

Instructor and Class Information

Office Location:	IS 300	Class Days:	Monday, Wednesday
Office Phone:	(501) 760-4109, (501) 538-4623 do not text	Class Time:	8:00 AM – 11:00 AM
Email:	wfreuck@np.edu	Class Location:	IS 300
Office Hours:	by appointment, email, & phone	Class Format:	Web-Enhanced

Course Description

This course presents the fundamentals of Programmable Logic Controllers (PLCs). It includes the principles of operation, programming techniques, and maintenance of PLCs. Basic relay ladder logic programming experiments are performed using timers, counters and internal coil instructions in laboratory projects. 4 SCH (2 Hour Lecture, 3 Hours Lab)

Prerequisites: Fundamentals of Electricity, Industrial Motor Controls

Co-requisites: None

Next Course in Sequence: None

Required and Recommended Materials

Required Textbook:

Title of Textbook:	Introduction to Programmable Logic Controllers, 2 nd ed. Introduction to Programmable Logic Controllers, Applications Manual
Author:	Glen A. Mazur
Publisher:	ATP (American Technical Publishers)
ISBN:	9780826913852, 978082691387-6

Additional Required Materials:

- Clothing should be worn that is appropriate for the electrical trades. No open toed shoes are allowed in the laboratory.
- Pencil/pen, loose-leaf paper, and the textbook must be brought to every class period.

Learning Objectives

General Education Goals and Objectives:

Upon successful completion of any degree at National Park College, the student will

- Communicate effectively
 - demonstrate a proficiency in the English language.
 - utilize appropriate communication technology.
 - present ideas and information orally and in writing in accordance with academic standards.
- Reason scientifically and quantitatively
 - demonstrate knowledge of mathematical and scientific principles.
 - apply these principles to solve problems.
 - interpret information presented in graphic form.
 - apply scientific methods to the inquiry process.
- Think critically
 - read, understand, analyze complex ideas .
 - locate, evaluate, and apply research information.
 - draw inferences from facts.
 - evaluate and present well-reasoned arguments.
- Develop a global perspective
 - recognize commonalities and differences among cultures.
 - examine the significance of diversity in social interaction.
 - interpret events and values within a given context.

Course Learning Objectives:

Students who successfully complete the course will be able to:

- Diagram and describe I/O modules including essential details.
- Download PLC programs and verify their correct operation.
- Program and operate a ladder diagram program to replace timer/relays
- Troubleshoot and repair failures in PLC I/O modules accurately.
- Define requirements for memory size, scan, update, and I/O modules
- Describe system interface communication requirements
- Comply with industry approved safety rules and procedures,
- Properly wire PLCs and related control circuits.

Students will gain an practical understanding of the selection, application, operation, programming, documentation, and troubleshooting of PLCs used on practically all automated equipment. PLC literacy to the maintenance technician has become just as important as personal computer literacy is throughout the businesses offices of today.

Students will demonstrate various logic operations of the PLC so they may examine a process variable or status of a switch or sensor and thereby minimize product defects.

Students will use number systems, logic instructions, codes, control sequence, data manipulation, and math instructions to create programs and verify correct operation.

Progress on achieving these objectives will be measured through the completion of assignments inside and outside the classroom, participation in discussions and lab work, and periodic quizzes and examinations.

Course Activities

To accommodate different learning styles, I will employ a variety of teaching methods in this course. Instructional methods may include lecture & discussion, peer interaction & learning, individual reading & research, lab exercises & work, group & field projects, media presentation, etc.

Interactive Activities (Discussions, Group Work, etc.)

You will be given the opportunity to interact with one another in a variety of ways. These will include such methods as discussion board postings, peer review/feedback, and other methods as appropriate. It is very important students take advantage of the interactive activities provided.

Assessments (Exams, Projects, Papers, etc.)

