ASTR/GEOL 1070: The Earth: Its Physical Environment
Spring, 2012

Class Hours: MWF 2:10 – 4:00 pm, Phys. Sci. Bldg. 239/237

Instructor: Mike Cheadle
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Office Hours: Mon. Weds, Friday 10:00-11:00am (12-1pm on exam days)
In practice, I find that most people tend to ask questions **after class** (class doesn't always use all of the available time) or during in-class review sessions. However, you are of course welcome at office hours as well. In addition to office hours and after class, I am also happy to meet with you at other times. Just talk to me, or e-mail me, or leave me a message and something can be arranged.

TA: Jonathan Hoffman
Office: ESB 1019
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Office Hours: MW 4:30pm-5:30pm & Thurs 10-11am

Other Instructors: Another Geology and Geophysics faculty member, Dr. Bryan Shuman, will be teaching the other section of this course. We may take each other's classes on occasion as scheduling requires. His TA will be Jeremiah Marsicek. Office Hours: MW 2:20-3:30pm & Tues 9:30-10:30am. Room 210.

Web Site: http://faculty.gg.uwyo.edu/cheadle/1070/Geol1070.htm

This web site contains a course syllabus, additional web-sites and general information about the course. Although some class information will be available on the web site, **it is not and can never be a substitute for coming to class.** This course is particularly dependent upon participation, hands on activities, and discussion. These simply cannot happen on the web, and it remains imperative that you come to class if you want to get anything out of it. As with many things in life, what you get out of a course depends on what you put into it.

Course Background: Geology (and Astronomy) 1070 are part of the Math and Natural Science for Elementary Education (MNSEL) course sequence. During the 1980s, it became clear that math and natural science teaching in the United States was in a dismal state. Among the reasons for this situation was that many elementary-level teachers lacked much knowledge of or enthusiasm for science. The National Science Foundation funded an effort at the University of Wyoming to develop science courses that, rather than being normal introductory science courses with separate lecture and lab, were designed to be much more "hands on", activity oriented, with little separation between lab and lecture. Based on outcomes, it was clear that this approach was much more successful in creating some enthusiasm for science than were traditional courses.

This course is, however, **not** one with content at the elementary level. **This is a university-level introductory science course.** Not everything you encounter in this

course is appropriate for elementary school students, at least not in the way that it is presented in this course. If you are reasonably successful in this and other MNSEL courses, you should feel confident that even if you don't know something you have the ability to learn enough about it quickly enough to use it (whatever it is!) in your elementary level teaching.

The course catalog says: "*Prerequisites: Math level 3 or equivalent courses, consent of instructor, elementary education major and EDCI 1450 must be taken concurrently.*" I do not "police" your enrollment in EDCI 1450. You do.

When we have a waiting list, we must give first priority to elementary education majors. Sometimes it becomes my unfortunate duty to ask non-education majors to drop this course. Students who are not education majors, but have a strong reason to take this course, should consult the instructor.

Text: There is no textbook required for the course. The course is designed to be self-contained, so that a text is unnecessary. IF, however, you would like a book for reference, we can, if you ask, recommend a book to check out of the library or possibly allow you to borrow one.

Lab Manual: You will be expected (and required) to purchase the lab manual from the bookstore. This lab manual will become your course notebook.
One of the course requirements is that you enter all you classwork into the lab. manual so that you can refer to it later (i.e., to study for exams/quizzes), and perhaps ultimately so you can modify or use some of the labs in your own teaching. This lab manual will be turned in at the end of the course for instructor evaluation and you will be able to collect it within a few days after it has been graded. Occasionally, I will give you extra handouts in class that either replace pages in the lab. manual or supplement it. These pages should be added to & kept with the manual.

Exams: There is an exam at the end of each unit or subunit (there are four units, and a couple of subunit exams in the geology unit). ***There is no comprehensive final exam.*** The amount that each exam contributes to your grade is given below.

Lab. manual: class exercises will not be individually graded, but I may collect and look at the lab manual once or twice to see how everyone seems to understand the concepts. **However, you will hand in your "Lab Manual" at the end of the semester for evaluation.** This will include everything we do in class. ***Sets of notes photo-copied from other students will incur a very poor evaluation.***

Subjective Evaluation: I will make a subjective evaluation of your attendance, participation and progress through the course. There are reasons for this that go beyond rewarding positive progress on borderline cases. Teaching is a chosen career path that requires professionalism – and it is not too early to expect you to show such professionalism. Teaching, for example, can put you between parents and their children in some occasionally very uncomfortable circumstances. A high level of maturity in necessary in order to deal with such situations if they arise.

