



ECE 4610 & ECE 6610: FUNDAMENTALS OF SOLAR ENERGY

ECE 4610 Sections 001, 400 & 843

ECE 6610 Sections 001, 400 & 843

FALL 2020

August 11, 2020

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

MEETING LOCATION: On line course for entire semester

INSTRUCTOR: Rajendra Singh, srajend@clemson.edu, Mobile: 864-710-1311

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: Introduces solar energy conversion systems: Topics include environmental benefits of solar energy, solar thermal systems, concentration solar power, photovoltaic (PV) Cell design and manufacturing, sizing of PV systems, hybrid photovoltaic/thermal systems, energy storage, and urban/rural applications

COURSE PREREQUISITES: ECE 3200 with a C or better or instructor approval for ECE 4610, Graduate students are expected to have completed a course comparable to ECE 3200 or instructor's approval for ECE 6610

STUDENT LEARNING OUTCOMES: **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 fundamentals behind solar energy as sustainable energy
2. Design of high efficiency and low-cost photovoltaic modules
3. Manufacturing of high efficiency and low-cost photovoltaic modules
4. Design of Photovoltaic systems with energy storage
5. Novel applications of photovoltaics for desalination and sustainable electric transportation

REQUIRED MATERIALS: No text book. 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)

Solar Energy: Introduction (2)

Importance of Solar Energy as Clean & Sustainable Energy (3)

Fundamentals & Technology of Solar Thermal Systems (1)

Fundamentals & Technology of concentration solar power (1)

Operating principles and design of photovoltaic (PV) cell (8)

Processing and manufacturing of photovoltaic Modules (8)

Design, sizing and sub-systems of PV system (5)

Operating principles design of hybrid photovoltaic/thermal systems (0.5)

Manufacturing of Hybrid photovoltaic /thermal systems (0.5)

Electrical energy storage systems (4)

Digitized grid and PV systems (2)

DC Microgrid and DC Nanogrid (3)

Urban and rural applications of solar energy (2)

Importance of PV in Transport Sector (1)

Topics of Instructors Choice (4)

Tests (2)

Total 48

MATLAB: In some optimization problems, we will use MATLAB. Make sure you can use MATLAB to solve some problems.

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

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. 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 August 12, 2020.

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. Information about course Teaching Assistant will be provided on Canvas as soon as the name of the TA is known.