COURSE OUTLINE
ENES-204
Basic Circuit Theory
3 Credits

HOWARD COMMUNITY COLLEGE

Description

The student will review the I-V relationships of resistors, capacitors, inductors, sources, op-amps, and transformers. The student will perform circuit analysis using Kirchoff's laws, node and mesh analysis, superposition, Thevenin and Norton theorems. The student will also perform DC and AC steady state and impulse analysis for first and second order circuits using Laplace Transforms and the Convolution Integral. Prerequisite: PHYS-111; Co-requisite: MATH-260. (3 hours weekly)

Overall Course Objectives

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

1. Discuss the variables in network, and explain their relationships.
2. Apply Kirchhoff's Laws to determine unknown voltages and currents.
3. Solve for the equivalent resistance of a network of series/parallel connections of resistors.
4. Explain the difference between independent and dependent power sources.
5. Use matrix-oriented methods to analyze a network.
6. Use node analysis to determine unknown voltages.
7. Use mesh analysis to determine unknown currents.
8. Discuss the Thevenin and Norton's theorems and apply them to the analysis of resistance networks.
9. Describe the behavior of a capacitor in terms of current/voltage equations.
10. Describe the behavior of an inductor in terms of current/voltage equation.
11. Compute the equivalent capacitance of a network of series/parallel connections of capacitors.
12. Compute the equivalent inductance of a network of series/parallel connections of capacitors.
13. Explain the behavior of coupled coils and their application to a transformer.
14. Using first order differential equations, determine unknown voltages and currents in a network excited by initial conditions only, or by initial conditions and sources.
15. Specify the value of an impulse that would generate desired initial conditions.
16. Using second order differential equations, determine unknown voltages and currents in a network excited by initial conditions only, or by initial conditions and sources.

Major Topics

I. Resistances
   - A. Network Variables
   - B. Reference Directions
   - C. Kirchhoff's Laws
   - D. Sources
   - E. Resistance Networks

II. Circuit Theorems
   A. Node Analysis
   B. Mesh Analysis
   C. Networks Containing Independent Sources
   D. Networks Containing Dependent Sources
   E. Thevenin's Theorem
   F. Norton's Theorem

III. Reactive Elements
   A. The Capacitor
   B. The Inductor
   C. Series and Parallel Combinations of Capacitors and Inductors
   D. Coupled Coils - Mutual Inductance

IV. Networks
   A. Excitation by Initial Conditions
   B. Excitation by Initial Conditions and Sources
   C. Response to Sources with Constant Excitation
   D. Use of Impulses to Generate Initial Conditions

Course Requirements

Grading/exams: Grading procedures will be determined by the individual faculty member but will be based on homework, quizzes, unit tests, writing assignments and a final exam.