

Clemson University
Holcombe Department of Electrical and Computer Engineering
ECE 8160, Spring 2024
Electric Power Distribution System Engineering
Syllabus

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Office Hours: Monday 11:00 AM to 12:00 PM, Tuesday, Thursday 3:30 AM to 4:30 PM,
or by appointment.

Class Location : Riggs 223, ZGEC 104 – 2:00 PM to 3:15 PM; Tuesday, Thursday.

Course Website : Canvas

Text:

- (a) **Required** - Electric Power and Energy Distribution Systems: Models, Methods, and Applications (Wiley- IEEE Press) 1st Edition, by Subrahmanyam S. Venkata, Anil Pahwa, ISBN: 978-1-119-83825-8, 978-1-119-83827-2 (e-book). This has a balance of models and analysis (both network and operation).

Other books:

- (b) Distribution System Modeling and Analysis, 4th Ed.; William Kersting; CRC Press, Boca Raton, FL, 2017. ISBN - 9781498772136, 9781315120782 (e-book). This book focuses on detailed derivation of models and model-based *network* analysis.
- (c) Electric Power Distribution Engineering, Turan Gonen, CRC Press, Boca Raton, FL, 2014. ISBN - 9781482207002, 9780429192814 (e-book). This book focuses on design.
- (d) Electric Power Distribution Handbook, 2nd edition, T. A. Short, CRC Press, Boca Raton, FL, 2014. ISBN – 9781466598652, 9781315215556 (e-book). This book focuses on practice.

Course Description from Catalog: Radial circuit analysis techniques, feeder and transformer modeling, load modeling, loss minimization and voltage control, causes of power quality problems, motor starting analysis, strategies for analyzing impacts of disturbances. **Required preparation is ECE 4180/6180 or equivalent.**

Homework:

Homework will be assigned almost every week. You will get one week to finish it. It will be assigned through Canvas. *No late homework will be accepted* and each late homework will result in zero grade.

Solving the homework questions with understanding will be a key to success; you are urged to spend time on it and grasp the underlying concepts and methods.

For Online Students

Online students will take the tests at any certified test taking centers. The test center shall email the instructor a scanned copy of the completed test. All communications will be done either through canvas or through Clemson email IDs; make sure you access this ID regularly. **I must get the contact details of test center within 10 business days after school starts. Failing this you risk being dropped from the course.**

You can contact me during office hours on phone or via any time via email (preferred). You will get a response in usually less than, but maximum up to two business days.

Attendance: Mandatory. A doctor's note or a note from Clemson official will be needed for any absence. Lectures, though recorded, will not be made available to students in sections 001 or 400, unless there is an official record for absence.

Course Objective and Course Topics:

- The objective of this course is to familiarize the students with the modeling of distribution system components and provide insight into analyzing and designing unbalanced distribution systems.
- The following table gives a break-down of topics to be studied in this course:

Topics	Chapter# from Book
Introduction to distribution systems <ul style="list-style-type: none">• Overview• Topologies and components	Chapter 1
Series impedance of overhead and underground distribution lines <ul style="list-style-type: none">• Carson's equations• Impedance in phase-domain• Impedance in sequence domain – errors.	Chapter 3
Shunt admittance of overhead and underground distribution lines <ul style="list-style-type: none">• Admittance of unbalanced feeder in phase-domain	Only overview (Kersting – Chapter 5 has details)
Analysis of unbalanced distribution system <ul style="list-style-type: none">• Power flow for radial feeder• Bus admittance and impedance matrices for unbalanced systems.• Short circuit analysis in phase domain	Chapter 4, notes.
Nature of load and Distribution System Planning <ul style="list-style-type: none">• Metrics for accounting loads in design• Sizing of transformers• Feeder performance calculations	Chapter 5
Transformer models and applications	Chapter 2, notes.
Voltage regulator models and application	Chapter 2, notes. Chapter 7 (Kersting).
Power quality analysis and relevance to today's distribution system.	Chapter 12.
Distribution Operation, Reliability, Automation.	Chapter 7, 8, 9.
Grounding and Protection of distribution systems	Chapter 10, 11, notes.

Learning Outcomes:

After completing this course, a student should be able to model and analyze unbalanced distribution systems with all their components in steady and faulted states.

