



COURSE OUTLINE: ELR223 - ROBOT/PLC CONTROL SY

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Approved: Corey Meunier, Chair, Technology and Skilled Trades

Course Code: Title	ELR223: ROBOTIC AND PLC CONTROL SYSTEMS
Program Number: Name	4026: ELECTRICAL TN-PROC 4029: ELECTRICAL TY-PROCES 4127: ELECTRICAL TN-TRADES
Department:	ELECT./INSTRUMENTATION PS
Semesters/Terms:	19W
Course Description:	This course will introduce the student with classical control fundamentals and reinforce them through robotic and programmable logic controller applications. The student will develop an understanding of PLC in general, the hardware and software associated with Allen Bradley 5000 family PLCs. PLC programming techniques using RS logic 5000 software will be used to design, document and commission basic to intermediate PLC lab assignments. The student will learn how to interface a PLC through HMI to control selected lab equipment as the final Lab Assignment. This course will require the student to work independently and / or in groups during lab times. The student will also be required to work independently on assigned work outside of class time and access information from help files, manuals, and internet as necessary to solve PLC related work problems. This course will prepare the student for basic PLC job related tasks.
Total Credits:	6
Hours/Week:	5
Total Hours:	75
Prerequisites:	ELR232
Corequisites:	There are no co-requisites for this course.
This course is a pre-requisite for:	ELR320, ELR325, ELR326
Vocational Learning Outcomes (VLO's) addressed in this course:	4029 - ELECTRICAL TY-PROCES VLO 1 Analyze, interpret, and produce electrical and electronics drawings, technical reports including other related documents and graphics. VLO 8 Use computer skills and tools to solve a range of electrical related problems. VLO 10 Prepare reports and maintain records and documentation systems. VLO 12 Apply and monitor health and safety standards and best practices to workplaces.
Please refer to program web page for a complete listing of program outcomes where applicable.	
Essential Employability Skills (EES) addressed in this course:	EES 1 Communicate clearly, concisely and correctly in the written, spoken, and visual form that fulfills the purpose and meets the needs of the audience. EES 2 Respond to written, spoken, or visual messages in a manner that ensures effective communication. EES 3 Execute mathematical operations accurately. EES 4 Apply a systematic approach to solve problems. EES 5 Use a variety of thinking skills to anticipate and solve problems.



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- EES 6 Locate, select, organize, and document information using appropriate technology and information systems.
- EES 7 Analyze, evaluate, and apply relevant information from a variety of sources.
- EES 8 Show respect for the diverse opinions, values, belief systems, and contributions of others.
- EES 9 Interact with others in groups or teams that contribute to effective working relationships and the achievement of goals.
- EES 10 Manage the use of time and other resources to complete projects.
- EES 11 Take responsibility for ones own actions, decisions, and consequences.

Course Evaluation:

Passing Grade: 50%, D

Other Course Evaluation & Assessment Requirements:

Grade
 Definition Grade Point Equivalent
 A+ 90 - 100% 4.00
 A 80 - 89%
 B 70 - 79% 3.00
 C 60 - 69% 2.00
 D 50 - 59% 1.00
 F (Fail) 49% and below 0.00

CR (Credit) Credit for diploma requirements has been awarded.
 S Satisfactory achievement in field /clinical placement or non-graded subject area.
 U Unsatisfactory achievement in field/clinical placement or non-graded subject area.
 X A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course.
 NR Grade not reported to Registrar's office.
 W Student has withdrawn from the course without academic penalty.

Books and Required Resources:

Technician`s Guide to Programmable Controllers by Terry Borden Richard Cox
 Publisher: Delmar Edition: sixth
 ISBN: 978-1-111-54409-6

Course Outcomes and Learning Objectives:

Course Outcome 1	Learning Objectives for Course Outcome 1
1. Identify basic PLC hardware and software	1.1 State the major advantages of a typical PLC controller over conventional hardware relay systems 1.2 Identify the four major components of a typical PLC and describe the function of each 1.3 Define the term discrete 1.4 Define the term analog 1.5 Identify different types of programming devices 1.6 Describe the I/O section of a PLC 1.7 Define the term interposing relay 1.8 Define the term optical isolation 1.9 Describe how basic AC and DC input and output modules work
Course Outcome 2	Learning Objectives for Course Outcome 2
2. Develop an understanding of basic PLC ladder logic instructions, numbering systems and	2.1 Describe the proper wiring connections for input devices and their corresponding modules 2.2 Explain why a hard-wire emergency-stop function is desirable



