SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO

Sault College

COURSE OUTLINE

COURSE TITLE: ELECTRICAL THEORY III

CODE NO. : ELR820 **SEMESTER:**

PROGRAM: CONSTRUCTION AND MAINTENANCE ELECTRICIAN APPRENTICESHIP

AUTHOR: BOB ALLEN

DATE: JAN. 2009 **PREVIOUS OUTLINE DATED:**

APPROVED:

"Corey Meunier"
CHAIR _____ **DATE**

TOTAL CREDITS:

PREREQUISITE(S):

HOURS/WEEK: 6

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	*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:

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.

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.

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*. 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.

VII. 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.

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