



ECE 4710 & ECE 6710: ELECTRIFICATION OF TRANSPORTATION

ECE 4710 Section 001, Section 100 & Section 843

ECE 6710 Section 001, Section 100 & Section 843

SPRING 2021

JANUARY 5, 2021

**MEETING TIME:** T, TH: 2.00 PM to 3.15 PM

**MEETING LOCATION:** on line course for the entire semester

**INSTRUCTOR:** Dr. Rajendra Singh, [srajend@clemson.edu](mailto:srajend@clemson.edu), Mobile: 864-710-1311

**TEACHING ASSISTANT:** Ms. Naireeta Deb, [ndeb@clemson.edu](mailto:ndeb@clemson.edu), Mobile: 850-524-3232

**ZOOM LINK FOR CLASS**

<https://clemson.zoom.us/j/98978736414?pwd=TkdIUktzR1FKSW5wa2Y5ZzVNaHRzQT09>

**OFFICE HOURS AND PROCEDURES:** Send e mail or text me to set up time to meet on line. Exclusively, I have set up M, W, and F (1 PM-3 PM) as office Hours. However, if these hours do not suit you, contact me to set up some other time. To connect with me (other than class hours) use following zoom link:

<https://clemson.zoom.us/j/98978736414?pwd=TkdIUktzR1FKSW5wa2Y5ZzVNaHRzQT09>

Keep this zoom link handy and always use to connect with me

**COURSE MODALITY:** On Line Course

**COURSE DESCRIPTION:** Introduction to the electrification of transportation driven by climate-related challenges and positive societal impacts. Topics include fundamentals of clean sustainable electric power, electric propulsion, electric motors, power control systems, electric drive trains, electric power storage devices, sizing battery packs, and electric systems built to a 48 V standard

**COURSE PREREQUISITES:** Junior Standing for ECE 4710 and Graduate Engineering student for ECE 6710

**STUDENT LEARNING OUTCOMES:** At the completion of the course, students should be able to

Upon completion of this course, students should be able to:

1. Analyze fundamental requirements to build clean electric power infrastructure
2. Describe the technologies for generation and storage of clean electric power
3. Design of electric motor for optimum performance for electric vehicles
4. Design of Electric Drive Train for Optimal performance of electric vehicles
5. Provide a technical description of Electric vehicle charging sustainable system with highest performance and low-cost.

**REQUIRED MATERIALS:** No text book is required. On the first day of the class some books will be recommended. Class notes will be provided

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.

**TOPICAL OUTLINE** (Topic hours in parenthesis):

Course Overview (1)

Drivers of Electrification of Transportation (2)

Technologies for Clean Sustainable Electric Power (2)

Local Direct Current Power Based Networks for the Electrification of Transportation (2)

Fundamentals of Electric Propulsion (3)

Design of Electric Motors (3)

Power Control Systems (3)

Electric Drive Train (7)

Batteries, Capacitors and Fuel Cell as Electric Energy storage Devices (5)

Rechargeable Battery Pack (4)

Sizing Battery Pack (2)

Different Power Electronics technologies and levels of charging for Electric Vehicles (3)

Fast Charging of Electric Vehicles (2)

Electric Systems Built to a 48 V standards (2)

Societal Impacts of Electric Transportation (1)

Topics of Instructors Choice (4)

Tests (2)

**Total 48**

**CLASS CANCELLATION POLICY:** Class is cancelled if the instructor is more than 15 minutes late to start on line lecture.

**GRADING POLICY:**

**ECE 4610 Grading Policy:** Final grade for this course will be determined by following procedure:

Tests (2) 50%

Homework 20%

Final Exam 30 %

A=90-100, B=80-89, C=70-79, D=60-69 and F= 0- 59

**ECE 6610 Grading Policy:** Final grade for this course will be determined by following procedure:

Tests (2) : 40%

Homework: 15%

Research Paper (individual research) : 25%

Final Exam : 20 %

A= 90-100; B= 80-89; C= 70-79; F= 0-69

**TEST AND FINAL EXAM DATES:**

**Test 1:** February 11, 2021 (In class time)

**Test 2:** April 5, 2021 (in class time)

**Final Exam** (As per University Schedule): April 29, 2021: 8 AM-10.30 AM

**RESEARCH PAPER (ECE 6710):** Each student will select their own individual topic and get approval from the instructor. All communications through e mail. Do not send PDF files. Submit only word files.

Following are the deadlines:

January 8-January 21, 2021: Get approval of Topic

February 19, 2021, 5 PM: Submit, Abstract (200 Words) and minimum two main recent journal articles

March 5, 2021, 5 PM: Complete list of references

April 2, 2021: Complete Paper, 5 PM: Single space, Times Roman, 12 Fonts, 6 pages (without Figures, Tables, references, Footnotes etc.)

April 9, 2021: Feedback given for making corrections

April 22, 2021, 5 PM: Submit both flees (a) paper with my input and (b) Final paper

**ATTENDANCE POLICY:** 1. On line attendance is mandatory. If for some genuine reason (e.g. sickness, job/internship interview etc.) you cannot attend the class, please send me e mail before the class that you will not be able to attend the class due to a particular reason.

2. All tests will be given only during class time. If on any test day class is canceled, alternate date will be used during class time.

3. A copy of class notes, power point files etc. will be distributed to the class.

4. Canvas will be used for posting course related material.

5. Every attempt will be made to record the lectures and post on Canvas.

**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](mailto: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/>)

**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>.

**MODIFICATION STATEMENT:** The instructor reserves the right to modify any aspect of the syllabus at any time during the semester for reasons including but not limited to COVID-related situations. This syllabus was posted on January 5, 2021.

**ADDITIONAL INFORMATION:** 1. All tests and final exam will be on line  
2. Procedures for turning in homework – online will be provided in Canvas announcements.  
3. Contact information of Teaching Assistant is included in this document.