

Fall 2014 – Syllabus EENG 4340.001 Environmental Monitoring

Class meetings Tuesday-Thursday 11:30 AM-12:50 PM in B-217

Description:

Fundamental course on sensors, instruments, and real-time systems to monitor environmental systems. Applications to atmospheric and radiation, weather, air quality, hydrological, water quality, terrestrial ecosystems, and aquatic ecosystems. Sensor technology, operation principles, calibration, and maintenance. Data acquisition systems and telemetry: data loggers, sensor networks, wireless communications and networks. Ground-based, airborne, and space-borne platforms. Short-term measurements vs long-term monitoring. Databases, metadata, analysis, and modeling, standards, ecoinformatics and hydroinformatics. Data sharing and preservation. Environmental observatories, application to policy and decision making, education and public outreach. Credit hours: 3 hrs.

Prerequisites:

- Consent of the instructor

Instructor

Miguel F. Acevedo, Regents Professor Electrical Engineering (EE) Dept, Geography Dept. and Institute of Applied Sciences (IAS). Office Discovery Park B-260, Phone 940-891-6701, acevedo@unt.edu, Office hours: Tuesday-Thursday 9-10 AM, or by appointment.

Teaching Assistant

XXXX, Graduate Student, [xxx](#) Office DP Bxxx Office Hours xxxxx

Format:

- Lectures
- Computer based exercises
- Field work exercises
- Assignments: weekly homework.
- Online resources: Through UNT ecampus Blackboard Vista <https://ecampus.unt.edu>

Grade:

- 60% graded assignments and 40% two exams.
- Attendance is required and will be monitored.

Exams

- Exam 1 (Midterm)
- Exam 2 (non-comprehensive Final)

Textbooks:

- Required: No textbook required.
- Recommended: “Environmental Monitoring and Characterization”, 2004, Authors: Janick Artiola, Ian L. Pepper, Mark L. Brusseau, Publisher: Elsevier.

- Gertz E. and Di Justo P. 2012. Environmental Monitoring with Arduino: Building simple devices to collect data about the world around us. O'Reilly Media Inc.

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. Principles of Monitoring
 - a. Why monitoring? short-term vs long-term
 - b. Earth systems, ecosystems, environmental systems
 - c. Ground based, airborne and spaceborne platforms
2. Sensors
 - a. Principles of circuits and electronics
 - b. Sensor technology, operation principles, calibration, and maintenance
3. Data acquisition systems, data loggers, sensor networks
 - a. Telemetry, Radio waves, transmission, reception, antennas
 - b. Wireless communications and networks
4. Power sources and storage
 - a. Solar cells, optimizing power
 - b. Batteries, super capacitors, charging
 - c. Energy harvesting
5. Atmosphere – radiation
 - a. Solar radiation, Electromagnetic Spectrum
 - b. Absorption, reflection, scattering
 - c. UV and ozone
 - d. Fiber Optics, spectrometers
 - e. Measurement from airborne and spaceborne platforms
6. Atmosphere–air quality
 - a. Aerosols and particulate matter
 - b. Gases, Ozone, NO₂, CO₂
7. Atmosphere –Weather
 - a. Temperature
 - b. Rain
 - c. Relative Humidity
 - d. Wind velocity and direction
 - e. Evapotranspiration
8. Hydrology and hydrodynamics
 - a. Soil moisture
 - b. Water velocity
 - c. Water flow, discharge
 - d. Water level and depth

9. Water quality and aquatic ecosystems
 - a. pH, chlorophyll, conductivity, turbidity
 - b. Fluorometers
 - c. DO and BOD
 - d. Productivity and respiration
10. Terrestrial Ecosystems
 - a. Productivity
 - b. Gas exchange
 - c. Tree growth, dendrometers
 - d. Leaf area
11. Biomonitoring
 - a. Ecotoxicology
 - b. Organism response to stress
 - c. Organism selection
12. Databases
 - a. Database design and implementation
 - b. Long-term monitoring
 - c. Metadata, standards, data interoperability
 - d. Ecoinformatics and hydroinformatics
 - e. Data sharing and preservation
 - f. Web interface, content management
13. Applications
 - a. Environmental observatories
 - b. Policy, regulatory, and decision making
 - c. Education and public outreach
 - d. Analysis and modeling

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.