	<p>Demonstrate hardwiring techniques for AB 5000 PLCs.</p>	<p>2.3 Describe the function of the PLC processor 2.4 Identify the two distinct types of memory 2.5 Explain the term on-line programming 2.6 Understand decimal, binary, hexadecimal, binary coded decimal (BCD) numbering systems 2.7 Identify a hard-wiring diagram 2.8 Understand the Examine ON, OFF, timers, counters move, limits test, sequencers and Internal Storage instructions 2.9 Describe basic programming techniques 2.10 Describe the Force On and Off features and hazards that could be associated with both</p>
	<p>Course Outcome 3</p>	<p>Learning Objectives for Course Outcome 3</p>
	<p>3. Develop and demonstrate basic programming techniques for AB 5000 PLCs using RS Logic software.</p>	<p>3.1 Demonstrate the ability to program basic PLC functions offline 3.2 Demonstrate the ability to program PLCs to control equipment 3.3 Demonstrate the ability to hard-wire PLCs to field equipment 3.4 Demonstrate the ability to add documentation to a PLC program</p>
	<p>Course Outcome 4</p>	<p>Learning Objectives for Course Outcome 4</p>
	<p>4. Demonstrate the ability to write basic PLC programs to control various electrical equipment in the lab and run the programs in a PLC in the lab.</p>	<p>4.1 Demonstrate the ability to download a program to a PLC attached to a PC 4.2 Demonstrate the ability to download a program to a PLC from a remote PC over Ethernet 4.3 Demonstrate the ability to online edit programs 4.4 Demonstrate the ability to upload a program to a PC from a PLC 4.5 Demonstrate the ability to program basic PLC functions online 4.6 Demonstrate the ability to program PLCs to control Motors, traffic lights, and robot 4.7 Demonstrate the ability to download a program to a local PLC and run a program 4.8 Demonstrate the ability to download a program to a remotely located PLC over the Ethernet network to a particular PLC and run a program</p>
	<p>Course Outcome 5</p>	<p>Learning Objectives for Course Outcome 5</p>
	<p>5. Demonstrate the ability to connect PLCs to control various electrical equipment in the lab and run the programs in a PLC in the lab.</p>	<p>5.1 The ability to hard-wire PLCs to field equipment and I/O cards 5.2 Use available resources such as internet, manuals, help files, and handbooks to aid in project troubleshooting 5.3 Apply problem-solving techniques and use the knowledge of computer systems and application software to resolve technical problems associated with PLC assigned projects. 5.4 Use appropriate application software for programming, communication and troubleshooting projects 5.5 Wire, test and configure automation and control systems that maybe required by the assigned projects to be connected to a PLC such as Lights, Motors Control, traffic lights, and robot 5.6 Apply, install, test and troubleshoot PLC project related equipment, systems and tasks</p>

Course Outcome 6	Learning Objectives for Course Outcome 6
6. Communicate information effectively and accurately by producing electrical PLC related equipment drawings and other related documentation.	6.1 Apply standards and standard symbols in the production of drawings 6.2 Use computers and selected tools and equipment to produce or reproduce drawings on CAD 6.3 Use and produce graphics such as single line drawings, schematics etc. as necessary to convey technical information for the associated projects assigned. 6.4 Use available recourses such as internet, manuals, help files and handbooks to aid in accurate project documentation. 6.5 Establish and document procedures required to successfully complete assigned projects 6.6 Document all work and produce a complete project manual

Evaluation Process and Grading System:	Evaluation Type	Evaluation Weight	Course Outcome Assessed
	Attendance	5%	
	Lab Demonstration	10%	
	Lab Write-ups	10%	
	Practical Test 1	15%	
	Practical Test 2	25%	
	Test 1 and Take Home Questions	15%	
	Test 2 and Take Home Questions	20%	

Date: August 22, 2018

Please refer to the course outline addendum on the Learning Management System for further information.