

GEOL/ESSE 2000: Geochemical Cycles and the Earth System Syllabus, Fall 2008

This course introduces the Earth system, including the solid Earth, hydrosphere, biosphere and atmosphere. We explore the origins of the elements and the solar system, which forms the basis for understanding why Earth is like it is. We then examine the interactions between the components of the Earth system, along with major past changes, recognizing that rocks provide a long-term record of past conditions and are thus key to understanding how the systems work over time. This knowledge helps us to understand where our resources come from, and the effects that their utilization have on the system. Understanding the Earth system helps us understand today's global issues such as resource availability (water, food, materials, and energy), global climate change, and such other phenomena as stratospheric ozone degradation and decreased biodiversity. An understanding of Earth's past changes helps us understand Earth's present – and likely future – changes, not just in climate, but also in the closely-related use of energy.

Instructors:

Carrick M. Eggleston, ESB 3020, 766-6769, carrick@uwyo.edu.

Office hours: Mon. 2-3, Thur. 9-11, other times by prior arrangement.

Robert R. Howell, Geology 222, 766-6296, rhowell@uwyo.edu

Office hours: Mon. 1:10-3:00, Wed. 1:10–2:00 other times by prior arrangement.

We are both happy to talk with you at any time that we are in our offices, unless we have another meeting or class about to happen or some other prior commitment.

Class meeting times:

Lectures:	MWF 10:00 to 10:50	Classroom Bldg. 214
Labs:	Mon., 2:10-4:00	Room GE 209
	Tues., 1:10 to 3:00, 3:10-5:00	Room GE 209
	Wed., 3:10 to 5:00	Room GE 209

Bring calculator and text to lab, other supplies as announced.

Required textbook: The Earth System, 2nd ed., by Kump, Kasting and Crane, Pearson Prentice-Hall, 2004. In addition to the textbook, we will hand out supplements to the textbook covering a handful of subjects that the textbook does not cover.

Prerequisites: A 4-credit 1000—level science course with laboratory; for geology majors this must be a 1000—level geology lab course. CHEM 1020 must be taken prior to, or concurrently with, this course.

Field Trip: If there is sufficient interest, we will have a field trip to the Snowy Range on Saturday, Sept. 13. The field trip will showcase rocks from the Carboniferous, recent glacial deposits, and rocks from the “Wyoming Province” of about 2.0 billion years ago that record a classic “passive margin” sequence up until a collision with the Colorado Province (~1.8 billion years ago). We will meet by 7:45 am to fill out paper work, and leave by 8:00 am!

Format: GEOL/ESSE 2000 consists of 3 lectures per week, a laboratory exercise on all but the first and last weeks of class, and homework problems due every Friday.

Evaluation/Grading:

The basis for grading will be 3 in-class hour exams, a final exam, lab performance, and homework performance.

Hour Exams: Friday Sept. 19

Friday Oct. 17

Friday Nov. 7 (all hour exams in classroom)

Final Exam: Monday, Dec. 8, 10:15-12:15, in classroom

Hour Exams:	100 points each	300	(31.3%)
Final Exam:	200 points	200	(20.8%)
Homeworks	120 points total	120	(12.5%)
Labs	240 points total	240	(25.0%)
Class participation:	100 points total	100	(10.4%)
TOTAL POINTS AVAILABLE:		960	

Note that content from the labs is meant to reinforce material introduced in class and therefore may be included on the tests. **Please note there are no scheduled make-up tests.** If you have to miss a test for a medical or other emergency let the instructor know **prior** to the test date to make alternative arrangements. Late labs will not receive full credit. If you will miss a lab, contact the TA to make **prior** alternate arrangements.

Obligatory Messages from the Dean:

- 1) Cheating. University Regulation 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.” There is a well-defined procedure to judge such cases, and serious penalties may be assessed. In this class, your exams are expected to be your work ONLY. You may work together on problems and labs, but you the work you turn in must represent your own thinking on the subject.
- 2) Conduct. 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.” In this class I expect engagement and participation, including regular attendance, and that we all treat each other with courtesy and respect. This does not mean we have to agree with each other!
- 3) College of Arts and Sciences document, **A&S - Students and Teachers Working Together**. A 5-page document is available at:

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

This document lays out the guidelines for the course syllabus, attendance, classroom etiquette (no sleeping or cell phone use!), phone and email protocol, office hours and how to make appointments outside of office hours. Good stuff.
- 4) Disabilities. If you have a physical, learning, or psychological disability and require accommodations, please let the instructor know immediately. You will need to register with, and provide documentation of your disability to, University Disability Support Services (UDSS) in SEO, room 330 Knight Hall, 766-6189, TTY: 766-3073.

Generalized Class Outline:

- Week 1: Chemical Background, Origin of Universe and Elements
- Week 2: Origin of the Solar System, Earth Materials
- Week 3: Systems (Chapters 1 and 2)
- Week 4: The Global Energy Balance (Chapter 3)
- Week 5: That atmospheric circulation system (Chapter 4)
- Week 6: The ocean circulation system (Chapter 5)
- Week 7: The earth circulation system (Chapter 7)
- Week 8: The carbon cycle (Chapter 8)
- Week 9: Ecosystems and Biodiversity (Chapters 9 and 13)
- Week 10: Origin of Life, Effects of Life on the Atmosphere (Chapters 10 and 11)
- Week 11: Long-term climate regulation (Chapter 12)
- Week 12: Pleistocene Glaciations (Chapter 14)
- Week 13: Recent and Present Climate Variability (Chapters 15 and 16)
- Week 14: Hubbert's Peak, Exponential Growth, and the Future Outlook

University Studies:

GEOL/ESSE 2000 carries an "SE" designation under the University Studies Program. As such it contains significant content addressing the Earth-sun relationship and astronomy (in the form of thinking about where our universe, solar system, and elements came from as well as the role of Earth-sun relations in modulating Earth's climate through Milankovitch cycles), and geological features and principles as applied to understanding the components, linkages, and feedback loops in the Earth System. We look at and interpret maps, we include large course segments that deal with the atmosphere and climate systems, we look at ocean circulation and nutrient systems, and we cover the role of soils, vegetation, and microorganisms in the Earth system.

The course goes beyond the basics of Earth science, taking a more quantitative approach than in 1000-level introductory courses. The subject is an excellent one for showing how present-day scientific thinking is the result of adjusting to new evidence as that evidence has been uncovered. The laboratory exercises and lecture content provide extensive familiarization with the scope and limitations of the scientific method, and the subject of climate in particular amply demonstrates relationships between scientific research and contemporary society. The laboratory exercises provide you with an opportunity to work with aspects of the Earth system in quantitative fashion, as well as to make measurements that allow us to derive simple quantitative relationships.