

Instructor Information:

Instructor: Clifford S. Riebe
Office: 2008 ESB
Office Hours: TBD

Phone: 307-766-3965
E-mail: criebe@uwyo.edu

Course Information: This is an SE course in the University Studies Program (USP) and satisfies the introduction to geology requirement (i.e., 1000-level GEOL with lab) for degrees from the Department of Geology and Geophysics. It is appropriate for students seeking a deeper understanding of environmental and natural resources issues.

Prerequisites: None. However, students will benefit from completion of, or concurrent enrollment in, a course in algebra.

Course Description: This course introduces the science of water, soil, and the earth's environment and how it matters to all our lives. In just a few short decades, the importance of conservation of resources and the environment has rocketed from an afterthought, to center-stage importance in our daily lives. Over the next generation, the need to confront the growing host of environmental issues of our world at today will only grow in importance. For example, the scarcity of resources, particularly water and arable land, will likely be near the root of much political and socioeconomic conflict as demand increases with human population growth. To make matters worse, rapidly developing populous countries are sating large demands for resources against a looming backdrop of climate change that may limit both the availability and quality of water and soil resources in unexpected ways. The threat of environmental degradation will rise with the growing use of resources. In particular, the need to feed and water the ever-increasing masses of humans mandates that an improved understanding of the environmental tradeoffs of resource use will be crucial to wise decision making for generations to come. Consideration of the sustainability of agriculture and water-dependent ecosystems must be at the heart of the debate—the outcomes of which will have long-term, global implications.

In this three part course, we will systematically tackle three timely resource-related topics—the environmental geology of i) water, ii) dirt, and iii) climate change. The first part of this course is an overview of all aspects of water and water resources, starting with a survey of the great cycle of water from the ocean to the atmosphere, through the land and back to the oceans. We will then consider water as a resource—in particular focusing on water quality and how we manage (and often mismanage) water for consumption. In the second part of the course, our focus shifts to the very earth beneath our feet. We consider the geobiology of dirt—how minerals break down during biotically-mediated erosion and weathering, and how this is critical to the development of fertile soils for productive and sustainable agriculture. We explore how we use dirt and how it affects us, with emphasis on natural hazards (e.g., landsliding) and the mismanagement of soil as a resource by a series of now defunct civilizations. In the third part of the course, we will tackle climate change, focusing first on the role of humans as modulators of climate and then on how impending climate change may affect the earth (its habitats, other species, and us). We conclude with a hopeful message: what we can do to make a difference.

Disability Statement: If you have a physical, learning, sensory or psychological disability and require accommodations, please let me know as soon as possible. You will need to register with, and provide documentation of your disability to, University Disability Support Services (UDSS) in SEO, room 330 Knight Hall.

Objectives/Outcomes/Standards: Your top objectives in this course should be to (i) acquire a foundational knowledge and understanding of environmental geology and (ii) begin to develop a set of quantitative problem solving skills and critical thinking abilities in the weekly lab sections. If you achieve these objectives, you will be well poised to tackle additional coursework in geology and the other natural sciences. If you take this as one of your only courses in science, you will emerge with a

knowledgeable appreciation of the world around you, and a better understanding of how you (and all humans) are both affected by and affect changes in environmental processes.

Texts and Readings: You should read all of the assigned readings (see schedule) before class, so that you are adequately prepared for lecture and laboratory discussions. Please be aware that we may not always have time in class to cover all of the material in the assigned readings. **You may nevertheless be held responsible (on labs, quizzes, and tests) for assigned reading material that we don't cover in class.** Assigned readings will come from the following sources:

- 1) *The Earth System* (2010) Kump, L. R., Kasting, J. F., & Crane, R. G. 3rd Ed. 420 pp.
- 2) *Dire Predictions: Understanding Global Warming* (2009) Mann, M. E. and Kump, L. R. 1st Ed. 208 pp.
- 3) *Dirt: The Erosion of Civilizations* (2007) Montgomery, D. R., 285 pp.
- 4) handouts and electronic supplements provided in advance as needed

Course Requirements/Assignments and Grading Standards: This course requires learning facts and concepts. You will be tested (and graded) on your comprehension of readings and lecture materials in three 1 hour exams and one 2 hour final exam (see schedule). Nearly half of the lab component of your grade will be based on quizzes related to the last week's lab, as a check on your comprehension of the material. Your overall grade will also depend on your attendance and your performance on lab assignments and quizzes according to the following breakdown:

Graded Performances	Available Points	Percent of Final Grade
attendance & participation in labs	50	5%
lab assignments	150	15%
lab quizzes	150	15%
Test 1	200	20%
Test 2	200	20%
Final Exam	250	25%
Total	1000	100%

Attendance/Participation Policy: University sponsored absences are cleared through the Office of Student Life. ***The policy for make-up tests and late lab assignments is as follows:*** Make-up dates for tests are not part of the schedule, and, if necessary (due to University-sponsored absences only), must be arranged in advance, whenever possible, and must occur within one week of a student's return from an excused absence. To receive credit, all make-up work must be completed by the last day of class. **It is the student's responsibility to approach the instructor to request a makeup exam!** All assignments are due at the beginning of class on the due date unless otherwise noted. Late lab assignments will not receive full credit, except when students are officially excused. Credit for late work will be scaled down by 25% for each day of class it is late (work turned in >3 classes late will receive 0 credit). **Please note that each period of lab and lecture counts in determining how to downgrade an assignment's value when it is late.**

I stress an interactive approach to learning. I expect regular attendance & participation in labs and respectful interactions at each meeting. That means no sleeping, iPods, video games, and/or networking/texting/talking on phones, PDAs, or PPCs in class.

