ECE 4320
Power System Analysis and Control
Fall 2026

Instructor: Dr. Dan Molzahn (molzahn@gatech.edu)

Course Text: Bergen and Vittal, *Power Systems Analysis*, 2nd Edition, Prentice Hall, 2000. Additional notes may be distributed occasionally via Canvas.

Course Description: This course covers several core engineering issues that arise in the analysis and operation of large-scale electric power systems. Topics covered in this course include 1) modeling of power system components and their interconnections, 2) performing power flow computations, 3) formulating various power system optimization problems, and 4) analyzing faults.

Objectives: Upon completing the course, students will have the theoretical and practical understanding needed to:

- Model power system components and their interconnections.
- Solve power flow problems relating the voltage phasors to the power outputs from the generators and power demanded by the loads.
- Formulate and solve several of the key optimization problems used to operate power systems.
- Analyze various types of faults.

Grading: Your course grade will be based on the following components:

Homework assignments (approximately five)	25%
Exam 1: Date to be announced (take home)	20%
Exam 2: Date to be announced (take home)	20%
Project: Due December 8 (end of the day)	35%

Final grades will be determined based on a standard scale: >90/80/70/60 for grades of A, B, C, D. Any modifications to make the scale more lenient will be made on the instructor's discretion.

Course Policies: The instructor recognizes the many challenges students face during the last semesters of their undergraduate studies and early semesters of their graduate studies. The instructor's goal is to have all students stay mentally and physically healthy while simultaneously learning all the material needed to be successful in the course. To accomplish this, all aspects of the course will be as flexible as possible. Accordingly, the course policies are listed below.

Lectures: During the scheduled course meeting times, the in-person lectures will be livestreamed via Zoom and recordings posted to Canvas afterwards. Students thus have three options for attending the lectures:

- Attend in person at the scheduled location.
- Attend virtually synchronously via Zoom.
- Attend virtually asynchronously via recorded Zoom videos on Canvas.

There will be several in-class activities throughout the semester. While an online synchronous option via Zoom breakout rooms will be available, students are encouraged to attend these in person if possible.

***Exams*:** Two take-home exams are scheduled at approximately one month into the semester and at the end of the semester, with specific dates to be announced. Each exam accounts for 20% of the students' overall grades. These exams will be given in a "take-home" format. When completing these exams, students may use their notes, the course textbook, the homework assignments and their solutions, and supplementary problems and their solutions provided by the instructor. Students are not allowed to discuss the exams with each other or use other resources while taking the exams. Students will have an extended period of time to complete these exams (several days from when the exams are posted to Canvas).

***Assignments*:** There will be approximately five homework assignments throughout the semester, accounting for 25% of the students' overall grade in total. Students should submit scanned versions of the homework assignments on Canvas (primarily via Gradescope) by the assigned due date and time. Accommodations for any extenuating circumstances that may delay completion of a student's homework assignment will be considered on a case-by-case basis. Students should notify the instructor as soon as possible regarding such circumstances.

The first three and the last homework assignments will consist of problems intended to be solved by hand. The fourth assignment will likely include programming tasks involving coding in Matlab.

***Project*:** A course project worth 35% of your grade will be due on December 8, the last day before the reading day of the final exam week. There will be multiple options for the course project, and you will be allowed to work in teams. The project will involve programming tasks in Matlab. More details will be provided later in the semester.

Academic Integrity Policy: Each student must submit his or her own homework solutions. In the process of solving homework problems, students may discuss their approaches with each other, but all students are expected to contribute to solving the problems and must understand the solutions. "Copying" solutions from another student is prohibited. All exams will be taken individually while accessing only the materials that are specifically permitted by the instructor. Violations of these policies may be referred to the Office of Student Integrity.

Learning Environment: Students have the right to a safe, healthy, and inclusive learning environment. Any student who feels that this class is not meeting that standard should feel free to contact the instructor or the Office of the Dean of Students. All issues will be treated with confidentiality and respect.

Email: The instructor aims to respond to email inquiries within 24 hours. Please send all email from your gatech.edu account with "ECE 4320" in the subject line. Your questions must be specific. Questions like "How do I do problem xyz?" are not specific and will not be answered without further details. If you have questions about a homework problem, then discuss how you are approaching the problem or what you are thinking about. If you have no idea how to begin a problem, discuss how it is similar to or different from other problems done in class and what aspects of the problem are giving you the most difficulty.

Regrades: Students who believe that an error has been made in grading one of your assignments or exams may request a regrade. In this case, students must submit a written statement outlining the potential error. Understand that such assignments are subject to a regrade **in their entirety**, so a regrade may result in a lower score than the original. Be sure of the error before asking for a regrade. As an exception to this policy, any instructor errors in computing your score by summing the assigned points will be corrected without further regrading.

Students with Disabilities: The instructor is committed to facilitating an effective learning environment for all students. Any student requesting accommodations related to a disability or any other condition should register with the Office of Disability Services (https://disabilityservices.gatech.edu) and provide the instructor with an accommodation notification, preferably within the first two weeks of class. All information will remain confidential.

Course Textbook: The textbook officially listed for the course is Bergen and Vittal, *Power Systems Analysis*, 2nd edition. This book is well organized and clearly presented and some students may already own it from previous courses such as ECE 4321. This book will be used as a reference for the course material to supplement to the lecture notes, but students are not required to purchase it. All homework problems and any other required course material will be separately provided.