

SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

COURSE TITLE: AC CIRCUIT ANALYSIS & MACHINES

CODE NO: ELR 109-5

PROGRAM: ELECTRICAL ENGINEERING TECHNOLOGY

SEMESTER: II

DATE: JANUARY 1985

AUTHOR: R. PALO

NEW: REVISION:

APPROVED: *PP Crozutt*
Chairperson

85-01-22
Date

AC CIRCUIT ANALYSIS & MACHINES

ELR 109-5

Course Name

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PHILOSOPHY/GOALS:

To provide an introduction to AC circuit analysis including single phase and three phase circuits.

To provide an introduction to DC and AC machines (transformers, motors and generators).

METHOD OF ASSESSMENT (GRADING METHOD):

1. Written tests will be conducted at regular intervals.
2. Grading

A - 76 - 100%
B - 66 - 75%
C - 50 - 65%
R - Less than 50%

Course mark - 70% for tests
30% for labs

TEXTBOOK(S):

"Direct and Alternating Current Machinery", 2nd Edition, by Rosenblatt and Friedman

REFERENCE TEXT(S):

"Electric Machinery and Transformers" by Kosow
"Fundamentals of Electric Circuits" by Bell

COURSE OUTLINE:

LECTURE HOURS

TOPIC

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STEADY STATE AC CIRCUIT ANALYSIS
SINGLE PHASE AC CIRCUITS

- 1) Phasors
- 2) Phasor arithmetic & phasor diagrams
- 3) Impedance & impedance diagrams
- 4) Series impedance
- 5) Parallel impedance
- 6) Series - parallel impedance
- 7) Apparent real & reactive power
- 8) Power diagrams

- 10) Wye-delta/Delta-wye impedance conversions
 - 1) 3 0 source
 - 2) Phase sequence
 - 3) Wye & delta source connections
 - 4) Voltage, current & power relationships in 3 0 ccts
 - 5) 3-phase power

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MAGNETIC CIRCUITS

- 1) Ampere's Circuital Law
- 2) Analysis of simple magnetic circuits
- 3) Energy in a magnetic field
- 4) Magnetic force & torque

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DC & AC MACHINES

- 1) Faraday's Law of electromagnetic induction - principle of generator action
- 2) Elementary generator construction
- 3) Commutation
- 4) Generator voltage eqn.
- 5) Electromagnetic force - principle of motor action
- 6) Elementary motor construction & machine models
- 7) Armature windings - Lap & wave
- 8) Types of AC generators
- 9) Magnetization curve & o/p voltage build-up
- 10) Load voltage characteristics of shunt, series & compound generators
- 11) Motor speed, equations
- 12) Electrical & mechanical power
- 13) Torque characteristics of shunt series & compound motors

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TRANSFORMERS

- 1) Functions & types
- 2) Construction
- 3) Ideal transformers & transformation ratios
- 4) Practical transformers
- 5) Equivalent circuits
- 6) Primary and secondary phasors
- 7) Regulation, unity, lagging & leading power factors
- 8) Open & short CCT tests
- 9) Efficiency
- 10) Single & 3-phase winding connections
- 11) Polarity & voltage tests
- 12) Auto transformers
- 13) Instrument transformers

14) Parallel operation

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AC MACHINES

POLYPHASE INDUCTION MOTORS

- 1) Construction, squirrel cage & wound motor
- 2) Polyphase rotating magnetic field
- 3) Torque production
- 4) Slip
- 5) Tests no-load, blocked rotor
- 6) Performance, rotor current & power torque (max. starting & rated)
- 7) Nema classifications
- 8) Wound rotor characteristics
- 9) Speed control pole changing variable frequency & rotor resistance
- 10) Efficiency

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SYNCHRONOUS MOTORS

- 1) Construction
- 2) Starting
- 3) Power factor control
- 4) VEE curves
- 5) Synchronous capacitor
- 6) Efficiency

54 HOURS TOTAL