

**ECE 420**  
**Renewable Energy Penetration on the power Grid**  
**Fall / 2010**

**Instructor:** Dr. E. B. Makram

Office: Rm. 303C Riggs Hall, ph 656-3378

Office Hours: TBA

Email: [elham.makram@ces.clemson.edu](mailto:elham.makram@ces.clemson.edu)

**Location:** TBA

**Text:** Renewable Energy Systems

M. Godoy Simoes and Felix A. Farret

**Attendance:** Test attendance and final exam are mandatory.

**Learning Objectives:** This course provides fundamental to understand the conversion of wind and solar energy to electricity and its eventual use by society. This course is useful for those interested in green energy. For others, it should provide enough understanding of the underlying principles of wind and solar operation and their impact on the power grid.

**Course Contents:**

1. (8-periods): Principles of Renewable Sources of Energy and Electric Power: basic definitions of electrical power, interfacing primary sources, generator and load, and types of different renewable energy resources.
2. (1-period): Problem Session.
3. (8-periods): Wind Energy: generator types, induction generator model and general characteristics of induction generator.
4. (1- period): Problem Session.
5. (7- periods): Solar Energy: i-V, P-V curves, electrical load matching, sun tracking, PV system component and peak power point operation.
6. (1- period): Problem Session.

7. (7-periods): Energy Storage: Battery, performance characteristics, battery charging, charge regulators and battery management.
8. (1- period): Problem Session.
9. (9-periods): Electrical Performance: Harmonic, distortion, voltage sags, and national standards.
10. (1- period): Problem Session.

**Tentative dates for tests:**

**TEST # 1:** TBA

**TEST # 2:** TBA

**TEST # 3:** TBA

**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.”

The Honor Code for the College of Engineering is in effect for all engineering courses. Clemson University also has a published statement in “Academic Integrity”. Lying, cheating, or stealing detracts from the value of a Clemson degree. Please see your student handbook for more details. Collaborating on homework is allowed provided you do your own work; however, copying homework is not permitted and will result in zero on that homework for everyone involved.

**Disability Access Statement:** “It is University policy to provide, on a flexible and individualized basis, reasonable accommodations to students who have disabilities. Students are encouraged to contact Student Disability Services to discuss their individual needs for accommodation.”

**Homework:** Will have approximately weekly assignments during the course. Homework is turned in at which it is due only. Solutions will be posted in the BLACKBOARD.

**Tests:** Each test and the final exam will be closed book with a formula sheet (one sheet is permitted, handwritten equations and formulas only and it will be turned in with the test). Two tests will be considered (lowest test grade will be dropped). Test attendance is mandatory. In the event that a true, documented personal emergency is going to cause an absence from a test, let me know immediately, otherwise a zero will be assigned for the missed test.

**Grading:** 40% tests average, 30% homework, 30% final exam.

**Final Grades:**

90% and above	A
80% - 89.9 %	B
65% - 79.9 %	C
50% - 64.9 %	D
Below 50%	F

Note: Once I enter the class final grades on-line you can immediately learn your grades using a touch-tone phone (864-656-2255). PC connected to the mainframe computer, or Clemson Web <http://www.clemson.edu/clemweb/>.