SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ON

COURSE OUTLINE

COURSE TITLE: ELECTRICAL FUNDAMENTALS

CODE NO.: ELR 104-3 SEMESTER: 4

PROGRAM: AVIATION

AUTHOR: A. GOODERHAM

DATE: AUG. 1995 PREVIOUS OUTLINE DATED: AUG. 1994

APPROVED: _____ _____

DEAN DAT

95-08-16

ELECTRICAL FUNDAMENTALS
COURSE NAME

ELR 104-3
CODE NO.

TOTAL CREDITS 3

PREREQUISITE(S): NONE

I.PHILOSOPHY/GOALS:

This course will develop the students' ability to understand and apply the basic concepts of electricity to the solution of direct current electrical circuit problems and analysis. An approach to the fundamentals of electricity will be presented with heavy emphasis on the solution of circuit problems using basic laws. After becoming familiar with the basic principles of electric circuits, students will learn and apply more advanced methods of analysing AC RLC circuits and magnetic circuits. Basic electronic devices and power supplies will complete the course.

II. STUDENT PERFORMANCE OBJECTIVES (OUTCOMES):

Upon successful completion of this course the student will:

1) Have a fundamental knowledge of AC and DC circuit theory
2) Be able to simplify and analyze basic AC and DC circuits comprised of resistors, capacitors and inductors
3) Understand basic magnetic and electromagnetic principles
4) Use phasors and complex numbers to assist in analysis of AC circuits
5) Be able to identify basic electronic components and analyze power supply operations

III. TOPICS TO BE COVERED:

1) Electrical units
2) Conductors and insulators
3) Series circuits
4) Parallel circuits
5) Series/parallel circuits
6) Network theorems
7) Magnetism
8) Magnetic circuits
9) Inductance
10) Capacitance
11) Alternating current fundamentals
12) AC circuit analysis
13) Power Supplies

IV. LEARNING ACTIVITIES/REQUIRED RESOURCES

Topic/Unit - Electrical Units

Learning Activities:

Listen to presentation of the principles of electrification by friction, planetary atom, potential difference, current and resistance. Discuss the electric lamp, simple circuit, some analogies, and the difference between ac and dc current. Draw circuit diagrams and practice scientific notation, metric prefixes and engineering notation numbering system conversions. Identify the difference between resistance and conductance.

Resources:

overheads, board work, Chapters 1 and 2 - text

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Topic/Unit: Ohm's Law, Work and Power

Learning Activities:

Listen to the presentation on the difference between energy and work, and the definition of power. Practice the calculation for power, efficiency and energy using the appropriate units of measure. Use the basic understanding of electron flow to analyze the nature of resistance and the effects of temperature on resistance. Practice Ohm's Law problems following its introduction.

Resources:

overheads, board work, Chapter 3 - text

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Topic/Unit: Series Circuits

Learning Activities:

Listen to the presentation on resistors in series, polarities of voltage drops and Kirchhoff's voltage law. Practice these concepts by applying them to the solution of series circuit problems involving resistance, voltage, current and maximum power transfer. Specific attention will be put on open and short circuits, potentiometers and voltage dividers.

Resources:

overheads, board work, Chapter 4 - text

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Topic/Unit: Parallel Circuits

Learning Activities:

Listen to the presentation on resistors in parallel, current flow in parallel circuits and the concept of using conductances to solve for equivalent total resistance. Apply Kirchhoff's current law to aide in the understanding of parallel circuit characteristics, and Ohm's law in the solution of parallel circuit problems.

Resources:

overheads, board work, Chapter 5 - text

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Topic/Unit: Series-Parallel Circuits

Learning Activities:

Listen to the presentation on resistors in series-parallel circuits and the concept of equivalent-circuit analysis. Use the basic concepts of Ohm's and Kirchhoff's laws to analyze more complicated circuits. Introduce the ideas of voltage and current dividing in the solution of problems.

Resources:

overheads, board work, Chapter 6 - text

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Topic/Unit: Network Theorems

Learning Activities:

Listen to the presentation on constant-voltage and constant-current sources and their conversions. Learn to analyze more complex circuits, with more than one source, by applying the Superposition, Thevenin's or Delta-Wye Transformation theorems.

Resources:

Topic/Unit: Magnetism and Magnetic Circuits

Learning Activities:

Listen to the presentation on magnetic fields, electromagnetism, magnetic flux and the correlation to electrical quantities. Become aware of the concepts of magnetomotive force, forces on current-carrying conductors in a magnetic field and then the application to the motor principle. Become familiar with the terms reluctance and permeability, relative permeability, hysteresis and eddy currents. Utilize magnetization curves to aide in problem solving.

Resources:

overheads, board work, Chapter 7 - text

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Topic/Unit: Inductance

Learning Activities:

Listen to the presentation on electromagnetic induction, Faraday's and Lenz's laws and self-induction. Become familiar with types of inductors and their uses, as well as self-inductance. Practice applying series and parallel solutions to circuits containing inductors. Become familiar with the concept of time constants in LR circuits, their uses and solutions for instantaneous values of voltage and current.

Resources:

overheads, board work, Chapter 10 - text

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Topic/Unit: Capacitance

Learning Activities:

Listen to the presentation on static electricity, electric field, capacitance and dielectrics. Different types of capacitors will be introduced and practice solving circuits with capacitors in series and parallel will be completed. Time constant applications will be applied to RC circuits to solve for instantaneous values as well as energy stored in a capacitor.

Resources:

overheads, board work, Chapter 10 - text

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Topic/Unit: Alternating Current

Learning Activities:

Listen to the presentation on the generation of alternating voltage, the sine wave, frequency, phase angle, wavelength, and the radian. Become familiar with and practice using instantaneous, peak, average and RMS values in the analysis of sine waves.

Resources:

overheads, board work, Chapter 8 - text

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Topic/Unit: AC Circuit Analysis

Learning Activities:

Listen to the presentation on phasors and complex numbers, and polar and rectangular conversions. Use these concepts to aide in the analysis of series, parallel and series-parallel RLC circuits. Gain further understanding by applying AC concepts to power factor correction problems.

Resources:

overheads, board work, Chapters 12, 13 and 14 - text

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Topic/Unit: Power Supplies

Learning Activities:

Listen to the presentation on the principles of diode operations, rectification and the basic use of capacitor filtering in power supplies. Practice the analysis of power supply designs by solving for output voltages and currents.

Resources:

overheads, board work, instructor notes

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V. EVALUATION METHODS: (INCLUDES ASSIGNMENTS, ATTENDANCE REQUIREMENTS, ETC.)

Four (4) tests worth 25% each Total 100%
The grading system to be used will be as follows:
A+= 90-100% A= 80-89% B= 70-79% C= 55-69%
R= Repeat

Notes: 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 a message should be left 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.

Students will be given advance notice of a test date (1 week minimum) . Quizzes (worth a maximum of 5%) may be given without notice. There will be no rewrites for students missing quizzes without prior notice and valid reasons as stated above.

Your instructor reserves the right to modify the course as he/she deems necessary to meet the needs of students.

VI. PRIOR LEARNING ASSESSMENT:
Students who wish to apply for advanced credit in the course should consult the instructor. Credit for prior learning will be given upon successful completion of the following:
A four (4) hour comprehensive written exam.

VII. REQUIRED STUDENT RESOURCES

Electric Circuits Fundamentals, 3rd ed.
by Floyd

VIII. ADDITIONAL RESOURCE MATERIALS AVAILABLE IN THE COLLEGE LIBRARY:

IX. SPECIAL NOTES