COURSE OUTLINE: ELR320 - AUTOMATED ELECT SYS

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Approved: Corey Meunier, Chair, Technology and Skilled Trades

Course Code: Title	ELR320: AUTOMATED ELECTRICAL SYSTEMS
Program Number: Name	4029: ELECTRICAL TY-PROCES
Department:	ELECT./INSTRUMENTATION PS
Semesters/Terms:	18F
Course Description:	The student will develop an understanding of control system integration, of equipment such as different PLCs, HMIs, analog / discrete cards, communication interfaces and Basic PLC Network interfaces. Advanced PLC techniques will be used to connect, commission and document projects. The AB PLC will be introduced for basic discrete & analog / PID control to prepare the student for advance control & integration in the sixth semester. The student will develop Function Block programs to enable Contrologix PLCs to access analog information and to configure and test PID instructions in preparation of integrating this platform into different types of system such as Process and Drive control in the sixth semester. This course will require the student to work independently and / or in groups (team).
Total Credits:	7
Hours/Week:	5
Total Hours:	75
Prerequisites:	ELN229, ELR223, ELR236
Corequisites:	There are no co-requisites for this course.
This course is a pre-requisite for:	ELR311, ELR315
Vocational Learning Outcomes (VLO's) addressed in this course: **Please refer to program web page for a complete listing of program outcomes where applicable.**	**4029 - ELECTRICAL TY-PROCES** VLO 1 Analyze, interpret, and produce electrical and electronics drawings, technical reports including other related documents and graphics. VLO 2 Analyze and solve complex technical problems related to electrical systems by applying mathematics and science principles. VLO 3 Design, use, verify, and maintain instrumentation equipment and systems. VLO 4 Design, assemble, test, modify, maintain and commission electrical equipment and systems to fulfill requirements and specifications under the supervision of a qualified person. VLO 7 Design, install, analyze, assemble and troubleshoot control systems under the supervision of a qualified person. 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. VLO 13 Perform and monitor tasks in accordance with relevant legislation, policies, procedures, standards, regulations, and ethical principles. VLO 17 Apply project management principles to contribute to the planning, implementation, and evaluation of projects.

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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.
	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:

PROGRAMMING CONTROLLOGIX PROGRAMMABLE AUTOMATION CONTROLLERS by Jon Stenerson
Publisher: Delmar
ISBN: 978-1-4354-1947-6

Course Outcomes and Learning Objectives:

Course Outcome 1	Learning Objectives for Course Outcome 1
1. State and Discuss various Basic Terminology, Concepts of a PLC Control and functions of AB PLC5, 500, and 5000	1.1 Identify and list the equipment and components that make up a basic automated control system network 1.2 Integrate a variety of PLC 1.3 Use available recourses such as internet, manuals, help files and handbooks to aid in selecting, installing commissioning, testing and troubleshooting appropriate equipment, components for projects assigned.

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	1.4 Identify and state the function of components of the SLC 500/ 5000 Family PLCs 1.5 State the function, operation and set-up of analog cards used on PLC 5, 5000 and SLC 500 series PLC 1.6 Discuss the function, advantages, and limitations of PLCs in Industrial Process Control Loops. 1.7 Discuss the basic communication functions of PLC 5, 5000 and 500 1.8 Discuss the function of PID in the PLC software control blocks for the PLC 5, 5000 and SLC 500 series PLCs.
Course Outcome 2	**Learning Objectives for Course Outcome 2**
2. Develop various Basic and advance programs to control PLCs functions through different programming structures such as address based structure and Tag based structure for AB PLC5, 500, and 5000	2.1 Develop advance PLC 5 & 500 & 5000 programs to control various electrical equipment 2.2 Analyze and troubleshoot PLC circuits that contain discrete logic, sequential logic and A to D and D to A conversion 2.3 Apply logic family characteristics in PLC programming design 2.4 Design and implement solutions to control problems using PLCs 2.5 Program PLC 5, 500 & 5000 processors using RSlogix programming software 2.6 Configure PLC Analog input and output interfacing modules 2.7 Configure PLC, PID software advance instructions 2.8 Program a PLC to control a single loop process
Course Outcome 3	**Learning Objectives for Course Outcome 3**
3. Develop various Basic HMI programs to control PLCs functions for AB PLC5, 500, and 5000	3.1 Program and simulate devices using graphical software 3.2 Develop advance HMI programs for the PLC 5, 500, 5000 to control various electrical equipment 3.3 Develop advance HMI programs for the PLC Analog input and output interfacing modules for both PLC 5, 500 & 5000 PLC 3.4 Develop HMI for PID Control
Course Outcome 4	**Learning Objectives for Course Outcome 4**
4. Develop various Basic skills to provide accurate meaningful information with respect to the projects (Labs) assigned so that they could be reproduced by and other group in the future.	4.1 Communicate information effectively and accurately by producing electrical PLC related equipment drawings and other related documentation 4.2 Apply standards and standard symbols in the production of drawings 4.3 Use computers and selected tools and equipment to produce or reproduce drawings on CAD 4.4 Use and produce graphics such as single line drawings, schematics etc. as necessary to convey technical information for the associated projects assigned. 4.5 Use available recourses such as internet, manuals, help files and handbooks to aid in accurate project documentation. 4.6 Establish and document procedures required to successfully complete assigned projects 4.7 Document all work and produce a complete project manual 4.8 Plan, organize, and deliver presentations including technical documents and projects 4.9 Use computer software and other technology to produce diagrams, charts, tables, graph and project timelines

Evaluation Process and Grading System:		

Evaluation Type	Evaluation Weight	Course Outcome Assessed
Assigned Test 1	10%	
Attendance	15%	
Lab Demonstration	10%	
Lab Write-ups	10%	
Practical Test 1	10%	
Practical Test 2	20%	
Test 2	10%	
Test 3	15%	

Date: August 22, 2018

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