

SYLLABUS for Environmental Measurements in Natural Systems (CE 320-4) SPRING 2004

Purpose: To introduce students in science and engineering to complexities and challenges associated with characterization and measurements of environmental processes in natural systems.

To provide hands-on experiences with selection of measurement strategies and sensing technologies; sampling network and protocol design; and deployment, acquisition and interpretation of measurements.

To enhance problem-solving skills and motivate student experiences by means of real-life laboratory and field experiments and class projects.

Instructor:

CAST 313
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CAST 203
Phone: (860) 486-3211
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Office Hours: Monday 3:00-4:00 CAST 313

Time: **Class:**
Tuesday 1:00-3:00PM CAST 201

Lab:
Thursday 1:00-4:00PM CAST 101

Text: Class notes and handouts

Grades: 50% on Lab Reports
30% on Group Project
20% on Final Examination
Scale: A>90%; B=80-89%; C=70-79%; D=60-69%; F<60%

Homework & Homework is due in class on Monday, 1 week after being assigned.

Lab Reports: Lab reports are due at the beginning of the following lab session.

Lecturers: Amine Dahmani (Longley Building, phone: 486-2781)
John Fikiet (UTEB 274, phone: 486-2439)
Prof. Bagtzoglou (CAST 327), phone: 203-251-8430

Prof. Robbins (BEACH 211, phone: 486-1392)
Prof. Liu (BEACH 213, phone: 486-1388)
Prof. Ogden (CAST 309, phone: 486-2771)
Prof. MacKay (CAST 314, phone: 486-2450)
Prof. Holmén (CAST 311, phone: 486-3941)
Prof. Anagnostou (CAST 308, phone: 486-6806)

Laboratory Reports: Reports are due one week after conducting the Lab experiment. Report write-up should be neat and concise (4-6 pages, excluding graphs), try to adhere to the following format:

Title - (don't forget your name and date).

Introduction - A brief discussion of the topic and the lab's objectives.

Materials and Methods - Keep it short, there is no need to repeat handout information, only deviation from it.

Results - Include tables of raw and/or transformed data; equations and graphs.

Discussion - Take some time and think! Check if results make sense (no negative weights please); explain their significance and the associated physical process; integrate concepts from class; discuss assumptions and limitations.

Literature Cited - List in alphabetical order literature you have consulted and mentioned in the report.

Topical Issues:

o Common Themes and Structures:

1. Introduction to theoretical aspects of the physico-chemical processes; survey of measurement technologies and practices; discussion of experimental objectives and available resources; experiments by student groups, analyses and reporting.

2. Specific topics will be presented by experts in the field.

o Natural and Engineered Surface Water Quality - sampling, characterization, and monitoring. (drinking water/waste water treatment plant, MyPond, large scale surface water sampling and analyses).

o Characterization of Subsurface Flow and Structural Properties - Direct sampling (introduction to HydroProbe capabilities and operation - ERI), textural and other characterization, laboratory and field measurements; Geophysical methods for non-invasive characterization (Prof. Liu); measurements in deep formations (Prof. Robbins); water content and matric potential measurements.

o Flux Measurements - Laboratory experiments - infiltration in well-equipped soil columns, gaseous fluxes through partially-saturated soil columns. Field measurements - infiltration and infiltrometers; in-situ CO₂ flux measurements (gradient and Li-Cor systems).

o Atmospheric Measurements - Near-surface radiation and energy balance principles, methods & issues of footprint etc.

. Setup and operation of standard radiation and energy balance station (radiation, wind speed, relative humidity, soil heat flux).

o *Air Quality Sampling* - Theoretical aspects, sampling in natural and engineered environments, ERI operational perspective, principles and methods (guest lecture - Prof. Holmen).

o *Class Projects*: (1) Design and deployment of a monitoring system (Phase I); (2) Remote acquisition and real-time interpretation (Phase II).
