

Syllabus for ECE 4330: Power Electronics

Fall 2026



Course Information:

This course will introduce students to the broad, interdisciplinary field of power electronics – the study of techniques for converting electrical power from its available form to the desired form using power semiconductor switches. Power electronics has become ubiquitous – from the wall-warts that power smartphones to computers, electric vehicles, renewable energy conversion, energy storage, industrial factory automation, robotics, trains, planes, and grid control – power electronics is everywhere. If you plan to specialize in power and energy, this course will provide the foundation and first principles you need to succeed in your career. Even if you do not plan to specialize in power, this course will provide you with the basics to talk knowledgeably about energy and its relationship to diverse fields, from equipment design to power grid operations.

Instructor: Dr. Richard Asiamah, asiamah@gatech.edu

Lecture time & place: Tue/Thu 09:30–10:45 AM, Van Leer C240

Drop-in hours: Wed 11 – 12 noon, Van Leer W324 or by request

Textbook (required): N. Mohan, S. Raju, “Power Electronics – A First Course”, Wiley, 2nd ed., 2023. ISBN 978-1-119-81856-4

Online resources: Canvas™ Learning Management System: <http://canvas.gatech.edu>. Check daily for updates, or set notifications to be pushed to email/messenger.

Grading:	20%	Homework
	20%	First Midterm
	20%	Second Midterm
	20%	Design Project
	20%	Final Exam

Your final numeric grade, expressed as a percent of the maximum possible numeric grade, will be converted to a final letter grade based on the following table. Cutoff values are the same for all students. The instructor reserves the right to adjust the minimum cutoffs below.

Letter	A	B	C	D	F
Grade	90	80	70	60	0

Attendance: You are strongly encouraged to keep up with the rhythm of lectures and assignments. Missed lectures make it very difficult to catch up. Lectures will not be recorded, and there is no plan to allow for remote participation. While lecture attendance is **very strongly encouraged**, it will not be verified.

If, for some extremely important, verifiable reason (i.e., written excuse from a doctor, etc.), you cannot take any of the exams at the scheduled time, the instructor must be notified **prior** to the exam time, so proper arrangements can be made to administer the exam. *No excuses after the date of the exam will be considered. No makeup exams will be given unless you notify Dr. Asiamah via email prior to the scheduled time and have a legitimate excuse for absence.* There will be no dropping of any exam grades. Failure to complete an exam will result in a score of zero.

Course Objective: This course covers the fundamentals of power electronics. It is intended to enable students to understand a wide range of existing and emerging power conversion techniques, to move toward a specialization in the area, and/or to effectively specify and utilize power converters.

Prerequisites: The topics covered in Electrical Energy Systems (ECE 3072), especially AC analysis, 3-phase power, power transformers, and synchronous generators. In addition, we expect you to be very familiar with time- and frequency-domain circuit analysis, and with the basics of semiconductor devices.

Homework: Homework due dates will be announced on Canvas™ and submitted on Canvas™ through Gradescope. Homework may be solved in groups, provided that all in the group participate fully. The use of AI tools is also permitted, provided the directions provided in the Homework instructions document are followed. Copying of any kind, from classmates' work or from AI, is not permitted. If copying on homework is suspected, no credit will be given. In general, **late homework will not be accepted.**

Academic Honesty: Suspected cases of academic misconduct, as defined in the Georgia Tech Student Honor Code, will be turned over to the Office of Student Integrity (OSI).

Student-Faculty Expectations Agreement: At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgment, and responsibility between faculty members and the student body. See <http://www.catalog.gatech.edu/rules/22/> for an articulation of some basic expectations that you can have of us and that we have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, we encourage you to remain committed to the ideals of Georgia Tech while in this class.

