

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 Logix 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 systems.***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 function of each.
- Identify the two distinct types of memory
- Understand decimal, binary, octal, hexadecimal, binary coded decimal numbering systems

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 I/O addressing to physical location
- Describe the proper wiring connection for input/output devices and their corresponding modules
- Describe how basic AC and DC inputs and output modules work and identify a hard-wiring diagram.

3. *Develop and demonstrate basic programming techniques for AB 5 PLCs using RS Logix software.*

Potential Elements of the Performance:

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

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

Potential Elements of the Performance:

- Download a program to a PLC.
- Edit PLC program while online.
- Upload a program to a PC from a PLC
- Program basic PLC functions online
- 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:

1. Theory		
Test 1	15 marks	15% overall
Test 2	25 marks	25% overall
2. Practical		
Practical Test 1	15 marks	15% overall
Practical Test 2	20 marks	20% overall
3. Demonstration and Write Up		
Lab demonstrations	5 marks	5% overall
Lab Write-ups and Class Participation	20 marks	20% overall
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Total 100 marks		100%

The following semester grades will be assigned to students:

Grade	Definition	<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:

Disability Services:

If you are a student with a disability (e.g. physical limitations, visual impairments, hearing impairments, or learning disabilities), you are encouraged to discuss required accommodations with your professor and/or the Disability Services office. Visit Room E1101 or call Extension 2703 so that support services can be arranged for you.

Retention of Course Outlines:

It is the responsibility of the student to retain all course outlines for possible future use in acquiring advanced standing at other postsecondary institutions.

Communication:

The College considers **WebCT/LMS** as the primary channel of communication for each course. Regularly checking this software platform is critical as it will keep you directly connected with faculty and current course information. Success in this course may be directly related to your willingness to take advantage of the **Learning Management System** communication tool.

Plagiarism:

Students should refer to the definition of “academic dishonesty” in *Student Code of Conduct*. Students who engage in academic dishonesty will receive an automatic failure for that submission and/or such other penalty, up to and including expulsion from the course/program, as may be decided by the professor/dean. In order to protect students from inadvertent plagiarism, to protect the copyright of the material referenced, and to credit the author of the material, it is the policy of the department to employ a documentation format for referencing source material.

Course Outline Amendments:

The professor reserves the right to change the information contained in this course outline depending on the needs of the learner and the availability of resources.

Substitute course information is available in the Registrar's office.

In order to maintain a passing grade the student must obtain a minimum 50% average in all subject sections of the course, 1. Theory, 2. Practical and 3. Demonstration and Write up.

In order to have a mark assigned to the write-ups the student must attach the lab demonstration sign off sheet with all labs signed off by the instructor.

If a student misses a test he/she must have a valid reason (e.g. medical or family emergency). In addition, the school must be notified before the scheduled test sitting.

The student should contact the instructor involved. If the instructor cannot be reached leave a message with the Dean's office. If this procedure is not followed the student will receive a mark of zero on the test with no rewrite option.

Pagers and cell phones should be 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.

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.

Students must 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 required PPE prior to entering the lab. The instructor will advise what specific PPE is required (safety glasses will definitely be required). Unsafe conduct in the lab will not be tolerated

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.

Any request 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 student's responsibility to maintain a copy of all such requests and associated permissions.

Since all final work must be performed on special network PLCs located at the college, there is limited time to run tested and demonstrated labs at the college, therefore reading, review questions, planning and offline programming must be done outside of class hours.

VII. PRIOR LEARNING ASSESSMENT:

Students who wish to apply for advance credit transfer (advanced standing) should obtain an Application for Advance Credit from the program coordinator (or the course coordinator regarding a general education transfer request) or academic assistant. Students will be required to provide an unofficial transcript and course outline related to the course in question.

Credit for prior learning will also be given upon successful completion of a challenge exam or portfolio.