Your grade this semester will come from a variety of activities as shown in the table below. A brief description of each is provided here:

- **Assignments:** Problems and textbook problems will be assigned to provide additional practice on the concepts. These assignments may be collected and graded to provide feedback.
- **Quizzes:** Announced or unannounced quizzes may be given. Makeup quizzes are at the discretion of the Instructor.
- **Examinations:** There will be 2 to 4 examinations worth 100 points each. Students will be required to take the exams in class or in a proctored environment. Alternative testing sites are acceptable but **MUST BE APPROVED BY THE INSTRUCTOR PRIOR TO THE EXAM**. Exams will consist of problems, fill-in-the-blank, and short essay.
- **Final Exam:** There will be a final comprehensive assessment of the course material worth approximately 200 points.
- **Lab requirements:** Completion of laboratory job cards is a crucial activity in learning the course material, proper completion of the cards' tasks and inquiries, as well as the participation and interaction with team members will be considered in the establishment of grades for this course work.

Grading Policy

At the end of the course, the overall numerical grade will be converted from a numerical scale to the following letter grade scale as indicated in the Grading Scale.

Grade Breakdown	
Activities	%
Exams	35%
Assignments/Quizzes/Participation	20%
Comprehensive Final Exam	35%
Attendance	10%
Total	100%

Grading Scale	
Final Grade	%
A	90 – 100%
B	80 – 89%
C	70 – 79%
D	60 – 69%
F	Below 60%

Late and Make-up Work

Due dates shall be provided as assignments are scheduled. Late/Make-up work will be accepted as determined by evaluation of circumstances and at instructor's discretion.

Extra Credit

No extra credit opportunities are provided in this course. Because of the mastery learning nature of the course, there should be no need for extra credit if you take advantage of opportunities to improve on your work.

Feedback

I will typically respond within:

- 24 hours, Monday-Friday, to messages or emails.
- 48 hours, Monday-Friday, with grades and feedback for graded work that is submitted on time.
- 72 hours, Monday-Friday, with feedback for work that is submitted late.

Course Policies

Classroom Etiquette:

- Students are expected to be attentive, participate in a positive manner and demonstrate respect for the ideas of others in this class.
- The use of pagers and cellular phones is prohibited during class time and site visits. The instructor must approve exceptions to this policy in advance.
- Limited foods and drink are permitted during lecture as long as they are not disruptive to the class.

Laboratory Policy: At all times, students are expected to comply with all Shop Rules. Clothing should be worn that is appropriate for the industrial trades. No short pants or open toed shoes are allowed in the laboratory. No food or drink is allowed in the laboratory.

Time and Effort Commitment: The key to success in this class is persistent effort. You should carefully consider your time obligations before committing to this course. The general suggestion for all college courses of 2 hours work per week outside class for every hour credited definitely applies to this course. (You should expect 6 hours of homework a week for a 3 hour course) plus the 3 hours you would normally be attending class for a total of 9 hours.

Inclement Weather: The campus will not be closed because of weather conditions unless highways leading to the College are closed by order of the State Police. Unless there is an announcement on radio, television, or by telephone to the contrary, we should all assume we are expected to attend on normal schedules. When NPC is out of class due to weather, accommodations to schedules course materials, assignments, and other activities shall be made accordingly.

Blackboard Downtime: In the event of an unplanned Blackboard downtime, any assignments that are due during that time will be reopened for one day. Blackboard down time that is announced by the NPC Online office will need to be observed by the learner and assignment submission modified by the learner if it interferes with a final due date/time for any assignment.

Communication Policy: I am here to help you understand the material. I will closely monitor all online communications. My aim is to have a learning community where we can all share knowledge, ideas, and experiences – and thus learn from one another. I may give you information periodically through Blackboard Announcements, Blackboard or discussion. For your own benefit, please learn how to use these resources and monitor them closely to keep informed. You will be held responsible for all of the information I provide. See “Feedback” above for guidelines on how you can get your questions answered quickly.

Messaging: Use Messages for **private** discussion between the two of us. We will use this instead of email. This keeps all communication within the course and provides me with notification when you have posted something and vice-versa.

Expectations for Written Assignments: All written assignments should be completed using professional and readily communicable formats as would be expected in your discipline at the workplace. This is a class of developing professionals so the assumption is you can spell and use proper grammar and punctuation. Formatting, grammar, punctuation and spelling are a component of all assessments in this course.