University Regulation 29, change 1, states that the instructor can "establish reasonable standards of conduct for each class which should be made known at the outset." Please download and read ***A&S—Students and Teachers Working Together***, available at:

http://uwadmnweb.uwyo.edu/a&s/Current/students_teachers_work.htm

It has guidelines for syllabi, attendance, classroom deportment, phone and email protocol, office hrs, and how to make appointments outside of office hrs.

Academic Honesty: Ethical integrity is one of the foundations of science. Without it, the framework of scientific inquiry—which is based on objective measurements and analyses—would be lost. The need for integrity extends to every scientific endeavor, including education. University Regulation 6-802, revision 2, defines academic dishonesty as “an act attempted or performed which misrepresents one’s involvement in an academic task in any way, or permits another student to misrepresent the latter’s involvement in an academic task by assisting the misrepresentation.” This pertains to aid from classmates as well as former students of the class and anyone else for that matter. UW has well-defined procedures for judging cases of suspected academic dishonesty, and serious penalties may be assessed to offenders. Please do not cheat and avoiding any behavior that might be misconstrued as cheating. You will be asked to sign the following honor pledge on each exercise to confirm your commitment to academic integrity:

Honor Pledge: “I have neither given nor received *unauthorized* aid on this (test/quiz/lab), nor have I concealed any acts of Academic Dishonesty (as defined by University Regulations).”

The key word in the pledge is “unauthorized.” I hereby authorize and encourage you to work with classmates on labs (but not on tests and quizzes). Still, the work you turn in must always be your own. Showing all of your work will be critical to demonstrating that your work is your own. This means that anything you print from a computer needs to be uniquely yours. It would be a serious breach of the honor pledge to turn in an assignment after inspecting a graded version of it. Note also that use of data storage/retrieval functions on calculators, phones, PDAs, PPCs (for equations and other information) and anything else that gives you an unfair edge over your classmates is prohibited during tests and quizzes.

Other University regulations can be found at:

<http://uwadmnweb.uwyo.edu/legal/universityregulations.htm>

Changes in the Syllabus: The instructor may make changes to the syllabus as the course proceeds. If such changes are necessary, they will be announced in class. Substantive changes to the syllabus shall be communicated in writing to the students.

Please check the course website (<http://geoweb.gg.uwyo.edu/geol1500/>) for a “live” version of the schedule. Updates will appear there after they are announced in class.

Short Description of the Course (from the UW Bulletin): Introductory environmental geology course focusing on water and soil both as hazards and as life-sustaining resources. Explores surface processes and climate change in the context of both geological and human timescales. Case studies illustrate the environmental tradeoffs of resource use.

Course Outline (MWF 1:10-2:00 PM):

Week	Day	Date	Topic	Reading
Background				
1	M	23-Aug	An Introduction to "Water, Dirt and Earth's Environment"	Ch 1, p 381, 383-386 KKC
1	W	25-Aug	Water: Giver of Life	handouts
1	F	27-Aug	Dirt: Shaping Landscapes and Civilizations	Ch 1-3 Dirt p.190-199 KKC
2	M	30-Aug	Earth's Environment: Living in the "Greenhouse"	Ch 3 KKC p. 6-39 M&K
Part I. Water: Giver of Life				
<i>I a. Water Reservoirs</i>				
2	W	1-Sep	Where Water Comes from: The Global Water Cycle	handouts; p. 75-82 KKC
2	F	3-Sep	Does Cloud Seeding Really Work?	articles
3	M	6-Sep	<i>Labor Day (University holiday)</i>	
3	W	8-Sep	Our Atmosphere: An Envelope of Gas	Ch 4 KKC
3	F	10-Sep	Rainfall, Runoff, and Flooding Hazards in the Front Range	articles
4	M	13-Sep	Anatomy of Rivers	handouts
4	W	15-Sep	Does Deforestation in the Himalaya Cause Flooding in Bangladesh?	articles
4	F	17-Sep	Oceans: The Great Conveyors of Nutrients and Heat	Ch 5 KKC
5	M	20-Sep	Waves, Tides, and Tsunamis	handouts
5	W	22-Sep	Groundwater, Where Old Meets New	handouts
5	F	24-Sep	Test 1 (covers Background and Part I a. of course)	
<i>I b. Water as a Resource</i>				
6	M	27-Sep	Deeper Wells and Saltier Waters: Groundwater Depletion in Coastal Areas	articles
6	W	29-Sep	An Invisible Threat: Groundwater Contamination	articles
6	F	1-Oct	The Secret Life of Rivers	Ch 9 KKC
7	M	4-Oct	Where Does Your Drinking Water Come from and What's in It?	articles
7	W	6-Oct	Water as a Limit to Growth	articles
7	F	8-Oct	Who Gets What? Allocating Water Resources	articles
8	M	11-Oct	Damming the Rivers of the World	articles
8	W	13-Oct	Management—and Mismanagement—of the World's Fisheries	articles
8	F	15-Oct	Water as a Source of Conflict	articles
Part II. Dirt: Shaping Landscapes and Civilizations				
<i>II a. A Geological Perspective on Dirt</i>				
9	M	18-Oct	The Anatomy of Earth	Ch 7 KKC
9	W	20-Oct	Minerals and Rocks: The Origins of Dirt	handouts
9	F	22-Oct	Erosion and Weathering: The Breakdown of Minerals	Ch 4 Dirt
10	M	25-Oct	Landscape Development: Routing Dirt and Eroding Rivers	Ch 5 Dirt
10	W	27-Oct	The Carbon Cycle: When Water, Dirt, and Air Meet	Ch 8 KKC
10	F	29-Oct	Test 2 (covers Parts I b. and II a. of the course)	

