

# SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO

## COURSE OUTLINE

Course Title : AC Circuits and Machines

Course No.: ELR109

Program: Electrical / Electronics / Instrumentation Technician

Semester: Two

Author(s): A. Gooderham, 7592554 ext 581

Date: Jan. 1998

Previous

Outline Dated: Jan. 1996

Approved:

K. DeRosario

Dean

Jan 10/98

Date

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For additional information, please contact Kitty DeRosario, Dean, School of Trades  
& Technology, (705) 759-2554, Ext. 642.

**Course Name: AC Circuits and Machines**  
**Course No.: ELR109**

**TOTAL CREDITS: 4**

**PREREQUISITES: ELR 100**

**COURSE LENGTH: 16 wks**

**TOTAL CREDIT HOURS: 5**

### **I. COURSE DESCRIPTION**

An analytical study of series and parallel, and series-parallel circuits, impedance networks, network theorems and poly-phase circuits. Fundamentals of DC circuit analysis is followed by AC analysis techniques. An overview of the basic construction and operation of DC and AC machines completes the course content.

### **II. TOPICS TO BE COVERED:**

1. DC networks (review)
2. Magnetism
3. Inductance
4. Capacitance
5. RL & RC DC Circuits
6. AC fundamentals (review)
7. Phasors & Complex Numbers
8. RL, RC & RLC AC Circuits, Resonance & Filters
9. Series-Parallel AC Circuits
10. Power in AC Circuits
11. AC Networks
12. Three-Phase AC Systems
13. Transformers
14. DC Motor/Generators
15. Three-Phase AC Motors (if time permits)

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### **III. LEARNING OUTCOMES AND ELEMENTS OF PERFORMANCE:**

#### **A. Learning Outcomes:**

Upon successful completion of this course the student will be able to:

1. Analyse fundamental dc circuits
2. Analyse fundamental single-phase ac circuits
3. Analyse fundamental three-phase ac circuits
4. Describe basic parts and operation of dc and ac machines

#### **B. Learning Outcomes with Elements of Performance:**

Upon successful completion of this course, the student will demonstrate the ability to:

1. Determine the impedance and operation of single-phase AC circuits using phasors and complex math.

##### **Potential elements of the performance:**

- Completion of complex math questions including the j operator
  - Completion of basic trigonometry questions
  - Completion of polar and rectangular conversions
  - Analysis of single-phase circuit operation using complex math, to find impedance(s), voltage and current values
  - Complete formal test
2. Determine magnetic flux properties, uses in dc machines and other electrical/electronic devices, and describe the concept of self-inductance

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**Potential elements of the performance:**

- Determine the direction of magnetic flux present as a result of current flow in a conductor
- Determine the direction of magnetic flux present as a result of current flow in a coil
- Determine the direction of rotation of a simple dc motor
- Determine the direction of current flow in a simple dc generator
- Complete test

3. Analyse a DC circuit containing inductors or capacitors and resistors, to determine charge and discharge characteristics

**Potential elements of the performance:**

- Completion of RL and RC cct questions regarding time constants
- Completion of RL and RC cct questions requiring the solution of the time for threshold voltage or current achievement
- Completion of test

4. Analyse a three-phase cct with respect to type (Delta or Wye) and solve for both line and phase voltages and currents.

**Potential elements of the performance:**

- Completion of three-phase cct questions regarding line and phase values
- Completion of three-phase cct questions having combinations of delta and wye generators and impedance loads
- Completion of test

5. Describe the basic operation of a dc motor/generator and identify the construction and parts of both ac and dc machines

**Potential elements of the performance:**

- Completion of dc machine diagrams showing flux fields, main fields and rotation

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- Completion of dc machine diagrams identifying parts of the machine
- Description of dc machine operation and characteristics
- Completion of test

**IV. REQUIRED STUDENT RESOURCES:**

•Principles of Electric Circuits, 5<sup>th</sup> Ed. , by Floyd

**V. METHODS OF EVALUATION:**

The following Grading System will be used:

A+ = 90% - 100%

A = 80% - 89%

B = 70% - 79%

C = 55% - 69%

R = less than 55% (Repeat Course)

X = Temporary Grade as per College Policy

**Three Tests @ 33.33 % each : TOTAL 100%**

**VI. SPECIAL NOTES:**

1. The Instructor reserves the right to modify the course as is deemed necessary to meet the needs of the students.
2. Students with special needs (Physical Limitations, Visual/Hearing Impairments etc. ) are encouraged to discuss confidentially, required accommodations with the instructor and/or contact the Special Needs Office, Room E1204, Extension 493, 717 or 491.
3. If a student misses a test or surprise quiz ( maximum 5% of final grade ) without contacting the instructor, the Dean's office or the switchboard prior to the test or quiz, a mark of zero will be granted without a re-write option.

**VII. PRIOR LEARNING ASSESSMENT:**

Students who wish to apply for advanced credit in this course, should consult with the Professor.

## ELR109 Course Outline Review

The following students attended the class session in which the course outline was reviewed and have been notified that a copy of the outline is listed on the "scorpion" server for their perusal. Should a hard copy be preferred by a student, a printout may be taken from that location.