Spring 2010 - Syllabus  
EENG 4010.003 Environment - Power Systems

Class meetings Tuesday-Thursday 11-12:20 in B-192 and Labs in B-242

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

Prerequisites:
- Consent of the instructor

Instructors
- Main Instructor: Miguel F. Acevedo, Regents Professor Electrical Engineering Department, EE Office B-260, Office Hours: MWF 2-3 PM; MEE Office F101H, Office Hours MWF 11-12 AM Phone 940-891-6701, Miguel.Acevedo@unt.edu
- Assistant Instructor: Ramalingam Vasudevan, Post-Doc Research Associate, Electrical Engineering Department, EE Office B-263, Office Hours: T-Th 10-11 AM and 1-3 PM Phone 940-891-6872, Ramalingam.Vasudevan@unt.edu
- Invited Guest Lecturer: Mike Snyder, Manager of the Electrical Engineering Group of SunPower Corporation, Richmond, CA. By video-Conference.
- Invited Guest Lecturer: Selma García-Iturbe, Manager Environmental Information Systems, GIGA, Caroni Hydroelectrical Company (CVG-EDELCA), CORPOELEC, Venezuela

Format:
- Lectures, with some computer based labs, and field exercises
- Assignments: weekly homework. Must be submitted by class time every Thursday.
- Online resources:
  - Through UNT ecampus Blackboard Vista https://ecampus.unt.edu
  - All students registered for the class will be automatically given access by UNT on the first class day

Grade:
- 70% graded assignments and 30% two exams.
- Attendance is required and will be monitored.

Schedules of exams
- March 4: Exam 1 (Midterm) Material covered up to Feb 25
- May 6: Exam 2 (non-comprehensive Final). Material covered up to April 29

Textbooks:
Recommended (available at the bookstore)

Others:

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 electric power
   a. Review of circuits, power supplies, power quality
   b. Power factor, three-phase systems, transformers
   c. Synchronous generators
   d. Review of Thermodynamics
   d. Carnot cycle, steam and combustion generation, gas turbines, co-generation
2. Electric power industry
   a. History, current situation, trends, policies, markets.
   b. Generation, transmission, distribution
   c. Base-load, intermediate and peaking power plants, load – duration curves
   d. Electric transmission line parameters, transformer, substation
3. Power generation
   a. Synchronous generators, equivalent circuit, steady-state and power-angle characteristics
   b. Types of alternative power plants: turbines, hydropower, geothermal, wave, tidal, solar
   c. Small scale power generation (distributed generation): Microturbines, reciprocating engines, fuel cells.
4. Solar power
   a. Sun-Earth relations, sunpath, insolation, radiation, tracking
   b. Photovoltaic systems
   c. Small scale
   d. Utility scale
   e. Environmental conditions, efficiencies
5. Electric power transmission and distribution
   a. Electric transmission line parameters, two-port networks, transmission line models, transformer, substations
b. Transients, balanced faults, symmetrical components, sequence networks, line-to-ground and line-to-line faults, system protection

c. Power flow control, stability considerations, power system state estimation, power system security

6. Wind power generation
   a. Environmental conditions
   b. Technologies, generators
   c. Efficiencies, economics
   d. Small-scale
   e. Utility scale

7. Energy carriers for storage and transportation
   a. Methanol, ethanol
   b. Batteries, super-capacitors
   c. Fuel cells

8. Basic concepts of environmental systems
   a. Resources and ecosystems
   b. Global climate change
   c. Pollution, land use, watersheds
   d. Sustainability

9. Hydropower
   a. Watersheds, Reservoirs, dams
   b. Turbines
   c. Reservoir and power management

10. Distributed generation systems
    a. Microturbines, solar, biomass, micro-hydropower
    b. Integrating green and renewable power systems, inverters

11. Smart grid distributed generation systems
    a. Power converter, power flow and stability.
    b. Energy end use, metering, monitoring, and conservation
    c. Human comfort in buildings
    d. Economics

12. Beyond conventional renewable energy
    a. New concepts for wind, solar, and hydro
    b. 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.