The best teachers have *intellectual curiosity* and show an *enthusiasm* for their profession- and are willing to make students work and to have real, and high, expectations of students. Those students in this class who, instead, demonstrate to me contempt for knowledge and unwillingness to make an effort will not only probably do

badly on the exams/quizzes but will also impress me as poor potential teachers, and will lose in the subjective evaluation category. This isn't a make-or-break evaluation- I allot 10% of the grade for this purpose- but it can make the difference between a B or a C, for example, in a borderline case. For the sake of the children you teach and who look to you as an authority, and for the sake of your own professional self-respect, you must expect mature behavior and professionalism from yourself.

Relative weightings used in course grading:

Unit exams:	
Astronomy; Earth, Moon and Planets	15%
Meteorology and the Atmosphere	15%
Geology	20%
Maps and Locations	10%
Subunit Exams:	
Rocks and Minerals	10%
Plate Tectonics	10%
Class notes:	10%
(neatness, completeness, accuracy)	
Instructor opinion, participation and attitude:	10%

Review Sessions: There will be a review session on the weds or thurs evening before each test/exam. Those of you that can't make it, can meet with me Friday morning before the exam/test.

Class Format: Most 4-credit college science courses have three 50 minute lectures and one 2-hour lab per week. Not so in Geol/Astr 1070; this course is activity-oriented, and the lectures, discussions, and hands-on activities are integrated throughout most class periods. A traditional 4-credit science lab class meets about 5 hours per week. We have 6 hours per week scheduled. The fact is that some classes take the whole time, and some do not, so this class works out to about an equivalent time in the end.

Attendance: ***It is expected that you will attend every class session.*** If you know you will have to miss a class for a legitimate reason, you should contact me beforehand. Missing a class not only affects you, but also other students because of group activities. Unexcused absences can affect your grade! We may take attendance occasionally. If you come to me with an official University absence excuse, that's fine. If you come to me and tell me why you can't be in class on a particular day, I will do my best to accommodate your needs. *It is, however, your responsibility to ask me for what you need, and to pester me about it until you get it!*

Talking, etc.: Every year, I seem to have a group/table or two that sit in the back of the room and talk while I'm trying to say something. I actually rarely notice this because I can't hear it up at the front of the class. **However**, students sitting nearby who actually do want to hear what I am saying often complain about it. I consider you adults who are responsible for your actions, and if you want to talk or read the paper while I'm trying to teach, that's your problem. IF, however, you disturb other students in the process, or fail to hold up your end of your responsibility for your group, THEN it is my duty to do something about it. If you want to talk about non-class stuff more than you want to participate in the class, why be in class?

Cheating: Nearly every year, I have at least one case of proven or suspected cheating. I take this very seriously. I should clarify, therefore, what is cheating and what isn't. I have no problem with groups working together in class- in fact, that's the idea. Studying together is great. However, **all work on the exams and quizzes must be exclusively your own!! The rule is simple: if you are simply copying other students' handouts without understanding, you are failing in your responsibility. If you copy on an exam, you are cheating.**

University Studies: This course fulfills the Earth Science (SE) component of the 2003 University Studies Program. This course has extensive content in the SE areas of (a) the earth-sun relationship, (b) astronomy, (c) distribution and causes of physical/geological features, (d) map interpretation, (e) weather and climate, and (f) some content relating to oceanography, soils and vegetation. We spend much of the class time using the scientific method, which illustrates its strengths and limitations. The course is nontraditional in that lecture and lab are integrated rather than separate – a subject is introduced, but then hands-on activites and demonstrations are a key part of each day's class content.

Course Content: I feel that it is my duty, in order to maintain the quality of the course, to modify the content as we go along if new and interesting ideas or activities come up. Also, each instructor should adjust as the class evolves because each class of students often has a different speed and different interests. Therefore, the class outline provided on the following pages is almost certain to change a bit as the semester progresses. It is intended to give a general overview of content. **What will not change are the dates of quizzes and exams!!!**

Class 1, Mon. Jan. 9

Introduction, enrollment issues, class structure, initial "challenge"
Dimensional analysis: Handling units and converting between units.
What is the difference between a globe and a map?

Unit 1: Locating Places on the Planet, Coordinates, Maps

Class 2, Wed. Jan. 11

How do we tell where we are on the planet?
How are maps made?
Why do maps of the Earth come in different shapes?
What is latitude, and how do people measure it?

Class 3, Fri. Jan 13

What is longitude, and how can we measure it?
Old Maps: How was America discovered and mapped?
Why are maps of Wyoming divided up into little squares?

Mon. Jan. 16

No class, Martin Luther King Jr./Wyoming Equality Day

Class 4, Wed. Jan. 18

What are topographic maps, and how can they keep me from getting lost?
What is GPS and how does it work?

Class 5, Fri. Jan. 20

What is Google Earth, and can we compare its information to topographic maps?

