NRE 480/AOSS 480 Climate Change: The Move to Action

Professor: Richard B. Rood (rbrood@umich.edu) (AOSS) (2525 Space Research Building)
Meeting Times: 10:00-11:30 Tues, Thurs
Lecture Classroom: 1024 Dana
Office Hours: TBA

Overview

This course explores the intersections of the science of climate change with society: policy, business, economics, public health, energy, ecosystems, environmental engineering, information science, journalism, religion, *etc*. The problem is approached from the perspective that there are communities with heterogeneous interests that are vested in both adapting to and mitigating climate change. The course will expose students to the fundamental factual and contextual elements surrounding climate change in order to facilitate effective participation in the response to realized and predicted climate change. The students will work in multi-disciplinary teams on projects to analyze current real-world problems and to develop strategies to address those problems.

Objectives

1) To understand the basic observations and scientific tenets of climate change.
2) To expose the role of uncertainty in science and how that uncertainty is used by non-scientific communities.
3) To introduce the issues of fundamental importance at the intersection of climate change predictions and different communities: e.g. policy, business, economics, public health, energy, ecosystems, environmental engineering, information science, journalism, religion, *etc*.
4) To develop a technique to analyze and address complex problems with stakeholders from multiple communities.

Format

This three-hour course meets for 1.5 hours on Tuesdays and Thursdays. Lectures focus on key concepts and the critical analysis of information – what is important, what is not important? Also how does knowledge developed by scientific investigation stand in comparison with other sources of knowledge and interests of different parts of society? How does this impact the response of these communities to scientifically generated knowledge? The project is based on an algorithm for addressing complex problems with intermediate, evolving solutions. This includes inventory and differentiation of knowledge, analysis in an changing knowledge and interest environment, identification of externalities, and the development of strategies to address the problem posed in the project. The projects are defined based on the interest and expertise of the class.

Grading and Evaluation

The grading is based on the projects, which will have both oral and written components. The projects are regularly reviewed over the course of the classes and students will provide progress reports and interactive analysis.

Class Materials

There is no specific textbook, as the course uniquely integrates material from several fields. There is a reading list, and all of the material in the reading list is available on line. The reading list includes basic introductory material on climate science, and often relies on reports from the National Academy of Sciences and the Intergovernmental Panel on Climate Change. Material that covers the non-scientific communities that are addressed in the course rely on survey articles in academic journals, reports by non-governmental organizations, and web resources. The lecture material and projects are steered by breaking news of both academic and non-academic sources.

There is a c-tools site, and the students have the opportunity to contribute to blogs and a wiki maintained by the professor.

Course Schedule

Week	Lecture	Title
1	1	Introduction: Course Outline, Basis of Climate Change Science and Impacts
	2	Role of IPCC and Summary of Predictions
2	3	IPCC Predictions of Temperature and Precipitation, Correlated Behavior in the Physical Climate System, Relation of Climate Change to Energy
	4	Conservation Principle, Conservation of Energy, Ice-Age Cycles, Role of Water in the Physical Climate System
3	5	Climate Variability of the Past 1000 Years, Radiative Balance of the Earth, Role of Terrestrial and Marine Ecosystems in the Carbon Budget
	6	Earth System: Roles of Atmosphere, Ocean, Land, and Cryopshere in Maintaining Earth's Climate; The Vertical Structure of the Greenhouse Effect.; Weather and Climate
4	7	Aerosols, Feedback Mechanisms, Models and the Role of Models
	8	Model Experiments: Diagnostics of Past Observations, Predictions of the Next Century (IPCC), Climate Forcing
5	9	Definition of Project Form, First Round of Project Definition, Synthesis of Previous Lectures

	10	Observing Systems, Observations of the Physical Climate, Observations of Ecosystems, Coherent and Convergent Evidence of Climate Change
6	11	Vulnerability, Ethics, Adaptation: Winners and Losers in Climate Change
	12	Project Proposals: Individuals or Teams
7	13	Climate Change as a Management Problem, Background of International Policy, Framework Convention, Kyoto
	14	Kyoto Protocol, Is the Sulfur Market a Good Policy Model for Climate Change
8	15	The Carbon Market
	16	Analysis of Market-based Approaches to Environmental Regulation: Can these be effectively applied to carbon dioxide management?
9	17	Selection of Project Proposals: Project Team Definition
	18	Local, State, and Regional Policy
10	19	The Role of the Judicial System and Litigation in Climate Change, Massachusetts vs EPA
	20	Project Status, Refinement of Scope, Identification of externalities
11	21	Public Health: Overview of Impacts of Climate Change on Public Health
	22	Public Health: Societal Response and Adaptation of Public Health Services, Heat Waves
12	23	Business and Climate Change: Preparing for the Future
	24	Global Geo-engineering: Strategies for Managing the Global Climate
13	25	Project Status and Discussion
	26	Synthesis and Discussion
14	27	Synthesis and Discussion
	28	Project Presentations