ECE/ENGR 565: Electrical Power Engineering

Syllabus

Fall Semester, 2025

1 Basic Course Information

1.1 Contact Information

Professor: Dr. James Cale Email: jcale@colostate.edu

1.2 Course Description

This graduate-level course covers the analysis of electrical power systems in terms of current, voltage, and active/reactive power. The course provides a review of three-phase power analysis, including transmission line and generator models, and solving the basic power flow problem. It also covers symmetrical components analysis, symmetric and asymmetric grid fault analysis, state estimation, power system stability, and economic dispatch (optimization). Numerical studies using MATLAB and Simscape will be used in class and course assignments. 3 credits.

1.3 Meeting Location and Time

Engineering Room: B103, CSU Fort Collins campus, Wednesday evenings, 5:15–8:00 PM (MST). Classes will also be recorded via Echo.

1.4 Prerequisites

– ECE 332, ECE 342, and familiarity with electric power systems, e.g., ECE 461 Power Systems

– Working knowledge of MATLAB/Simscape is required for this class.

1.5 Textbook

J.J. Grainger and W.D. Stevenson, *Power System Analysis*. McGraw-Hill. 1994. ISBN: 0-07-061293-5.

1.6 Other Learning Materials

Supplemental technical content for this course will provided via the instructor's typed notes ("monograph"), displayed and/or written during lecture.

1.7 Software

MATLAB/Simscape install info: `https://www.engr.colostate.edu/ets/matlab/`

2 Course Assignments & Grading Weights

2.1 Homework

Homework sets will consist of shorter analytical or numerical simulation problems. All homework will be graded and will generally be due two weeks after distribution (solution format, due dates/times will be listed on the assignment). No late homework will be accepted.

2.2 Mid-term Exam

There will be a "take-home" mid-term exam in this course, which will require written, typed and/or computer simulation solutions. The exam will be posted on Canvas at **5:15 PM (MST), Oct. 15, 2025**. Solutions will be due via Canvas upload by **11:59 PM (MST), Oct. 17, 2025**. No late solutions will be accepted.

2.3 Simulation Projects

This course includes two simulation projects, performing power systems analyses in MATLAB/Simulink (Simscape Electrical library). The purpose of these projects is to give you experience applying the numerical analysis techniques introduced in class to larger power system studies, visualization and interpretation of the results. Projects will generally be due 2-3 weeks after distribution (solution format, due dates/times will be listed on the project assignment). No late projects will be accepted.

2.4 Exams and Projects

No make-up homeworks/exams/projects will be given, except possibly under severe extenuating circumstances. If unable to make a deadline or comply with a time constraint for any reason, contact the instructor at least five days beforehand.

2.5 Lecture Material and Text

Knowledge in this course in cumulative, and having a solid understanding of the "basics" (covered in the first few lectures) is critical. Read the text book along with attending the lectures and complete all homework assignments. If you do not attend a lecture, or need to review prerequisite technical concepts or use of MATLAB/Simulink, you are responsible for reviewing the material on your own time.

2.6 Course Grading Weights

Homework:	33.3%
Mid-term Exam:	33.3%
Simulation Projects (2):	33.3%
Class Participation:	3.0%

Bonus credit (up to 3%) is given for active class participation. Examples include: contributing to the live class discussion, answering questions posed in lecture, etc.

3 Tentative Course Schedule By Week

Table 1: Tentative Topics by Week.

Week	Topic
1	Course introduction, review of three-phase power concepts: notation, per-unit method, nodal equations, admittance and reactance diagrams
2	Three-phase power analysis, transformers, equivalent transformer model
3	Components of line impedance and transmission line models
4	Synchronous machines and equivalent voltage-behind reactance model
5	Admittance matrix, automated matrix modifications, calculations
6	Impedance matrix, automated matrix modifications, calculations
7	The power-flow problem, solution in MATLAB/Simscape
8	Mid-term exam **Oct. 15th** (no in-person class session)
9	Mid-term review; symmetrical faults; fault analysis in MATLAB/Simulink
10	Symmetric components analysis
11	Asymmetric faults; analysis in MATLAB/Simulink
12	Economic analysis and unit commitment
13	State estimation
14	Fall recess (no in-person class session)
15	Guest lecture
16	Final exam week (no in-class session)

4 Course Policies

4.1 Communication Policy

Questions on the course material can usually be answered most quickly via Canvas messaging or email; this is the preferred method when possible. The instructor will respond to your inquiry within 24 hours (but typically sooner). For more in-depth questions, you may choose to schedule a Zoom meeting with the instructor. Important: this is a graduate-level course; questions/office hours will not be used to "walk you through" assignments. Office hours are for additional clarification of course content if needed.