NPC Policies

Attendance Policy: The National Park College attendance policy may be found at <http://catalog.np.edu/content.php?navoid=496&catoid=4>

Academic Honesty Policy: The Academic Honesty Policy may be found at <http://catalog.np.edu/content.php?navoid=553&catoid=4>

Blackboard Policy: Blackboard is the official learning management system (LMS) for the college. All students are expected to complete the Blackboard Student Training prior to the first day of class during your first semester here.

Other Policies

Privacy Policy: Links to the privacy policies for all external tools used in the course are provided in Blackboard. You can find the various privacy policies by clicking on Student Policies, Resources, and Procedures link in the navigation pane in each of your courses.

Accessibility Statement: Links to the accessibility statements all technologies required in the course are provided in Blackboard. You can find the various privacy policies by clicking on Student Policies, Resources, and Procedures link in the navigation pane in each of your courses.

Netiquette Policy: The netiquette policy for this course is located in your Blackboard course. You can find the Netiquette policies by clicking on the Netiquette Link in the navigation pane in each of your courses.

Flexibility Clause: The aforementioned requirements, assignments, policies, evaluation procedures, etc., are subject to change. Learners experiences and needs, as well as emerging knowledge, will be considered in modifying this course syllabus.

Student Resources

ADA Statement: National Park College's ADA statement may be located at <http://catalog.np.edu/content.php?navoid=557&catoid=4>. Students with disabilities should visit our website at <http://np.edu/student-services/disability-services/default.aspx> for more information.

Academic Success Center: The Academic success center provides tutoring and other resources to help students succeed. Visit our webpage at <http://np.edu/student-services/tutoring/>

Computer Resource Center: The Computer Resources Center provides computing resources for students. Visit our webpage at <http://np.edu/student-services/computer-services/>

NPC Library: The NPC Library provides a wide variety of services to students. Visit the website at <http://www1.youseemore.com/NPC/>

Technical Support: Information relating to specific technical support needs and requirements can be found in Blackboard. Click on the Technical Requirement and Support link in the Navigation pane within you course.

Testing Center: The testing center provides test support for students and faculty. To learn more about the testing center visit our webpage at <http://np.edu/student-services/testing-center/default.aspx>

Course Evaluations

Students will be asked to evaluate their instructor and course near the end of the semester. These student evaluations are very important to the improvement in the quality of instruction and course materials. All results are anonymous and shared with the faculty only after the semester is over and grades have been posted.

Course Schedule

Topical Outline and schedule

Week	Chapter	Topic
1	1	PLC Hardware Components
2	2	Number Systems and Codes
3	3	Fundamentals of Logic
4	4	Basics of PLC Programming
5		
6	5	Wiring Diagrams and Ladder Logic Programs
7	6	Programming Timers and Counters
8	7	Program Control Instructions
9	8	Data Manipulation and Math Instructions
10		
11	9	Sequencer and Shift Register Instructions
12	10	PLC Installation, Editing, and Troubleshooting
13	11	Process Control and Data Acquisition Systems
14		Computer Controlled Machines and Processes
15		Final Exam Period

Legal Disclaimer

The schedule, policies, and assignments in this course are subject to change in the event of extenuating circumstances or by mutual agreement between the instructor and the students. The instructor will always inform the students of any changes in a timely manner.

CCBY License Statement

This workforce product was funded by a grant awarded by the U.S. Department of Labor's Employment and Training Administration. The product was created by the grantee and does not necessarily reflect the official position of the U.S. Department of Labor. The U.S. Department of Labor makes no guarantees, warranties, or assurances of any kind, express or implied, with respect to such information, including any information on linked sites and including, but not limited to, accuracy of the information or its completeness, timeliness, usefulness, adequacy, continued availability, or ownership.

DOL Attribute

This course is part of a program at National Park College that is (wholly or partially) funded by a DOL TAACCCT grant, awarded to the SouthWest Arkansas Community College Consortium in 2013.