

SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY  
SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

COURSE OUTLINE: A.C. CIRCUIT ANALYSIS AND MACHINES  
CODE NO.: ELR 109  
PROGRAM: ELECTRICAL/ELECTRONIC TECHNOLOGY  
SEMESTER: TWO  
DATE: DECEMBER, 1991  
PREVIOUS  
OUTLINE DATED: JANUARY, 1990  
AUTHOR: R. MCTAGGART

NEW: \_\_\_\_\_ REV.: X

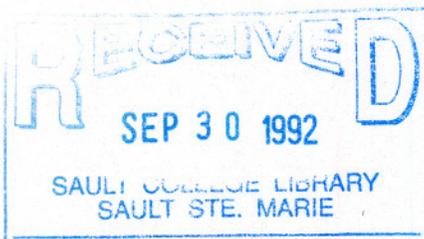
APPROVED:

W. Filipowich  
COORDINATOR

Dec 19/91  
DATE

J.P. Choquette  
DEAN

9/12/23  
DATE



AC CCTS & MACHINES  
COURSE NAME

ELR 109  
CODE NO.

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TOTAL CREDIT HOURS: 75

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PREREQUISITE(S): ELR 100

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PHILOSOPHY/GOALS:

AN ANALYTICAL STUDY OF SERIES, PARALLEL AND SERIES-PARALLEL IMPEDANCE NETWORKS, NETWORK THEOREMS AND POLYPHASE CIRCUITS. CONCURRENTLY AN INTRODUCTION TO AC AND DC MOTORS AND GENERATORS TOGETHER WITH THEIR CONTROL METHODS IS STUDIED. RELATED PRACTICAL EXERCISES.

STUDENT PERFORMANCE OBJECTIVES:

UPON SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENT WILL BE ABLE TO:

1. ANALYZE FUNDAMENTAL AC NETWORKS.
2. HAVE A BASIC UNDERSTANDING OF DC MACHINES.
3. HAVE A BASIC UNDERSTANDING OF AC MACHINES.

TOPICS TO BE COVERED:

1. AC CIRCUIT ANALYSIS.
2. SERIES & PARALLEL AC CIRCUITS.
3. POWER IN AC CIRCUITS.
4. AC NETWORK ANALYSIS.
5. RESONANCE.
6. POLYPHASE AC SYSTEMS.
7. MAGNETIC CIRCUIT CALCULATIONS.
8. PRINCIPLES OF DC MACHINES.
9. DC GENERATORS.
10. DC MOTORS.
11. AC POWER GENERATION.
12. TRANSFORMERS.
13. POLYPHASE INDUCTION MOTORS.
14. SINGLE PHASE MOTORS.
15. THREE PHASE SYNCHRONOUS MOTORS.
16. STARTING AND CONTROL OF AC MOTORS.

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LEARNING ACTIVITIES	REQUIRED RESOURCES
	TEXT: FUNDAMENTALS OF ELECTRIC CIRCUITS. 4TH ED., D.A. BELL
1. AC CIRCUIT ANALYSIS - PHASORS AND COMPLEX NUMBERS - POLAR AND RECTANGULAR NOTATION - SERIES, PARALLEL, AND SERIES- PARALLEL RLC CIRCUITS - RESONANCE	CH.18, 19
2. SERIES & PARALLEL AC CIRCUITS - ANALYZE USING POLAR, RECTANG- ULAR AND PHASOR DIAGRANS	CH.20
3. POWER IN AC CIRCUITS - REAL AND REACTIVE POWER - POWER FACTOR - DECIBEL MEASUREMENT OF POWER	CH.21
4. AC NETWORK ANALYSIS - THEVENIN'S THEOREM - SUPERPOSITION - MAXIMUM POWER TRANSFER - DELTA - WYE TRANSFORMATIONS	CH.22
5. RESONANCE - SERIES AND PARALLEL RESONANCE IN RLC CIRCUITS - ENERGY TRANSFER BETWEEN L & C	CH.23
6. POLYPHASE AC SYSTEMS - GENERATION OF THREE PHASE VOLTAGES - WYE CONNECTED ALTERNATOR - WYE CONNECTED LOADS - DELTA CONNECTED ALTERNATOR - DELTA CONNECTED LOADS - WYE-DELTA, WYE-WYE, AND DELTA-DELTA SYSTEMS - THREE PHASE POWER, POWER FACTOR AND POWER MEASUREMENT	CH.26  TEXT: ELECTRICAL MACHINES AND TRANSFORMERS. RYFF, PLATNICK, KARNAS
7. MAGNETIC CIRCUIT CALCULATIONS - REVIEW OF ELECTROMAGNETIC PRINCIPLES - ANALYSIS OF MAGNETIC CIRCUITS	CH.1

