

ECE 4391: Electric Machines and Drives

Credit / Contact hours: 3 / 3

Course coordinator: Michael Giesselmann

Textbook(s) and/or other required material: A. M. Trzynadlowski, Control of Induction Motors, Academic Press 2001

Catalog description: Analysis and control of DC machines and induction machines. Space vector theory. Field oriented control. Modeling of machine and controller dynamics. Pre-requisite(s) or co-requisites: ECE 3341.

Designation: Elective

Software use: MathCAD & LTSpice

Course learning outcomes: Upon completion of this course, students should be able to do the following:

1. Analyze the dynamics and control of DC machines.
2. Analyze the dynamics and control of 3-phase induction machines.
3. Develop and validate models for machines.
4. Develop and validate models for complete drive systems.

Student outcomes addressed: a, e, and k.

Topics covered:

Analysis of permanent magnet and shunt field DC machines – 4 hours

Steady state and dynamic models of DC machines – 3 hours

Closed loop control of DC machines – 3 hours

Steady state models of AC induction machines – 4 hours

Reference frame theory and transformations – 4 hours

Dynamic models of AC induction machines; model validation – 5 hours

V/f control of induction machines – 4 hours

Direct field oriented (Vector) control of induction machines – 4 hours

Indirect field oriented (Vector) control of AC induction machines – 5 hours

Sensorless field oriented (Vector) control of AC induction machines – 3 hours

Tests and reviews – 3 hours