Course description

The University of Manitoba *Undergraduate Calendar* describes 007.239 as follows:

> Examination of geological processes and material as they interact with human activities, environmental planning, and management.

This course will provide an overview of the salient aspects of geology as the science relates to human activities that affect the natural process-response systems of the earth. The topics covered in the course will emphasize three basic components of geologic sciences:

Natural hazards originating from within the earth (endogenic hazards).

Hazards originating from processes operating at the surface of the earth (exogenic hazards).

Human's role in accelerating or mitigating geologic hazards and environmental degradation.

Course goals

Why do we study environmental geology? It is clear that the environment and environmental problems have become matters of intense concern on local, national, and international levels. With this increasing awareness, the need for rational, informed decision making by the public and by policy makers is imperative. Environmental Geology 007.239 has three main goals:

To present and discuss the role that natural geologic processes play in creating conditions that are detrimental to human activities.

To assess how some types of human activity can negatively affect the environmental setting on local, regional, and global scales.

To examine how the impact of these natural and man-induced hazards—human suffering, property damage, economic disruption—can be mitigated by proper consideration of geologic factors in planning.

As you systematically progress through the course material during the next thirteen weeks, you will:

define the relationship between environmental geology and other branches of physical, chemical, biological, and social science;

demonstrate how nearly all of our major environmental concerns and hazards are rooted in basic geological processes;

understand how environmental geology is a collage of many different geological subdisciplines, from hydrology to geochemistry, from economic geology to geomorphology;

outline how our perception of geological hazards, environmental and resource conservation, and human interaction with geological processes has evolved over time and is different in various other cultures;

identify the differences between mission oriented geoscience and problem-solving pursuits;

locate, on a regional and global basis, areas most prone to naturally occurring geological hazards, and outline what types of actions can be used to reduce risk and losses from these hazards;

describe human's role in aggravating normally nonhazardous geologic processes to the point that a threshold is exceeded, resulting in rapid and often catastrophic changes;

show how the organization, control, and coordination of new industrial and urban development can be integrated with a basic knowledge of geological processes to protect environmental, cultural, and aesthetic characteristics of the land.

As you work through the course, you will have the opportunity to apply the theoretical knowledge you are accumulating to solve site-specific problems and environmental dilemmas. The objective of these "real world" exercises is to integrate the concepts of environmental geology with practical, often quantitative, information in order to resolve or at least lessen the impact of the hazard. It is therefore important that you study and adequately understand the assigned problem sections.

Course materials

Required text

Pipkin, B. W. *Geology and the Environment.* St. Paul, MN: West Publishing, 1994. (478 pages)

Geological Highway Map of Manitoba. 2d ed. 1994.

Optional reading

Hartman, James B. *Learning Skills for Adult Students*, 1995, 20 pages. Available at the University Book Store, $3.50.

Course manual

This manual contains study notes, learning activities, and assignments.

Note: If you have not already ordered or received your required texts please call the University of Manitoba Bookstore (474-8321) or Manitoba Toll-Free 1-800-432-1960 ext. 8321) and identify yourself as a Distance Education Student. Textbooks can be mailed to you C.O.D. or on Visa or Mastercard.

Course content

Environmental geology is a very broad branch of applied geology that focuses on the entire spectrum of possible interactions between people and the physical environment. Obviously no single course can fully cover the wide range of topics germane to environmental geology as it is viewed by modern professional geoscientists. The topics you will cover during the next thirteen weeks represent an overview of *selected* concepts, processes, problems, and solutions of critical importance to a practising environmental geologist today. The selection and coverage of these topics are based not only on the traditional view of environmental geology as a "corrective" science (the treating of environmental problems after they occur), but also on its role as a "preventative" science (anticipating the problems induced by human interaction with the geologic environment).

The course is broadly organized in such a way as to familiarize you first with the developmental history and techniques of environmental geology as a modern science, then with the deep-seated earth processes that influence human settlements, and finally with the near-surface and surficial processes that must be understood by planners and policymakers to undertake proper environmental management. Within this broad framework, specific attention will be given to the following topics (in order of coverage):

What is environmental geology?

The general concept, evolution, and perception of environmental geology in science and society.

Techniques, tools, and analytical skills most commonly used by practicing environmental geologists.

Endogenic geologic hazards

Earthquake hazards: mechanisms, potential dangers and sources of damage, prediction and mitigation.

Volcanic hazards: mechanisms, types of hazards, prediction, and protective measures.

Exogenic geologic hazards

Flood hazards: fluvial hydrology, coastline and nearshore hydrology, flood magnitude and frequency analysis, identification, prediction, and mitigation.

Landslides and mass movements: Landslide process, slope stability analysis, types of mass movements, hillslope development and management, landslide hazard mitigation techniques.

Subsidence and problem soils: types and causes of subsidence, mechanism of natural subsidence, hazard recognition, clay mineralogy and expansive soils, permafrost, hazard mitigation.

Geoscience in environmental management

Water resources: water as a substance, the hydrologic cycle, groundwater geology and hydrology, water supply and use, wetlands systems, water resources control by dams, geology of dam sites and dam impacts, drought.

Geology of pollution: water and soil contamination, liquid waste and disposal systems, solid wastes, landfill geology, hazardous waste, mining and pollution, acid drainage and acid precipitation, radioactive waste disposal.

Coastal zone processes and environmental geology: special problems of the coastal zone, types of coasts, mechanisms of sediment transport and wave dynamics, seiches, surges, and tides, coastal geoengineering.

Evaluation and grading

Assignments

You will be asked to use the knowledge you have assimilated in the course to examine, evaluate, and solve a variety of practical environmental geology problems during the term. There will be six assignments that will help you to bridge the gap between the theoretical aspects of the science and the practical application of these concepts. It is very important that you think about and work through these problems as completely as possible. Environmental geology is a practical, applied, and pragmatic science whose goal is to generate viable and reasonable solutions to perceived or anticipated problems. Your ability to APPLY what you have learned is the single most critical factor in successful completion of this course. Although the problems you will be solving are based on real world data and situations, in order to complete the tasks asked for in a reasonable amount of time, simplifying conditions and constraints are often built into the exercises. In total, the problem sets you are assigned during the term are worth 40% of your final mark.

Assignment due dates

Assignment	Sept.-Dec.	Jan.-Apr.	May-Aug.
1 & 2	September 30	January 21	May 21
3	October 15	February 7	June 7
4 & 5	October 30	February 28	June 30
6	November 15	March 15	July 15

Distribution of marks

Assignment	Percentage
1 Environmental geology data and tools	5
2 Earthquakes	5
3 Flood hazards	10
4 Landslides	5
5 Subsidence	5
6 Groundwater flow	10
Final examination	60
Total	100

Grading scale

Letter grade	Percentage range	Description
A+	90 – 100	Exceptional
A	80 – 89	Excellent
B+	75 – 79	Very good
B	70 – 74	Good
C+	65 – 69	Satisfactory
C	60 – 64	Adequate
D	50 – 59	Marginal
F	49 and below	Failure

Final examination

At the end of the course a final examination will be written that will be worth 60% of your final mark. This examination will be designed to test not only your grasp of the theoretical concepts of environmental geology, but also the more practical critical evaluation and problem-solving abilities you have acquired.