

Spring Quarter - 2026

EE 546- Electric Drives

Course Logistics:

Date: Mondays 6:30pm – 9:20pm

Room: ECE 003

Instructor: Prof. Nagel (nnagel@uw.edu)

Course Objectives:

- To review the basics of power electronics
- To develop techniques to control the electromagnetic torque of the machine using our understanding of physics of machines and power electronics
- To provide the student with sufficient background to understand and apply the tremendous wealth of knowledge presented in IEEE publications on this topic
- To provide specific application examples of motors and drives (Robotics, Automation, and Electric Vehicles)

Course Syllabus – Spring 2026

<u>Class</u>	<u>Date</u>	<u>Topic</u>	<u>Lectures</u>	<u>Assignment</u>
1	3/30	Course Overview, Background Material, Electric Drives Overview	L1a, L1b, L2	Software tools review
2	4/6	Power Electronics Overview, Power Electronics Switching Operation, MOSFET Supplemental Video	L3, L4, SV1	Hand out HW #1
3	4/13	AC-DC Converters for DC Drives, DC Machines Supplemental Video, DC/DC Converters – Buck, Buck Converter Supplemental Video	L5, SV2, L6, SV3	Hand in HW #1, Hand out HW #2
4	4/20	DC/DC Converters – Boost, DC/DC Converters for DC Drives, DC/AC Inverters, Boost Converter Supplemental Video	L7, L8, SV4	Hand in HW #2 Hand out HW#3
5	4/27	DC/AC Inverters, DC/AC Inverters Supplemental Video	L9, L10, SV5	Hand in HW #3
6	5/4	DC/AC Inverters cont., Volts per Hertz IM Drive	L11, L12	Midterm
7	5/11	DC Machine Current Regulation, BLDC Machine Control	L13, L14	Hand out HW#4
8	5/18	AC Machine Current Regulation, Practical Considerations in Drives, Double Pulse Testing Supplemental Video	L15, L16, SV6	Hand in HW #4 Hand out HW #5
9	5/25	Memorial Day – no class Active Rectifier, Device Physics, PN Junction Supplemental Video	L17, L18, SV7	Hand out Final Project
10	6/1	Device Physics cont.	L19	Hand in HW #5
11	6/8	Final week – no class, just Final Project submittal		Turn in Final Project

Reference Text Books:

1. *Introduction to Electric Machines and Drives*, D.W. Novotny, T.A. Lipo, and T. M. Jahns, Wisconsin Power Electronics Research Center, Madison, WI, 2009.

2. *Fundamentals of Power Electronics*, 2nd Addition, R W. Erickson, D Maksimovic Kluwer Academic Publishers, NY, 2004.
3. *Power Electronics Converters, Applications, and Design*, 2nd Addition, N. Mohan, T. M. Undeland, and W. P. John Wiley & Sons, Inc., NY, 1995.
4. *Fundamentals of Electric Drives*, Mohamed A. El-Sharkawi, Brooks/Cole, Pacific Grove, Ca, 2000.
5. *Brushless Permanent Magnet and Reluctance Motor Drives*, T. J. E. Miller, Magna Physics Publishing, Madison, WI, 1993.

Prerequisites: EE 453 or similar, or consent of instructor

Grading:	HW	50%
	Midterm Exam	25%
	Final Project	25%

Initial tasks:

- Download PLECS Standalone from Plexim. Follow the instructions [here](#) to get a license. (Note: if you have PLECS from the Winter quarter, you do not need to do this again.)
- Begin watching lectures from Week 1 in the **Modules** section.