

**SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY**

**SAULT STE. MARIE, ONTARIO**



**COURSE OUTLINE**

**COURSE TITLE:** Electrical Theory II

**CODE NO. :** ELR720 **APP Level:** TWO

**PROGRAM:** Construction & Maintenance Electrician – Level 2

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**DATE:** April 2017 **PREVIOUS OUTLINE DATED:** June 2016

**APPROVED:** *“Corey Meunier”* April 17  
CHAIR

**TOTAL CREDITS:** 8

**PREREQUISITE(S):** None

**HOURS/WEEK:** 6

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**I. COURSE DESCRIPTION:**

This is a course covering the topics of magnetism, DC machines and AC circuit theory.

**II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:**

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

1. Describe magnetic flux and flux density.
2. Solve problems associated with magnetic energy, including magnetic potential difference, flux density, reluctance, permeance, and permeability.
3. List and explain the factors that affect the magnitude and direction of induced EMF in single conductors and in coils.
4. Describe factors which affect inductance and perform related calculations.
5. State Fleming's hand rules.
6. State and apply Lenz's law.
7. Describe the creation and effects of eddy currents.
8. Describe the construction, operation and characteristics of permanent magnet, separately excited, shunt, series and compound (cumulative and differential) DC motors and generators.
9. Draw connection diagrams for all types of DC motors and generators.
10. Describe a sine wave, calculate RMS average, maximum and instantaneous values.
11. Explain and calculate frequency, electrical and mechanical degrees.
12. Interpret and calculate phasors, vectors, and vector diagrams.
13. Describe the effects of alternating voltage and current in a resistive device.
14. Describe inductance, self-inductance and characteristics of a coil connected to a DC source.
15. Describe the characteristics of a coil connected to an AC source.
16. Calculate inductive reactance, voltage, current and power of an inductive circuit.
17. Describe capacitance and the characteristics of a capacitor connected to a DC source.
18. Describe the characteristics of a capacitor connected to an AC source.
19. Calculate the capacitive reactance, voltage, current, power and phase relationships of a capacitive circuit.

20. Calculate the values for RL/RC/RLC series circuits.
21. Describe and calculate resonant circuits and phase relations.
22. Explain and calculate RL/RC parallel circuits.
23. Label, describe and calculate values for RLC parallel circuits.
24. Describe the method for testing RLC parallel circuits.
25. Explain and calculate RLC parallel circuits.
26. Explain and calculate the efficiency of AC loads as related to power factor correction.
27. Explain the effects of power factor correction.
28. Calculate power factor correction for single-phase loads.
29. Describe the principles of operation of various types of single phase transformers.
30. Determine and perform calculations involving turns/voltage/current ratios for single phase transformers.

### **III. TOPICS:**

1. Magnetism
2. Magnetic Induction
3. Basic Trigonometry and Vectors
4. Alternating Current (AC)
5. Inductance in AC circuits
6. Resistive-Inductive Series Circuits
7. Resistive-Inductive Parallel Circuits
8. Capacitors
9. Capacitors in AC Circuits
10. Resistive-Capacitive Series Circuits
11. Resistive-Capacitive Parallel Circuits
12. Resistive-Inductive-Capacitive Series Circuits
13. Resistive-Inductive-Capacitive Parallel Circuits
14. Single Phase Transformers
15. DC Generators
16. DC Motors

### **IV. REQUIRED RESOURCES/TEXTS/MATERIALS:** **Delmar's Standard Textbook of Electricity, 5<sup>TH</sup> Ed.** **By Stephen L. Herman**

**V. EVALUATION PROCESS/GRADING SYSTEM:**

4 Tests equally weighted      100%\*

The professor reserves the right to adjust the number of tests as warranted. Any modifications will be discussed in class. Attendance is mandatory and quizzes will only be marked when completed in class.

Tests will not be returned but will be available for review.

\*See special notes.

The following semester grades will be assigned to students:

<b>Grade</b>	<b><u>Definition</u></b>	<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.	

If a faculty member determines that a student is at risk of not being successful in their academic pursuits and has exhausted all strategies available to faculty, student contact information may be confidentially provided to Student Services in an effort to offer even more assistance with options for success. Any student wishing to restrict the sharing of such information should make their wishes known to the coordinator or faculty member.

**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 been closed, the learning process has begun. Late arrivers will not be granted admission to the room.*

If a student misses a test he/she must have a valid reason (i.e. medical or family emergency – documentation may be required). 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. 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.

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

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

Use of cell phones/PDAs for any form of communication (voice, text...) during class or lab time 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.**

Students may not wear earphones of any kind during lab activities or test sittings. This does not include hearing aids required for the hearing impaired.

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.

## **VII. COURSE OUTLINE ADDENDUM:**

The provisions contained in the addendum located in D2L and on the portal form part of this course outline.