

Technical College of the Lowcountry
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IMT233
PROGRAMMABLE LOGIC CONTROLLER

COURSE DESCRIPTION

This is the study of programmable logic controllers. Students will learn how to state the characteristics of different types of memory and count and convert between number systems.

3 Credits(3 lect/pres, 0 lab, 0 other)

COURSE FOCUS

Upon completion of this course, the student shall be able to identify different types of PLCs, major components of the PLC, and how the I/O are controlled by it. They will also have an understanding of the programming logic and PLC programming languages. Practical application of the PLC will be part of the curriculum.

TEXT AND REFERENCES

Reference only: Industrial Maintenance, 2nd Edition, Michael E. Brumbach & Jeffrey A. Clade, Delmar Cengage Learning, 2014, ISBN 9781133131199.

COURSE GOALS

The following list of course goals will be addressed in the course. These objectives are directly related to the learning outcomes and you are expected to have a thorough understanding of these goals.

1. Identify components of a PLC.
2. Describe the function of a PLC.
3. Correctly wire a PLC I/O module.
4. Develop a simple PLC program.
5. Develop a PLC I/O wiring diagram.
6. Define various terms used in conjunction with PLCs.
7. Become familiar with Lab-Volt PLC trainer.
8. Run RSlogix Micro software.

9. Enter default project files path.
10. Create and save project files.
11. Initiate a project.
12. Edit a PLC ladder program.
13. Document a PLC ladder program.
14. Print a report on a project.
15. Download a project to a PLC.
16. Run and test a PLC ladder program.
17. Monitor data files when PLC is in run mode.
18. Modify a PLC ladder program and retest it.
19. Develop latching instruction in a PLC program.
20. Test latching instructions in ladder program.
21. Develop timer instructions in a PLC program.
22. Test PLC ladder program that uses timer instructions.
23. Program counter instructions.
24. Test counter instructions in a PLC program.
25. Learn the use of sequencer instructions.
26. Check sequencer instructions in a PLC program.
27. Program comparison instructions.
28. Test the use of comparison instructions.
29. Learn to use shift register instructions.
30. Test PLC ladder program that uses shift register instructions.
31. Understand Force function of the PLC.
32. Familiarization with the Bottling Process System.
33. Single Stepper Motor Control.
34. Setting up system to rotate and cap bottles continuously.
35. Finding fault in a Bottling Process System.
36. Controlling the stepper motors using the PLC Pulse Train Output (PTO) function files.
37. Familiarization with the Electromechanical System using Stepper motor.
38. Basic Programming using stepper motor drive
39. Simulating a desktop scanner with Electromechanical – Stepper motor system.
40. Troubleshooting Electromechanical – Stepper motor system.
41. Practice Single-Operation Sequence.
42. Familiarize Electromechanical System using DC motors.
43. Learn Basic positioning using limit switches.
44. Use timer to improve the positioning reliability.
45. Troubleshooting inserted fault in the Electromechanical – DC Motor system.
46. Crafting closed loop positioning control system using optical encoders.
47. Familiarization with the Electro-Pneumatic Systems.
48. Learn to create two structured ladder program using timer.
49. Practice controlling pneumatic devices using the proximity detectors.
50. Familiarize with alarm management.

STUDENT CONTRIBUTION

Each student will spend approximately 2.5-5 hours per week preparing for class and completing assignments to turn in weekly.

Each week students will turn in assignments as specified by the instructor. In addition, tests are to be completed as assigned. Students will also complete mid-term and final exam/project to demonstrate their knowledge of the material.

Student Attendance Policy: See student handbook within the TCL Catalog.

COURSE EVALUATION

The grading scale is as follows:

Practical Exercises = 50%, Midterm Exam = 25%, and Final Exam = 25%.

90 - 100 = A 80 - 89 = B 70 - 79 = C 60 - 69 = D Below 60 = F

COURSE SCHEDULE

The class meets for 5 lecture/presentation hours per week. Course content will be taught in the order that the content goals are presented in the syllabus.

ADA STATEMENT

The Technical College of the Lowcountry provides access, equal opportunity and reasonable accommodation in its services, programs, activities, education and employment for individuals with disabilities. To request disability accommodation, contact the counselor for students with disabilities at (843) 525-8228 during the first ten business days of the academic term.

ACADEMIC MISCONDUCT

There is no tolerance at TCL for academic dishonesty and misconduct. The College expects all students to conduct themselves with dignity and to maintain high standards of responsible citizenship.

It is the student's responsibility to address any questions regarding what might constitute academic misconduct to the course instructor for further clarification.

The College adheres to the Student Code for the South Carolina Technical College System. Copies of the Student Code and Grievance Procedure are provided in the *TCL Student Handbook*, the Division Office, and the Learning Resources Center.

ATTENDANCE

The College's statement of policy indicates that students must attend ninety percent of total class hours or they will be in violation of the attendance policy.

- Students not physically attending class during the first ten calendar days from the start of the semester must be dropped from the class for NOT ATTENDING.
- Students taking an online/internet class must sign in **and** communicate with the instructor within the first ten calendar days from the start of the semester to indicate attendance in the class. Students not attending class during the first ten calendar days from the start of the semester must be dropped from the class for NOT ATTENDING.
- Reinstatement requires the signature of the division dean.

