**EECE 3001 Electric Circuits and Machinery**

**Class schedule** – Three Credits

**Course Coordinator** – EECE Dept. Chair

**Course Materials**

* Giorgio Rizzoni, “Principles and Applications of Electrical Engineering”, 5th edition, McGraw-Hill, 2007

**Course Information:**

Circuit modeling; basic solution methods for d-c and a-c circuits; d-c and a-c machines. May not be taken for credit by EECE students.

**Prerequisites:** none

**Elective:** Cross-disciplinary engineering in Civil and Mechanical Engineering

**Contribution to Professional Component:** Engineering Science 100%

**Course Goals:**

* Introduce basic electric quantities such as *current, voltage, and power*.
* Introduce linear, lumped circuit elements: *resistance, inductance, and capacitance*.
* Introduce independent and dependent, ideal *voltage sources, and current sources*.
* Introduce basic circuit theorems: *Ohm’s Law, Kirchoff’s Voltage Law, and Kirchoff’s Current Law*.
* Introduce basic circuit analysis techniques: *Voltage dividers, Current dividers, Mesh Currents, Node Voltages, Superposition, Thevenin’s Theorem, and Norton’s Theorem*.
* Introduce the fundamental concepts of Sinusoidal, Steady-State, AC analysis including *phasors and frequency domain techniques*.
* Apply the above goals to analyze DC and AC circuits.
* Introduce balanced 3φ circuit analysis.
* Introduce the Natural and Step responses of first order RL and RC circuits.
* Introduce the Natural and Step responses of second order RLC circuits.
* Introduce magnetic field concepts such as *magnetic flux density, magnetic field intensity, Gauss’ Law, Ampere’s Law, Faraday’s Law, and the Lorentz Force Law*.
* Analyze simple magnetic circuits.
* Model and analyze ideal, linear transformer circuits.
* Introduce the principle of translational and rotational electromechanical energy conversion.
* Introduce the concept of rotating magnetic flux.
* Provide an overview of the operating principles of DC machines, AC synchronous machines, and AC induction machines.
* Provide an overview of the modeling and analysis of rotating machines.

**Course Objectives:**

By the end of this course, you should be able to ...

* Be able to express the electrical characteristics of voltage sources, current sources, resistors, inductors, and capacitors.
* Be able to apply phasors to represent sinusoidal steady state signals.
* Be able to compute the impedance of resistors, capacitors, and inductors.
* Be able to compute the RMS value of an arbitrary periodic function of time.
* Be able to compute the power in both DC and AC circuits.
* Be able to express complex power and power factor in AC circuits.
* Be able to apply Ohm’s law to DC and AC circuits.
* Be able to apply Kirchoff’s circuit laws to both DC and AC circuits.
* Be able to apply standard circuit analysis techniques to both DC and AC circuits.
* Be able to compute the power in a balanced 3φ circuit.
* Be able to solve first order RL and RC circuits.
* Be able to solve second order RLC circuits.
* Be able to discuss magnetic field concepts as applied to magnetic circuits.
* Be able to compute voltages and currents for an ideal, linear transformer.
* Understand the elementary circuit model that shows the electromechanical energy conversion principle in a rotating machine.
* Be able to discuss the differences between DC, AC synchronous, and AC induction machines.

**Partial fulfillment of Criterion 3 objectives A, E, G, and K.**

**Course Topics**

* Chap 1 Introduction
* Chap 2 Fundamental of Electric Circuits
* Chap 3 DC circuit analysis
* Chap 4 AC circuit analysis
* Chap 7 Power in AC circuits
* Chap 5 Transient analysis
* Chap 18 Magnetic principles and magnetic circuits
* Chap 19 Electric Machines
* Chap 6 Frequency Response (if time permits)