

EEL 4220 Electrical Machines

1. **Credits:** 3
2. **Text book, title, author, and year:** Chapman, S. J., Electric Machinery Fundamentals, Fifth Edition, WCB/McGraw–Hill, 2012
 - a. **Supplemental materials:** Handouts and notes
3. **Specific course information**
 - a. **Brief description of the content of the course:** Transformers, 3-phase distribution systems, 3-phase motors and generators, dc motors and generators, motor speed control, single phase ac motors.
 - b. **Prerequisites:** EEL 3111 Circuits 1 **Co-requisites:** EEL 3112 Circuits 2
 - c. **Required, elective, or selected elective:** Elective

4. Specific goals for the course

Specific outcomes of instruction:

The student will understand how Ampere's law and Faraday's law applied to an analysis of magnetic circuits.

The student will understand the hysteresis and loss mechanisms in magnetic circuits.

The student will learn a transformer connection, dot convention, and simple technique to improve power factor on power line system.

The student will understand the concepts of 3 Φ synchronous machines, induction machines.

The student will understand the behavior of DC motors and Generators.

The student will calculate real and reactive power and perform power factor correction in ac circuits.

The student will be able to effectively communicate in writing answers to qualitative questions on tests.

5. Brief list of topics to be covered

Review network analysis, three–phase balanced systems, three–phase power

Magnetic Circuits, Hysteresis, Faraday's and Ampere's Laws

Ideal Transformers, Practical Transformers and Models

Three-phase transformers and the autotransformer

AC Machine Fundamentals, AC Machine Torque, Power and Losses, Synchronous Machine

Basic Induction Motor Concepts, Speed Control and Induction Motor

DC Machine Fundamentals, DC Motor Types

Single Phase

Stepper motors