Electrical Engineering 575: Analysis Of Electric Machines And Motor Drives

Course Description: 3 cr. U/g. Effective summer 2001, analysis of DC machines, induction and synchronous machines, single phase motors, phase controlled DC machines, chopper controlled DC machines, switched reluctance machines, brushless DC machines, stepper motors, vector control induction machines. Prereq: jr st, eleceng 331(p) & 362(p).

Textbook:
1- *Electric Motor Drives: Modeling, Analysis, and Control*, By: R. Krishnan, 1st Edition, Prentice Hall, 2001.
2- *Fundamentals of Electric Drives*, By: M. A. El-Sharkawi, 1st Edition, PWS Pub. Co., 2000.

Prerequisites by Topics:

- Fundamental electric circuit analysis
- Fundamental electric machinery analysis
- Concepts of power electronic circuits

Course Learning Outcomes:

- Students will be able to analyze torque-speed characteristics of DC machines, induction and synchronous machines.
- Students will be able to analyze single-phase motors.
- Students will be able to analyze phase-controlled and chopper-controlled DC drive circuits.
- Students will be able to analyze switched reluctance motor and generators.
- Students will be able to analyze brushless DC motor and generators.
- Students will be able to analyze the basic of stepper motors and drives.
- Students will be able to apply reference-frame theory to the analysis of induction motors.
- Students will be able to predict motor drive performance using simulation software (Matlab Simulink).

Topics Covered:

- Mechanical system analysis
- Torque-speed characteristics of DC and AC machines
- Single-phase motors
- Switched reluctance motor analysis
- Permanent-magnet machine analysis
- Basics of stepper motor analysis
- Induction motor analysis
- Computer simulation of electric machinery

Class/Laboratory Schedule: 42 lectures

Contribution of Course to Meeting the Professional Component:

This course contributes to the engineering sciences component of the curriculum. Students learn fundamental electrical engineering science concepts related to electric machines and industrial motor drives.

Relationship to Program Objectives:

Program
Outcome   Explanation

    iii.   Students will develop understanding of DC machines, switched reluctance motors, permanent-magnet, and induction machines as well as drive and control circuits.

    iv.   Students will complete projects involving open-ended problems.

    vi, vii.   Students will use Matlab Simulink to predict motor drive performance.

    xiii.   Student project will require electrical and mechanical system design.

Prepared by: Adel Nasiri, December 08, 2005.

Methods of Assessment:

- Graded homework
- Graded examinations
- Course evaluation by students
- Instructor judgment

Resources Commonly Available:

- Instructor
- Simulink software

Desirable Student Competencies:

- Phasor analysis, ordinary differential equations