SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO

Sault College

COURSE OUTLINE

COURSE TITLE: Programmable Logic Controllers

CODE NO. :   IIM701   **SEMESTER:**   Int.

PROGRAM: Industrial Instrument Mechanic

AUTHOR: Bill Armstrong

DATE: January 2004   **PREVIOUS OUTLINE DATED:**   NA

APPROVED:

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                        DEAN   **DATE**

TOTAL CREDITS: 5

PREREQUISITE(S):

HOURS/WEEK: 4

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 systems

> **<u>Potential Elements of the Performance</u>:**
> - 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 (BCD) numbering systems
> - Perform conversions from one system to another

2.   Understand the I/O addressing and hardwiring requirements.

> **<u>Potential Elements of the Performance</u>:**
> - 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 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 PLCs
     using RS Logic 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 PLCs 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 attached 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 B
       1035 to room B 1060 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

III. TOPICS:
1. Overview of PLC terminology and principles
2. Overview of industrial controls and automation hardware/software.
3. Overview of RS Logic *5* software
4. Overview of PLC/PC networking.
5. Basic PLC programming.

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:
Instructor will indicate this in the first theory class

V. EVALUATION PROCESS/GRADING SYSTEM:

Test 1	15 marks	15% overall
Practical Test 1	15 marks	15% overall
Test 2	25 marks	25% overall
Practical Test 2	20 marks	20% overall
Lab demonstrations	5 marks	5% overall
Lab Write-ups and Class Participation & Quizzes	20 marks	20% overall
Total 100 marks		**100 %**

The following semester grades will be assigned to students in postsecondary courses:

Grade	Definition	Grade Point Equivalent
A+	90 - 100%	4.00
A	80 - 89%	4.00
B	70 - 79%	3.00
C	60 - 69%	2.00
D (Fail)	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:

Special Needs:
If you are a student with special needs (e.g. physical limitations, visual impairments, hearing impairments, or learning disabilities), you are encouraged to discuss required accommodations with your instructor and/or the Special Needs office. Visit Room E1204 or call Extension 493 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.

Plagiarism:
Students should refer to the definition of "academic dishonesty" in *Student Rights and Responsibilities*. 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 that the course may have, such as, the theory Tests section, Practical Tests section, Lab & Lab Write-ups and Demonstrations of Labs to Instructor section.

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 or the College switchboard. If this procedure is not followed the student will receive a mark of zero on the test with no rewrite option.

The Instructor, if time permits, will summarize the main points of   this course outline in the first Lecture. Student's questions related to the course outline will be addressed at that time. The Instructor through out the course may also expand on particular items related to the course outline and the course requirements.

It is the responsibility of the student to read the course outlines and be aware of the course requirements.

General Information to include in course outlines
Special Accommodations:
If you have a special learning need or issue, it works to your advantage to notify your instructor <u>immediately</u> 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 **<u>before</u>** the next class. Absence does not constitute a reason for missed work or late assignments.

ADDITIONAL:

Since all work must be performed on a special network computer software located at the college, there will be little opportunity to work on the projects at home. The reading, review questions, and planning must be done outside of class time.

All student assignment materials that are not picked up by the student will be held for a maximum of two weeks after grading. After this time materials may be discarded or used at the professor's discretion. Attendance may be monitored. Regular absentia may be reported to OSAP at the college's discretion.

VII.   PRIOR LEARNING ASSESSMENT:

Students who wish to apply for advanced credit in the course should consult the professor. Credit for prior learning will be given upon successful completion of a challenge exam or portfolio.

VIII.   DIRECT CREDIT TRANSFERS:

Students who wish to apply for direct credit transfer (advanced standing) should obtain a direct credit transfer form from the Dean's secretary. Students will be required to provide a transcript and course outline related to the course in question.