ISET-1420: APPLIED ELECTRICITY II

Cuyahoga Community College

Viewing: ISET-1420 : Applied Electricity II

Board of Trustees:
December 2023

Academic Term:
Fall 2024

Subject Code
ISET - Integrated Systems Engineering

Course Number:
1420

Title:
Applied Electricity II

Catalog Description:
Principles and applications of electricity with emphasis on alternating current, inductors, capacitors, and phase relationships. Electrical quantities and units of measurements, Ohm's Law, Kirchoff's voltage and current laws, single and three phase transformers will also be included. Extensive guided instruction and practice provided.

Credit Hour(s):
3

Lecture Hour(s):
2

Lab Hour(s):
2

Requisites

Prerequisite and Corequisite
ISET-1410 Applied Electricity I, or departmental approval.

Outcomes

Course Outcome(s):
Apply principles of alternating current (AC) power in installation, maintenance and troubleshooting of circuits.

Objective(s):
1. Explain the phase relationship between voltage and current in an AC circuit.
2. Discuss and calculate frequency.
3. Explain magnetism.
4. Apply troubleshooting techniques for AC circuits.
5. Explain reactance in an AC circuit.
6. Describe Skin effect.
7. Explain, calculate and apply impedance.
8. Identify true, reactive, and apparent power.
9. Calculate power factor.
10. Define Capacitance and Inductance.
11. Calculate capacitive and inductive reactance.
12. Explain the relationship between voltage and current in capacitive and inductive AC Circuits.
13. Express AC values using trigonometry.
14. Define AC parameters of a right triangle using sine, cosine, tangent and the Pythagorean Theorem.
15. Discuss the advantages of Alternating Current over Direct Current.
16. Identify different waveforms.
17. Explain and calculate Sine wave values, RMS (Root Mean Square), peak-to-peak, and average values for installation and repair of AC circuits.
18. Describe power consumption in an AC circuit.

19. Calculate power consumed measured in watts for an AC circuit.

Course Outcome(s):

Apply the principles of mutual inductance in the design, installation, and troubleshooting of transformers.

Objective(s):

1. Analyze the operating principles for transformers (single & three-phase).
2. Identify different types of transformers.
3. Apply transformer calculations.
4. Identify Step-up or step-down transformers.
5. Explain transformer impedance.
6. Calculate maximum short circuit current.
7. Recognize different transformer connections for both single and three-phase transformers.
8. Identify Wye and Delta configurations.
9. Calculate current and voltage for three-phase Wye and Delta transformer configurations.
10. Apply transformer types for different applications.

Course Outcome(s):

Identify and resolve problems with harmonics on single & three-phase systems.

Objective(s):

1. Explain harmonics to internal/external customers.
2. Discuss harmonics in AC circuits.
3. List remedies for unwanted harmonics.
4. Apply troubleshooting procedures for harmonic analysis.

Methods of Evaluation:

1. Periodic Quizzes
2. Mid-course and final exams
3. Classroom participation
4. Completion and demonstration of assigned projects.

Course Content Outline:

1. CONCEPTS
    a. Matter (electrons)
    b. Ohm's Law
    c. Magnetism
    d. AWG (American Wire Guage)
    e. Conductors
    f. Overcurrent Protection
    g. KVL (Kirkoff Voltage Law)
    h. KCL(Kirkoff Current Law)
    i. Principles of Alternating Current (AC)
    j. Mutual inductance (transformers)
    k. Principles of single & three phase transformers
    l. Wye & Delta wiring configurations
    m. Root Mean Square (RMS)
    n. Peak, average, and effective values
    o. Reactance (Inductance, Capacitance, Impedence)
    p. Structure of power in an AC circuit
    q. Power Factor
        i. Harmonics
    r. Meter types and applications
    s. Work (NEC)
    t. Safety (codes)

u. Grounding
v. Flowcharting
w. Troubleshooting
x. Hand tools
y. Raceways
z. Measurement systems (U.S. Customary & Metric)

2. SKILLS
   a. Designing AC circuits
   b. Calculating circuit values (voltage, current, reactance, impedence, power, and power factor)
   c. Installing wire for circuits
   d. Reading instrumentation (meters)
   e. Troubleshooting (fundamentals)
   f. Creating troubleshooting flow charts
   g. Communication skills
   h. Safety rule application
   i. Customer Service
   j. Interpreting schematics and drawings
   k. Interpreting National Electric Code (NEC)
   l. Locating additional resources for materials & troubleshooting
   m. Identifying measuring and hand tools for specific jobs.
   n. Applying maintenance procedures
3. ISSUES
   a. Networking
   b. Safe installations
   c. Design for future growth
   d. Taking concept and applying it
   e. Troubleshooting
   f. Inability to identify problem
   g. Math

Resources

Boylestad, Robert L. (2022) *Introductory Circuit Analysis*, Printice Hall.

Floyd. (2022) *Principals of Electric Circuits*, Pearson.

Nilsson, J. W. and Riedel, S. (2023) *Electric Circuits*, Pearson.

Paynter and Boydell. (2009) *Electronics Technology Fundamentals,*Pearson.

Robbins, A. H. and Miller, W. C. (2013) *Circuit Analysis, Theory and Practice,*Delman Cengage Learning.

Thomas Kubala. *Electricity I, Devices, Circuits, Materials.* 10th Ed. Delmar Cengage Learning, 2013.

Resources Other

1. Amatrol Software

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Key: 2441