4.2 Grading Policy

Grades on homework, projects and exams will generally be posted in Canvas by one week after the due date. In addition, solutions to assignments will typically be posted within a day of the due date so you'll have a good idea of your grade before it's posted. If there is an unexpected delay in grading, the updated date will be announced to the class.

4.3 AI Usage Policy

The use of artificial intelligence (AI) tools and technologies may be used for this course for research, to generate portions of code, and as a tutor to help deepen your knowledge and understanding of the course content and learning objectives. You are however cautioned that your real intelligence (RI) must deeply understand the content so you can even direct AI effectively. Also note that you'll not be able to use AI during your PE license exam down the road. You can use generative AI models (e.g., ChatGPT, Dall-E, Co-Pilot), neural networks, machine learning, and other techniques for these purposes, however, **you must cite and describe your AI use in your submitted work**. You may *not* submit material generated by AI that is misrepresented as your own, self-generated creative work.

Example AI-usage citation (MATLAB): Include at top of file: `% I used AI to [fill in]`

Permitted With Citation:

– Use of machine learning techniques for data analysis and to summarize results

– Use of generative AI to assist with coding or writing sections of code

– Use of generative AI to assist with grammar and readability of submitted work

Important: Anything you submit that was generated by AI has your explicit "check-off" and approval. This means any mistakes or errors are yours—you will *not* be able to claim that "it was AI's mistake."

4.4 Regrades

Regrading can only be accommodated under two circumstances: (1) incorrect calculation of scores; (2) incorrect assignment of scores. **All requests for regrading must be turned in within 5 days of the return of the graded homework/project/exam**. When requesting a regrade, contact the course instructor. Note that your solution to the entire problem as well as the regrade request form will be scrutinized and the allocation of partial credit is at the discretion of the grader. In some cases, regrade requests may result in a reduced score.

4.5 Final Grade Assignments

Grade	Score
A+	96.67–100.00
A	93.33–96.66
A-	90.00–93.32
B+	86.67–89.99
B	83.33–86.66
B-	80.00–83.32
C+	76.67–79.99
C	70.00–76.66
D	60.00–69.99
F	0.00–59.99

4.6 Sexual Harassment-Free Environment

Colorado State University strives to create and maintain a work and study environment that is fair, humane, and responsible so that each member of the University community is treated with dignity and rewarded for such relevant considerations as ability and performance. Abusive treatment of individuals on a personal or stereotyped basis is contrary to the concepts of academic freedom and equal opportunity. Sexual harassment is one form of such abuse and will not be tolerated.

4.7 Academic Integrity

The faculty expects every member of the CSU community to practice honorable and ethical behavior in the classroom. Any actions that might unfairly improve a student's score on homework, projects or examinations will be considered academic misconduct and will not be tolerated.

Examples of academic misconduct include (but are not limited to):

– Sharing results or other information during homework, projects or examination.

– Working on an exam before or after the official time allowed.

– Requesting a regrade of answers or work that has been altered.

– Submitting assignments that are not your own work or engaging in forbidden collaborations.

– Representing as your own work anything that is the result of the work of someone or some thing else. This includes use of AI (without citation), solutions obtained via solution manuals, the Internet and/or other services.

At the professor's discretion, academic misconduct on an assignment or examination/report will result in a reduced score, a zero score, or a failing grade for the course. All occurrences of academic misconduct will be reported to the Vice President for Student Affairs and copied to the ECE Department Head. If there is any question as to whether a given action might be construed as academic misconduct, please see the professor before you engage in any such action. For more information, please see CSU's page on Practicing Academic Integrity.

4.8 Additional Resources and Policies

For additional information on university resources and policies, see the "Resources and Policies" document posted under Canvas, Modules, Organizational.