

**Clemson University**  
**Holcombe Department of Electrical and Computer Engineering**  
**ECE 8160, Spring 2020**  
**Electric Power Distribution System Engineering**  
**Syllabus**

**Instructor:** Dr. Sukumar Brahma  
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**Office Hours:** Tuesday, Thursday 3:30 PM to 5:00 PM, or by appointment.

**Class Location :** Riggs 226, ZGEC 102 – 2:00 PM to 3:15 PM; Tuesday, Thursday.

**Course Website :** Canvas

**Text:**

(a) **Required** - Distribution System Modeling and Analysis, 4<sup>th</sup> Ed.; William Kersting; CRC Press, Boca Raton, FL, 2017. ISBN - 9781498772136, 9781315120782 (e-book). This book focuses on model-based analysis.

**Other books:**

(b) Electric Power Distribution Engineering, Turan Gonen, CRC Press, Boca Raton, FL, 2014. ISBN - 9781482207002, 9780429192814 (e-book). This book focuses on design.

(c) Electric Power Distribution Handbook, 2<sup>nd</sup> 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.

**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:

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

**Final Grading Policy:**

<b>Grade</b>	<b>Lower Limit</b>
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 – 2/25/2020, Second test – 4/14/2020.
- Final exam will be comprehensive – April 30, 2020, Thursday, 8 am – 10:30 am.

- Course project will be offered. This will reinforce concepts without the time-pressure of exams. Coding will be required. 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**

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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](mailto: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 22, 2020
- Last Day to Drop a Class without a final grade: March 13, 2020

**Academic Integrity**

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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](#).

## Access Accommodations

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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 this class should let the professor 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, by emailing [studentaccess@lists.clemson.edu](mailto:studentaccess@lists.clemson.edu), or by visiting Suite 239 in the Academic Success Center building. Appointments are strongly encouraged – drop-ins will be seen if possible, but there could be a significant wait due to scheduled appointments. Students who receive Academic Access Letters are strongly encouraged to request, obtain and present these to their professors 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: <https://www.clemson.edu/academics/studentaccess/index.html>.

## Anti-Harassment and Non-Discrimination

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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. This policy is located at <http://www.clemson.edu/campus-life/campus-services/access/title-ix/>. Ms. Alesia Smith is the Clemson University Title IX Coordinator, and the Executive Director of Equity Compliance. Her office is located at 110 Holtzendorff Hall, 864.656.3181 (voice) or 864.656.0899 (TDD).

## Emergency Procedures

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Emergency procedures have been posted in all buildings and on all elevators. Students should review these procedures for their own safety. Students are required to monitor their university email (see <https://www.clemson.edu/studentaffairs/student-handbook/universitypolicies/email-communications.html>) thus establishing this as a convenient method for official communication to students. Students are also encouraged to enroll in CU-Safe alerts. See <https://www.clemson.edu/cusafety> for more information.

## Copyright Statement

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Materials in some of the courses are copyrighted. They are intended for use only by students registered and enrolled in a particular course and only for instructional activities associated with and for the duration of the course. They may not be retained in another medium or disseminated further. They are provided in compliance with the provisions of the Teach Act. Students should be reminded to refer to the Use of Copyrighted Materials and "Fair Use Guidelines" policy in on the Clemson University website for additional information: <https://www.clemson.edu/library/>.

**Disclaimer:** I reserve the right to modify this syllabus at any time due to extenuating circumstances or to facilitate improved student learning.