

GLY 2038: Sustainability and the Changing Earth
Spring 2012, 3 credit hours, Location: WM202

Instructor: Dr Andrew Zimmerman

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Office Hours: M 4-5 pm or by appointment

Pre-requisites and Co-requisites: None

CATALOGUE DESCRIPTION

An introduction to planet Earth as a dynamic and complex global system which impacts and is impacted by humans. Course materials will demonstrate physical and chemical linkages between the geosphere, hydrosphere, biosphere and atmosphere, which directly impact the sustainability of human lifestyles at a variety of timescales. Recommended for students not majoring in the physical sciences.

General Education Learning Objectives

Content Knowledge

- Know the basic concepts, theories and terminology of the physical sciences
- Understand what science is and the scientific method
- Know the major scientific developments within the physical sciences and the impacts on society and the environment.

Critical Thinking

- Formulate empirically-testable hypotheses derived from the study of physical processes and living things within the natural and physical sciences.
- Apply logical reasoning skills effectively through scientific criticism and argument within the physical sciences.
- Apply techniques of discovery and critical thinking effectively to solve experiments and to evaluate outcomes.

Communication

- Communicate scientific findings clearly and effectively using oral, written and/or graphic forms.
- Write effectively in several forms, such as reading summaries, exercises and research papers.

Specific Course and Gen Ed Learning Objectives

- Explain the scientific method and its application to understanding Earth sciences.
- Explain the physical conditions on Earth which make it rare among planets as able to support life
- Describe the history of human population on Earth and reasons for these trends
- Understand the Earth as a complex system of interacting spheres (Geosphere, biosphere, hydrosphere, atmosphere) that includes feedbacks and thresholds
- Explain how an Earth scientist might view sustainability and how this view likely differs from no-Earth scientists
- Explain how the scientific theory of plate tectonics is supported by the various lines of evidence.
- Understand how the general properties or materials found on earth and how their distribution and use govern sustainability of life.
- Understand the science behind natural disasters, their human impacts, and sustainable solutions to remediate these impacts
- Address issues of environmental concern using qualitative and quantitative arguments

- Describe the major natural and anthropogenic factors that can influence our climate, and have a general sense of our level of scientific understanding of each
- Understand global/national trends in resource consumption and environmental damage that can be caused through its overuse
- Use qualitative and quantitative arguments to address issues of resource conservation and the pursuit of alternative materials and energy technologies
- Describe and debate the strategies by which a more sustainable future can actually be achieved.
- Collaborate with other students to examine the science behind a sustainability-related environmental issue and quantitatively evaluate various possible solutions

These general education and course objectives will be accomplished through lectures, readings and discussion of those readings, exercises, and accessed via completion of a group final project with oral presentation and written products.

REQUIRED TEXTBOOK

Pipikin et al., *Geology and the Environment* 6e, 2011 Brooks/Cole Pub.

GRADING

- 30% 10 quizzes/exercises (attendance/participation)
- 50% Two exams (mid-term and final) worth 25% each (multiple choice)
- 20% Final project/presentation (done in pairs of students)

GRADING SCALE

A = ≥93%, A- = 90-92.99, B+ = 87-89.99, B = 83-86.99, B- = 80-82.99, C+ = 77-79.99, C = 73-76.99, C- = 70-72.99, D+ = 67-69.99, D = 63-66.99, D- = 60-62.99, E < 60

***Note:** A C- grade is not a qualifying grade for major, minor, Gen Ed, or College Basic distribution credit.

For further information on UF's Grading Policy, consult the following:

<http://www.registrar.ufl.edu/catalog/policies/regulationgrades.html>

<http://www.isis.ufl.edu/minusgrades.html>

EXAMS

Everything associated with the class, including lecture material, textbook readings and exercises, is fair game on exams. However, the focus will be on material presented in lecture. Exam material is cumulative but focuses on most recent material. I will offer pre-exam Q&A sessions. Make-ups for exams will only be given by pre-arrangement (before the exam) or under extraordinary circumstances.

Exam grades will be curved using a linear method described here:

<http://www.ats.amherst.edu/software/excel/excel-grading/excel-grades/#CurvingGrades>. Grades will be curved to a median of 80%. So half the class will get A's or B's on exams. Your participation and eagerness to learn will be used to aid final grade determination in borderline situations.

