Course Description: This course addresses theoretical and empirical questions about natural resource scarcity, covering both depletable and renewable resources. This course consists of two parts. First, we provide students a solid foundation in the theory of natural resource economics by introducing a broad set of tools used this field. In particular, we apply dynamic optimization and optimal control methods to the management of natural resources. Second, we highlight some contemporary themes in resource economics. Those topics of policy importance will be selected and analyzed. We use econometric models to test the results predicted by the theory.

This course is mainly designed for PhD students in environmental and resources economics. However, those students in macroeconomics, applied microeconomics, public finance, public policy and development may find the applied tools useful in their research. Students must have completed a year of PhD-level microeconomic theory and econometrics.

Readings: I recommend the following four text books.


Requirement: The course will be run as a combination of lectures by the instructor and discussions by students. Thus, attendance at class meetings is mandatory. The homework assignment includes three parts: 1) Three problem sets in the first three weeks, 2) Leading classroom discussion for designated papers. Please sign up here for discussion leader: [http://goo.gl/COaYWf](http://goo.gl/COaYWf). Presentation slides can be used but are not required; and 3) A final project that proposes to apply nonlinear dynamics or optimal control theory to an economic question. The project can be theoretical or empirical. Some preliminary results are expected to demonstrate the project is feasible.

Grading: The course grade will be based 20% on classroom participation, 20% on homework assignment, 20% on discussion leader, and 50% on a research proposal.
**Academic Integrity:** Student conduct related to this course is governed by the UCSD Policy on Integrity of Scholarship: “Students are expected to complete the course in compliance with the instructor’s standards. No student shall engage in any activity that involves attempting to receive a grade by means other than honest effort.”

**Course Outline**
(* designates discussion papers)

**Week 1: Introduction and logistics**

Strogatz chapter 1


**Week 2: Nonlinear dynamics: one-dimensional system**

Strogatz chapters 2-4 & Clark chapter 1


**Week 3: Nonlinear dynamics: n-dimensional system**

Strogatz chapters 5-12 & Clark chapter 6


**Week 4: Optimal control theory**

Caputo chapters 1-3, 10, 12 & Clark chapter 4

**Week 5: Non-renewable resources: lecture**


**Week 6: Non-renewable resources: discussion**


**Week 7: Renewable resources: lecture**


**Week 8: Renewable resources: discussion**


**Week 9: Additional Topics**

**Session 1: Stock pollutants**


**Session 2: Sustainable Development**


**Week 10: Research project proposal presentations**