THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Electric Machines

ECE 5041

Credit Hours:
3.00

Course Levels:
Undergraduate (1000-5000 level)
Graduate (5000-8000 level)

Course Components:
Lecture

Course Description:
Principles of electromechanical energy conversion; basic structures of electric machines; steady state models and performance analysis; advanced topics on AC machine control.

Prerequisites and Co-requisites:
Prereq: 3020 (323) and 3040 (341), or Grad standing in Engineering, Biological Sciences, or Math and Physical Sciences.

Course Goals / Objectives:
- Master analyzing the steady-state and dynamic performance of different kinds of machines including: synchronous, induction and dc machines.
- Be competent with using phasor analysis to analyze the steady-state performance of ac circuits and devices.
- Be competent with the magnetic material properties .
- Be competent with device modeling with windings associated with magnetic coupling.
- Be competent understanding the relationship and interactions between electric equivalent circuit model and magnetic equivalent circuit model.
- Be competent with the concept of time-varying transformations in the analysis of time-varying systems.
- Be competent with the field-oriented control of induction machines.

Course Topics:

- Introduction to electromechanical energy conversion, principles of electric machines
- General structure and major components of electric machine; derivation of steady state model of electric machines and other electromechanical devices
- Steady state performance analysis of electric machine and other electromechanical devices
- Variable speed control and operation of electric machines
- Matrix representation of magnetic coupling of windings
- Dynamic modeling and simulation of AC machines
- Interface of AC machine with voltage source converters
- AC machine with power electronics control
- Torque and speed capability of AC machine drives
- Vector control of AC machines
- Special topics on permanent magnetic machines and control

Designation:

Elective