**ELEN 3210: Electric Drives**

**Class Schedule:** 3 Credit course, meeting the equivalent of 3-50 minute class periods per week.

**Course Coordinator**: Dr. Nathan Weise

**Course Materials:**

**Required:** Kingsley A. Fitzgerald, & Umans, Electric Machinery, 6th Edition, McGraw-Hill, 2003.

**Course Description:**

Application of electromagnetic field and circuit theory to electromechanical energy conversion systems. Solutions for the magnetic fields, electromagnetic and electrostatic induced forces, and equivalent circuits using conservation of energy principles. Operation of electric machinery from solid-state power switching converters.

**Prerequisites:**  ELEN 3110.

**Selected Elective** in Power and Energy Systems area.

**Contribution to Professional Component:**

Engineering Science 80%

Engineering Design 20%

**Course Goals:**

To introduce the student to the principles of electromechanical energy conversion, including magnetic circuits, and AC and DC machines, including the parameters associated with machines and similar devices, such as torque, efficiency, and equivalent circuit parameters.

**Course Objectives:**

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

1. compute the magnetomotive forces and flux distributions and induced electromotive forces associated with windings in AC polyphase-induction machines. AC polyphase-synchronous machines, DC brush-type and brushless-type machines, as well as other devices of similar nature.
2. compute input power, output power, losses, efficiencies and torques in AC polyphase-induction and synchronous machines, as well as in brushless and brush-type DC machines, and other devices of similar nature.
3. compute equivalent circuit parameters from physical geometries and design particulars of AC and DC machines.
4. compute torque-speed characteristics and other related motor performance for AC induction and synchronous motors, as well as DC brush and brushless motors in adjustable speed drives.
5. relate equivalent electric circuit parameters and their calculations to electromagnetic field qualities and phenomenon in the magnetic circuits of electromechanical energy conversion devices.
6. properly select motors and generators for a given practical engineering application and carry out the necessary performance assessment computations.

**Contribution to Program Objectives:**

Partial fulfillment of Criterion 3 objectives A, B, C, E, G, I, K

**Course Topics:**

Magnetic Circuits and Magnetic Materials (chapter 1)

Electromechanical Energy Conversion Principles (chapter 3)

Basics of Power Electronic Energy and Power Conditioning for Electric Motors and Generators (chapter 10)

Basic Concepts of Rotating Electric Machines (chapter 4)

Polyphase AC Induction Machines (chapter 6)

Brush-type and Brushless-Type DC Machines (chapter 7)

Polyphase AC Synchronous Machines (chapter 5)

Single-phase AC Induction, Commutator- (chapter 9)

Type and Other Special Machines (chapter 8)

Modern Trends in State-of-the-Art

Developments in Electric Machines and Drives

Last modified: December 4, 2017