

GEOGRAPHY (GEG) 105
Physical Geography: Earth System Science
Fall 2009

Lesson (105-001): MWF 10:30-11:20am, Nobel Hall Room 105
Lab (105-003): Tuesday 10:30am-12:20pm, Nobel Hall Room 123

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Office hours:
Tuesday 1:00 - 2:00pm
Friday 9:00 - 10:00am, 11:30am - 12:30pm
and by appointment

Course Objectives

In this course, students will

1. gain an understanding of the earth as a physical system created through the interactions of water, atmosphere, the sun's energy, weather, rocks, nutrients, humans and other creatures;
2. come to appreciate how the earth's physical systems are complex, interconnected, and essential to life;
3. practice looking at the world around them and developing ideas on the physical processes that form landscapes and weather;
4. develop a deeper appreciation for our home, the earth;
5. reflect upon the degree to which humans change the earth system, and evolve strategies to better care for the earth;
6. practice finding, evaluating, and communicating information to classmates and broader audiences; and
7. work together to employ reasoning and critical thinking to explore concepts, ask significant questions, and solve problems.

Course Materials

- Christopherson, R. W. 2009. *Geosystems: An Introduction to Physical Geography*. Seventh Edition. Upper Saddle River, NJ: Pearson Prentice Hall.
- An instructor-approved, nonfiction book of your choice on a course-related subject (see "Book Review" below).
- Additional readings and lab activities will be made available on Moodle.
- Basic calculator and lab notebook.

Course Components

Grading: Final grades are based upon four exams (50%), lab assignments (25%), a book review (15%), and assignments (10%). Grades will be posted to Moodle. Letter grades will be assigned according to the following scale: 100-93% =A, 92-90% =A-, 89-88% =B+, 87-83% =B, 82-80% =B-, 79-78 =C+, 77-73% =C, 72-70% = C-, 69-60% = D, 59-0% = F. Late assignments and labs will be penalized 10% per week overdue, beginning immediately after the assignment is collected at the start of class.

Exams: Exams allow me to assess how well you understand and carry out the course objectives. Exams will be based upon class lessons, labs, readings, and assignments. There will be four exams, including the final exam. Each exam carries the same weight toward your final grade.

Labs: We meet each Tuesday for a two-hour lab related to the week's topic. Lab activities provide a hands-on introduction to techniques and issues in the study of earth's systems and afford

opportunity to practice problem-solving skills. You are encouraged to work together to complete lab assignments. Many labs cannot be made up if they are missed, so plan to attend lab regularly. Lab assignments are due at 10:30 am Tuesday one week after assigned, unless otherwise noted. Each lab is weighted equally; there will be approximately 12 labs over the course of the semester. If you are having trouble completing a lab, see me before it is due. Two of the labs are field trips. The field trip on September 29 will be during regular lab hours and is mandatory. If missed, it cannot be made up. The field trip on November 24 is about four hours long and is optional; students not participating in the field trip will complete an alternative lab on their own.

Assignments: Assignments are of two types: 1) **in-class assignments**, such as writing a two-minute summary of the day's topic at the end of class, and 2) **homework assignments** that you complete outside of class. The assignments are designed to help you interact with the course material and practice critical thinking. Assignments also allow me to assess your understanding of the course topics. Sometimes the assignments will be completed in groups, in which case everyone in the group will earn the same grade. Sometimes the assignments will be assessed via an informal oral presentation (rather than a written response). The in-class assignments will not be announced ahead of time and cannot be made up if a student is not present. Homework assignments will generally be due the next class period. If you miss class you are still responsible for completing the homework and turning it in on time. All homework assignments are mandatory, but the two in-class assignments with the lowest grades will be dropped.

Book review: See below for a detailed explanation of the book review.

