SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

COURSE TITLE:	ELECTRICAL THEORY III		
CODE NO. :	ELR820	**SEMESTER:**	ADVANCED LEVEL
PROGRAM:	CONSTRUCTION & MAINTENANCE ELECTRICIAN APPRENTICESHIP		
AUTHOR:	Al Gooderham		
DATE:	January 2016	**PREVIOUS OUTLINE DATED:**	January 2015

APPROVED: *"Corey Meunier"*

CHAIR **DATE**

TOTAL CREDITS: 6

PREREQUISITE(S): N/A

HOURS/WEEK: 6

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%
(Three tests, 33.33% each).

No Rewrites will be granted for tests attempted with unsuccessful results.
No Final exam is provided. Block/section tests only.

The following semester grades will be assigned to students:

Grade	**Definition**	*Grade Point Equivalent*
A+	90 – 100%	4.00
A	80 – 89%	
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:

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.

VII. COURSE OUTLINE ADDENDUM:

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