Final Grading Policy:

Grade	Lower Limit
A+	95%
A	90%
A-	88%
B+	85%
B	80%
B-	75%
C	70%
F	<70%

Tests:

- 2 mid-term tests will be given. First test – 2/27/2024, Second test – 4/18/2024.
- Final exam will be comprehensive – May 2, 2024, Thursday, 8 am – 10:30 am.
- Course project will be offered. This will reinforce concepts without the time-pressure of exams.

Project is to be treated as a take-home exam, and no discussion among students is permitted.

No make-up test or change in test-time is allowed without a doctor's note or official leave from university.

Percent Grading :

40% Mid-term tests
20% Course Project
20% Homework
20% Final Exam

Online Courses

In an online course, you will interact with the content, instructor, and/or classmates on at least a weekly basis through course assignments, asynchronous discussions and/or synchronous sessions as indicated on the course specific syllabus. Further resources for online courses may be found here: <http://www.clemson.edu/online/students/>.

Computing technology questions may be sent to ITHELP@clemson.edu.

Classroom Etiquette: Students are expected to be present in class and to arrive to class on time. If you must be late, please enter quietly and find a seat at the back of the room so as to not disrupt other students when you come in. If the instructor is late, students are expected to wait at least 10 minutes before leaving. No tobacco products are permitted in class. No electronic devices may be used in class for purposes not related to the course. Cell phones must be turned off or on silent and put away for class. Disruptive behaviors, as determined solely by the instructor, will result in dismissal from class.

Important Dates:

- Last Day to Drop a Class without a “W”: January 24, 2024.
- Last Day to Drop a Class without a final grade: March 15, 2024.
- Spring Break: March 18 – 22, 2024.

Academic Integrity

As members of the Clemson University community, we have inherited Thomas Green Clemson's vision of this institution as a 'high seminary of learning.' Fundamental to this vision is a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating, or stealing in any form. In instances where academic standards may have been compromised, Clemson University has a responsibility to respond appropriately to charges of violations of academic integrity.

Collaboration with classmates on course topics is encouraged, however direct collaboration (e.g., copying) on assignments is strictly prohibited. You may not copy solutions and all work submitted must be your own. If you do not understand what constitutes collaboration but independent work, please ask your professor for a clarification. No work from prior classes may be submitted. Any violations of these policies will be reported.

Further information on Academic Integrity can be found in the [Undergraduate Announcements](#) and in the [Graduate School Policy Handbook](#).

ACCESSIBILITY STATEMENT: Clemson University values the diversity of our student body as a strength and a critical component of our dynamic community. Students with disabilities or temporary injuries/conditions may require accommodations due to barriers in the structure of facilities, course design, technology used for curricular purposes, or other campus resources. Students who experience a barrier to full access to a class should let the instructor know and make an appointment to meet with a staff member in Student Accessibility Services as soon as possible. You can make an appointment by calling 864-656-6848 or by emailing studentaccess@lists.clemson.edu. Students who receive Academic Access Letters are strongly encouraged to request, obtain, and present these to their instructors as early in the semester as possible so that accommodations can be made in a timely manner. It is the student's responsibility to follow this process each semester. You can access further information here: <http://www.clemson.edu/campus-life/campus-services/sds/>.

TITLE IX STATEMENT: Clemson University is committed to a policy of equal opportunity for all persons and does not discriminate on the basis of race, color, religion, sex, sexual orientation, gender, pregnancy, national origin, age, disability, veteran's status, genetic information or protected activity in employment, educational programs and activities, admissions and financial aid. This includes a prohibition against sexual harassment and sexual violence as mandated by Title IX of the Education Amendments of 1972.

SAFE CAMPUS: Clemson University is committed to providing a safe campus environment for students, faculty, staff, and visitors. As members of the community, we encourage you to take the following actions to be better prepared in case of an emergency:

- a. Ensure you are signed up for emergency alerts
(<https://www.getrave.com/login/clemson>)

- b. Download the Rave Guardian app to your phone:
(<https://www.clemson.edu/cusafety/cupd/rave-guardian/>)
- c. Learn what you can do to prepare yourself in the event of an active threat
(<http://www.clemson.edu/cusafety/EmergencyManagement/>)

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<https://clemson.libguides.com/copyright>.

EMERGENCY PREPAREDNESS STATEMENT: Emergency procedures have been posted in all buildings and on all elevators. Students should be reminded to review these procedures for their own safety. All students and employees should be familiar with guidelines from the Clemson Police Department.

Disclaimer: The instructor reserves the right to modify this syllabus at any time due to extenuating circumstances or to facilitate improved student learning, including but not limited to COVID-related situations.