How to Succeed in this Course

- Complete the assigned readings and assignments on time, be prepared for class, bring your textbook (or other reading) to class, and contribute to class discussions and group work.
- Regularly check the course Moodle pages and your email to keep alert of course happenings and any changes. Some readings, labs and assignments will not be handed out in class but will only be posted to Moodle.
- Come talk to me to discuss ideas, problems or things you don't understand. I am here to help you learn.
- Take the exams at their scheduled time. Make-up exams are highly discouraged and will not be given unless you notify me at least several days prior to the exam date. The format and content of a make-up exam may differ from the regular exam.
- During labs, take the time to reflect on what you are doing. Resist rushing through labs or finishing as quickly as possible.
- Uphold academic integrity! This is expected of everyone participating in this course. The Gustavus policy regarding academic honesty is found at http://gustavus.edu/academics/general_catalog/current/acainfo. Cheating or plagiarism will result in no credit for the assignment(s), notification of the Office of the Provost, and possible further action.
- If your first language is not English, the Writing Center has a part-time tutor who can help you. Students can schedule work with this tutor by contacting the Writing Center (x7392). For further information, contact the Academic Advising Office (x7027)
- If you have a specific physical, psychiatric or learning disability and require accommodations, please let me know during the first week of class so that your learning needs may be appropriately met. You will need to provide documentation to Laurie Bickett (x7027) in the Advising Center. All discussions are confidential.

SCHEDULE

We will work hard to stick to this schedule, but we may have to make changes as the semester progresses. I will alert you to any changes in topics or readings. It is your job to come to class and check Moodle and email regularly for any schedule changes.

Week	Date	Topics	Reading in Christopherson	Tuesday Lab
1	Sep 9	What are systems and why is this concept important for this class?		No lab
	Sep 11	What are the important differences between the real earth, globes and maps?	Chapter 1	
2	Sep 14 & 16	Besides picnics and going to the beach, why do we need the sun? Why are there seasons? Why are the seasons in MN not like the seasons in Miami?	Chapter 2	Lab 1: I ♥ maps
	Sep 18	I know we need oxygen to breath, but what other roles does our atmosphere play in making the earth habitable?	Chapter 3 (pages 60-72)	
3	Sep 21	How have humans changed the earth's atmosphere? What's the connection between using electricity and driving cars and air pollution?	Chapter 3 (pages 72-83)	Lab 2: Can you balance the energy budget?
	Sep 23 & 25	What happens to energy from the sun once it reaches the earth's atmosphere and surface? What can change this relationship? Why does it matter?	Chapter 4	
4	Sep 28 & 30	Where is water found and how does it flow from one place to another? Why is this water cycle important to us? Where do we get water? What impact do humans have on the water cycle?	Chapter 9	Lab 3: Field trip to Seven Mile Creek Park
	Oct 2	How do rivers function as systems? How do rivers change the landscape?	Chapter 14	
5	Oct 5	Why are rivers important to humans? How do we change rivers for better or worse?	Chapter 14	No lab (Nobel Conference)
	Oct 7	<i>Nobel Conference</i>		
	Oct 9	Exam I		
6	Oct 12 & 14	What determines temperature at earth's surface? Why don't Wichita and San Francisco have similar temperatures? Why do land and water heat differently and why is this important?	Chapter 5	Lab 4: Specific heat and temperature
	Oct 16	What creates wind?	Chapter 6 (pages 140-152, 162-167)	