PROJECT

Students in groups of 2-3 will write a summary and present to the class their analysis of a pressing environmental issue. Each student is responsible for presenting one aspect of the topic such as: 1) Background, 2) The science behind the issue, and 3) The sustainable solution. During the semester

there will be due dates such as: a) report topic and team member assignments, b) list of sources, c) presentation, d) paper. Each student will be assessed individually on the basis of the quality of their written work (50%) and their presentation (50%). For each of these, a grading rubric will be used which incorporates the General Education Learning Objectives; Content Knowledge (40%), Critical Thinking (30%) and Communication (30%).

COURSE WEBSITE

Go to the e-learning Support Services homepage [<https://ss.at.ufl.edu/services/els/>] and click on the Sakai System Entry link. The course site provides access to announcements, downloadable lecture notes/outlines and readings. You are responsible for checking this site for announcements and to see that your grades are being correctly recorded. Do not send me e-mail through this site. I don't check it there (use azimmer@ufl.edu).

READINGS/EXERCISES

In addition to textbook chapters, readings (mainly from journals) will be assigned periodically and must be read prior to class discussion. These will be available in pdf format. Each reading will have an accompanying series of questions designed to test the student's mastery of the specific course and Gen Ed learning objectives corresponding to the reading. Student's work will be graded on this basis as well. Readings are listed below.

ATTENDANCE, ABSENCE AND MAKEUP POLICY

Attendance and participation will be gauged by the level of completion of 10 unannounced in-class quizzes or exercises during the semester.

Students are expected to complete all requirements (quizzes, exams, etc.) on the specified dates and will not be granted an alternate date unless they have an acceptable reason for their absence as specified in the undergraduate catalog (e.g., absences due to medical illness, observance of religious holidays, military obligation, twelve-day rule), fulfill the conditions described therein, and provide the instructor with timely notification (see <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx#absences>).

CLASSROOM POLICY

Use of mobile phones and computers (for purposes other than note-taking) are prohibited during lectures. Refusal to comply will result in immediate dismissal from the classroom.

ACADEMIC POLICY

Students are required to be honest in their coursework, may not use notes during quizzes and/or exams, and must properly cite all sources that they have consulted for their papers. Any act of academic dishonesty will be reported to the Dean of Students, and may result in failure of the assignment in question and/or the course. For University of Florida's honor code, see <http://www.dso.ufl.edu/sccr/honorcodes/honorcode.php>

DISABILITY RESOURCE CENTER

Students who will require a classroom accommodation for a disability must contact the Dean of Students Office of Disability Resources, in Peabody 202 (phone: 352-392-1261). Please see the University of Florida Disability Resources website for more information at: <http://www.dso.ufl.edu/drp/services/>.

- It is the policy of the University of Florida that the student, not the instructor, is responsible for arranging accommodations when needed. Once notification is complete, the Dean of Students Office of Disability Resources will work with the instructor to accommodate the student.

UF Counseling Services

- Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:
 - o UF Counseling & Wellness Center, 3190 Radio Rd, 392-1575, psychological and psychiatric services.
 - o Career Resource Center, Reitz Union, 392-1601, career and job search services.
- Many students experience test anxiety and other stress related problems. “A Self Help Guide for Students” is available through the Counseling Center (301 Peabody Hall, 392-1575) and at their web site: <http://www.counsel.ufl.edu/>.

GLY 2038: Sustainability and the Changing Earth: Spring 2012**Prof. Andrew Zimmerman - Tentative Schedule**

