

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: R. Allen

DATE: JAN 2014 **PREVIOUS OUTLINE DATED:** JAN 2013

APPROVED: *"Corey Meunier"*
CHAIR DATE

TOTAL CREDITS: FIVE

PREREQUISITE(S):

HOURS/WEEK: FOUR

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For additional information, please contact Corey Meunier, Chair
Technology & Skilled Trades
(705) 759-2554, Ext. 2610

I. COURSE DESCRIPTION:

The student will develop an understanding of the hardware and software associated with the Allen Bradley 5 family PLCs. PLC programming techniques using RS logic 5 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 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
- 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 identify a hard-wiring diagram

3. *Develop and demonstrate basic programming techniques for AB 5 PLC's using RS Logix 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 which is interfaced to a PC
- Download a program to a PLC from a remote PC over Ethernet through a gateway server to Data Highway and then 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
- Download a program to a remotely located PLC from room B1035 to room B1050 over the Ethernet network to a gateway server to the AB Data Highway to a particular 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 RS Logix 5 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:

Practical Test 1 (Performed Independently)	25%
Practical Test 2 (Performed Independently)	25%
Lab demonstrations	20%
Lab write-ups	20%
<u>Attendance Participation and</u>	<u>10%</u>
Totals	100%

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%	3.00
B	70 - 79%	2.00
C	60 - 69%	1.00
D	50 – 59%	0.00
F (Fail)	49% and below	
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. . 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. 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. They are required to check this email account daily. The instructor may announce details of lab and test requirements and scheduling through the Sault College email 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.

VII. COURSE OUTLINE ADDENDUM:

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