Accommodations for Students with Disabilities: At Georgia Tech, we strive to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, please contact Dr. Hughes to discuss options. If you have already established accommodations with the Office of Disability Services, please communicate your approved accommodations at your earliest convenience so we can discuss your needs in this course. If you have not yet established services through Disability Services, you are welcome to contact that office at 404-894-2563, dsinfo@gatech.edu, or <http://disabilityservices.gatech.edu>.

Artificial Intelligence Use Agreements: In this course, the use of artificial intelligence (AI) tools is welcomed as an educational resource. For all take-home work, including homework sets and the design project, you may use AI tools to brainstorm, get concepts explained, check your work, and improve your writing. Use of AI is entirely optional, and office hours remain available for homework help regardless of whether you use it. If you use AI tools, following the process described in the Homework Instructions document is highly recommended. AI tools are not permitted during in-person assessments, including exams and quizzes. Using AI, or choosing not to, has no direct effect on your homework grade, but homework problems are designed to prepare you for the exams, so treat any AI-assisted practice as practice for material you are expected to know on your own.

ECE 4330 - Course Outline (see also detailed schedule & course roadmap):

1. Introduction to Power Electronics (textbook chapter 1)
2. Mathematical Fundamentals and Physics (not in textbook)
3. Devices and Components: Part 1 (chapters 2 & 3)
4. DC-DC Converters (chapter 3)
5. Rectifiers (chapter 5)
6. Devices and Components: Part 2 (chapters 7 & 9)
7. Switched-Mode Power Supplies (chapter 8)
8. Inverters (chapter 12)
9. Advances in Power Electronics

ECE 4330 - Course Outcomes

1. Analyze and design fundamental power electronic converters, including buck, boost, and buck-boost topologies
2. Understand the behavior and selection of power semiconductor switches (diodes, MOSFETs, IGBTs) in switching circuits
3. Evaluate efficiency, losses, and thermal considerations in converter design
4. Develop the practical skills to simulate, build, and test power electronic circuits

Appendix: Support Services and Resources:

In your time at Georgia Tech, you may find yourself in need of support. Below are some resources to support you both as a student and as a person.

a) Academic support

- Center for Academic Success <http://success.gatech.edu>
 - 1-to-1 tutoring <https://www.success.gatech.edu/tutoring/1-to-1-tutoring/>
 - Peer-Led Undergraduate Study (PLUS) <https://www.success.gatech.edu/tutoring/plus/>
 - Academic coaching <https://www.success.gatech.edu/retention/academic-coaching/>
- Residence Life's Learning Assistance Program <https://housing.gatech.edu/>
 - Drop-in tutoring for many 1000-level courses
- Communication Center (<http://www.communicationcenter.gatech.edu>)
 - Individualized help with writing and multimedia projects

b) Personal Support (Georgia Tech Resources)

- The Office of the Dean of Students: <https://studentlife.gatech.edu/request-assistance>; 404-894-6367; Smithgall Student Services Building 2nd floor
- Counseling Center: <http://counseling.gatech.edu>; 404-894-2575; Smithgall Student Services Building 2nd floor
 - Services include short-term individual counseling, group counseling, couples counseling, testing and assessment, referral services, and crisis intervention. Their website also includes links to state and national resources.
 - Students in crisis may walk in during business hours (8 a.m.- 5 p.m., Monday through Friday) or contact the counselor on call after hours at 404-894-2204.
- Students' Temporary Assistance and Resources (STAR): <https://star.studentlife.gatech.edu/>
 - Can assist with interviews, clothing, food, and housing needs.
- Stamps Health Services: <https://health.gatech.edu>; 404-894-1420
 - Primary care, pharmacy, women's health, psychiatry, immunization and allergy, health promotion, and nutrition
- Women's Resource Center: <http://www.womenscenter.gatech.edu>; 404-385-0230
- LGBTQIA Resource Center: <http://lgbtqia.gatech.edu/>; 404-385-2679
- Veteran's Resource Center: <http://veterans.gatech.edu/>; 404-385-2067
- Georgia Tech Police: 404-894-2500