In the event it becomes necessary for a student to withdraw from the course **OR if a student stops attending class, it is the student's responsibility to initiate and complete the necessary paperwork.** Withdrawing from class may have consequences associated with financial aid and time to completion.

When a student exceeds the allowed absences, the student is in violation of the attendance policy. The instructor **MUST** withdraw the student with a grade of "W", "WP", or "WF" depending on the date the student exceeded the allowed absences and the student's progress up to the last date of attendance

or

under extenuating circumstances and at the discretion of the faculty member teaching the class, allow the student to continue in the class and make-up the work. This exception must be documented at the time the allowed absences are exceeded.

Absences are counted from the first day of class. There are no "excused" absences. All absences are counted, regardless of the reason for the absence.

- A student must take the final exam or be excused from the final exam in order to earn a non-withdrawal grade.

A copy of TCL's STATEMENT OF POLICY NUMBER: 3-1-307 CLASS ATTENDANCE (WITHDRAWAL) is on file in the Division Office and in the Learning Resources Center.

HAZARDOUS WEATHER

In case weather conditions are so severe that operation of the College may clearly pose a hardship on students and staff traveling to the College, notification of closing will be made through the following radio and television stations: WYKZ 98.7, WGCO 98.3, WGZO 103.1, WFXH 106.1, WWVV 106.9, WLOW 107.9, WGZR 104.9, WFXH 1130 AM, WLVH 101.1, WSOK 1230 AM, WAEV 97.3, WTOC TV, WTGS TV, WJWJ TV, and WSAV TV. Students, faculty and staff are highly encouraged to opt in to the Emergency Text Message Alert System. www.tcl.edu/textalert.asp

EMERGENCY TEXT MESSAGE ALERT

Students, faculty and staff are highly encouraged to opt in to the Emergency Text Message Alert System. Participants receive immediate notification of emergency events and weather cancelations via text messaging on their cell phones. Participants can also opt in to receive non-emergency news and announcements. Go to www.tcl.edu. On the homepage, click on “emergency Text Alert at TCL” and fill out the form or go to www.tcl.edu/textalert.asp

SYLLABUS SAFETY ADDENDUM

Purpose

The purpose of this safety addendum is to provide each student with safety guidelines during an incident, emergency, or disaster at TCL. In addition, it provides students guidelines for lockdown procedures, evacuation procedures, and active shooter.

Definition

An incident is any event, potential or actual, that may impact normal operations but has no immediate health or life threatening consideration or serious effect on the overall functional capacity of the College. An event of this nature should be reported to the Office of the Vice President for Administrative Services. Also notify the off-site campus administrator if applicable.

An emergency is any incident, potential or actual, which may endanger life or health or which affects an entire building or buildings, and will disrupt the overall operations of the College. Outside emergency services will probably be required, as well as major efforts from campus support services. Major policy considerations and decisions will usually be required from the college administration during times of crises. An emergency should be reported immediately by directly using **911** if life or health/injury considerations exist and then to the Office of the President or Vice President for Administrative Services as quickly as possible. Also notify the off-site campus administrator if applicable.

A disaster is any event or occurrence that has taken place and has seriously impaired or halted the operations of the College. In some cases, mass personnel casualties and severe property damage may be sustained. A coordinated effort of all campus-wide resources is required to effectively control the situation. Outside emergency services will be essential. In all cases of disaster, an Emergency Control Center will be activated, and the appropriate support and operational plans will be executed. The disaster should be immediately reported, first by calling **911** and then to the Office of the President or Vice President for Administrative Services. Also notify the off-site campus administrator if applicable.

Types of Emergencies

- Hurricane
- Tornado
- Fire
- Biochemical or Radiation Spill
- Explosion/Bomb
- Downed Aircraft (crash which directly impacts campus operations)
- Utility Failures
- Violent or criminal behavior

➤ Psychological Crisis

Procedures

Active Shooter

Run/hide/fight (<http://www.fbi.gov/about-us/cirg/active-shooter-and-mass-casualty-incidents/run-hide-fight-video>)

Building Evacuation

1. Building evacuations occur when an alarm sounds and/or upon notification by Security or the Emergency Director.
2. When the building evacuation alarm is activated during an emergency, individuals should exit according to the building evacuation plan and alert others to do the same.
3. Once outside, individuals should proceed to a clear area that is at least 500 feet away from the affected building. Streets, fire lanes, hydrant areas and walkways should be kept clear for emergency vehicles and personnel.
4. Individuals should not return to an evacuated building unless told to do so by Security or the Emergency Director.
5. Individuals should assist persons with disabilities in exiting the building. Elevators are reserved for disabled persons

Campus Evacuation

1. A uniformed Security Guard, the Emergency Director, or an Emergency Resource Team member will announce evacuation of all or part of the campus grounds.
2. All persons (students and staff) are to immediately vacate the campus, or in the case of a partial evacuation relocate to another part of the campus grounds as directed.

Lockdown

1. Clear the halls
2. Report to the nearest classroom/office
3. Assist those needing special assistance
4. Ensure classroom/office doors are closed and locked
5. Turn off lights
6. Stay away from doors and windows (out of the line of sight)
7. BE QUIET and follow instructor's directions
8. Silence cell phones
9. Wait for the "All Clear" before leaving

Developed/Revised: May 2015