

SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO



COURSE OUTLINE

COURSE TITLE: Programmable Logic Controllers

CODE NO. : ELR 824 **SEMESTER:** FOUR

PROGRAM: CONSTRUCTION & MAINTENANCE/INDUSTRIAL
ELECTRICIAN APPRENTICESHIP

AUTHOR: C. Beauchamp

DATE: JAN 2016 **PREVIOUS OUTLINE DATED:** JAN 2015

APPROVED: *"Corey Meunier"*
CHAIR DATE

TOTAL CREDITS: FIVE

PREREQUISITE(S):

HOURS/WEEK: FOUR

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I. COURSE DESCRIPTION:

The student will develop an understanding of the hardware and software associated with the Allen Bradley ControlLogix 5000 family PLCs. PLC programming techniques using RSLogix 5000 software will be used to design, document and commission basic to intermediate PLC lab assignments.

II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

Upon successful completion of this course, the student will demonstrate the ability to:

1. *Describe the function and basic operation of a PLC and understand the related terminology including numbering system***Potential Elements of the Performance:**

- Describe the function of a PLC and state its applications
- State the major advantages of a typical programmable logic controller(PLC) over conventional hardware relay systems
- Identify the four major components of a typical PLC and describe the functions of each
- Identify the two distinct types of memory
- Understand decimal, binary, octal, hexadecimal, binary coded decimal (BCD) numbering systems
- Perform conversions from one system to another

2. *Understand the I/O addressing and hardwiring requirements.***Potential Elements of the Performance:**

- Define the term discrete and the term analog
- Describe the I/O section of a PLC
- Define the term interposing relay
- Define the term optical isolation
- Understand the concept of base and alias tags
- Relate the I/O addressing to physical location
- Describe the proper wiring connections for input/output devices and their corresponding modules
- Describe how basic AC and DC input and output modules work and create a wiring diagram

3. *Develop and demonstrate basic programming techniques for AB ControlLogix 5000 PLC's using RSLogix 5000 Software*

Potential Elements of the Performance:

- Describe basic programming techniques
- Understand the Examine ON, OFF, timers, counters, move, limit test, sequencers and internal storage instructions
- Describe the Force On and Off features and hazards that could be associated with both
- Program basic PLC functions offline
- Program PLC's to control
- Hard-wire PLCs to field equipment and input/output cards
- Create documentation to add to a PLC program

4. *Demonstrate the ability to write basic PLC programs to control various electrical equipment in the lab and run the programs on a PLC*

Potential Elements of the Performance:

- Download a program to a PLC from a remote PC over Ethernet to a particular PLC in the Lab
- Edit online programs
- Upload a program to a PC from a PLC
- Program basic PLC functions online
- Program PLCs to control motors, traffic lights
- Download a program to a local PLC and run a program

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*

Potential Elements of the Performance:

- Hard-wire PLCs to field equipment and I/O cards
- Hardwire PLCs to control motors and traffic lights
- Troubleshoot PLC control systems

III. TOPICS:

1. Overview of PLC terminology and principles
2. Overview of Industrial controls and automation hardware/software
3. Overview of RSLogix 5000 software
4. Overview of PLC/PC networking
5. Basic PLC programming and troubleshooting

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:
Instructor will indicate this in the first theory class**V. EVALUATION PROCESS/GRADING SYSTEM:**

Lab demonstrations	45%
Lab write-ups	45%
<u>Attendance and Participation</u>	<u>10%</u>
Totals	100%

*The student must complete and demonstrate all labs in order to receive a passing grade for the lab demonstration portion of evaluation.

*The student must achieve a passing grade in both lab demonstrations and lab write-ups in order to achieve a passing grade for the course.

The following semester grades will be assigned to students:

Grade	<u>Definition</u>	<i>Grade Point Equivalent</i>
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.	

VI. SPECIAL NOTES:

Attendance:

Sault College is committed to student success. There is a direct correlation between academic performance and class attendance; therefore, for the benefit of all its constituents, all students are encouraged to attend all of their scheduled learning and evaluation sessions. This implies arriving on time and remaining for the duration of the scheduled session.

It is the departmental policy that once the classroom door has closed, the learning process has begun. Late arrivers will not be granted admission to the room.

Class/Lab Conduct:

Attendance to scheduled lab activities is compulsory, unless permission has been granted by the instructor. Lab attendance and final grades are directly related. Students must continuously wear all Sault College required personal protective equipment (PPE) during lab activities. Failure to do this will result in expulsion from the lab activity and a grade of zero being assigned. Students are expected to be wearing their PPE prior to entering the lab. The instructor will advise what specific PPE is required (safety glasses, and steel toed work boots will definitely be required). Unsafe conduct in the lab will not be tolerated.

If a student arrives late for, or is not continuously present and actively participating at (scheduled breaks excepted) a scheduled lab class he/she will be considered absent for the entire class and will not be permitted to submit the associated lab report.

Use of cell phones/PDAs for any form of communication (voice text/internet) during class is strictly prohibited. Cell phones/PDAs must be silenced during regular class and lab times and must be turned off and kept out of sight during test sittings. Failure to follow the latter requirement during a test sitting will result in a grade of 0 being assigned. If your phone should ring or you are found to be texting during scheduled lectures or labs a deduction of 5% per event will be subtracted from your final grade per occurrence.

Students may not wear earphones of any kind (i.e. for play back of recorded music/voice) during lab activities or test sittings. This does not include hearing aids required for hearing impaired.

Students are expected to maintain an active Sault College email account and use LMS. They are required to check this email account and LMS daily. The instructor may announce details of lab and test requirements and scheduling through the Sault College email or LMS system (as well as sharing other important information).

Any requests to deviate from the aforementioned course outline requirements must be made to the instructor in writing or via Sault College email. If permission is granted it must also be granted in writing or via Sault College email. Verbal requests/permissions are not acceptable. It is the students' responsibility to maintain a copy of all such requests and associated permissions.

General Information:

Special Accommodations:

If you have a special learning need or issue, it works to your advantage to notify your instructor immediately if special devices or assistance will help you in this class.

Classroom Etiquette:

Pagers and cell phones should be either turned off or set to vibrate mode during class. Please show courtesy to the class by restricting conversation to in-class topics, and raise your hand to gain attention when asking a question or raising a point of discussion.

Class Room Safety:

Safety is the most important aspect in this course and any compromise in student safety by any other student will not be tolerated. Students that observe any unsafe lab condition and/or act must report it to the instructor immediately. Student safety in the Labs is the number one priority. Students are to contact the instructor before working on any live equipment that they are not familiar with or have not been instructed in the safety procedures of that particular equipment.

Turning in Work :

Be sure to include your name and the course name and section on all work to be turned in.

Late Coursework :

All assignments are to be turned in on the due date. Students may be allowed to make up any late work at the instructor's discretion.

Term tests/quizzes

With the expectation that the student will attend all classes, there will be no make-up tests for missed tests. There will be no rewrites for low-test scores.

Attendance

Students' attendance and participation are required in all activities. If a student is absent from class, it is her/his responsibility to find out what was missed prior to the next class and complete any assigned work before the next class. Absence does not constitute a reason for missed work or late assignments.

VII. COURSE OUTLINE ADDENDUM:

The provisions contained in the addendum located on the portal form part of this course outline.