Week	Date	Topics	Reading in Christopherson	Tuesday Lab
7	Oct 19	At the global scale, how does air in the lower atmosphere move around? Why is this circulation of air important? Why can't the air just stay still? Then we could skip this chapter.	Chapter 6 (pages 152-162)	Lab 5: Who likes 100% relative humidity?
	Oct 21 & 23	Why should we care about the energy transfer that occurs when water changes from gas to liquid to solid or vice versa? Why is it not humid in MN in winter? What's the connection between humidity, rising air parcels and the weather?	Chapter 7	
8	Oct 26	<i>Reading Day</i>		No lab (Reading Day)
	Oct 28	Why do ocean currents matter and why the heck is this ocean stuff in the chapter on atmospheric circulation?	Chapter 6 (pages 167-170)	
	Oct 30	Exam II		
9	Nov 2, 4 & 6	What's the difference between weather and climate? What creates weather—especially here in MN? How is this connected with Chapter 7 (I was really hoping to forget that adiabatic stuff)? Aren't thunderstorms cool? Why don't we get hurricanes in MN?	Chapter 8	Lab 6: Rising and sinking air parcels and weather
10	Nov 9 & 11	What's the big deal about global climate change? Wouldn't it be nice if MN got warmer? How can anyone know what the climate used to be like thousands of years ago? Or predict what it will be like in the future? What should we do about climate change?	Chapter 10 (pages 308-317), Chapter 17 (pages 563-568), Chapter 19 (pages 617-621)	Lab 7: The earth is heating up!
	Nov 13	How do geologists think about time? What's it like inside the earth and how do we know? What's the rock cycle and what makes it happen?	Chapter 11 (pages 322-340)	
11	Nov 16	What??? The continents are <i>moving</i> ??? Who comes up with these crazy ideas about plate tectonics, and why should I believe them? Why are there no volcanoes and few earthquakes in MN?	Reading posted on Moodle	Lab 8: Volcanoes!
	Nov 18	How do rocks weather? How does this relate to rivers, climate and the rock cycle?	Chapter 13 (pages 400-416)	
	Nov 20	Can we please learn about avalanches and mudflows and landslides? They sound exciting. What role do humans play in creating these hazards?	Chapter 13 (pages 416-426)	
12	Nov 23	Exam III		Lab 9: Field trip or groundwater
	Nov 25 & 27	<i>Thanksgiving Break</i>		

Week	Date	Topics	Reading in Christopherson	Tuesday Lab
13	Nov 30	What are glaciers? Where are they found? What creates them? How do they move?	Chapter 17 (pages 530-541)	Lab 10: The amazing world of glaciers
	Dec 2	What impact do glaciers have on the landscape? How do we know MN was once covered with glaciers?	Chapter 17 (pages 542-548, 555-563)	
	Dec 4	What is soil anyway? How does it form? It's just dirt, so why does our professor get so excited about it? How do we humans impact soil, and why is this important?	Chapter 18 (pages 574-584)	
14	Dec 7, 9 & 11	What about all the living creatures on earth? They're nice and all, but what do they have to do with the earth system?	Chapter 19	Lab 11: Analyzing soil texture
15	Dec 14	How is all this stuff—rocks and climate and the sun and ecosystems and oceans and glaciers and so on—related? How does it all work together as a system? Why should we care?	Reading posted on Moodle	Lab 12: The earth as a system
	Dec 16	<i>Reading Day</i>		
	Dec 17-21	Finals Week		

Book review

Each student is responsible for reading and reviewing a book on a subject matter covered in this course. The book review will allow you to

- read beyond textbook and course materials and contribute to the class topic that connects with your book;
- recognize how the earth system impacts and is impacted by politics, history, economics, and other social forces;
- understand and become engaged with an issue relevant to the earth system and humanity;
- exercise critical reading, reviewing, speaking and writing skills; and
- share your assessment of the book with a broad audience (the class and anyone on the 'net).

Topics may include climate change, pollution, weather, oceanography, tornadoes, geology, environmental history, and many more addressing the physical earth system. Generally, the book should be a recent work of nonfiction written for an adult, "popular" audience. A list of possible book choices is provided below, but you may choose a book not on this list. The librarians at our library can also help you select a book.

The book is to be chosen by you but **must receive my approval by Monday, September 21**. Books will be approved on a "first come, first serve" basis to avoid two students reading the same book. Please try to have the book with you when you ask for approval. There are two reasons for this: 1) I want to see you have already made the effort to secure the book, and 2) if I am not familiar with the book, I will need to see it to decide if it is acceptable.

Since you will be reading such interesting things, I expect that you **share something relevant you learn from the book during class or lab with the entire class**. Please note when we will be studying your subject area so you can be ready to share with the class (even if you haven't completely finished the book).

The book review should 1) clearly and concisely summarize the main concepts presented in the book, and 2) present your own well-argued critique of the book. To receive an "A" grade, the book review must exhibit superb understanding of the topic, present sound and convincing arguments from your own thinking, follow correct procedures for organization and mechanics (e.g., sentence structure and spelling), and be submitted on time. Please avoid starting your review with "The book I choose to review is . . ." or similar construct that lacks imagination. Generally, use the present tense, as in "the author argues. . ." rather than "the author argued. . ." Take a look at book or movie reviews in magazines, newspapers or on the Internet to get an idea of how others review books (or movies, albums, etc.).

