



# COURSE OUTLINE

## ELR320

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Prepared: Ron Chartrand Approved: Corey Meunier

<b>Course Code: Title</b>	ELR320: AUTOMATED ELECTRICAL SYSTEMS
<b>Program Number: Name</b>	4029: ELECTRICAL TY-PROCES
<b>Department:</b>	ELECT./INSTRUMENTATION PS
<b>Semester/Term:</b>	17F
<b>Course Description:</b>	<p>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 &amp; analog / PID control to prepare the student for advance control &amp; 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).</p>
<b>Total Credits:</b>	7
<b>Hours/Week:</b>	5
<b>Total Hours:</b>	75
<b>Prerequisites:</b>	ELN229, ELR223, ELR236
<b>Corequisites:</b>	ELR325
<b>This course is a pre-requisite for:</b>	ELR311, ELR315
<b>Vocational Learning Outcomes (VLO's):</b>  Please refer to program web page for a complete listing of program outcomes where applicable.	<p>#1. Analyze, interpret, and produce electrical and electronics drawings, technical reports including other related documents and graphics.</p> <p>#2. Analyze and solve complex technical problems related to electrical systems by applying mathematics and science principles.</p> <p>#3. Design, use, verify, and maintain instrumentation equipment and systems.</p> <p>#4. Design, assemble, test, modify, maintain and commission electrical equipment and systems to fulfill requirements and specifications under the supervision of a qualified person.</p> <p>#7. Design, install, analyze, assemble and troubleshoot control systems under the supervision of a qualified person.</p> <p>#8. Use computer skills and tools to solve a range of electrical related problems.</p>



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	<p>#10. Prepare reports and maintain records and documentation systems.</p> <p>#12. Apply and monitor health and safety standards and best practices to workplaces.</p> <p>#13. Perform and monitor tasks in accordance with relevant legislation, policies, procedures, standards, regulations, and ethical principles.</p> <p>#17. Apply project management principles to contribute to the planning, implementation, and evaluation of projects.</p>
<b>Essential Employability Skills (EES):</b>	<p>#1. Communicate clearly, concisely and correctly in the written, spoken, and visual form that fulfills the purpose and meets the needs of the audience.</p> <p>#2. Respond to written, spoken, or visual messages in a manner that ensures effective communication.</p> <p>#3. Execute mathematical operations accurately.</p> <p>#4. Apply a systematic approach to solve problems.</p> <p>#5. Use a variety of thinking skills to anticipate and solve problems.</p> <p>#6. Locate, select, organize, and document information using appropriate technology and information systems.</p> <p>#7. Analyze, evaluate, and apply relevant information from a variety of sources.</p> <p>#8. Show respect for the diverse opinions, values, belief systems, and contributions of others.</p> <p>#9. Interact with others in groups or teams that contribute to effective working relationships and the achievement of goals.</p> <p>#10. Manage the use of time and other resources to complete projects.</p> <p>#11. Take responsibility for ones own actions, decisions, and consequences.</p>
<b>Course Evaluation:</b>	Passing Grade: 50%, D
<b>Other Course Evaluation &amp; Assessment Requirements:</b>	<p>Grade</p> <p>Definition Grade Point Equivalent</p> <p>A+ 90 – 100% 4.00</p> <p>A 80 – 89%</p> <p>B 70 - 79% 3.00</p> <p>C 60 - 69% 2.00</p> <p>D 50 – 59% 1.00</p> <p>F (Fail) 49% and below 0.00</p> <p>CR (Credit) Credit for diploma requirements has been awarded.</p> <p>S Satisfactory achievement in field /clinical placement or non-graded subject area.</p> <p>U Unsatisfactory achievement in field/clinical placement or non-graded subject area.</p> <p>X A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course.</p> <p>NR Grade not reported to Registrar`s office.</p> <p>W Student has withdrawn from the course without academic penalty.</p>



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### Evaluation Process and Grading System:

Evaluation Type	Evaluation Weight
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%

### 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.

State and Discuss various Basic Terminology, Concepts of a PLC Control and functions of AB PLC5, 500, and 5000

#### Learning Objectives 1.

Identify and list the equipment and components that make up a basic automated control system network

Integrate a variety of PLC

Use available resources such as internet, manuals, help files and handbooks to aid in selecting, installing commissioning, testing and troubleshooting appropriate equipment, components for projects assigned.

Identify and state the function of components of the SLC 500/ 5000 Family PLCs

State the function, operation and set-up of analog cards used on PLC 5, 5000 and SLC 500 series PLC

Discuss the function, advantages, and limitations of PLCs in Industrial Process Control Loops.

Discuss the basic communication functions of PLC 5, 5000 and 500



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Discuss the function of PID in the PLC software control blocks for the PLC 5, 5000 and SLC 500 series PLCs.

### **Course Outcome 2.**

Develop various Basic and advance programs to control PLC's functions through different programming structures such as address based structure and Tag based structure for AB PLC5, 500, and 5000

### **Learning Objectives 2.**

Develop advance PLC 5 & 500 & 5000 programs to control various electrical equipment  
Analyze and troubleshoot PLC circuits that contain discrete logic, sequential logic and A to D and D to A conversion  
Apply logic family characteristics in PLC programming design  
Design and implement solutions to control problems using PLCs  
Program PLC 5, 500 & 5000 processors using RSlogix programming software  
Configure PLC Analog input and output interfacing modules  
Configure PLC, PID software advance instructions  
Program a PLC to control a single loop process

### **Course Outcome 3.**

Develop various Basic HMI programs to control PLC's functions for AB PLC5, 500, and 5000

### **Learning Objectives 3.**

Program and simulate devices using graphical software  
Develop advance HMI programs for the PLC 5, 500, 5000 to control various electrical equipment  
Develop advance HMI programs for the PLC Analog input and output interfacing modules for both PLC 5, 500 & 5000 PLC  
Develop HMI for PID Control

### **Course Outcome 4.**





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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.

### **Learning Objectives 4.**

ommunicate information effectively and accurately by producing electrical PLC related equipment drawings and other related documentation

Apply standards and standard symbols in the production of drawings

Use computers and selected tools and equipment to produce or reproduce drawings on CAD

Use and produce graphics such as single line drawings, schematics etc. as necessary to convey technical information for the associated projects assigned.

Use available recourses such as internet, manuals, help files and handbooks to aid in accurate project documentation.

Establish and document procedures required to successfully complete assigned projects

Document all work and produce a complete project manual

Plan, organize, and deliver presentations including technical documents and projects

Use computer software and other technology to produce diagrams, charts, tables, graph and project timelines

**Date:**

Friday, September 1, 2017

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