

I. COURSE DESCRIPTION:

This course introduces the student to three phase AC transformers, motors, loads and associated equipment. Lab exercises will provide the students with hands-on experience with typical commercial AC motor control circuit connections.

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. *Connect, test and analyze single phase and poly phase transformers.*Potential Elements of the Performance:

- Describe and demonstrate the operation of single-phase transformer in terms of polarity, impedance and winding ratios.
- Describe and demonstrate the operation of three phase transformers in wye and delta configurations.
- Describe and demonstrate three phase transformer connections for RLC balanced loads.
- Describe and demonstrate single and three phase autotransformers for reduced voltage motor starting

2. *Connect, test and analyze wound rotor motors.*Potential Elements of the Performance:

- Identify the mechanical parts, windings and connections for three phase wound rotor induction motors.
- Describe and demonstrate the operation of a three phase wound rotor induction motor and its external control circuits.
- Connect and describe the effects of differing resistances in the rotor circuit of a wound rotor motor under varying loads.

3. *Connect, test and analyze synchronous and squirrel cage motors.*Potential Elements of the Performance:

- Describe and demonstrate the operation of synchronous motors in power factor correction and constant speed applications.
- Describe and demonstrate the controller circuit for a two-speed squirrel cage motor.

- Describe and connect autotransformers used for reduced voltage starting

III. TOPICS:

1. Single phase and poly phase transformers.
2. Wound rotor motors.
3. Synchronous motors.
4. Squirrel cage motors.

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:

- Notes supplied by instructor
- Hand tools
- Safety Glasses, High Voltage Gloves, CSA Hard-Toed Boots/Shoes

V. EVALUATION PROCESS/GRADING SYSTEM:

Labs and Lab reports 25%
 Testing 25%

Total	50 %
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The other 50% for this course is made up of the PLC labs
 A passing grade in both portions of the course is required to obtain an overall passing grade for this course.

While marks are not given for attendance, marks may be deducted for classes missed. See Special Notes section.

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

Grade	<u>Definition</u>	<i>Grade Point Equivalent</i>
A+	90 – 100%	4.00
A	80 – 89%	3.00
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:

Additional Information:

If a student misses a test he/she must have a valid reason (i.e. medical or family emergency – documentation such as a Doctor's note or death certificate may be required). A flat tire or vehicle problems are not a valid reason. In addition, the instructor must be notified prior to the test sitting. If this procedure is not followed the student will receive a mark of zero on the test with no make-up option.

If a student misses class time due to sickness, family emergency or other reason beyond his/her control the student must at his/her first opportunity meet with the course faculty to discuss if the missed time has placed the student at an increased risk of failing. The student must follow up the meeting by emailing the faculty with a summary of the meeting's discussions. Documentation validating the missed time may be required.

Deadlines will be specified for submission of assignments for grading. Late assignments will not be accepted and a grade of 0 will be assigned.

Required texts are brought to each class. Sections of the course text books may be highlighted however they are not to be written in. Tests will be 'open book' as far as the textbooks are concerned. However, use of a book containing markings other than the aforementioned highlights is not permitted and will be considered as academic dishonesty. Students are responsible for supplying their own texts for tests. Sharing books during a test is not permitted

Any material covered during any absence legitimate or not is the responsibility of the student.

There are no make-up tests, assignments or extra work allowed for any reason.

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Cell Phone Use Cell phones in the classroom are to be put on Silent or Vibrate during lectures, and labs.

Ringling during class will result in a deduction of 5% from the final grade per event.

During Tests, Cell Phones are to be *SHUT OFF* and put away, and are not to be used as a calculator.

Should your phone ring during a test or be pulled out for any reason you will be asked to hand your test in and immediately leave the classroom.

A Grade of 0% will be issued for that test.

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.

Disruptions to classes such as lateness, excessive talking, inappropriate language, etc are not acceptable and will be dealt with on an individual basis.

Students will be given the opportunity to review / correct the test material

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 required PPE prior to entering the lab.

The instructor will advise what specific PPE is required. If a student repeatedly neglects to wear PPE as required he/she will be considered to be in violation of the Sault College Academic Code of Conduct and may be sanctioned accordingly (see Student Code of Conduct & Appeal Guidelines).

For instance, first violation – verbal warning, second violation written warning, third violation suspension from lab activities.

Students will be given the opportunity to review the test material but test will not be returned to students.

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 required PPE prior to entering the lab.

The instructor will advise what specific PPE is required. If a student repeatedly neglects to wear PPE as required he/she will be considered to be in violation of the Sault College Academic Code of Conduct and may be sanctioned accordingly (see Student Code of Conduct & Appeal Guidelines).

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VII. COURSE OUTLINE ADDENDUM:

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