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: JANUARY 1990

PREVIOUS
OUTLINE DATED: FEB. 28, 1989

AUTHOR: R. MCTAGGART

NEW: _____ REV.: ____X____

APPROVED: _____   _90/02/02_
CHAIRPERSON   DATE

AC CCTS & MACHINES   ELR 109
COURSE NAME   CODE NO.

TOTAL CREDIT HOURS: 75

PREREQUISITE(S):   ELR 100

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. SERIES & PARALLEL AC CIRCUITS.
 2. POWER IN AC CIRCUITS.
 3. AC NETWORK ANALYSIS.
 4. RESONANCE.
 5. POLYPHASE AC SYSTEMS.
 6. MAGNETIC CIRCUIT CALCULATIONS.
 7. PRINCIPLES OF DC MACHINES.
 8. DC GENERATORS.
 9. DC MOTORS.
10. AC POWER GENERATION.
11. TRANSFORMERS.
12. POLYPHASE INDUCTION MOTORS.
13. SINGLE PHASE MOTORS.
14. THREE PHASE SYNCHRONOUS MOTORS.
15. 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. SERIES & PARALLEL AC CIRCUITS - ANALYZE USING POLAR, RECTANGULAR AND PHASOR DIAGRANS	CH.20

2. POWER IN AC CIRCUITS
  - REAL AND REACTIVE POWER
  - POWER FACTOR
  - DECIBEL MEASUREMENT OF POWER
	CH.21

3. AC NETWORK ANALYSIS
  - THEVENIN'S THEOREM
  - SUPERPOSITION
  - MAXIMUM POWER TRANSFER
  - DELTA - WYE TRANSFORMATIONS
	CH.22

4. RESONANCE
  - SERIES AND PARALLEL RESONANCE IN RLC CIRCUITS
  - ENERGY TRANSFER BETWEEN L & C
	CH.23

5. 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

6. MAGNETIC CIRCUIT CALCULATIONS
  - REVIEW OF ELECTROMAGNETIC PRINCIPLES
  - ANALYSIS OF MAGNETIC CIRCUITS
	CH.1

7. PRINCIPLES OF DC MACHINES
  - PRINCIPLE OF GENERATOR ACTION
  - COMMUTATION
  - WINDINGS AND WINDING DIAGRAMS
  - PRINCIPLES OF MOTOR ACTION
  - MACHINE CONSTRUCTION
	CH.2

AC CCTS & MACHINES   ELR 109
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LEARNING ACTIVITIES	REQUIRED RESOURCES
8. DC GENERATORS - GENERATOR EQUIVALENT CIRCUITS - TYPES OF DC GENERATORS - CHARACTERISTICS OF DC GENERATORS - ANALYZING GENERATOR OPERATION	CH.3
9. DC MOTORS - MOTOR EQUIVALENT CIRCIUTS - 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
10. 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
11. TRANSFORMERS - PRINCIPLE OF OPERATION - TYPES AND CONSTRUCTION - EQUIVALENT CIRCUITS AND PHASOR DIAGRAMS - INSTRUMENT TRANSFORMERS	CH.8,9
12. POLYPHASE INDUCTION MOTORS - PRINCIPLE OF OPERATION - EQUIVALENT CIRCUIT - TYPES AND CONSTRUCTION - OPERATING CHARACTERISTICS	CH.10
13. SINGLE PHASE MOTORS - PRINCIPLE OF OPERATION - TYPES AND CONSTRUCTION - OPERATING CHARACTERISTICS	CH.11

AC CCTS & MACHINES   ELR 109
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LEARNING ACTIVITIES	REQUIRED RESOURCES

14. THREE PHASE SYNCHRONOUS MOTORS
   - PRINCIPLE OF OPERATION
   - OPERATING CHARACTERISTICS
   - POWER FACTOR CORRECTION
	CH.12

15. STARTING AND CONTROL OF AC MOTORS	CH.13

ADDITIONAL RESOURCE MATERIALS:

AC CCTS & MACHINES   ELR 109
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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 = 65 - 79%   C = 55 - 64%

R   REPEAT

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:

SPECIAL NOTES: