CLEMSON
ELECTRICAL AND COMPUTER ENGINEERING

ECE Course Specific Syllabus | Summer 2024

ECE 3600
Electric Power Engineering

Instructor: Dr. Ramtin Hadidi rhadidi@clemson.edu

310 Zucker Family Graduate Education Center, Charleston 843-730-5106

TA Information:

TBD TBD@clemson.edu

Please feel free to contact the instructor and/or TA with any questions you have regarding assignments or lectures. Students are encouraged to contact the TA or the instructor with any questions about assignments or other posted materials. The TA will post office hours to chat with students via Zoom.

References:

- Electric Machinery and Power System Fundamentals, McGraw-Hill, 2002, by Stephen J. Chapman; ISBN 0-07-229135-4.

Please note at minimum 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

Office hours: This is an online class. For questions and answers, you can contact the instructor and TA via email or discussion board on Canvas. Phone or virtual office visits (via Zoom or equivalent) are also possible by appointment.

Prerequisites: ECE 2620 (Electric Circuits I and II), PHYS 2210 (Physics II) each with a C or better. You should have a good understanding of electric circuits, including AC and DC, plus the concepts of phasors, power calculations, and basic understanding of three-phase systems. You should also have a good physics background regarding electromagnetics.

Course Overview: The course presents the basic principles of electromagnetic induction, electromagnetic force development, and energy conversion. Topics include magnetic circuits, power transformers, electric power transmission and distribution systems, synchronous machines, DC motors, and induction motors. Three-phase AC circuits and power concepts will be reviewed, and include complex power; power factor and power factor correction; efficiency; power and energy relationships.

Course Objectives: This class is a foundational course in electric power engineering and provides the basis for advanced study. Power generation, transmission, distribution, and utilization are fundamental aspects of electrical power engineering. After completing this course, students understand the key components and concepts in the electric power system and how to analyze systems which include them. Students will have deep experience with energy conversion, power and energy computations, transformers, electric machinery, and transmission lines in practical applications.

The class section number: 400

Classroom Policies: Clemson University's academic resources are provided for the intellectual growth and development of students. Lectures will be posted on the university's Canvas course management system (www.clemson.edu/canvas). The course will be conducted entirely online. Students should regularly check the Canvas system throughout the summer session.

Announcements about the course, tests and homework will be posted to Canvas. No make up for missed exams or assignments will be given. Students are required to take the final examination and all 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 but would have been made available in the lectures and/or assignments. It is the responsibility of each student to make up any deficiencies that result from getting behind.

Clemson's Electrical and Computer Engineering Department Policy on Location of Students Taking Online Courses: Students should be prepared to meet their course's proctor requirements. Instructors may use video proctoring through Respondus. In such cases, a Respondus-compatible webcam and microphone are required. It is a Clemson ECE policy that students taking online ECE classes at the time of taking the courses reside within North America. Your instructor for ECE 3600 will require the use of the Respondus lockdown browser for all tests and the final exam.

A note on 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. If you forward your email to another account, or if you use another account, you may not receive important emails and you do this at your own peril. Please check your Clemson account frequently to ensure you receive important messages. Please ensure you have the Canvas set up properly to receive notifications.

Technical Support: If you have problems accessing the course using Canvas, please contact CCIT (http://www.clemson.edu/ccit/) as soon as possible. The Help Desk can be reached at +1.864.656.3494.

Communication: All class-related information from the instructor, TA or university staff pertaining to this course will be posted, and archived, under the announcements section on Canvas. All email inquiries from students to instructors, should be sent to both the instructor and the TA. Due

to the large volume of emails received, a response may not be immediate or the same day. **For homework questions, please email the TA for quicker response.** Be aware, emails sent right before an assignment is due may not be answered before the deadline. Please plan accordingly. **As a primary means of communication, please use the Discussion Board on Canvas.** It will be arranged by topic and is a great place to post your questions and help your classmates.

Course Outline:

Mechanical and Electromagnetic Fundamentals (Chapter 1)
Three Phase Circuits (Chapter 2)
Transformers and Per-Unit Analysis (Chapter 3)
AC Machinery Fundamentals (Chapter 4)
Synchronous Machines (Chapter 5)
Induction Motors (Chapter 7)
DC Motors (Chapter 8)
Transmission Lines (Chapter 9)
Note: We do not cover Chapter 6 (parallel operation of synchronous generators).

Schedule: For each topic, students are expected to watch the video lectures posted on Canvas and read the corresponding chapter by the date listed below. Note that these dates overlap weekends and holidays, but lectures can be viewed at any time, regardless of the date or time. Pace yourself, but ensure you have completed the videos from each chapter prior to the last date in the date range.

Course content will begin on June 27, 2024 and end on July 31, 2024. The final exam will be Monday, August 5, 2024. The following schedule will be approximately followed:

June 27 – June 29:	Chapter 1: Mechanical and Electromagnetic Fundamentals
July 30 - July 4:	Chapter 2: Three Phase Circuits
July 5 - July 11:	Chapter 3: Transformers
July 12 - July 13:	Chapter 4: AC Machinery Fundamentals
July 14 - July 20:	Chapter 5: Synchronous Machines
July 21 - July 25:	Chapter 7: Induction Motors
July 26 - July 30:	Chapter 8: DC Motors
July 31 - July 31:	Chapter 9: Transmission Lines

Note: We do not cover Chapter 6 (parallel operation of synchronous generators).

Evaluation:

Assignments and Homework	20%
Tests (2) – highest 30%, lowest 20%	50%
Final Exam	30%

Grading Scale:

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

A = 90 – 100
B = 80 – 89.99
C = 70 – 79.99
D = 60 – 69.99
F = Below 60

Homework: Homework assignments will be posted and completed on Canvas. All homework must be submitted by the due date and time. Late homework will not be accepted for any reason. Canvas may allow students to submit after the due date and time; however, late homework will receive a grade of 0. Students are expected to complete all assignments.

Any assignments that require written submission must be legible; submissions that cannot be read will be marked wrong.

Testing: Students must complete all tests. No makeup tests will be given. Missed tests will result in a zero. All grades count. Final grades will be determined using the percentages shown on page three. Test grades **will not** be dropped or replaced by the final examination.

Test and the final exam dates are listed below. No exceptions will be made for test/exam dates or times. If an adjustment is needed, you will be notified in advance.

Test 1: Tuesday, July 9, 2024 from 11:00pm – 12:30pm, EDT

Test 2: Tuesday, July 23, 2024 from 11:00pm – 12:30pm, EDT

Final Exam: Monday, August 5, 2024 from 11:30am – 2:00pm, EDT

Exam Proctoring and Notes:

All times and dates given are local to Clemson, SC, using Eastern Daylight Time (EDT) or UTC-4. This is the same time zone as New York and Washington DC. Students will be surveyed to find out geographic locations as part of the Syllabus Quiz. Students may not be located outside of North America without

specific permission. Times may be adjusted as the course progresses, so please pay attention to all announcements on Canvas. Add 30 minutes before and after these times for logistics.

Students are reminded that although we encourage collaboration while studying, all assignments and testing must be your sole effort. **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. **If you are thinking of using a third party to take your exams for you, or you plan to collaborate with others, you will be caught and you will be referred to Clemson's academic integrity office.**

Important Dates:

https://www.clemson.edu/registrar/academic-calendars/calendars.html?year=2024&semester=second_summer

- Last Day to Drop a Class without "W" Grade: July 2, 2024
- Last Day to Drop a Class without a Final Grade: July 22, 2024

Competencies Developed and Demonstrated in ECE 3600

Mathematics: Demonstrate mathematical literacy through solving problems, communicating concepts, reasoning mathematically, and applying mathematical or statistical methods, using multiple representations where applicable.

Example: Include samples of solving problems throughout the course including, but not limited to, homework and tests.

Natural Sciences: Demonstrate scientific literacy by explaining the process of scientific reasoning and applying scientific principles inside and outside of the laboratory or field setting.

Ethical Judgment: Demonstrate an ability to identify, comprehend, and deal with ethical problems and their ramifications in a systematic, thorough, and responsible way.

Example: Examine the ethical arguments behind an issue in the electric power industry and discuss in a report.

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, 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.

Agreement: If you disagree with any of the policies or procedures spelled out in this syllabus, or cannot accept the demands of the course (i.e., the amount of time and work required), do not enroll

in the course. If you have already enrolled, 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. **Warning:** Any evidence of academic dishonesty will be pursued through Clemson's academic integrity process, even if you are a transient student and not seeking a Clemson degree. If you are found in violation, for a first offense, you are subject to an "F" grade in the course and a record of this violation in your records.

Acknowledgement:

Special thanks to Dr. Randy Collins, Dr. Elham Makram and Dr. Andrew Clark that helped to create some of the content of this course at Clemson University.