course coordinator:
Harry Bittner, 609-570-3751, bittnerh@mccc.edu

Required texts & Other materials:
Programmable Logic Controllers by Frank D. Petruzella, McGraw-Hill, 978-0-07-351088-0

LogixPro Lab Manual by Frank D. Petruzella, McGraw-Hill, 978-0-07-747799-2

Course Student Learning Outcomes (SLO):

Upon successful completion of this course the student will be able to:
1. Identify and describe all PLC hardware and software components. [ILG # 1, 10; PLO # 1]
2. Demonstrate knowledge of commonly used digital logic gate configurations. [ILG # 1, 2; PLO # 1]
3. Convert between decimal, binary and hexadecimal number systems. [ILG # 2]
4. Understand the differences and various applications of input and output devices. [ILG # 4, 10, 11; PLO #]
5. Develop a PLC ladder diagram from a verbal or written set of requirements. [ILG # 1, 2, 4, 10, 11; PLO # 1, 2, 6]
6. Properly connect input and output devices to a PLC unit to perform a desired function and verify operation. [ILG # 3, 4, 10, 11; PLO # 2, 6, 8]

Course-specific Institutional Learning Goals (ILG):

Institutional Learning Goal 1. Written and Oral Communication in English. Students will communicate effectively in both speech and writing.
Institutional Learning Goal 2. Mathematics. Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.
Institutional Learning Goal 3. Science. Students will use the scientific method of inquiry, through the acquisition of scientific knowledge.
Institutional Learning Goal 4. Technology. Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.
Institutional Learning Goal 10. Information Literacy: Students will recognize when information is needed and have the knowledge and skills to locate, evaluate, and effectively use information for college level work.
Institutional Learning Goal 11. Critical Thinking: Students will use critical thinking skills understand, analyze, or apply information or solve problems.

Program Learning Outcomes for Electronics Engineering Technology (PLO)

1. Communicate effectively in English, both orally and in written form.
3. Work as a team with fellow workers.
6. Demonstrate an understanding of fundamental digital circuits.
8. Set up and operate modern electronic equipment such as DMM, oscilloscope, and signal generators.

Units of study in detail – Unit Student Learning Outcomes:

Unit I   Introduction to PLC Components, Digital Logic and Numbering Systems [Supports Course SLO # 1, 2, 3, 4, 5, 6]

Learning Objectives
The student will be able to:
1. Express the functionality of commonly used digital logic gates.
2. Convert between decimal, binary and hexadecimal numbering systems.
3. Identify the various hardware modules used on a PLC system and explain their function.
4. Demonstrate familiarity with RSLogix PLC software interface.
5. Create ladder logic programs from digital logic expressions.
6. Implement typical PLC installation practices used in industry.

Unit II   PLC Software and Ladder Logic Programs [Supports Course SLOs # 1, 4, 5, 6]
Learning Objectives
The student will be able to:

1. Demonstrate working knowledge of sensors and actuators used in industry.
2. Apply a seal-in circuits for motor control circuits.
3. Use latch and unlatch relays in control circuits.
4. Develop a PLC ladder logic program using timers.
5. Develop a PLC ladder logic program using counters.
6. Troubleshoot ladder logic and circuit wiring problems.

<u>**Unit III**</u>   **Advanced PLC Software and Ladder Logic Topics** [Supports Course SLOs # 1, 4, 5, 6]

<u>Learning Objectives</u>
The student will be able to:

1. Explain the types of safety circuits used in PLC systems.
2. Create ladder logic programs utilizing jump and subroutine commands.
3. Understand PLC control protocols and communication networks.
4. Create ladder logic programs using mathematical operators.
5. Create ladder logic programs using sequencer and shift instructions.
6. Troubleshoot advanced ladder logic and circuit wiring problems.

Evaluation of student learning: [Evaluates SLOs # 1 - 6]

Students' achievement of the course objectives will be evaluated through the use of the following:
- Three unit tests assessing students' comprehension of terminology, calculations and practices related to the unit objectives.
- Lab grade based on shop projects and lab assignment results.
- In class participation, homework and attendance.

Evaluation Tools	Percentage Of Grade
3 Unit Tests	60%
Lab Experiments & Reports	20%
Homework	20%
Total	100%