GEOL 1500/ENR 1500
Water, Dirt and Earth's Environment

Fall 2010
Course Syllabus

Week	Day	Date	Topic	Reading
<i>II b. Dirt as a Resource</i>				
11	M	1-Nov	Graveyard of Empires I: Dirt in Rome, Greece, and the Renaissance	Ch 6-7 Dirt
11	W	3-Nov	Nothing Is New Except What Has Been Forgotten (Graveyard of Empires II)	Ch 8-10 Dirt
11	F	5-Nov	The Lifespan of Dirt (and Civilizations)	Ch 10 Dirt
<i>II c. Dirt as a Menace</i>				
12	M	8-Nov	Getting to Know Unstable Terrain: Landslides and Earth Flows	handouts
12	W	10-Nov	Fires, Floods, Grass, and Goats	articles
12	F	12-Nov	Spotted Owls and Gold Mining: The Impact of Resource Use on River Ecosystems	articles; Ch 18 pages KKC
Part III. Earth's Environment: Living in the "Greenhouse"				
13	M	15-Nov	Water in Ice: A Shrinking Reservoir?	Ch 6 KKC
13	W	17-Nov	Greenhouse/Icehouse: A Geological Perspective on Climate Change	Ch 12 KKC; p. 40-75 M&K
13	F	19-Nov	Pleistocene Glaciations: Orbital Forcing of Climate	Ch 14 KKC
14	M	22-Nov	The Global Greenhouse: Welcome to the Anthropocene!	Ch 15 KKC; p. 77-105 M&K
14	W	24-Nov	<i>Thanksgiving Break (University holiday)</i>	
14	F	26-Nov	<i>Thanksgiving Break (University holiday)</i>	
15	M	29-Nov	Climate Extremes: The Future Impacts of Strange Weather	Ch 16 KKC; p. 107-139 M&K
15	W	1-Dec	The Threat of Humans: A Modern Extinction	Ch 18 KKC
15	F	3-Dec	Our Vulnerability to Climate Change and What We Can Do	p. 141-197 M&K
16	TBD	TBD	Final Exam (Comprehensive, with 2/3 on Parts II b., through III, and 1/3 on Parts I through IIa)	

Test Schedule (1:10-2:00 PM):

Wk.	Date	Number	Covers
5	F 9/24	Test 1	Part 1a
10	F 10/29	Test 2	Pt. 1b, 2a
16	time & date TBD	Final Exam	comprehensive

Lab Schedule (W 3:10-5:00 or Th 1:10-3:00):

Week	Date		Lab #	Description
	Wed	Thurs		
1	08/25	08/26	--	1 st Week (hand out lab 1)
2	09/01	09/02	1	Systems, Feedbacks & Equilibrium
3	09/08	09/09	2	To Gauge a River (Field Trip)
4	09/15	09/16	3	Flood Frequency Analysis
5	09/22	09/23	4	Intro to Lab 4; Review for Test 1
6	09/29	09/30	4	Water: How Much Do You Use?
7	10/06	10/07	5	Bottled H ₂ O: Health Food, Fad, or Fraud?
8	10/13	10/14	6	Panel Debate on Water Resources
9	10/20	10/21	7	Hands on With Minerals and Rocks
10	10/27	10/28	--	Review for Test 2
11	11/03	11/04	8	Panel Debate on Dirt (the book)
12	11/10	11/11	9	Slope Stability
13	11/17	11/18	10	Glaciations: Past, Present and Future
14	11/24	11/25	--	University holiday
15	12/01	12/02	--	Review for Final

Note on Readings: "Dirt" is short for "Dirt: The Erosion of Civilizations"; M&K refers to "Dire Predictions"; KKC refers to "The Earth System." All are required texts.]