I. CATALOG DESCRIPTION:

A. Division: Technical and Workforce Development
Department: Electricity/Electronics
Course ID: ELECTR 115
Course Title: Alternating Current Circuit Analysis
Lecture: 3 hours
Units: 3
Prerequisites: ELECTR 110 and ELECTR 111
Corequisite: ELECTR 116

Course Description:
An in depth analysis of alternating current circuits to include AC generation and transformation, inductance and inductive circuits, capacitance and capacitive circuits, time constants, rectangular and polar notation, AC circuit analysis, resonance, and filters.

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II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: One

III. EXPECTED OUTCOMES FOR STUDENTS:

Upon completion of this course, students will be able to:

A. Define magnetism, electromagnetism, and electromagnetic induction.
B. Explain the generation of AC voltage from electro-mechanical generators.
C. Define reactance; inductive/capacitive, units of measurement, their source, and their relation to resonance.
D. Describe the interaction between volts, ohms, current, and frequency in AC series and parallel circuits.
E. Apply circuit analysis to series and parallel and complex circuits.
F. Use rectangular and polar number systems, in series and parallel variational analysis.
G. Distinguish between half-wave, full-wave, and bridge rectifier circuits.
H. Analyze the filtering process of an LC pi filter network.

IV. CONTENT:

A. Introduction to AC
1. Electromagnetism
2. Practical applications, self-induction
3. Digital multimeter
4. Trouble shooting hints
5. Generators, period and frequency, voltage and current values

B. Induction and Inductive Reactance
1. Inductance, H
2. Inductance - series and parallel
3. Inductive reactance, XL, ELI
4. XL - series and parallel
5. Pythagorean theorem, voltage problems (series)
6. Impedance Z
7. Voltage and Impedance analysis (series)
8. Trigonometric functions

C. Capacitance and Capacitive Reactance
   1. Capacitance C
   2. C in series and parallel
   3. Capacitive reactance, XC, ICE
   4. XC in series and parallel
   5. Series RC circuit analysis
   6. Fco_2
   7. Series RL circuit analysis
   8. AC power - power factor

D. RLC Circuits, Series and Parallel Resonance
   1. Fco_1
   2. Complex numbers
   3. Series, RLC analysis
   4. Series resonance, Q
   5. Parallel resonance
   6. Parallel: R, RL, RC, RLC
   7. Parallel variational analysis
   8. Complex circuits

E. Linear Power Supplies
   1. Transformers
   2. Turns ratio, voltage ratio
   3. Current ratio
   4. Semiconductor rectifiers
   5. Filters
   6. Regulators

V. METHODS OF INSTRUCTION:
Methods of instruction will vary from instructor to instructor but may include:
   A. Lectures and discussions about alternating current characteristics and fundamentals to include: units of measurement, series and parallel reactive circuit analysis, special frequency conditions and linear power supply circuits.
   B. Lectures and discussion are complemented with handouts and instruction on different methods of analysis and trouble shooting.
   C. Dynamics are accented with the use of graphs and videos.
   D. Homework is assigned to promote know how, expertise, vocabulary and writing skills.

VI. TYPICAL ASSIGNMENTS:
Typical assignments will vary from instructor to instructor but may include:
   A. Given inductance and frequency, calculate reactance.
   B. Apply vector addition to determine impedance or voltage.
   C. Given L, C, R, frequency and the applied voltage, graph a current vs. frequency curve of a series resonant circuit.
   D. Complete a variational analysis of a series RL circuit with an increase in frequency.

VII. EVALUATION:
   A. Methods of evaluation will vary from instructor to instructor but may include:
      1. Quizzes and chapter tests
      2. Final exam
         Typical Questions:
         a. If the frequency is increased in a series RL circuit, what happens to the power factor?
         b. Z = 50 -J35, represents what kind of circuit?

B. Frequency of evaluation will vary from instructor to instructor but shall include a topic journal and may additionally include:
   1. Periodic feedback based on chapter quizzes
   2. Five (5) chapter exams
   3. One (1) comprehensive final exam

VIII. TYPICAL TEXT:
Meade, R. L., Foundations of Electronics, 3rd Edition, ITP Delmar, New York, 1998
Gates, E. D., Introduction to Electronics, 4th Edition, ITP Delmar, New York, 2001
Harsany S.C., Introduction to Electronics, Prentice Hall, New Jersey, 2000

IX. OTHER SUPPLIES REQUIRED OF STUDENTS:
Scientific calculator.