Course Syllabus

ELCT 510 – Renewable Energy Technologies: Photovoltaic Systems and Devices

<table>
<thead>
<tr>
<th>Course Coordinator:</th>
<th>Dr. Krishna Mandal</th>
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<tbody>
<tr>
<td>Catalog Description:</td>
<td>Lecture-based course provides an introduction to renewable energy. The focus is on photovoltaic energy technology, solar cells devices, efficiency, and cost analysis.</td>
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<tr>
<td>Credit Hours</td>
<td>3</td>
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<td>Prerequisite(s) by course</td>
<td>ELCT 363 or equivalent recommended, not required</td>
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<tr>
<td>Prerequisite by topics</td>
<td>Microelectronics</td>
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Course Outcomes:
Students who successfully complete this course will be able to:

- Identify basic principles of different renewable energy technologies and their role in energy sustainability
- Identify operating principles of photovoltaic solar cells and get familiarized with deferent parameters of solar cells for performance evaluation
- Understand essential tools for improving the efficiency of solar cells
- Analyze different photovoltaic materials; electronic and optical properties of semiconductor micro- and nanostructures
- Calculate solar radiance and understand fundamentals of solar cell modules and balance of system to build a small solar panel
- Conduct literature search, review and report findings; demonstrate teamwork and develop communication skill through group report and presentation

Students who demonstrate higher proficiency will earn higher grades.

Course Topics:

- Importance of energy sustainability and introduction to different renewable energies
- Terrestrial and space solar spectrum and solar radiance
- Operating principle of photovoltaic solar cells
- Factors affecting conversion efficiency in terms of equivalent circuit analysis
- Current-voltage and capacitance-voltage measurements of solar cells
- Different Photovoltaic materials
- Compound semiconductor solar cell design
- Components of photovoltaic systems- modules and balance of system
Course Contribution to Program Outcomes:
ELCT 510 contributes to an achievement of:
- Outcome A – an ability to apply knowledge of mathematics, science and engineering
- Outcome B – an ability to design and conduct experiments, as well as to analyze and interpret data
- Outcome C – an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- Outcome D – an ability to function on multidisciplinary teams
- Outcome E – an ability to identify, formulate, and solve engineering problems
- Outcome G – an ability to communicate effectively
- Outcome H – the broad education necessary to understand the impact of engineering solutions
- Outcome I – recognition of the need for, and an ability to engage in life-long learning.
- Outcome J – a knowledge of contemporary issues
- Outcome K – an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

General Course Policies

Academic Integrity
Unless otherwise stated, assignments and examination work are expected to be the sole effort of the student submitting the work. Students are expected to follow the University of South Carolina Honor Code and they should expect that every instance of a suspected violation will be reported. Students found responsible for violations of the Code will be subject to academic penalties under the Code in addition to whatever disciplinary sanctions are applied.

Accommodating Disabilities
Reasonable accommodations are available for students with a documented disability. If you have a disability and may need accommodations to fully participate in this class, contact the Office of Student Disability Services: 777-6142, TDD 777-6744, email sasds@mailbox.sc.edu, or stop by LeConte College Room 112A. All accommodations must be approved through the Office of Student Disability Services.

Diversity
When scheduling exams, I have attempted to avoid conflicts with major religious holidays. If, however, I have inadvertently scheduled an exam or major deadline that creates a conflict with your religious observances, please let me know as soon as possible so that we can make other arrangements.

Deviations
Minor deviations from the syllabus are a normal part of any adaptive teaching and learning process.