Global Change Ecology (11:216:451) (3 credits)

Fall 20XX Thursday 9:15-12:15 (ENR 123, Cook Campus)
Instructor: Ming Xu (mingxu@crssa.rutgers.edu**, 848-932-9211)**
Office Hours: Thursday 12:20-13:30, ENR 132 or by appointment

Course Description

While global change is of increasing concerns worldwide, the rapidly - emerging field of Global Change Ecology is just beginning to address how organisms and ecosystems will respond. This course will focus on the physical science perspectives on global environmental change by discussing the causes, mechanisms, and impacts of major types of global changes on ecosystem structure and functions. The course will emphasize how integrating ecology, physiology, behavior, and evolution is enabling understanding past responses and predicting future responses at various scales (from cell to globe). The course will consist of some lectures, but will primarily be comprised of presentation and discussion of readings. Emphasis will be placed on the recent literature, but will also include readings from various books.

Course Learning Goals:

The goal of the course is to critically evaluate information about the causes and biological consequences of the major types of global change as a result of human activities.

1) To gain a broad understanding of the mechanisms by which plants, animals, communities, and ecosystems are responding to global change
2) To directly engage with the primary literature and identify topics at the frontier of global change research
3) To enhance skills in communicating science and to become acquainted with methods and tools for predicting future responses to global change.

Course Prerequisites

A course in general ecology or permission of the instructor. The course is intended for advanced undergraduates and graduate students.

Activities

Courses meetings will consist of approximately two - thirds lectures (**Lec** on schedule) and one third activities which include:
Discussions: discussing the motivations, methods, results, and implications of recent papers.
Debates: hot topics of current interest in global change ecology will be debated in class. Background reading will be assigned before the debate. Students will sign up on the sakai website (two days before the debate) for one of two specified debating positions. If the number of people selecting each position is unbalanced, the instructor will randomly reassign people one day before the debating class.
Modeling exercise: Using computer models to predict the potential impacts of global changes on species distribution and ecosystem functions.

Text and Reading Materials

Articles, chapters and online reading materials will be assigned and distributed on the course sakai website. Check the sakai frequently for potential changes in reading assignments. The following texts are optional supplement to the assigned readings. Used copies can be purchased online inexpensively.

1. Graves and Reavey, 1997. Global Environmental Change: Plants, Animals and Communities.

2. **Shugart and Woodward, 2011. Global Change and the Terrestrial Biosphere: Achievements and Challenges**
3. **Lee Jay Hannah, 2010. Climate Change Biology**
4. **IPCC 2013, Climate Change 2013: The Physical Science Basis, free download at:**
http://www.ipcc.ch/report/ar5/wg1/

5. Lester R. Brown. 2011. World on the edge. Free to download at: http://www.earth-policy.org/images/uploads/book_files/wotebook.pdf

Assignments

1. One-page (< 500 words) critique on each article/chapter assigned. DO NOT copy any text from the article itself. That is plagiarism and counteracts the purpose of the assignment. I am more interested in what you got out of the article than the article itself.
2. **Mid-term:** Define terms and short-answer questions
3. Final project: Each student will select a species/ecosystem and investigate whether the species/ecosystem has already responded to climate change and how the species/ecosystem is likely to respond in the future. Will the species/ecosystem move, acclimate, adapt, or face extinction? Provide evidences in detail **(10-15 pages, double-spaced, including tables, figures and maps)**.

Grading

Class attendance (participation/preparedness for debates and discussions) 20%

Critique assignments 20%

Mid-term 30%

Final project paper 30%

Course schedule

Month	Date	Lecture	Topic
Sept	3	1	Introduction and Overview of Course Topics
	10	2	Earth climate system
	17	3	Greenhouse gases (GHGs) and GHG effect
	24	4	Observed climate changes
Oct	1	5	CC impacts on plants and animals
	8	6	CC impact on biodiversity and communities
	15	7	CC and ecosystem carbon and nitrogen cycles
	22	8	Bioclimate modeling: Maxent
	29	9	CC and agriculture
Nov	5	10	CC and wetlands/water resources
	12	11	Nitrogen deposition and invasive species
	19	12	CC mitigation and adaptation
	26		no class (Thanksgiving)
Dec	3	13	Ecosystem/biodiversity management under GC

	10	14	CC politics and negotiations