The book review, **due December 9**, must be posted on a website for book reviews as well as submitted to me in paper form. You may wish to make the website version shorter than the version you submit to me. Possible websites include powells.com, goodreads.com, amazon.com, your facebook page (make the posting public so others can read it), your personal webpage or blog, and barnesandnoble.com. Please don't buy something to register for a site (unless you want to—I believe amazon makes you purchase something in order to post book reviews).

I will use the following rubric to assess your book review:

Criterion	Score out of 5 points
Did the student share something relevant from the book with the entire class at an appropriate time?	
Does the book review clearly and concisely summarize the author's main argument, thesis or idea (without giving a chapter-by-chapter summary)?	
Does the book review use course concepts appropriately and accurately?	
Does the book review demonstrate that the student has a good understanding of the subject?	
Is there completeness of content? Does the book review address the major issues involved with the book's subject?	
Does the student clearly present a coherent critique of the book?	
Is the book review interesting, showing creative and critical thinking?	
Was the book approval received by September 21? Was the book review submitted on time and clearly posted to an appropriate internet site?	
Is the book review well-organized and fluent with logical order and appropriate paragraph and sentence structure?	
Is the book review free of errors? Does the book review make careful and correct use of words?	

Possible book choices

Most are available from the Gustavus library.

- Adams, J. 2007. *Vegetation-Climate Interaction: How Vegetation Makes the Global Environment*. Springer.
- Carson, R. 1964. *Silent Spring*.
- Crosby, A. W. 1993. *Ecological Imperialism: The Biological Expansion of Europe, 900-1900*.
- Forsyth, A., and K. Miyata. 1987. *Tropical Nature: Life and Death in the Rain Forests of Central and South America*. Touchstone.
- Glennon, R. 2004. *Water Follies: Groundwater Pumping and the Fate of America's Fresh Waters*. Island Press.
- Grazulis, T. P. 2003. *The Tornado: Nature's Ultimate Windstorm*. University of Oklahoma Press.
- Hough, S. E. 2004. *Earthshaking Science: What We Know (and Don't Know) about Earthquakes*. Princeton University Press.
- Kolbert, E. 2006. *Notes from a Catastrophe: Man, Nature, and Climate Change*. Bloomsbury USA.
- Leopold, A. 1949. *A Sand County Almanac*.
- Logan, W. B. 1996. *Dirt: The Ecstatic Skin of the Earth*. Riverhead.
- Lopez, B. 2001. *Arctic Dreams*. Vintage.
- Lowenfels, J., and W. Lewis. 2006. *Teaming with Microbes: A Gardener's Guide to the Soil Food Web*. Timber Press.
- Lynas, M. 2008. *Six Degrees: Our Future on a Hotter Planet*. National Geographic.
- McPhee, J. 1987. *Rising from the Plains*. Farrar, Straus and Giroux.
- Mooney, C. 2007. *Storm World: Hurricanes, Politics, and the Battle Over Global Warming*. Harcourt.
- Morton, O. 2008. *Eating the Sun: How Plants Power the Planet*. HarperCollins.
- Murphy, D. 2008. *To Follow the Water: Exploring the Ocean to Discover Climate*.
- Pearce, F. 2008. *With Speed and Violence: Why Scientists Fear Tipping Points in Climate Change*. Beacon Press.
- Pielou, E. C. 1991. *After the Ice Age: The Return of Life to Glaciated North America*. University of Chicago Press.
- Reisner, M. 1993. *Cadillac Desert: The American West and Its Disappearing Water*. Penguin.
- Safina, C. 1999. *Song for the Blue Ocean: Encounters Along the World's Coasts and Beneath the Seas*. Holt Paperbacks.
- Smil, V. 2001. *Enriching the Earth: Fritz Haber, Carl Bosch, and the Transformation of World Food Production*. Cambridge, MA: The MIT Press.
- Somerville, R.C.J. 2008. *The Forgiving Air: Understanding Environmental Change*. American Meteorological Society.

Welland, M. 2009. *Sand: The Never-Ending Story*. University of California Press.