

Spring 2012 - Syllabus

EENG 4010.005 & 5940.001 Renewable Electrical Power Systems

Class meetings Tuesday-Thursday 10-11:20 in B-242

Description

Fundamental course on efficient and renewable electrical power systems with relationships to environmental systems. Integration of renewable and alternative energy generation to the electric power system grid. Environmental challenges for the harnessing of renewable and alternative energy source for electrical power systems. Credit hours: 3 hrs.

Prerequisites

Consent of the instructor

Instructor

Miguel F. Acevedo, Regents Professor Electrical Engineering Department, Office B-260, Phone 940-891-6701, Email Miguel.Acevedo@unt.edu

Office hours

T-W- 3-4 PM, or by appointment.

Format

- Lectures, with computer based labs, and field exercises
- Assignments: weekly homework. Must be submitted by class time every Thursday.
- Online resources: Blackboard Learn <https://learn.unt.edu>, all students registered for the class will be automatically given access by UNT on the first class day

Grade

- EENG 4010: 70% graded assignments and 30% two exams.
- EENG 5940: 55% graded assignments, 30% two exams and 15% for a research paper.
- Attendance is required and will be monitored.

Schedules of exams

- Midterm: Exam 1
- Designated final day: Exam 2 (Final) and papers due (for 5940)

Textbooks

Required:

- Renewable and Efficient Electric Power Systems, Gilbert M. Masters, ISBN: 978-0-471-28060-6, 2004, Wiley-IEEE Press

Class Evaluation by Students

The Student Evaluation of Teaching Effectiveness (SETE) is a requirement for all organized classes at UNT and is available for your input at the end of the semester.

Topics

1. Basic concepts of environmental systems

- Resources and ecosystems
 - Global climate change
 - Pollution, land use
 - Sustainability
2. Basics of electric power and thermodynamics
 - Review of circuits, electrical quantities, and power
 - Capacitors
 - Resistors and wires
 - Review of thermodynamics
 - Carnot cycle, steam and combustion generation, gas turbines
 3. Basics of magnetic circuits and steam cycles
 - Electromechanical devices
 - Inductors, transformers
 - AC generators
 - Rankine cycle, heat engines, power generation
 - Coal-fired power plants, environmental impacts
 4. Electric power quality and efficiency
 - Reactive power, power factor and correction
 - Three-phase systems, transformers
 - Harmonics
 - Transmission lines
 5. Electric power industry
 - History, current situation, trends, policies, markets.
 - Generation, transmission, distribution
 - Base-load, intermediate and peaking power plants, load – duration curves
 6. Power generation
 - Synchronous generators, equivalent circuit, steady-state and power-angle characteristics
 - Types of alternative power plants: turbines, hydropower, geothermal, wave, tidal, solar
 - Small scale power generation (distributed generation): Microturbines, reciprocating engines, fuel cells
 7. Electric power transmission and distribution
 - Electric transmission line parameters, two-port networks, transmission line models, transformer, substations
 - Transients, balanced faults, system protection
 - Power flow control, stability considerations, power system state estimation, power system security
 8. Distributed generation systems
 - Smart grid
 - Power converter, power flow and stability.
 - Energy end use, metering, monitoring, and conservation

- Human comfort in buildings
 - Microturbines, solar, biomass, micro-hydropower
 - Integrating green and renewable power systems, inverters
9. Solar power
- Sun-Earth relations, sunpath, insolation, radiation, tracking
 - Photovoltaic systems
 - Small scale
 - Utility scale
 - Environmental conditions, efficiencies
10. Wind power
- Environmental conditions
 - Technologies, generators
 - Efficiencies, economics
 - Small-scale
 - Utility scale
11. Energy carriers for storage and transportation
- Batteries, super-capacitors
 - Fuel cells
12. Hydropower
- Watersheds, Reservoirs, dams
 - Turbines
 - Reservoir and power management
 - Low-head and high-head
13. Beyond conventional renewable energy
- New concepts for wind, solar, and hydro
 - Hydrogen, liquid nitrogen

Policies

Grades: All grades for the course will be final. No extra credit assignments or work will be considered after the final grade has been recorded.

Accommodations: The EE Department in cooperation with the Office of Disability Accommodation complies with the Americans with Disabilities Act in making reasonable accommodations for qualified students with disabilities. Please present your written accommodation request before the 12th class day.

Academic Dishonesty: Students caught cheating, plagiarizing, or any other academic dishonesty will be subject to penalty according to the new Policy on Students Standards on Academic Integrity. See full policy at http://www.unt.edu/policy/UNT_Policy/volume3/18_1_16.pdf

According to this policy the categories of academic dishonesty are:

- A. Cheating. The use of unauthorized assistance in an academic exercise, including but not limited to:
 - a. use of any unauthorized assistance to take exams, tests, quizzes or other assessments;
 - b. dependence upon the aid of sources beyond those authorized by the instructor in writing papers, preparing reports, solving problems or carrying out other assignments;
 - c. acquisition, without permission, of tests, notes or other academic materials belonging to a faculty or staff member of the University;
 - d. dual submission of a paper or project, or re-submission of a paper or project to a different class without express permission from the instructor;
 - e. any other act designed to give a student an unfair advantage on an academic assignment.
- B. Plagiarism. Use of another's thoughts or words without proper attribution in any academic exercise, regardless of the student's intent, including but not limited to:
 - a. the knowing or negligent use by paraphrase or direct quotation of the published or unpublished work of another person without full and clear acknowledgement or citation.
 - b. the knowing or negligent unacknowledged use of materials prepared by another person or by an agency engaged in selling term papers or other academic materials.
- C. Forgery. Altering a score, grade or official academic university record or forging the signature of an instructor or other student.
- D. Fabrication. Falsifying or inventing any information, data or research as part of an academic exercise.
- E. Facilitating Academic Dishonesty. Helping or assisting another in the commission of academic dishonesty.
- F. Sabotage. Acting to prevent others from completing their work or willfully disrupting the academic work of others.