Learning Objectives and Course Content:

- To study the major issues and analytical tools in natural resource economics. We will cover issues related to the use of renewable and non-renewable resources over time, biodiversity conservation, climate change and sustainability. We will analyze the issue of efficient use of resources over time, whether market equilibrium achieves an efficient outcome, common property resources, spatial modeling, imperfect competition, multiple equilibria, uncertainty, irreversibilities, discounting, and sustainability.
- To increase your ability to do economic research. We will do a set of activities to increase your ability to think critically and formulate specific researchable questions, as well as improving your modeling and analytical skills.

Course Requirements:

Homework: 20%
Midterm: 20%
Final: 30%
Paper, presentation, participation: 30%

We will read and discuss major articles that have helped define the field of resource economics and recent articles on the frontier. Reading the literature is important for gaining literacy and understanding the evolution of ideas and analytical techniques. Class time will be largely devoted to lecture and discussion of this material.

Each week you will hand in a question or insight arising from lecture, class discussion, class readings, other readings, or recent events. A couple of sentences will typically be sufficient for each question or insight. At the start of each class session we will spend a few minutes discussing selected issues raised by submitted questions or insights, or from outside events. We will use this time to think critically about the issue, formulate specific researchable questions, and potential modeling strategies.

There will be periodic problem sets. The best way to learn natural resource economics (or any branch of economics) is to solve problems. The problem sets will be mostly analytical but will also include some numerical problems. The latter type may involve the use of Excel or Matlab on the computer. I encourage you to work together on problem sets but each of you will hand in your own assignment.
You will complete a term paper which addresses a research question of your choice in resource economics. The paper could form a basis for your subsequent research. As an alternative to a term paper

**Texts**
There are two books that we will reference fairly extensively in the course:
Clark (1990) contains useful discussion of renewable resource models. Conrad and Clark (1987) contain a summary of important concepts and a set of exercises that will allow you to apply the concepts to resource problems. I will assign some exercises from this book on problems set. Most of the readings for the course are journal articles. I will try to make them available to you.

There are several other useful books that are good reference books that you may wish to purchase or have access to:


Resource economics often employs techniques of dynamic optimization (optimal control theory and dynamic programming). What follows are good reference books for the subject.

b. Dixit and Pindyck. 1994. *Investment under Uncertainty*
Topics to be covered
I. The Big Picture: Resources and Sustainability

II. Renewable Resources:
A. Basic Growth Theory
B. Bioeconomic Models: Optimal Harvesting (Fishery Models)
C. Open Access and Regulation
D. Common Property Resources: Game Theoretic Models
E. Age Dependent Growth and Timing of Harvest (Forestry Models)
F. Spatially Explicit Models
G. Renewable Resource Management with Uncertainty
H. Irreversibility, Uncertainty, and Option Value

III. Non-Renewable Resources
A. The Basic Hotelling Model and Extensions
   Implications about intertemporal nonrenewable resource use
B. Empirical Tests
   Empirical tests of Hotelling principles
C. Exploration and Uncertainty
   Implications to resource use of exploration with uncertain outcomes
D. Imperfect Competition
   Market power at industry/national levels and intertemporal use of nonrenewables

IV. Biodiversity
A. Biodiversity Measures and the Value of Biodiversity
   Concepts/definitions, applications
B. Strategies to Conserve Biodiversity
   Policies and institutions for biodiversity conservation
C. Land Use Modeling
   What’s different from renewable/nonrenewable resources, implications of spatial attributes of land

V. Climate Change
Review of science of climate change, optimal climate-change mitigation: review of various arguments, policies for climate-change mitigation, international cooperation

VI. Sustainability
Concepts/definitions, applications
Reading List
(This is meant to be a list of useful readings. Required readings are to be announced.)

I. The Big Picture: Resources and Sustainability

II. Renewable Resources:
A. Basic Growth Theory
Conrad and Clark, chapter 1.
Hanley, Shogren and White, chapter 7.

B. Bioeconomic Models: Optimal Harvesting (Fishery Models)
Clark, chapters 1-4, 7.
Conrad and Clark, chapter 2.
Hanley, Shogren and White, chapter 10.
Hartwick and Oiewiler, chapter 11.

C. Open Access and Regulation

D. Common Property Resources: Game Theoretic Models
[TO BE UPDATED]
Clark, chapter 8.


E. Age Dependent Growth and Timing of Harvest (Forestry Models)

Clark, chapter 9.

Hanley, Shogren and White, chapter 11.

Hartwick and Oleviler, chapter 10.


F. Spatially Explicit Models


G. Renewable Resource Management with Uncertainty

Clark, chapter 11.

Conrad and Clark, chapter 5.


H. Irreversibility, Uncertainty, and Option Value

Dixit and Pindyck, chapter 2 and chapter 4, pp. 93-103.

Conrad and Clark, chapter 5, sections 5.1 and 5.7.


III. Non-Renewable Resources

A. The Basic Hotelling Model and Extensions

Conrad and Clark, chapter 3.
Dasgupta and Heal, chapter 6.
Hanley, Shogren and White, chapter 9.
Hartwick and Olewiler, chapter 8.

**Gaudet’s (2007) new article in CJE**
**Roughgarden’s New article**
**“Scarcity” JEL article and new RFF article!!**

B. Empirical Tests


C. Exploration and Uncertainty


**D. Imperfect Competition**

Hartwick and Olewiler, chapter 9.


**IV. Biodiversity**

A. Biodiversity Measures and the Value of Biodiversity


B. Strategies to Conserve Biodiversity


C. Land Use Modeling


**V. Climate Change**
[TO BE UPDATED: Newell and Pizer, Stern Report, IPCC AR4, Nordhaus, Weitzman, Dasgupta, etc.]

**VI. Sustainability**
Hanley, Shogren and White, chapter 14.
Hartwick and Olewiler, chapters 2, 12.
Dasgupta and Heal, chapters 7-8.