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## ECE 4180/6180 Power System Analysis

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**Instructor:** Dr. Ramtin Hadidi [rhadidi@clemson.edu](mailto:rhadidi@clemson.edu)

310 Zucker Family Graduate Education Center, Charleston

843-730-5106

### References:

- Power System Analysis & Design, 7th Ed. by Glover, Overbye, Sarma & Brichfield, Cengage Learning, 2022.

Please note the student is required to have a laptop computer, internet connectivity capable of transmitting and receiving video, a video camera, a microphone, and a cell phone.

### Additional references:

- Lecture notes and videos
- Handouts posted on Canvas

**Course Description:** Study of power system planning and operational problems. Topics include three-phase system study, transmission line modeling, load flow, economic dispatch, control of power flow, symmetrical faults, Symmetrical components and unsymmetrical faults.

**Student Learning Outcomes:** At the completion of the course, student should be able to:

- Analyze and design three-phase power systems in steady state
- Conduct per unit analysis and change of base
- Analyze transmission line electrical performance.
- Understand and perform power flow analysis
- Understand symmetrical components and their role in unsymmetrical fault analysis
- Analyze symmetrical and unsymmetrical short circuit scenarios (time permitting)

**Software:** PowerWorld, MS Office, and MATLAB will be required at minimum.

**Lecture:** Tuesday- Thursday 9:30-10:45 a.m. Riggs Hall 223 and 102 Zucker Family Graduate Education Center. Lectures will be recorded and made available for the 400 section in Canvas.

**The class section number:** 001, 843 and 400

**Office hours:** Office hours are by appointment. A fixed weekly office hour will be announced based on students' inputs. Other than that, office hours are by appointment. Please contact the instructors and the TA via email to set up an appointment.

**Prerequisites:** ECE 3600 and ECE 3800, each with a C or better

### TA Information:

- Sahand Liasi ([liasi@clemson.edu](mailto:liasi@clemson.edu)), Hours: TBA
- Narges Ghiasi ([nghiasi@clemson.edu](mailto:nghiasi@clemson.edu)), Hours: TBA

**Classroom Policies:** Attendance is voluntary but strongly encouraged. Students are required to take the final examination and tests. Students are responsible for all material covered and all assignments given in every lecture. Some lectures may cover material not found in the textbook. It is the responsibility of each student to make up any deficiencies that result from missed classes. Students are expected to wait 15 minutes before leaving if the instructor is late. Cell phones must be turned off or silenced before coming into class. If you are connecting online, mute yourself upon entry.

The academic resources of Clemson University are provided for the intellectual growth and development of students. Lectures will be posted on the University's Canvas System (<https://www.clemson.edu/canvas/>). The course will be conducted entirely online for 400 section. Students should regularly check the Canvas system during the semester. Announcements about the course, tests and homework will be posted on the Canvas system.

### Email Communication:

Because of privacy regulations, University faculty and staff communicate with students only through Clemson email. Therefore, you must use your Clemson email account in this course for all email communications. Check your Clemson account at least three times per week for important messages.

### Technical Support:

If you have problem accessing the course using Blackboard, please contact CCIT (<http://www.clemson.edu/ccit/>) as soon as possible.

### Course Outline:

This is a tentative outline for the course:

- Study of basic power system concepts ( 1.5 weeks)
- Per-Unit System for Power System Analysis and transformers (1.5 weeks)
- Transmission Lines (2.5 weeks)
- Power Flow Studies (3 weeks)
- Economic Dispatch and Optimal power Flow ( 1 week)
- Symmetrical Faults (2.5 week)
- Symmetrical Components and Unsymmetrical Faults (2 week)

## Evaluation:

	ECE 4180	ECE 4180-400	ECE 6180	ECE 6180-400
<b>Assignments</b>	20%	30%	20%	30%
<b>Quizzes</b>	10%	0%	10%	0%
<b>Tests</b>	40%	40%	30%	30%
<b>Projects</b>	0%	0%	15%	15%
<b>Final</b>	30%	30%	25%	25%

Assignments may be graded on a selective basis.

## Grading Scale:

Below is the letter grade scale that will be used in this class:

ECE 4180	ECE 6180
A = 90 – 100	A = 90 – 100
B = 80 – 89	B = 80 – 89
C = 70 – 79	C = 70 – 79
D = 60 – 69	F = Below 70
F = Below 60	

**Tests:** All students must attend all tests. **Makeup tests will not be given under any circumstances. A student who misses a test or the final examination for any reason will receive a grade of 0 for that test or examination.** To accommodate students who must miss class when a test is given because of a true and documented personal emergency, significant illness or other circumstances beyond their control, the final examination score will be substituted for the missed test score. The test and final exam will be closed book and notes. Formula sheets will be allowed. The specifics will be announced prior to the tests. No exceptions will be made for exam dates and time.

Tentative dates for the exams are as follows:

- **Test1:** October 5, 2023
- **Test2:** November 14, 2023
- **Final Examination:** Wednesday December 13th from 8-10:30 am

Please note: All times given are local time in Clemson, SC which is Eastern Daylight Time (GMT-4 hours)

**All forms of collaboration during tests and the final examination are strictly PROHIBITED. During these times, students may not communicate with anyone other than the person administering the test. Phones and other communication devices are strictly PROHIBITED during testing. Students shall not give or receive aid in any form during testing, including use of the internet. Collaboration**

or use of materials other than what has been specifically stated is strictly prohibited and will be reported for disciplinary action.

**Homework and Projects:** All homework and projects (for ECE6180) should be submitted online by its due date and time. Late homework and projects will not be accepted and results in a 0 on the assignment. All homework/project must be legible. Submissions that cannot be read will be marked wrong. The submitted homework should be able to stand on its own. Collaborative work up to three persons are permitted on homework provided it is mentioned on the front page of the submitted work. Every student must submit its own solution to the homework. 400 section of the course won't have quizzes.

### Important Dates:

<https://www.clemson.edu/registrar/academic-calendars/calendars.html?year=2023&semester=fall>

- Last Day to Add a Class: Tue, August 29, 2023
- Last Day to Drop a Class without "W" Grade: Sept. 6, 2023
- Last Day to Drop a Class without a Final Grade: November 1, 2023

### 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 this 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, 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 at all possible, but there could be a significant wait due to scheduled appointments. Students who have accommodations are strongly encouraged to request, obtain and send these to their instructors [through the AIM portal](#) 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 at the [Student Accessibility website](#). Other information is at the university's [Accessibility Portal](#).

**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.

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

**Copyright Statement:** Materials in this course are copyrighted. They are intended for use only by students registered and enrolled in this 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://clemson.libguides.com/copyright>.

**Changes to Syllabus:** The instructor reserves the right to make changes to this syllabus during the semester for reasons including but not limited to COVID-related situations.

**Agreement:** If you disagree with any of the policies or procedures spelled out above or cannot accept the demands of the course (i.e., the amount of time and work required), you need to drop the course as soon as possible. By staying in the course, you agree to comply with all the policies and procedures described in this syllabus