

SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO



**SAULT
COLLEGE**

COURSE OUTLINE

COURSE TITLE:	ELECTRICAL THEORY – LEVEL III		
CODE NO. :	ELR820		
PROGRAM:	CONSTRUCTION AND MAINTENANCE ELECTRICIAN		
AUTHOR:	PETER SZILAGYI		
DATE:	JAN 2010	PREVIOUS DATE OUTLINED:	JAN 2009
APPROVED:	_____ <i>“Corey Meunier”</i> CHAIR		_____ DATE
CREDITS:			
PREREQUISITE(S):	ELR720		
HOURS/WEEK:	SIX		

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For additional information, please contact Corey Meunier, Chair

School of Technology & Skilled Trades

(705) 759-2554, Ext. 2610

I. COURSE DESCRIPTION:

This is a course in electrical theory covering the topics of three-phase circuits, three-phase transformers and AC machines. The three-phase machines studied will be synchronous motors and generators, squirrel cage motors, and wound-rotor motors. Single phase squirrel cage motors will also be studied.

II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

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

1. List the advantages of three phase circuits over single phase circuits.
2. State the advantage and disadvantages of three phase Wye and Delta systems.
3. Calculate voltage, current and power for three phase Wye and Delta systems with resistive loads.
4. Calculate voltage, current and power for three phase Wye and Delta systems with series and parallel RLC loads.
5. Calculate the changes in circuit values as a result of three phase power factor correction.
6. Perform calculations and show connections of wattmeters for three phase systems.
7. Explain the principles of and show proper connection for power-factor and phase-angle meters.
8. List the various classifications of transformers and identify applications.
9. List losses associated with transformers and methods to reduce them.
10. Describe the methods employed to cool transformers.
11. Identify and describe safety concerns of transformer cooling mediums.
12. Identify and describe safety procedures for taking instrument transformers off line.
13. Interpret transformer nameplate data.

14. Calculate voltages and currents for three phase transformers.
15. Calculate transformed and conducted power for autotransformers.
16. Perform calculations for the determination of transformer impedances.
17. Calculate maximum available fault currents at the secondary of a transformer.
18. Describe procedures for determining transformer polarity, terminal identification, winding ratio and insulation resistance.
19. Describe procedures for paralleling transformers and taking one off line.
20. Describe alternator and transformer connections for various 3 phase systems.
21. Explain the principles of three phase open delta connections and perform related calculations.
22. Describe the theory of operation of alternators.
23. Perform calculations to illustrate principles for single and 3-phase power conversion.
24. Describe the methods of synchronizing alternators.
25. Describe the construction of three phase squirrel cage induction motors.
26. Describe the principle of operation of three phase squirrel cage induction motors.
27. Describe the operating characteristics of three phase squirrel cage induction motors.
28. Describe the troubleshooting procedures for three phase squirrel cage induction motors.
29. Identify AC motor connections and terminal markings for multiple voltage and speed applications.
30. Describe the construction of single-phase induction motors.
31. Describe the principle of operation of single-phase induction motors.

32. Describe the operating characteristics of single-phase induction motors.
33. Describe the troubleshooting procedures for single-phase induction motors.
34. Describe the construction of three-phase wound rotor induction motors.
35. Describe the principle of operation of three-phase wound rotor induction motors.
36. Describe the operating characteristics of three phase wound rotor induction motors.
37. Describe the trouble-shooting procedures for three-phase wound rotor induction motors.
38. Describe the construction of three phase synchronous motors.
39. Describe the principle of operation of three phase synchronous motors.
40. Describe the operating characteristics of three phase synchronous motors.
41. Describe the troubleshooting procedures for three phase synchronous motors.
42. Describe the operation of synchronous motors in power factor correction and constant speed applications.
43. State the types of insulation classification and applications used in AC motors.
44. Describe:
 - i. brush adjustments
 - ii. brush selection for wound rotor motors
 - iii. slip ring care
 - iv. bearing specifications and types
 - v. bearing applications
 - vi. bearing lubrication
45. Interpret motor name plate specification values.

III. TOPICS:

1. Three-phase circuits
2. Single-phase transformers
3. Three-phase transformers
4. Three-phase alternators
5. Three-phase motors

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:

Delmar's Standard Textbook of Electricity
by Stephen L. Herman

V. EVALUATION PROCESS/GRADING SYSTEM:

Theory 100%

The following semester grades will be assigned to students:

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

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.

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.

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. Please refer to the Student Academic Calendar of Events for the deadline date by which application must be made for advance standing.

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

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

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.

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*. A professor/instructor may assign a sanction as defined below, or make recommendations to the Academic Chair for disposition of the matter. The professor/instructor may (i) issue a verbal reprimand, (ii) make an assignment of a lower grade with explanation, (iii) require additional academic assignments and issue a lower grade upon completion to the maximum grade “C”, (iv) make an automatic assignment of a failing grade, (v) recommend to the Chair dismissal from the course with the assignment of a failing grade. 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.

Student Portal:

The Sault College portal allows you to view all your student information in one place. **mysaultcollege** gives you personalized access to online resources seven days a week from your home or school computer. Single log-in access allows you to see your personal and financial information, timetable, grades, records of achievement, unofficial transcript, and outstanding obligations. Announcements, news, the academic calendar of events, class cancellations, your learning management system (LMS), and much more are also accessible through the student portal. Go to <https://my.saultcollege.ca>.

Electronic Devices in the Classroom:

Students who wish to use electronic devices in the classroom will seek permission of the faculty member before proceeding to record instruction. With the exception of issues related to accommodations of disability, the decision to approve or refuse the request is the responsibility of the faculty member. Recorded classroom instruction will be used only for personal use and will not be used for any other purpose. Recorded classroom instruction will be destroyed at the end of the course. To ensure this, the student is required to return all copies of recorded material to the faculty member by the last day of class in the semester. Where the use of an electronic device has been approved, the student agrees that materials recorded are for his/her use only, are not for distribution, and are the sole property of the College.

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.