ECONOMICS OF SUSTAINABILITY MANAGEMENT
ECONOMICS OF SUSTAINABILITY MANAGEMENT **Fall 2019 Sustainability Management SUMA-PS4190** **Day/Time:** M 6:10pm-8:00pm **Location:** 424 Pupin Laboratories
Instructor: J. Nicolas Hernandez-Aguilera **Email:** jnicolas@iri.columbia.edu **Office Hours** : M 4:00-5:45pm **Location:** Hogan Hall, Conference Room B17 North
Graduate Assistant: Svetlana Mainagasheva **Email:** sm4688@columbia.edu **Office Hours**: M 2:00-4:00pm, M 8:15-9:30pm **Location:** Business & Economics Library

Course Objective

This course of Economics of Sustainability Management builds on core economics courses and innovative frameworks to address issues of environmental, resource, and ecological economics. By the end of the semester, it is expected that students will gain experience using economic concepts to recommend or critique actual sustainability management policies and decisions. An important goal of the class is to have students work in groups to apply economic concepts to current public policy issues that will require coordination with governments, civil society, the scientific community, and business. Students not only learn economic concepts, but they will also learn how to explain them to decision-makers. The course will cover concepts and metrics from microeconomic theory, game theory, information economics, and risk management.

Course Overview

This is a semester-long course and, in the first lecture, we will discuss what sustainability means in economic terms and outline a general framework. After that, the course has three broad sections. The first section, focuses on the principles of classical micro-economic models that address the appropriate way of regulating economic activity to balance environmental and social goals. We discuss methods by which aggregate resource-allocation decisions occur in capitalist economies. We will also briefly review the policy and welfare implications of perfectly competitive markets that represent an idealized analytical benchmark. We then analyze markets where the benchmark assumptions do not hold. Specifically, we will study inefficient outcomes in the presence of "market failures" such as monopoly power, externalities, and public goods. In addition, we will discuss the appropriateness of various "command and control" as well as market-based public policy options (taxes, subsidies, tradable permits, regulations, public provision of goods and services) to correct these failures. Moreover, we will examine practical steps in the implementation of these tools by studying environmental-valuation techniques and cost-benefit analysis, and analyze financial instruments to manage risk and uncertainty.

The second section of this course covers the optimal use of renewable and non-renewable natural resources. Simple dynamic models and policy brief documents about food systems, agriculture, biodiversity, land management, fossil fuel and energy will be analyzed. Emphasis will be placed on the economic intuition of concepts like common-pool resources and cooperation challenges. In addition, simple numerical examples will be suggested to understand the intuition behind optimality conditions. We will end the semester with a final section and debate where we will examine non-traditional set of rules and economic insights to guide sustainability management policies.

Differences between ecological and traditional environmental and resource economics approaches will be emphasized during this final section. Alternative modelling methods for discussion will include agent-based models, evolutionary models, and participatory approaches among others.

Prerequisites

Students are expected to have had some exposure to economics. Students who have had an undergraduate course in intermediate micro-economics with calculus will be adequately prepared to excel in the course. Those who have not had such preparation, will need to work harder to absorb the theoretical concepts along with the applications. It is not uncommon, however, for students with little economics preparation to excel in this course. In the absence of any economics preparation, it is useful to have some mathematical fluency.

If you are concerned about your level of mathematics preparation, and did not attend the Math Camp provided before the start of the Fall semester, you are strongly encouraged to watch the lectures online. The lectures are available at:
http://www.youtube.com/view_play_list?p=DD613FD445373CB9

Method of Instruction

Pre-class reading, regular attendance at lectures, class participation and diligent efforts to do the problem sets are each necessary to master the course. The course will use some basic mathematical tools when convenient. The emphasis will be, however, on building strong economic intuition and critical interpretation of economic research rather than technical research skills.

Textbook and Reading

The course will draw on two main recommended textbooks, as well as additional articles and readings listed on this program and Canvas. All reading material is subject to evaluation through homeworks, team projects, mid-term and class participation.

Main Textbooks

Kolstad, Charles D. 2010. *Environmental Economics*. 2nd Edition. Oxford University Press. (CDK)

Tietenberg, Thomas H., and Lynne Lewis. 2010. *Environmental Economics and Policy*. 6th Edition. Addison-Wesley. (TTLL)

Additional Textbooks and Readings

Axelrod, Robert. 1997. *The Complexity of Cooperation: Agent-Based Models of Competition and Collaboration*. Princeton University Press. (RA)

Barrett, Scott. 2007. *Why Cooperate?:The Incentive to Supply Global Public Goods: The Incentive to Supply Global Public Goods*. OUP Oxford. (SB)
Conrad, Jon M. 2010. *Resource Economics*. 2nd Edition. Cambridge University Press. (JC)

Hellmuth, M. E. et al. 2009. *Index Insurance and Climate Risk: Prospects for Development and Disaster Management*. International Research Institute for Climate and Society. Working Paper. https://cgspace.cgiar.org/handle/10568/932 (September 3, 2019). (IRI)

Hernandez-Aguilera, J. Nicolas, Jon M. Conrad, Miguel I. Gómez, and Amanda D. Rodewald. 2019. "The Economics and Ecology of Shade-Grown Coffee: A Model to Incentivize Shade and Bird Conservation." *Ecological Economics* 159: 110–121. (JNHA)

Libecap, Gary D. 1993. *Contracting for Property Rights*. Cambridge University Press. (GDL)

Nordhaus, William D. 2007. "A Review of the Stern Review on the Economics of Climate Change." (WN)

———. 2015. *The Climate Casino: Risk, Uncertainty, and Economics for a Warming World*. New Haven London: Yale University Press. (WN)

Ostrom, Elinor. 1990. *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge University Press. (EO)

Proops, John L. R., and Paul Safonov. 2004. *Modelling in Ecological Economics*. Edward Elgar Publishing. (JP & PS).

Raworth, Kate. 2017. *Doughnut Economics: Seven Ways to Think Like a 21st-Century Economist*. Chelsea Green Publishing. (KR)

Sachs, Jeffrey D. 2015. *The Age of Sustainable Development*. Columbia University Press. (JS)

Stern, Nicholas, Nicholas Herbert Stern, and Great Britain Treasury. 2007. *The Economics of Climate Change: The Stern Review*. Cambridge University Press. (NS)

"Sustainable Development Solutions Network | Pathways to Sustainable Land-Use and Food Systems." http://unsdsn.org/resources/publications/pathways-to-sustainable-land-use-and-food-systems/ (September 4, 2019). (FABLE)

Course Outline

The following is a preliminary course outline. Certain sections may be extended or speeded up depending on the progress of the class. Additional readings will be posted on Canvas before each lecture.

Date	Topic	Readings
Week 1 09/09/2019	Introduction to Sustainability Economics	CDK (1,2) TTLL (1) JS(1)
Environmental Economics		
Week 2 09/16/2019	Social Choice and Efficient Markets	CDK(3,4) TTLL (2)
Week 3 09/23/2019	Market Failures & Regulation	CDK(5,11) TTLL (4)
	.. Homework 1 posted on Canvas	
Week 4 09/30/2019	Instruments: Property Rights, Taxes & Marketable Permits	CDK(12,13) GDL (1,2)
	..Homework 1 Due Date	
Week 5 10/07/2019	Valuing the Environment: General Framework and Cost Benefit Analysis	CDK(6) TTLL(3)
Week 6 10/14/2019	Valuing the Environment: Indirect and Direct Methods	CDK(7,8,10)
	Homework 2 posted on Canvas	
Week 7 10/21/2019	Risk, Uncertainty and Financial Instruments	CDK(18) IRI
	Homework 2 Due Date -	
Week 8 10/28/2019	Midterm Exam	
Week 9 11/04/2019	Academic Holiday – No Classes	

Resource Economics		
Week 10 11/11/2019	Basic Concepts: Renewable and Nonrenewable	JC (1.1 – 1.3) TTLL(7)
Week 11 11/18/2019	Food, Agriculture, Biodiversity and Land	JC (1.4) TTLL(10, 11) JNHA FABLE
	Last date to send one-page team project draft and schedule an office hour appointment (First come- first serve)	
Week 12 11/25/2019	Common Pool Resources: Fisheries and Water	EO (1) TTLL(13) SB
	Homework 3 posted on Canvas	
	***Last date** for Team Project Appointments - –*	
Week 13 12/02/2019	Climate Change & Energy	TTLL(8,16) NS, SB, WN
	Homework 3 Due Date	
Ecological Economics and Alternative methods		
Week 14 12/09/2019	Team Project Presentations	RA, JP&PS, KR

Method of Evaluation

Regular attendance and active class participation are required. Students are expected to have covered the readings for each lecture before class. As in management, teamwork is an essential element of success in the class. Grades for the course will be based on:

1.   Midterm Examination (25%)

> The examination will be given in class. Each student is required to take the examination and it will be a closed-book examination.

2. Team Project (10% Appointment / Draft + 30% Presentation / Final Report)

The main goals of the team project are to generate an opportunity where students will evaluate the pros and cons of **i)** classic economic frameworks and methods, and **ii)** alternative perspectives such as ecological economics, in response to a specific sustainability challenge.

Students are free to choose their topic and will be randomly assigned to a group of five people. In preparation to the presentation students will schedule an appointment with the main instructor during his office hours and not later than Monday Nov. 25th. During these 15 to 20 minutes appointments, students will share their ideas and receive feedback. Five business days before the appointment the group should e-mail a one-page draft to the instructor and CC the Grad Assistant. On this draft the group clearly state the problem, the research/management question associated to this problem, the specific aims for the team, and the alternative methods they will suggest/compare to tackle the problem.

A list of references is provided in this syllabus and Canvas, but refences should not be restricted to those suggested. The project also includes a group presentation and a written report. Presentation should not exceed 20 minutes (15 minutes presentation and 5 minutes for questions). Final report comprises up to five pages, without references, written in 12-point Times font with one-inch margins, with the exception of references that can be in 11-point font.

3. Problem Sets (20%)

There are 3 problem sets. You can work individually or form groups of up 2 people to work on the problem sets. Each team member must sign on the front page that they contributed to the problem sets. Except under extenuating circumstances, students are expected to remain in the same problem set team for the entire semester. Problem sets are always due at the beginning of class and no late problem sets will be accepted, as solutions will be posted in Canvas the same day after class.

4. Class Participation (15%)

Students will be required to contribute to class and team project discussions. Contributing to class discussions enhances the quality of the class and makes it more interesting and exciting for all of us. All contributions are accepted and welcome, based on mutual respect and recognition. The only "bad question" or comment is the one that you are not asking or commenting on. We are all learning from each other's experience and academic backgrounds.

Re-Grading Policy

If you feel your solution has been overlooked or graded it incorrectly, please hand in a written note explaining why the particular item should be regarded within two weeks after the problem set/exam was made available for pick-up. Once the two weeks have passed, you forfeit the right for a re-grade.

Academic Integrity and Professional Conduct

Columbia University expects that its students will act with honesty and propriety at all times and will respect the rights of others. It is fundamental University policy that academic dishonesty in any guise or personal conduct of any sort that disrupts the life of the University or denigrates or endangers members of the University community is unacceptable and will be dealt with severely.

Additional information on Academic Integrity and Professional Conduct can be viewed online:

http://sps.columbia.edu/student-life-and-alumni-relations/academic-integrity-and-community-standards

Academic dishonesty includes failure to properly cite ideas in your work that are not originally yours. Please familiarize yourself with the proper methods of citation and attribution. The University provides some useful resources online; we strongly encourage you to familiarize yourself with these various styles before conducting your research:

http://library.columbia.edu/help/howto/endnote.html