COURSE OUTLINE

ELR315

Prepared: Ron Chartrand   Approved: Corey Meunier

Course Code: Title	ELR315: AUTOMATIC CONTROL SYSTEMS
Program Number: Name	4029: ELECTRICAL TY-PROCES
Department:	ELECT./INSTRUMENTATION PS
Semester/Term:	18W
Course Description:	The student will develop an understanding of control system integration of industrial equipment The student will interface PLCs to control drives, robotic equipment, process control equipment and other equipment through either analog or direct communication using communication techniques such as serial communication, peer to peer communication and master/slave. The student will use lab industrial networks and their components to interface automated equipment. The student will develop advance HMI programs to run each project including trending and troubleshooting screens. The student will program PLCs using advanced instruction, program files and utilize the trending and troubleshooting features of the software programs. The student will also use ladder, functional block, structured text and SFC programming techniques to program. 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.
Total Credits:	6
Hours/Week:	5
Total Hours:	75
Prerequisites:	ELR320, ELR325
Vocational Learning Outcomes (VLO's): **Please refer to program web page for a complete listing of program outcomes where applicable.**	**4029 - ELECTRICAL TY-PROCES** #1. Analyze, interpret, and produce electrical and electronics drawings, technical reports including other related documents and graphics. #2. Analyze and solve complex technical problems related to electrical systems by applying mathematics and science principles. #3. Design, use, verify, and maintain instrumentation equipment and systems. #4. Design, assemble, test, modify, maintain and commission electrical equipment and systems to fulfill requirements and specifications under the supervision of a qualified person. #6. Design, assemble, analyze, and troubleshoot electrical and electronic circuits, components, equipment and systems under the supervision of a qualified person. #7. Design, install, analyze, assemble and troubleshoot control systems under the supervision of a qualified person.

	#8. Use computer skills and tools to solve a range of electrical related problems. #9. Create, conduct and recommend modifications to quality assurance procedures under the supervision of a qualified person. #10. Prepare reports and maintain records and documentation systems. #11. Design, install, test, commission and troubleshoot telecommunication systems under the supervision of a qualified person. #12. Apply and monitor health and safety standards and best practices to workplaces. #13. Perform and monitor tasks in accordance with relevant legislation, policies, procedures, standards, regulations, and ethical principles. #14. Configure installation and apply electrical cabling requirements and system grounding and bonding requirements for a variety of applications under the supervision of a qualified person. #16. Select and recommend electrical equipment, systems and components to fulfill the requirements and specifications under the supervision of a qualified person. #17. Apply project management principles to contribute to the planning, implementation, and evaluation of projects.
Essential Employability Skills (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. #2. Respond to written, spoken, or visual messages in a manner that ensures effective communication. #4. Apply a systematic approach to solve problems. #5. Use a variety of thinking skills to anticipate and solve problems. #6. Locate, select, organize, and document information using appropriate technology and information systems. #7. Analyze, evaluate, and apply relevant information from a variety of sources. #8. Show respect for the diverse opinions, values, belief systems, and contributions of others. #9. Interact with others in groups or teams that contribute to effective working relationships and the achievement of goals. #10. Manage the use of time and other resources to complete projects. #11. Take responsibility for ones own actions, decisions, and consequences.
Course Evaluation:	
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.
Evaluation Process and Grading System:	

Evaluation Type	Evaluation Weight
Project Demonstrations	40%
Project Write-ups	60%

Course Outcomes and Learning Objectives:	## Course Outcome 1.

Understand various Process Automation Terminology, and concepts of PLC Control System networks. Assist in the design of a variety of PLC control systems.

Learning Objectives 1.

Utilize block diagrams to model basic Networked control systems
Identify different industrial network systems such as DeviceNet, ControlNet, DH+, and Industrial Ethernet etc.
Basic Setup and installation of industrial networks
Purpose and use of the above industrial networks
Restrictions and imitations of the above industrial networks

Course Outcome 2.

Develop and demonstrate animated graphic for HMI displays and advance programming of HMI screens.

Learning Objectives 2.

The ability to program animated graphic screens for HMI
The ability to program HMI to display various variables in both digital and animated forms
The ability to set-up animated functions in HMI graphic

Course Outcome 3.

Develop advance PLC programs to control various electrical equipment.

Learning Objectives 3.

The ability to program PLCs and HMI to control Motor Drives, AC Variable Frequency Drives and Soft-starts
The ability to program PLCs and HMI to retrieve and display motor control functions and operational data
The ability to connect PLCs in Scanner / adapter mode to transfer or retrieve information from smart equipment through either Peer to Peer or Remote I/O communications

Course Outcome 4.

Assemble and connect a variety of automated equipment to perform process control and to develop Process Control PLC programs and HMI control and data acquisition.

Learning Objectives 4.

The ability to program PLCs to control two and three loop processes (cascading)
The ability to program HMI FactoryView to Control Two and Three Loop Process with PLCs

Course Outcome 5.

Assemble and connect a variety of electrical automated equipment to perform as integrated

systems utilizing task and control through HMI software and PLC Hardware and Smart equipment.

Learning Objectives 5.

The ability to program PLCs, HMI, to perform selected tasks over different networks from local and remote locations
The ability to program, connect PLCs, HMI, and control process control loops and smart equipment through Ethernet and DH+ Protocols from remote locations
The ability to connect and implement basic safety circuits and requirements for control systems.
Select and connect several different types of electrical equipment such as Motor Drives, PLCs, Process Control Equipment, and HMIs along with sensing device and output power devices into a structured unified controlled system performing simulated tasks.

Date:	Monday, December 18, 2017
	Please refer to the course outline addendum on the Learning Management System for further information.