

# ECE 461: Power Systems

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*Syllabus*  
Fall Semester, 2023

Professor: Dr. James Cale                      Email: James.Cale@colostate.edu  
TA: Cláudio de Andrade Lima              Email: Claudio.Lima@colostate.edu  
Office Hours: T/Th, 11:00–12:00, in person (Spruce, room 16) or virtual (Zoom)

**Course Description:** Introduction to the analysis of electrical power systems in terms of current, voltage, and active/reactive power. Introduction to the analysis of electrical motors and drives. Computer-aided simulation for the analysis of power systems, power electronic drives and motor operations. This course also includes laboratories to reinforce course content and enhance students' understanding of power systems. 4 credit hours.

## Lecture Location and Time

Microbiology Building, room A113, CSU Fort Collins campus, Tuesday and Thursday, 12:30–1:45 PM (MST).

## Laboratory Location and Time

Engineering Building, room C207, CSU Fort Collins campus. Time periods for the laboratories will be established in the first few weeks of class.

## Prerequisites<sup>†</sup>

- ECE 332 (with a grade of C or higher)
- Working knowledge of MATLAB is required for this class.

## Course Materials

All course material for this class will be provided by the instructor, which will include written lecture notes and slides. No textbook is required.

## 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 and/or TA will respond to your inquiry within 36 hours (typically sooner). For more in-depth questions, office hours on T/Th, 11:00–12:00 (MST) will also be held.

## Homework

Homework will consist of shorter analytical and/or simulation problems. Homework will generally be released on a Tuesday and due on Thursday of the following week (see schedule of due dates below). No late homework will be accepted; however, **one homework score will be dropped.**

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<sup>†</sup>Contact the instructor (jcale@colostate.edu) with questions and/or requests for waivers for the prerequisites.

## Exams

There will be three in-class examinations in this class; the final exam will be comprehensive. Exam problems will be based on the material discussed in lecture, homework, and laboratories. No make-up exams 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.

## Exam Dates

Exam 1	Oct. 7
Exam 2	Nov. 9
Final exam:	Dec. 7

## Laboratories Assignments

There will be a total of five (5) laboratories for this class, with four (4) assignments (“lab reports”) that are due, see additional detail in the ECE 461: Power Systems Laboratory document.

## Course Grading Weights

Homework	25%
Lab Reports	25%
Exam 1	15%
Exam 2	15%
Final Exam	20%

## Computer Simulations

Course homework may include simulations using MATLAB/Simulink (Simscape Electrical library). The purpose of these simulations is to give you more experience applying the analysis techniques introduced in class and laboratories.

## Software

MATLAB installation <https://www.engr.colostate.edu/ets/matlab/>

## Regrades

Regrading can only be accommodated under two circumstances: (1) incorrect calculation of scores or (2) incorrect assignment of scores. **All requests for regrading must be turned in within 5 days of the return of the graded homework/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.

## Lecture Topics by Week:<sup>†</sup>

Week	Dates	Topic
1	8/22, 8/24	Course introduction, review of phasor analysis
2	8/29, 8/31	Single-phase power, power factor, power factor correction
3	9/5, 9/7	Harmonic analysis, distortion and power quality
4	9/12, 9/14	Intro to magnetic materials, magnetic equivalent circuits
5	9/19, 9/21	Single-phase transformers, transformer analysis
6	9/26, <b>9/28*</b>	Review, Exam 1 (9/28)
7	10/3, 10/5	Three-phase power flow, Y– and $\Delta$ –connections
8	10/10, 10/12	Three-phase transformers, per-phase analysis
9	10/17, 10/19	Synchronous generators, nodal admittance matrix
10	10/24, 10/26	Nodal admittance solution, Guest Lecture
11	10/31, <b>11/2*</b>	DC motor theory and operation; Exam 2 (11/2)
12	11/7, 11/9	DC/DC converter drives for motor applications
13	11/14, 11/16	Feedback control design for DC motors
14	11/21, 11/23	Fall recess (no class sessions)
15	11/28, 11/30	Supplementary topics
16	12/5, <b>12/7*</b> ,	Course Review, Final exam (12/7)

\*Exam date.

### Lecture Material and Text

Knowledge in this course is cumulative, so it's important to attend 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.

### Working Together

Studying together in this class is encouraged, and laboratories are group assignments. However, any individual assignments (homework and exams) *must be solely your own work*. Homework solutions will be checked to ensure academic honesty. Academic misconduct has serious consequences (see below).

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<sup>†</sup>Session topics and dates may change based on added/deleted material and observed progress of students. In the event that the instructor is on business-related travel or personal (sick or emergency) leave the respective class may be canceled or taught by the teaching assistant.

## 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

## Academic Integrity

The faculty expects every member of the CSU community to practice honorable and ethical behavior both inside and outside the classroom. Any actions that might unfairly improve a student's score on homework 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 or examination.
- Bringing forbidden material or devices to an examination.
- Working on an exam before or after the official time allowed.
- Requesting a regrade of answers or work that has been altered.
- Submitting homework that is not your own work or engaging in forbidden homework collaborations.
- Representing as your own work anything that is the result of the work of someone or something (AI) else. This includes 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.\* For information on the Honor Pledge, see the Honor Pledge.†

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\*<http://learning.colostate.edu/integrity/>

†<http://tilt.colostate.edu/integrity/honorpledge/>

## **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 cannot be tolerated.

For more information, please see the CSU Office of Equal Opportunity's Sexual Harassment Policy<sup>‡</sup> and Principles of Community<sup>§</sup>.

## **COVID-19 University Policy**

We will follow any COVID-19 policies directed by the university. For the latest information about the University's COVID resources and information, please visit the CSU COVID-19 site: <https://covid.colostate.edu/>.

## **Additional Resources and Policies**

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

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<sup>‡</sup><http://oeo.colostate.edu/sexual-harassment-policy>

<sup>§</sup><http://oeo.colostate.edu/colorado-state-university-principles-of-community/>