THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Measurement and Modeling of Climate Change for Graduate Students

ENVENG 6218

Credit Hours:
3.00 - 3.00

Course Levels:
Graduate

Course Components:
Lecture

Course Description:
The course will focus on the science behind climate change, and specifically on physical processes at the earth surface, and the interactions between the ecosystem, human activities and climate change. Design of data analysis research project, testing hypotheses regarding climate change and its effects using observational data, hands-on climate data analysis experience through personal project.

Prerequisites and Co-requisites:
Prereq: Grad standing in CivilEn or EnvEng, 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.

Designation:

Elective