EE 220

Electrical Engineering Program

1. **Course Number & Name:** EE 220, Electric Circuits

2. **Course Credit and Contact Hours:** 3 Unit, 3 hours

3. **Course Coordinator:** Mohamed Salem


5. **Supplemental Materials:** N/A

6. **Specific Course Information:**
   
a. **Description:** Review of Kirchhoff’s laws, circuit design, node and mesh analysis, etc.; Thevenin’s theorem, Norton’s theorem, steady state and transient analysis, transfer function. AC power and three-phase circuits, Y-Delta equivalents. Multi-port networks, two-port networks with energy storage, ideal transformers. Amplifiers and frequency response, filters.

b. **Prerequisites:** EE 110, CS 115, and MATH 211; or consent of Instructor

c. **Co-Requisite:** EE 221 and PHYS 214; or consent of Instructor

d. **Status:** ☑ Required for EE program, ☐ Elective, ☐ Selected Elective

7. **Specific Goals for the Course:**
   
a. **Specific outcomes of instruction:** Upon successful completion of this course the students will be able to:

   i. Analyze circuit problems involving voltage, current, charge, and power.

   ii. Understand and apply basic circuit laws and analyze DC circuits using nodal and mesh analysis methods.

   iii. Apply superposition, source transformation, Thevenin’s & Norton’s theorems.

   iv. Analyze linear circuits with ideal operational amplifiers.

   v. Understand current and voltage characteristics of capacitors and inductors and their use in basic circuits.

   vi. Determine transient responses of first order RC and RL circuits.

   vii. Use phasors for steady-state sinusoidal circuit analysis.

   viii. Understand the basics of instantaneous, average, effective, and complex power; power factor, and three-phase circuits.
ix. Understand the basics of ideal transformers.

x. Determine transfer function and frequency response of first order circuit.

xi. Understand and articulate public health, safety, and welfare considerations in engineering design solutions.

b. This course supports the following ABET Student Outcomes:

i. SO-1: an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

ii. SO-2: an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

8. Brief List of Topics to be Covered:

a. Basic Concepts

b. Basic Laws: Ohm’s Law, Kirchhoff’s Laws, Series and Parallel Resistors

c. Methods of Analysis: Nodal Analysis, Mesh Analysis

d. Circuit Theorems: Superposition, Source Transformation, Thevenin’s & Norton’s Theorems

e. Operational Amplifier

f. Capacitors and Inductors

g. First-Order Circuits: RC and RL Circuits, Transients & Steady State Analysis

h. Sinusoids and Phasors

i. AC Power Analysis and Three-Phase Circuits

j. Transformers

k. Frequency Response: Transfer Function, Bode Plots, Passive Filters

l. Engineering Design and Public Health, Safety, and Welfare