

GEOL 1360 ENVIRONMENTAL EARTH SCIENCE

INSTRUCTOR:

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LECTURES:

Monday, Wednesday, Friday: 1:30 pm in Room 218 Wallace Building (note: this course is also offered online via University of Manitoba Continuing Education).

Course Content:

Modern environmental Earth science is a broad subject encompassing virtually every aspect of the traditional topics of geology, geophysics & geochemistry, and including many associated scientific and engineering subdisciplines. During this term our investigations and discussions of environmental Earth science will revolve around two major themes: (i) *Earth system science*, and (ii) the *geoscience of natural hazards*. A third major component of environmental Earth science, namely that of *pollution geology* or how humans affect the Earth's environment, is covered in the course GEOL 2390 Environmental Geology.

Over the past few years scientists have come to the realization that an understanding of the interconnectedness of air (atmosphere), water & ice (hydrosphere and cryosphere), rocks & soils (geosphere), and life (biosphere) on a global basis is often preferable to the traditional approach of studying separate individual units. This approach to investigating the Earth as a whole with many interacting parts is the basis of *Earth System Science*.

Coupled with this enhanced understanding of the complex dynamics between the various Earth reservoirs is a renewed appreciation of how the geological environment and geological processes interact (usually adversely!) with human activities and communities. This is often termed *hazard geology* or the geoscience of natural hazards. Hazard geology most commonly involves the traditional pursuits of hydrology, volcanology, earthquake geoscience, and land subsidence, landslide & mass movement studies, combined with climate change investigations.

This course during the 2007-08 academic session will examine selected aspects of both of these two perspectives of environmental Earth science. Importantly, the course is intended to provide an *overview* of the salient aspects of environmental Earth science, some of which are unique to the field, others being shared with allied disciplines such as soil science, engineering geology, hydrology, and geochemistry. Finally, although GEOL 1360 is intended to be an introductory overview, it is, nonetheless, a rigorous course that will use the basic principles you learned in your previous geoscience course(s); it is not an academic refuge for bolstering GPAs. The ultimate objective of the course is to foster your analytical and critical thinking skills. We will have plenty of facts to learn, but we will always want to go beyond just the bare facts to the environmental implications and interpretations.

Course Format:

The format of this course during the 2007-2008 academic session will be mainly lectures, supplemented by occasional special guest speakers, seminars, and movie/video presentations. *All* audiovisual program presentations as well as special lecturers should be considered an integral part of the course and the material covered by these special components is, unless otherwise indicated, testable.

The *required* text for this course is *Environmental Geology* (Seventh edition; 2006) by C. W. Montgomery (published by McGraw Hill). Unfortunately this book is *not* available in the University of Manitoba Library System. In addition to the textbook readings, occasional outside reading will be assigned. This textbook has an extensive collection of student study aids/practice tests, etc. online at <http://www.mhhe.com/montgomery7> You are strongly encouraged to access and use this site.

Grading:

Grades for this course will be determined on the basis of the following components:

Three term tests (70%) The precise format of the tests will be announced before each test but will generally be a combination of short answer and long answer style. There is no final examination for this section of GEOL 1360.

Term assignments & quizzes (30%); Assignments will be given out weekly in lecture, with instructions regarding due dates and format. Quizzes will *not* be announced beforehand, however if you are unavoidably absent during a quiz day, you will be permitted to have the next quiz count double.

The last date for voluntary withdrawal from the course without academic penalty is *March 20, 2008*. I am instructed by ROASS policy to advise you to read the academic regulations and policies in the 2007-2008 University Undergraduate Calendar. In particular, be aware of the policies regarding academic dishonesty, including plagiarism and cheating, examination personation, and attendance at class and debarment. In the case of individual assignments, I will provide specific instructions concerning due dates at the time each assignment is made. If you have any questions, ask. **Late assignments will be penalized 20% per day.**

Tentative Lecture & Schedule and Topics:

Week of:

Jan. 7 *Week 1:* Course introductory material; Fundamentals of ESS & EES; Basic concepts & definitions; historical perspectives, introduction to physical systems; paradigms & politics; Environmental Earth science techniques & methods.

Jan. 14 *Week 2:* Environmental Earth science techniques & methods (continued); Earth system science & geohazards; Endogenic versus exogenic hazards; Prediction & risk assessment from a geoscience perspective; Overview of the lithosphere & hydrosphere.

Jan. 21 *Week 3:* Endogenic hazards (continued): Earthquake hazards mitigation & prediction.

Jan. 28 *Week 4:* Endogenic hazards (continued): Volcanic hazards, mitigation & prediction
Introduction to exogenic hazards; **tentative Term Test 1**

Feb. 4 *Week 5:* Exogenic hazards (continued): Fluvial & catchment Basin system; Introduction to floods & flood hazards; Type of flood hazards; flood analysis, prediction, mitigation.

- Feb. 11** *Week 6:* Exogenic hazards: Floods (continued); the slope & regolith system.
- Feb. 18** **Mid-term break; no lectures**
- Feb. 25** *Week 7:* Exogenic hazards (continued): Mass movements & landslides, causes, prevention; Subsidence: perception, prediction & mitigation.
- Mar. 3** *Week 8:* Subsidence and related hazards (continued); **tentative Term Test 2**
- Mar. 10** *Week 9:* Other geohydrological exogenic hazards; Aspects of geoengineering & applied environmental Earth science; groundwater hazards, perceptions, mitigation.
- Mar. 17** *Week 10:* Water resources and Environmental Earth sciences; supply & management topics; applied environmental Earth science; Environmental geohydrology, hydrogeology, geoengineering in Western Canada (**Last date for VW: March 20; no lectures March 21**)
- Mar. 24** *Week 11:* The Coastal system: nearshore dynamics, processes, erosion/deposition; coastal zone geohazards Coastal environmental Earth science; sea level changes.
- March 31** *Week 12:* Overview of the Atmosphere & the Ecosphere. Atmospheric geohazards; Erosion & Salinisation.
- Apr. 7** *Week 13:* Global environmental change and Earth system science; global warming. Canadian perspectives & case studies; **Term Test 3** (**Classes end April 11**)