Week	Date	Topic	Reading*
1	Jan X	Course Intro/Science and Sustainability	Ch 1
	Jan X	Origins of Everything and Geol. Time	
	Jan X	Origins of Everything and Geol. Time	Reading 1
Sustainability and the 'Solid' Earth			
2	Jan X	Plate tectonics	Ch 3
	Jan X	Plate tectonics	
	Jan X	Earthquakes	Ch 4
3	Jan X	Volcanoes	Ch 5
	Jan X	Mass Wasting	Ch 7
	Jan X	Case Studies in Sustainable Habitation	Reading 2
Sustainability and Climate			
4	Jan X	The Atmosphere	Ch 2
	Jan X	Past climate variability	
	Jan X	Case Studies in Climate & Sustainability	#Topic & team due
5	Feb X	Climate Change Today - Evidence	Ch11
	Feb X	Climate Change Today – C Cycle	
	Feb X	Climate Change Today – Solutions	Reading 3
Sustainability and Water			
6	Feb X	The Oceans	Ch 6 & 7
	Feb X	The Oceans	(Abel & McConnell)
	Feb X	Marine Resources and Sustainability	Reading 4
7	Feb X	The Coastal Environment	Ch 10
	Feb X	The Coastal Environment	
	Feb X	Case Studies in Coastal Sustainability	*team sources due
8	Feb X	Freshwater	Ch 8
	Feb X	Freshwater/Desertification	Ch 12
	Feb X	Case Studies in FW Sustainability	Reading 5
9	Mar X	Mid-Term Exam	
Earth Resources and Sustainability			
9	Mar X	Soils and Fertility	Ch 6
	Mar X	Soil and Erosion of Civilization	Reading 6
10	Mar X	Case Studies in Soil Sustainability	
	Mar X	Mineral Resources	Ch 13
	Mar X	Mineral Resources	

11	Mar X	Energy Resources	Ch 14
	Mar X	Energy Resources	
	Mar X	Case Studies Min. & Energy Sustain.	Reading 7
12	Mar X	Pollution/Recycling	Ch 15
	Mar X	Pollution/Recycling	
	Mar X	Case Studies in Waste Management	
Student Presentations of Sustainability Issue Analyses and Discussion			
13	Apl X	Student Presentations	
	Apl X	Student Presentations	
	Apl X	Student Presentations	
14	Apl X	Student Presentations	
	Apl X	Student Presentations	
	Apl X	Student Presentations	
15	Apl X	Student Presentations	
	Apl X	Student Presentations	
Final Exam: Issue Analysis Paper due at the time the final examination is scheduled.			

Chapter readings are from Pipkin et al.

Reading 1

An Epoch Debate. 2011. Gaia Vince. Science. v.334 p32.

Reading 2

Cutter, S.L., Barnes, L., Berry, M., Burton, C., Evans, E., Tate, E., Webb, J., 2008. A place-based model for understanding community resilience to natural disasters. *Global Environmental Change-Human and Policy Dimensions* 18, 598-606.

Reading 3

Paleoclimate Implications for Human-Made Climate Change. Hansen and Sato. 2011. *Climate Change: Inferences from Paleoclimate and Regional Aspects*. A. Berger, F. Mesinger, and D. Šijački, Eds. Springer.

Reading 4

Ecosystem science and the sustainable management of marine resources: from Rio to Johannesburg. Barange, 2009. *Front Ecol Environ*; 1(4): 190–196.

Reading 5

Biemans, H., Haddeland, I., Kabat, P., Ludwig, F., Hutjes, R.W.A., Heinke, J., von Bloh, W., Gerten, D., 2011. Impact of reservoirs on river discharge and irrigation water supply during the 20th century. *Water Resources Research* 47.

Reading 6

Montgomery, D.R., 2007. Soil erosion and agricultural sustainability. Proceedings of the National Academy of Sciences of the United States of America 104, 13268-13272.

Reading 7

Armaroli, N., Balzani, V., 2011. The Legacy of Fossil Fuels. Chemistry-an Asian Journal 6, 768-784.

Chalmers, H., Gibbins, J., 2011. Carbon capture and storage: More energy or less carbon? Journal of Renewable and Sustainable Energy 2.

A partial list of potential topics to be analyzed by the students:

- A case study in Earth-Human interaction and sustainability
- Evaluation of an Earth resource not discussed in detail during class
- A pollution issue not discussed in detail during class (marine, coastal, air pollution, river)
- marine habitat protection/preserves
- marine invasive species
- eutrophication-nutrient runoff
- aquaculture
- irrigation/dams
- overfishing (fishing practices)
- geological C sequestration
- climate change policy
- ocean fertilization
- scientific ethics/media
- alternative energy (solar, wind, wave etc.)
- sea level rise/coastal effects
- ocean acidification/coral bleaching
- food security
- genetically modified organisms
- collapse of ancient civilizations
- biofuels
- soil C sequestration
- climate change paleorecords
- land use change