Fall 2026 - Syllabus

EENG 4580/5580 - Power Electronics

Class meetings: Tuesday and Thursday, TuTh 6:30PM - 7:50PM NTDP D201

Description

The aims of this course are to present the use of electronic devices to control and convert electric power. The basic principles of power conversion techniques and their applications will be introduced. Students will obtain the fundamental knowledge to simulate and model different power electronics converters. Credit hours: 3 hrs.

Prerequisite(s): EENG 3520 Electronics II.

Instructor

Sensong An, Assistant Professor, Electrical Engineering Department

Office E255A, Email Sensong.An@unt.edu, Office hours: by appointment.

Teaching Assistant

Dheeraj Pappula DheerajPappula@my.unt.edu

Format

- Lectures, based on the instructor's lecture notes (posted on Canvas)
- Online: announcements, grades and homework submission via Canvas

Grade

Homework: 25%

Final Project: 25%

Mid-term Test 1: 25%

Mid-term Test 2: 25%

Homework policy:

- Students have one week to submit each assignment after it is released. Homework is submitted through Canvas; only PDF or Word format is accepted.
- Homework turned in late will be penalized 50%. No homework is accepted after 24 hours.
- Students have one week to contest any grade once the grade is posted.
- Other than the group project, students should work independently.

Grade distribution

A=90-100, B=80-89, C=70-79, D=60-69, F=0-59

Schedules of exams

Mid-term Test 1: Tuesday, October 6, 2026

Mid-term Test 2: Tuesday, November 10, 2026

Final Project: presentations during the last week of classes; final report due during finals week (December 7-11, 2026). There is no final exam for this course.

Textbooks

Recommended: Ned Mohan, Tore M. Undeland, and William P. Robbins, Power Electronics: Converters, Applications, and Design, 3rd Edition, Wiley, 2002.

Lecture notes provided by the instructor serve as the primary course material.

Class Evaluation by Students

Student Perceptions of Teaching (SPOT) is a requirement for all organized classes at UNT and is available for your input at the end of the semester.

Topics

- Introduction to Power Electronics Systems (Lectures 0-1)
- DC-DC Converters (Lectures 2-4)
- AC-DC Rectifiers (Lectures 5-6)
- DC-AC Inverters (Lectures 7-9)
- Power Semiconductor Switches (Lectures 10-11)
- Cooling System and Thermal Model (Lecture 12)
- Basic Electrical and Magnetic Circuit Concepts (Lecture 13)
- Fundamentals of Feedback Control for Power Electronics (Lectures 14-16)
- Applications of Power Electronic Converters: EVs and UPS (Lectures 17-18)
- Practical Converter Design Considerations (Lecture 19)
- Power Electronics Simulation with MATLAB/Simulink (Lecture X)

Policies

Grades: All grades for the course will be final. No extra credit assignments or work will be considered after the final grade has been recorded.

Attendance: Attendance is required and will be recorded in each class. Students aware of an authorized absence (religious observance, military service, official university function, etc.) should notify the instructor as soon as possible according to UNT Policy 15.2.5. Students are expected to communicate to the instructor any issue regarding their performance in class ahead of time.

Accommodations: The EE Department in cooperation with the Office of Disability Accommodation complies with the Americans with Disabilities Act in making reasonable accommodations for qualified students with disabilities. Please present your written accommodation request before the 12th class day.

Academic Dishonesty: Students caught cheating, plagiarizing, or any other academic dishonesty will be subject to penalty according to the Policy on Student Standards of Academic Integrity. See full policy at http://www.unt.edu/policy/UNT_Policy/volume3/18_1_16.pdf

According to this policy the categories of academic dishonesty are:

- Cheating. The use of unauthorized assistance in an academic exercise, including but not limited to: use of any unauthorized assistance to take exams, tests, quizzes or other assessments; dependence upon the aid of sources beyond those authorized by the instructor in writing papers, preparing reports, solving problems or carrying out other assignments; acquisition, without permission, of tests, notes or other academic materials belonging to a faculty or staff member of the University; dual submission of a paper or project, or re-submission of a paper or project to a different class without express permission from the instructor; any other act designed to give a student an unfair advantage on an academic assignment.
- Plagiarism. Use of another's thoughts or words without proper attribution in any academic exercise.
- Forgery. Altering a score, grade or official academic university record or forging the signature of an instructor or other student.
- Fabrication. Falsifying or inventing any information, data or research as part of an academic exercise.

- Facilitating Academic Dishonesty. Helping or assisting another in the commission of academic dishonesty.
- Sabotage. Acting to prevent others from completing their work or willfully disrupting the academic work of others.

Tentative Course Calendar

Week	Date	Topics	Lecture Notes
1	08/18	Course overview; Introduction to Power Electronics	Lectures 0–1
	08/20	Introduction to Power Electronics (cont.)	Lecture 1
2	08/25	DC-DC Converter – Part 1	Lecture 2
	08/27	DC-DC Converter – Part 1 (cont.)	Lecture 2
3	09/01	DC-DC Converter – Part 2	Lecture 3
	09/03	DC-DC Converter – Part 3	Lecture 4
4	09/08	AC-DC Rectifier (Line Frequency) – Part 1	Lecture 5
	09/10	AC-DC Rectifier (Line Frequency) – Part 1 (cont.)	Lecture 5
5	09/15	AC-DC Rectifier (Line Frequency) – Part 2	Lecture 6
	09/17	AC-DC Rectifier (Line Frequency) – Part 2 (cont.)	Lecture 6
6	09/22	DC-AC Inverter – Part 1	Lecture 7
	09/24	DC-AC Inverter – Part 2	Lecture 8
7	09/29	DC-AC Inverter – Part 3	Lecture 9
	10/01	Converter review / Mid-term 1 review	Lectures 1–9
8	10/06	Mid-term Test 1	
	10/08	Power Electronics Switches – Part 1	Lecture 10
9	10/13	Power Electronics Switches – Part 2	Lecture 11
	10/15	Cooling System – Thermal Model	Lecture 12
10	10/20	Basic Magnetic Concept	Lecture 13
	10/22	Basic Magnetic Concept (cont.)	Lecture 13
11	10/27	Basic Control Theory for Power Electronics – Part 1	Lecture 14
	10/29	Basic Control Theory for Power Electronics – Part 2	Lecture 15
12	11/03	Basic Control Theory for Power Electronics – Part 3	Lecture 16
	11/05	Mid-term 2 review	Lectures 10–16
13	11/10	Mid-term Test 2	
	11/12	Application: Bidirectional DC-DC Converters for EVs	Lecture 17
14	11/17	Application: Uninterrupted Power Supply (UPS)	Lecture 18
	11/19	Practical Converter Design Consideration – Gate Driver	Lecture 19
15	11/24	Thanksgiving Break – No Class	
	11/26	Thanksgiving Break – No Class	
16	12/01	Final project presentations	

Week	Date	Topics	Lecture Notes
	12/03	Final project presentations / Course wrap-up	
TBD		Final project report due during finals week (Dec 7–11, per UNT final exam schedule)	