THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Measurement and Modeling of Climate Change

ENVENG 4218

Credit Hours:
3.00 - 3.00

Course Levels:
Undergraduate (1000-5000 level)

Course Components:
Lecture

Course Description:
A study of the atmospheric boundary layer, its interaction with the land surface and vegetation in particular, and hand-on experience with micrometeorological and eddy-covariance instrumentation and data analysis.

Prerequisites and Co-requisites:
Prereq: CivilEn 2060, or permission of instructor.

Course Goals / Objectives:
- Introduce students to the general theory of boundary layer meteorology and earth-surface atmosphere interactions
- Understand boundary layer dynamics and effects on ecosystems
- Understand the role of surface fluxes and land surface use in global climate
- Enable the students to use meteorological sensors and data

Course Topics:

- History of climate change science. Climate politics. Tragedy of the commons.
- Basic atmospheric physics – properties of the air, atmospheric pressure, definitions of temperature and humidity. Atmospheric boundary layer definitions and classifications. Relationships between boundary layer conditions and weather.
- The surface energy balance and Atmosphere-Biosphere interactions. Radiation attenuation. Distribution of solar energy at the land surface. Surface fluxes – heat, water, CO2. Role of vegetation in the surface energy budget.
- Global energy budget, climate change and greenhouse gasses. Introduction to on-line sources of meteorological, ecosystem, and climatic data archives
- Greenhouse gas budgets of ecosystems. Ecosystem services of weather stabilization. IPCC and the US SOCCR report. Societal valuation and costs of climate change
- How are surface flues measured? Surface fluxes and eddy-covariance technique. Methods to identify and correct data errors, spikes and biases.
- Data analysis – Averaging, smoothing and gap filling techniques. The effects of scale. Upscaling, downscaling
- Modeling the boundary layer – Monin Obhukov similarity, K theory, Navier-Stokes equations, introduction of the modeling techniques: large eddy simulations and the turbulence closure problem
- IPCC and the US SOCCR report. Societal valuation and costs of climate change. Climate change Seminar - Presentations of graduate student projects that study aspects of climate change and climate change effects in Ohio

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Designation:

Elective