Master Course Syllabus

For additional course information, including prerequisites, corequisites, and course fees, please refer to the Catalog: https://catalog.uvu.edu/

Semester: Spring
Year: 2025
Course Prefix: AET
Course and Section #: 2255-801
Course Title: Industrial Programmable Logic Controllers-PLCs Lab
Credits: 2

Course Description

Covers the theory, programming and industrial control system applications of small and medium sized programmable controllers (PLCs). Studies basic maintenance, operation, troubleshooting and programming instructions / techniques for industrial PLCs. Concentrates on interfacing analog and digital I/O to the PLC. Covers human machine interface (HMI) configuration, programming and PLC integration. Includes hands-on labs and industry examples.

Course Attributes

This course has the following attributes:

☐ General Education Requirements
☐ Global/Intercultural Graduation Requirements
☐ Writing Enriched Graduation Requirements
☒ Discipline Core Requirements in Program
☐ Elective Core Requirements in Program
☐ Open Elective

Other: *Click here to enter text.*

Instructor Information

Instructor Name: Trever Parker

Student Learning Outcomes

Upon successful completion of this course, students will be able to:

- Describe safe work practices
- Define how a PLC works
- Convert relay ladder logic to PLC ladder logic
- Describe operation of basic PLC ladder logic instructions
- Draw PLC I/O wiring diagrams
- Utilize binary numbering in industrial Ethernet
- Describe standard installation practices and techniques
- Calculate component sizes for analog systems

Course Materials and Texts

Tools:

- Basic electrical AET tools required

Course Requirements

Course Assignments, Assessments, and Grading Policy

- Labs: Will be done in the lab and are due by the end of each week. (75% of Grade)
- Safety: It is required of you to obey all posted safety rules in the lab and what is required in the Canvas course module on safety. (25% of grade)

Final grades are rounded to the nearest whole number and assigned the corresponding letter grade:

A = 100% to 94%	B- = <84% to 80%	D+ = <70% to 67%
A- = <94% to 90%	C+ = <80% to 77%	D = <67% to 64%
B+ = <90% to 87%	C = <77% to 74%	D- = <64% to 61%
B <87% to 84%	C- = <74% to 70%	F = <61% to 0%

Required or Recommended Reading Assignments

There is no textbook for this course.

General Description of the Subject Matter of Each Lecture or Discussion

Safety Module:

- Safety Record: Is where all the safety rules and guide lines are.
- Lab Safety Reminder: An additional reminder about required PPE

Lab 1: Hardwire

- A review of relay logic and wiring of 3-phase motor

Lab 2: Intro to Micrologix PLC

- Connecting and Programming a micrologix PLC using RS500 software

Lab 3: Micrologix TON

- Programming timers using on-delay and off-delay instructions

Lab 4(a): Brick FTS Alarm & Micro Brick TMRs

- Introduce the motor failed start alarm and continued use of timers

Lab 4(b): Brick FTS Alarm & Micro Brick TMRs

- Continued practice of using TON, TOF and RTO timer instructions

Lab 5(a): Intro to Counters

- A wiring of PLCs review

Lab 5(b): Intro to Counters

- Program using count-up and count-down counter instructions

Lab 6(a): 2’s Complement & MOV

- Learn to use the MOV instruction and verify that micrologix PLC use 2’s complement binary

Lab 6(b): 2’s Complement & Pressure Monitoring

- Understand a pressure monitoring program

Lab 7: Headworks

- A real industrial application and you have to create the program from the required description
- Use timers and counters together

Lab 8: Banding Machine

- A real industrial application that you create a program for based on the description
- Use timers, move and math instructions

Lab 9: 12 Hr Clock

- Create a 12-hr clock using timers, counters, move, math and compare instruction
- Use N7 data type

Lab 10: 12 Hr Clock

- Introduce HMI software and how to use

Lab 11: Traffic Light

- Finish the program that is given to you to create a 4-way traffic light program

Lab 12: Spray Painting BSL

- Program using the BSL instruction

Lab 13: Traffic Light SQO

- Redo the traffic light program using the SQO instruction

Lab 14: Hydro SQC

- Program using the SQC sequencer instruction

Lab 15: Intro to Analog

- Program using an analog simulator to read the values from it

Lab 16: Analog Current Sensors

- Program using a current analog sensor to measure current from a motor

Lab 17: SMC

- You are on your own to program a small machine using everything taught to this point

