Faculty of Engineering and Technology

Department of Electrical and Computer Engineering

ENEE 5303 – Electrical Machine Drive and Special Machines

1st semester 2017/2018

Course Outline

Instructor
• Dr. Mahran Quraan
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Office Hours
• N/A

Teaching Assistant
• N/A

Contact Hours
• 3 credit hours
• Lectures:
3 hours x 16 weeks = 48 hours

Prerequisites:
• ENEE 3305
Power Electronics
• ENEE 2408
Electrical Machines

Course Website:
N/A

Important Dates

Evaluation

Exams 40%
Final Exam 45%
Activity and Assignments 15%

Course description and objectives

A course focuses on the analysis and design of electric motor drives. Major topics include: rectifier drives, chopper drives, voltage controller drives, slip energy recovery drives, voltage source inverter `drives, current source inverter drives, cycloconverter drives. The course focuses on the analysis of the steady state operation of drive systems that allows the specification of suitable converters and machines for the speed and position control system encountered. Transient operation is discussed but not studied in detail. At the end of this course, the successful student will be able to analysis motor drive system performance using concept of various engineering knowledge, design the motor drive system based on the engineering requirements, be familiar with system modeling and simulation, be familiar with power converters used for drive systems. and be familiar with various programming methods of popular types of PLC's such as Siemens and Mitsubishi

Course Content

The following topics will be covered:
• DC motor drives
• Induction motor drives
• Synchronous motor drives
• Control of special electric machines
• Programmable logic controllers PLCs

Textbook

"Electric Motor Drives, Modeling, Analysis and Control" by R. Krishnan, published by Prentice Hall, 2001.
"Programmable Logic Controllers" by W. Bolton, NEWNES 2006

Learning Outcomes

1. Develop and analyze a dynamic model of a separately excited dc motor model, its control structure and design current, speed and position controllers for both constant torque and constant power operation.
2. Identify and analyze different chopper topologies for to drive a separately excited dc motor in different quadrants.
3. Develop and analyze an induction motor model suitable for a scalar controller and the different speed control schemes.
4. Develop and analyze dynamic model of an induction motor using space phasor and reference frame theory approach suitable for vector control of induction motor for improved transient performance.
5. Have good knowledge about the operation and drive of some special purpose motors such as stepper motor, switched reluctance motor, brushless dc motor, and permanent magnet synchronous motor
6. Learn various programming methods of popular types of PLC's such as Siemens and Mitsubishi