Class 6, Mon. Jan. 23
Exam 1: Maps and Locations

Unit 2: Astronomy- The Universe and the Solar System
Class 7, Wed. Jan. 25
Orders of Magnitude.
How far are we from the sun? How fast does light travel?
Class 8, Fri. Jan. 27
How do waves work, and what is light?
What are the Doppler Effect and the Hubble Constant?
How can we tell how far away other galaxies are?
The 3 ways to measure distances: Parallax, Luminosity & Red Shift
How can we tell the temperature of distant stars and galaxies?
Class 9, Mon. Jan. 30
The Solar System: What are the different planets like?
Class 10, Weds. Feb. 1
Planetarium visit
Planetary distances: How far is it from the sun to the planets?
A Model for the solar system.

Class 11, Fri. Feb. 3
Planetary Temperatures.
How much light energy do we get at different planets?
How warm would the Earth be without its atmosphere?
How warm would other planets be without their atmospheres?
Faint Young Sun Paradox: Why isn't Earth frozen?
Class 12, Mon. Feb. 6
Why do we have seasons? Why doesn't the moon always look the same?
Do variations in Earth's orbit of the sun affect Earth's climate?
Class 13, Wed. Feb. 8
How are craters formed? What are Comets, Asteroids, and Meteors? Did an impact really kill the dinosaurs?
Class 14, Fri. Feb. 10
Exam 2: Astronomy Unit Exam

Unit 3: Geology and the Earth System:
Subunit B: Plate Tectonics
Class 15, Mon. Feb. 13
What is inside the Earth? How do we know?
Class 16, Wed. Feb. 15
How do we know exactly where and how big earthquakes are?
Class 17, Fri. Feb. 17
Plate tectonics: What are the different kinds of plates?
Class 18, Mon. Feb. 20
Hotspots & Yellowstone
Class 19, Wed. Feb. 22
What is some evidence that Earth's plates move?
How fast do plates move?

Class 20, Fri. Feb. 24
Exam 3: Plate Tectonics Quiz

Subunit B: Rocks and Minerals
Class 21, Mon. Feb. 27
What are atoms, elements, molecules, minerals, and rocks?
Class 22, Weds. Feb. 29
Why are there different kinds of rocks?
What are igneous rocks? What minerals do we find in them?
Gold & Diamonds
Class 23, Fri. Mar. 2
What are Weathering & Erosion?
What are sedimentary rocks, what minerals do we find in them and why?

Class 24, Mon. Mar. 5
What environments are reflected in different sedimentary rocks?
What is the role of rocks in regulating climate?
Class 25, Weds. Mar. 7
What are metamorphic rocks?
How do rocks tell us about Earth's history? The Rock Cycle in action!
Class 26, Fri. Mar. 9
Exam 4: Rocks and Minerals Quiz

March 12-16: Spring Break

Subunit C: Geology & the Geologic Time scale: Our Physical Environment
Class 27, Mon. Mar. 19
Geologic Maps: Where does Laramie get its water?
Class 28, Wed. Mar. 21
Geologic Timescale, How old is the Earth?
What was life like on early Earth? Evolution
Class 29, Fri. Mar. 23
How can we "read" Earth history in rocks?
Class 30, Mon. Mar. 26
What does the layering in the Grand Canyon tell us about Earth history?
How can we use isotopes to "read" parts of Earth's history?
Class 31, Wed. Mar. 28
Dinosaurs & the Dinosaur Museum (TBA)
Class 32, Fri. Mar. 30
Exam 5: Geology Unit Exam: This is a comprehensive exam covering all 3 Geology sub-units

Unit 4: Atmosphere, Oceans, Weather, Climate and Energy
Class 33, Mon. Apr. 2
What is air? What controls how much water and heat are in the air? Why do clouds form? Why does hot air rise? How does heat move?
Class 34, Wed. Apr. 4
What is humidity? Why does it rain?

Class 35 Fri. Apr. 6

No Class: Easter Break

Class 36, Mon. Apr. 9

Why is there less air to breathe in the mountains? Why does it get colder when you go up in the mountains? Why do clouds form over the mountains?

Class 37, Wed. Apr. 11

What is the Coriolis Effect, and what causes storms to move?

Why are climates different in different places? How much solar radiation is received & how much is reflected?

Class 38, Fri. Apr. 13

What is a weather front? What is the importance of low and high pressure centers, and why do they occur?

Class 39, Mon. Apr. 16

How do I read a weather map?

Class 40, Wed. Apr. 18

Exponential Growth: population growth & the future of the Earth.

Class 41, Fri. Apr. 20

What is carbon dioxide? Where does it go? What does it do? What are some other greenhouse gasses?

Class 42, Mon. Apr. 23

What is Climate? Why does climate change? What is the history of climate change?

Is sea level changing? What is "thermohaline circulation"?

How has climate changed in the past? Is it really changing now?

Class 43, Wed. Apr. 25

Weather, Storms & Fronts: Your data

Class 44, Fri. Apr. 27

Exam 6: Weather/Climate Unit Exam

Turn in notebooks