Lab 17.5: BootP

- Use ethernet commissioning software to put an IP address into a PLC

Lab 18: Intro to PAC

- Program using Studio 5000 software

Lab 19: PAC Textbook

- Pick a program from the textbook and program it in Studio 5000 software

Lab 20: FTVS Color Animation

- Using HMI software to program more advanced screen using motors changing color

Lab 21: PAC SQO Traffic Light

- Program the traffic light in Studio 5000 using SQO instructions

Lab 22: PAC Spray Painting BSL

- Program the spray paint booth in Studio 5000 using BSL instruction

Lab 23: PAC Analog

- Learn how to wire and program analog devices to Control logic platform

Lab 24(a): VFD videos

- Watch the videos in this lab to understand theory, wiring, connecting and programming VFDs

Lab 24: VFD Voltage Control / Lab 25 VFD Current Control

- Wire and program a VFD to control the speed of a 3-phase motor using voltage and current control

Lab Clean up: Clean up the Lab

Required Course Syllabus Statements

Generative AI

Use of AI in this course is encouraged to help understand the principles taught. It may be used to help on the lab assignments. It may not be used to do the entire programming logic, the program must be the students work.

Using Remote Testing Software

☒ This course does not use remote testing software.

☐ This course uses remote testing software. Remote test-takers may choose their remote testing locations. Please note, however, that the testing software used for this may conduct a brief scan of remote test-takers' immediate surroundings, may require use of a webcam while taking an exam, may require the microphone be on while taking an exam, or may require other practices to confirm academic honesty. Test-takers therefore shall have no expectation of privacy in their test-taking location during, or immediately preceding, remote testing. If a student strongly objects to using test-taking software, the student should contact the instructor at the beginning of the semester to determine whether alternative testing arrangements are feasible. Alternatives are not guaranteed.

Required University Syllabus Statements

Accommodations/Students with Disabilities

Students needing accommodations due to a permanent or temporary disability, pregnancy or pregnancy-related conditions may contact UVU Accessibility Services at accessibilityservices@uvu.edu or 801-863-8747.

Accessibility Services is located on the Orem Campus in BA 110.

Deaf/Hard of Hearing students requesting ASL interpreters or transcribers can contact Accessibility Services to set up accommodations. Deaf/Hard of Hearing services can be contacted at DHHservices@uvu.edu

DHH is located on the Orem Campus in BA 112.

Academic Integrity

At Utah Valley University, faculty and students operate in an atmosphere of mutual trust. Maintaining an atmosphere of academic integrity allows for free exchange of ideas and enables all members of the community to achieve their highest potential. Our goal is to foster an intellectual atmosphere that produces scholars of integrity and imaginative thought. In all academic work, the ideas and contributions of others must be appropriately acknowledged and UVU students are expected to produce their own original academic work.

Faculty and students share the responsibility of ensuring the honesty and fairness of the intellectual environment at UVU. Students have a responsibility to promote academic integrity at the university by not participating in or facilitating others' participation in any act of academic dishonesty. As members of the academic community, students must become familiar with their rights and responsibilities. In each course, they are responsible for knowing the requirements and restrictions regarding research and writing, assessments, collaborative work, the use of study aids, the appropriateness of assistance, and other issues. Likewise, instructors are responsible to clearly state expectations and model best practices.

Further information on what constitutes academic dishonesty is detailed in UVU Policy 541: *Student Code of Conduct*.

Equity and Title IX

Utah Valley University does not discriminate on the basis of race, color, religion, national origin, sex, sexual orientation, gender identity, gender expression, age (40 and over), disability, veteran status, pregnancy, childbirth, or pregnancy-related conditions, citizenship, genetic information, or other basis protected by applicable law, including Title IX and 34 C.F.R. Part 106, in employment, treatment, admission, access to educational programs and activities, or other University benefits or services. Inquiries about nondiscrimination at UVU may be directed to the U.S. Department of Education's Office for Civil Rights or UVU's Title IX Coordinator at 801-863-7999 – TitleIX@uvu.edu – 800 W University Pkwy, Orem, 84058, Suite BA 203.

Religious Accommodation

UVU values and acknowledges the array of worldviews, faiths, and religions represented in our student body, and as such provides supportive accommodations for students. Religious belief or conscience broadly includes religious, non-religious, theistic, or non-theistic moral or ethical beliefs as well as participation in religious holidays, observances, or activities. Accommodations may include scheduling or due-date modifications or make-up assignments for missed class work.

To seek a religious accommodation, a student must provide written notice to the instructor and the Director of Accessibility Services at accessibilityservices@uvu.edu. If the accommodation relates to a scheduling conflict, the notice should include the date, time, and brief description of the difficulty posed by the conflict. Such requests should be made as soon as the student is aware of the prospective scheduling conflict.

While religious expression is welcome throughout campus, UVU also has a specially dedicated space for meditation, prayer, reflection, or other forms of religious expression.