

SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO



COURSE OUTLINE

COURSE TITLE: AC Circuits and Machines

CODE NO. : ELR109 **SEMESTER:** TWO

PROGRAM: Electrical Engineering Technician

- Process Automation
- Process Automation & Trades
- Power Generation

AUTHOR: A. Gooderham

DATE: January 2017 **PREVIOUS OUTLINE DATED:** January 2016

APPROVED: *“Corey Meunier”* **CHAIR** **DATE** Dec '16

TOTAL CREDITS: FIVE

PREREQUISITE(S): ELR100 Electrical Fundamentals DC

HOURS/WEEK: FIVE

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For additional information, please contact Corey Meunier, Chair
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I. COURSE DESCRIPTION:

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

II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

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

1. *Analyse a DC circuit containing capacitors and resistors, to determine charge and discharge characteristics*

Potential Elements of the Performance:

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

2. *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
- Completion of test

3. *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 three-phase transformer connections and values
- Analysis of ideal vs real transformer model calculations, including no-load vs full-load phasor diagrams using R, L and C loads
- Investigate the characteristics of 3-phase synchronous AC generators
- Completion of test

III. TOPICS:

1. Capacitance
2. RC , DC Circuits
3. AC fundamentals (review)
4. Phasors & Complex Numbers
5. RL , RC & RLC AC Circuits, Resonance & Filters
6. Series-Parallel AC Circuits
7. Power in AC Circuits
8. AC Networks
9. Three-Phase AC Systems
10. Transformers
11. Three-Phase AC Generators

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:

Fundamentals of Electric Circuits, 7th Ed., by Bell

V. EVALUATION PROCESS/GRADING SYSTEM:

**Three Tests @ 33 % each + Review Assignment @ 1% =
TOTAL 100%**

NOTES: 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.

Surprise Quiz's may be given for a maximum of 5% of the final grade and are attributed toward the next test percentage value.

No rewrites are given for any test attempted.

The following semester grades will be assigned to students:

Grade	<u>Definition</u>	<i>Grade Point Equivalent</i>
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:

Attendance:

Sault College is committed to student success. There is a direct correlation between academic performance and class attendance; therefore, for the benefit of all its constituents, all students are encouraged to attend all of their scheduled learning and evaluation sessions. This implies arriving on time and remaining for the duration of the scheduled session.

It is the departmental policy that once the classroom door has been closed, the learning process has begun. Late arrivers will not be granted admission to the room.

VII. COURSE OUTLINE ADDENDUM:

The provisions contained in the addendum located on the portal form part of this course outline.