AEDE 7320: Advanced Resource Economics  
Spring 2016  
Monday/Wednesday 3:55pm – 5:15pm,  
Room 108, Agricultural Administration Bldg.

Instructor: Dr. Sathya Gopalakrishnan  
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Office Hours: Tuesday 10:00 – Noon and by appointment.  
If you cannot make it during office hours, I will be happy to set up an alternative time to meet with you. Email is the best way to reach me outside class.

Course Description:  
Are we running out of natural resources? How can we optimally allocate the use of renewable and non-renewable resources over time? How do biological and physical processes affect the optimal management of natural resources? What is sustainability? What are the factors that influence inter-generational allocation of resources? This course addresses these central questions and aims to provide students a solid foundation in the theory of natural resource economics. The course is broadly divided into three sections. The first section will focus on the capital theoretic foundation, optimal control theory and methods to solve dynamic problems. The second section of the course will cover the theory of non-renewable and renewable resource economics and the seminal papers in the field. The third section will focus on contemporary issues and advanced topics such as spatial-dynamic problems, and coupled human-natural systems.

Prerequisites:  
This course is designed for second-year PhD students in economics, agricultural, environmental and development economics, or public policy. It is assumed that students have completed at least one graduate-level course in microeconomic theory (ECON 8711, 8712 or equivalent) and econometrics (ECON 8731, 8732 or equivalent), and are comfortable with differential and integral calculus.

Learning Objectives: Upon completion of this course, students will:

1. Be familiar with the literature in resource economics and the contemporary policy issues surrounding sustainable use of natural resources.
2. Be able to set up and solve dynamic resource problems using analytical and numerical methods.
3. Have the theoretical foundation and methodological tools to pursue research in the field on environmental and resource economics, and teach a course in this subject in the future.
Assignments and Grading

The grade will be determined by 4-5 homework assignments (40% grade), a take-home midterm exam (25%) and a referee on a working paper that relates to the course (25%). In the homework problem sets, students will set up and solve dynamic optimization problems relating to natural resource management. You can work in small groups and turn in one homework assignment per group. Most dynamic problems cannot be analyzed in just one or two hours. Therefore, there will be a take-home exam that will allow students sufficient time to explore dynamic analysis in depth. You must work independently on take-home exams. You will also be writing weekly summaries of the papers that we will read (10%).

Books and Readings:

It is difficult to find a single textbook that addresses all the topics of the course in sufficient detail. Below I list several books that are useful. I will make available copies of some chapters that we will read for the course. I suggest that everyone have at least one good reference on dynamic optimization. I recommend Caputo’s book because it clearly ties economic intuition and interpretation with the mathematics. If you plan to work in fisheries economics or more generally renewable resource economics, I strongly recommend purchasing Clark’s book. If you are interested in non-renewables, then getting a copy of Dasgupta and Heal would be useful.


Course Policies:

Any student who feels s/he may need an accommodation based on the impact of a disability should contact me privately to discuss your specific needs. Please contact the Office for Disability Services at 614-292-3307 in room 150 Pomerene Hall to coordinate reasonable accommodations for students with documented disabilities.

From the Code of Student Conduct, “Plagiarism is the representation of another's works or ideas as one's own; it includes the unacknowledged word for word use and/or paraphrasing of another person's work, and/or the inappropriate unacknowledged use of another person's ideas”. Plagiarism is a violation of the Code of Student Conduct and is considered academic misconduct. It is my policy to follow the university recommendation that all incidences of academic misconduct be reported to the committee on academic misconduct for disciplinary action.
Tentative Course Outline:

Week #1: Overview, Introduction to Dynamics, Discounting and Dynamic Optimization

1. Brief History of Natural Resource Economics

Week #2: Optimal Control Theory and the Maximum Principle

2. Dynamic Optimization and the Maximum Principle
   a. Caputo (Chapter 1, 2)
   b. Clark (pp 68-87)

3. Tools: Using MATLAB to solve differential equations and dynamic problems

Week #3: Natural Resources as Capital

4. Natural Resources and Capital Theory
   a. Dasgupta and Heal, pp. 1-10
   b. Caputo, pp 312-336

5. Interpreting Current Value Hamiltonian as a welfare measure

Week #4-5: Non-renewable resources

6. Optimal Extraction and Hotelling’s Rule
   a. Dasgupta and Heal, pp. 153-175.

7. Empirical tests of the Hoteling Rule

8. Backstop Technology and Resource Exploration
d. Dasgupta and Heal pp. 175-226


**Week #6-7: Economics of Renewable Resources – Fisheries**

9. Bioeconomics of the Fishery and the Problem of Open Access

10. Predator-Prey Models in Renewable Resource Economics
   a. Clark, pp. 310-342

**Week #8: Renewable Resources – Forests**

11. Forest Economics and Rotational Harvesting
   a. Clark, pp. 267-274

**Week #9: Coupled human-Natural Systems**

12. Coupled models of Coastline Change

13. Resilience and Regime Shifts

**Week #10: Sustainability and Resource Economics**

14. Intergenerational Equity and Sustainability Paradigms

15. Non-Constant Discounting

**Week #11-14: Advanced topics of interest (TBD)**
Advanced Topics in Resource Economics

1. Empirical Bioeconomics


2. Spatial Models in Renewable Resource Economics


3. Invasive Species – Spatial/ Spatial-Dynamic Problems


4. **Stock Pollutants and Climate Change**
   
   
   
   

5. **Economics of Non-Convex Ecosystems**
   
   

6. **Green Accounting / Value of Natural Capital**
   
   
   

7. **Empirical Analysis of Resource Scarcity and Measuring Sustainability**
   
   
   
   