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LEARNING ACTIVITIES	REQUIRED RESOURCES
8. PRINCIPLES OF DC MACHINES - PRINCIPLE OF GENERATOR ACTION - COMMUTATION - WINDINGS AND WINDING DIAGRAMS - PRINCIPLES OF MOTOR ACTION - MACHINE CONSTRUCTION	CH.2
9. DC GENERATORS - GENERATOR EQUIVALENT CIRCUITS - TYPES OF DC GENERATORS - CHARACTERISTICS OF DC GENERATORS - ANALYZING GENERATOR OPERATION	CH.3
10. DC MOTORS - MOTOR EQUIVALENT CIRCUITS - CLASSIFICATION OF DC MOTORS - CHARACTERISTICS OF DC MOTORS - ANALYZING MOTOR OPERATION - STARTING AND CONTROL OF DC MOTORS - FOUR QUADRANT OPERATION OF DC MACHINES	CH.4,5
11. AC POWER GENERATION - CONSTRUCTION AND OPERATION OF AC GENERATORS - CHARACTERISTICS OF AC GENERATORS - WINDINGS AND WINDING DIAGRAMS - EQUIVALENT CIRCUITS AND PHASOR DIAGRAMS	CH.6,7
12. TRANSFORMERS - PRINCIPLE OF OPERATION - TYPES AND CONSTRUCTION - EQUIVALENT CIRCUITS AND PHASOR DIAGRAMS - INSTRUMENT TRANSFORMERS	CH.8,9
13. POLYPHASE INDUCTION MOTORS - PRINCIPLE OF OPERATION - EQUIVALENT CIRCUIT - TYPES AND CONSTRUCTION - OPERATING CHARACTERISTICS	CH.10

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LEARNING ACTIVITIES	REQUIRED RESOURCES
14. SINGLE PHASE MOTORS - PRINCIPLE OF OPERATION - TYPES AND CONSTRUCTION - OPERATING CHARACTERISTICS	CH.11
15. THREE PHASE SYNCHRONOUS MOTORS - PRINCIPLE OF OPERATION - OPERATING CHARACTERISTICS - POWER FACTOR CORRECTION	CH.12
16. STARTING AND CONTROL OF AC MOTORS	CH.13

ADDITIONAL RESOURCE MATERIALS:

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METHOD(S) OF EVALUATION

TESTS	70%
LAB EXERCISES	30%
TOTAL	100%

THE GRADING SYSTEM USED WILL BE AS FOLLOWS:

A+ = 90 - 100%    A = 80 - 89%    B = 70 - 79%    C = 55 - 69%

R REPEAT

NOTES: IN ORDER TO OBTAIN A PASSING GRADE THE STUDENT MUST MAINTAIN A MINIMUM 55% AVERAGE IN BOTH TEST SCORES AND LAB EXERCISES.

IF A STUDENT MISSES A TEST HE/SHE MUST HAVE A VALID REASON (ie. MEDICAL OR FAMILY EMERGENCY). IN ADDITION, THE SCHOOL MUST BE NOTIFIED BEFORE THE SCHEDULED TEST SITTING. THE STUDENT SHOULD CONTACT THE INSTRUCTOR INVOLVED. IF THE INSTRUCTOR CANNOT BE REACHED LEAVE A MESSAGE WITH THE DEAN'S OFFICE OR THE COLLEGE SWITCHBOARD. IF THIS PROCEDURE IS NOT FOLLOWED THE STUDENT WILL RECEIVE A MARK OF ZERO ON THE TEST WITH NO REWRITE OPTION.

REQUIRED STUDENT RESOURCES:

- TEXT BOOKS: 1. FUNDAMENTALS OF ELECTRIC CIRCUITS.  
4TH ED., DAVID A. BELL
2. ELECTRICAL MACHINES AND TRANSFORMERS.  
PRINCIPLES AND APPLICATIONS.  
P. F. RYFF, D. PLATNICK, J. A. KARNAS

ADDITIONAL RESOURCE MATERIALS AVAILABLE IN THE COLLEGE LIBRARY BOOK SECTION: