

SUMA K4140 Sustainability Science

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1 Course Overview

Global environmental threats have suddenly become part of our everyday life, both in the form of news about natural disasters in different parts of the world and through a series of new scientific discoveries. Scientific knowledge about our planet as a system in which there is interplay between the atmosphere, oceans and land surfaces has increased dramatically in recent decades. In step with that development it is becoming progressively clearer that our political and economic systems must take these global challenges seriously. Sustainable development was launched 20 years ago as society's response both to conventional social problems, such as poverty, conflicts and ill-health, and to the new global environmental problems, such as climate changes, the loss of biological diversity, water shortage and changes in land-use. That means that sustainability science is a broad scientific field which studies integrated social and natural systems, processes and structures and in which the objective of knowledge is the sustainable development of society. This interdisciplinary course seeks to provide a general overview in sustainability science and to help students develop new knowledge in order to better understand society's role as communities begin transitioning towards sustainable development.

The Science of Sustainability course explores some of the major scientific issues behind our understanding of sustainability. Through lectures, readings, and discussions, the class will explore such issues as biodiversity, population, food and water resources, climate change, energy, public health, and the overall forecast for the environment and the human condition for the next several decades. Students will gain a greater appreciation of how science can inform the policies and practices that will shape a more sustainable future

This course satisfies the program's physical dimensions requirement. Students are able to identify about the connections between environmental inputs (i.e. natural resources) and outputs (i.e. energy), and their effects on the natural environment. The emphasis in this requirement will be on assessing the environmental impacts from organizational activities. The planning, design or architecture courses give students a foundation in planning, design and spatial issues. This is particularly important, as many sustainability initiatives concern land use, buildings and other physical entities.

2 Course Objectives

- Become familiar with some of the major scientific issues behind our understanding of "sustainability"
- Develop an understanding of how scientific methods are used to construct ecological / environmental knowledge
- Become familiar with some of the major ecological / environmental challenges facing the Earth today, and the important research which needs to be done to address these concerns
- Gain a greater appreciation of how science can inform policies that will shape a sustainable future
- Recognize some of the limits of our knowledge when predicting how modern industrial methods and technology will affect the human condition and the sustainability of the

natural environment

- Develop a deeper understanding of how human development impacts natural systems
- Become familiar with the ecological justifications for sustainable practices in building and design

3 Course Content

- Session 1: Introduction to sustainability science
Chapter 1
McMichael et al. "New Visions for Addressing Sustainability." Science 302, 1911 (2003).
- Session 2: Fundamentals of Ecology I: Biodiversity and the cycling of matter and energy
Chapter 3, 6
- Session 3: Fundamentals: Population ecology I (interactions within species)
Chapter 4
- Session 4: Fundamentals: Population ecology II
Quiz 1
- Session 5: Fundamentals: Population ecology III and Evolution
Paper Topic Due
- Session 6: Fundamentals: Community ecology (interactions between species)
Chapter 5
- Session 7: Community II and ecosystem ecology
Quiz 2
- Session 8: Sustainability of marine resources

Ch 7 - pp. 176-183; Ch 20 - pp. 518-519, 524, 535-541
- Session 9: No Class
- Session 10: Human populations and food security
- PAPER OUTLINE DUE
- Watch the video "The World at 7 Billion: Sustaining Our Future"
<http://www.earth.columbia.edu/7billion/>
Chapter 8, 12
- Session 11: Energy I: Nuclear and fossil fuels
Quiz 3
Chapter 14, 15
- Session 12: Energy II: Renewable fuels

- Session 13: Climate change
- Session 14: Pollution and prevention

4 Method of Instruction and Evaluation

Organization of the course

Format. One hour to hour and a half of lecture will be used to provide an overview of a topic and provide examples of the application of the scientific theory to sustainable development analyses. Course lectures intend to present a broad overview of the issues in environmental science affecting and each session will cover a new topic.

Discussions:

(for Courseworks information see numeral 5. Resources and Software Package)

You may post messages and documents under each Discussion "Forum" in Courseworks to which everyone in the class will have access. Each session you are responsible for posting one comment to the Discussion section regarding any one of the session's reading assignments. This posting must occur before class for it to be counted toward your participation grade. This is a good way to let the class know about interesting documents, websites, etc. on the topic of the session. You can also post provocative questions here to stimulate ideas for the debate.

Grades will be based on the following:

Grading will be based on three of four quizzes (35%), a 3000-word review paper on a topic of the student's choosing related to sustainable development (50%), and attendance and participation (15%).

5 Resources and Software Packages

All readings will be listed in Courseworks.

Courseworks is a web-based system operated by the University to assist classroom instruction. We will use Courseworks extensively in this course for:

1. Posting the syllabus (Course Information).
2. Posting instructor lecture notes (Lectures) and required readings selected by the instructors (Class Files).
3. Posting discussions and reference materials selected by students (Discussions).
4. Posting announcements from instructors (Announcements).

6 Textbooks and Reading

The Students will be expected to do a significant amount of reading for the course and to

contribute to discussions on readings. The principal text for this course will be required:

Wright & Boorse. 2010. 11th Edition. Environmental Science Towards a Sustainable Future

7 Policies

Academic Integrity

The School of Continuing Education does not tolerate cheating and/or plagiarism in any form. Those students who violate the Code of Academic and Professional Conduct will be subject to the Dean's Disciplinary Procedures. The Code of Academic and Professional Conduct can be viewed online:

<http://ce.columbia.edu/node/217>

Please familiarize yourself with the proper methods of citation and attribution. The School 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>

Violations of the Code of Academic and Professional Conduct will be reported to the Associate Dean for Student Affairs.

Accessibility Statement

Columbia is committed to providing equal access to qualified students with documented disabilities. A student's disability status and reasonable accommodations are individually determined based upon disability documentation and related information gathered through the intake process. For more information regarding this service, please visit the University's Health Services website:

<http://health.columbia.edu/services/ods/support>