

## *Electric Machines and Drives*

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### *Course Syllabus*

<u>Lec</u>	<u>Date</u>	<u>Topic</u>	<u>Assignment</u>
1	10/3	Course Overview, Background Material, Physics of DC Machines – Theory of Operation	Software tools review
2	10/10	Dynamics of DC Machines – Modeling, Root Locus Methods, Introduction to AC Machines	Hand out HW #1
3	10/17	Induction Machine Per Phase Equivalent Circuit, Speed-Torque Curve of Induction Machines, Per Unit Representation, V/Hz Control of Induction Machines, Coupled Circuit Modeling of AC Machines, Winding Functions, AC Machine Inductance Calculations	Hand in HW #1, Hand out HW #2
4	10/24	Space Harmonics in AC Machines, Flux Linkages in 3 $\phi$ Machines, Modeling of 3 $\phi$ Machines	Hand in HW #2
5	10/31	Midterm Exam	
6	11/7	Complex Vector Modeling of AC Machines, Coordinate Transformations, dq Modeling of AC Machines, dq Equivalent Circuits, Block Diagrams of AC Machines, Power Flow in 3 $\phi$ Machines, Torque Production in 3 $\phi$ Machines	Hand out HW#3
7	11/14	Physical Interpretation of Torque Production in 3 $\phi$ Machines, dq Theory Applied to Salient Pole Machines, Torque Production in Salient Pole Machines, Extension of dq Theory Applied to PM Machines, Introduction to Field Orientation	Hand in HW #3 Hand out HW#4 Hand out Final Project
8	11/21	Steady State and Dynamic Field Orientation of Induction Machines, Direct FOC, Indirect FOC, Current Regulation in DC Machines, Speed Control, Current Regulation in AC Machines	Hand in HW #4
9	11/28	Brushless DC (BLDC) Machines, Direct Torque Control, Fundamentals of Inverters for Machine Control	
10	12/5	Review of Pulse Width Modulation Techniques, Course Review Final Project Submittal	
11	12/12	Final Exam	Turn in Final Project

#### **Student Evaluation**

Homework- 33.3%

Midterm- 33.3%

Final Project- 33.3%

#### **Learning Objectives**

- Understand the physics of DC and AC machines, how they are similar, and how they are different
- Understand techniques to control the electromagnetic torque of the machine using their understanding of physics of machines
- Analyze the performance of electric machine and drive systems
- Simulate machine and drive system dynamics
- Understand the design of controllers for electric machines and drive systems