GEOS 5308 Earth System
Spring 2006
Dr. Richard Mitterer (972-883-2462; mitterer@utdallas.edu)

Outline of Topics	Text Readings: *The Earth System*
Part 1: Earth Systems	
Introduction; Matter and Energy	Ch. 1
Solar Energy	Ch. 3
Water Cycle	Ch. 4
Oceans and Atmosphere	Ch. 5
Plate Tectonics	Ch. 7
Carbon Cycle	Ch. 8
Review	
1st Exam – February 9	
Part 2: The Biosphere	
Terrestrial Systems	Ch. 9
Aquatic Systems	Ch. 9
Origin and Early Evolution of Life	Ch. 10
Later Evolutionary Events	Ch. 11 & 12
Daisyworld and Snowball Earth	Ch. 2 & 12
Mass Extinctions	Ch. 13 & Alvarez Book
Review	
2nd Exam – March 16	
Part 3: Climate Change and Human Impacts	
El Niño	Ch. 15
Ozone	Ch. 17
Past Climates	Ch. 14
Historical Climate	Ch. 16
Future Prospects	Ch. 16
Pollution	
Review	
3rd Exam – April 20	

Chapter 1 (Global Change) in the Kump et al. text provides an excellent overview of the topics covered in later chapters as well as an overview of this course. Read this chapter first.

COURSE GRADING

Grading for the course is based on three tests (no final exam), three project (the weighted value is 25% for each test and 25% for the projects (5, 5, and 15 %, respectively, for Projects 1, 2, and 3)), reviews of movies, and a compilation of articles from news sources.

REFERENCES

1. Books

The Earth System (2nd Edition), Kump, Kasting and Crane (Prentice Hall) – primary text

T. Rex and the Crater of Doom, Alvarez (paperback, Vintage Books)

The Two-Mile Time Machine, Alley (paperback, Princeton)

2. PowerPoints used in Lectures may be downloaded from the course web site:
http://www.utdallas.edu/~mitterer/GlobalChange

3. Visual Media (available at the Reserve Desk in McDermott)

Part 1: Earth Systems
Introduction: Matter and Energy: *Earth Becoming Alive* (VCR)
Earth's Heat Engine: *Earth's Interior* (VCR)
Tectonic Cycle: *Plate Tectonics: The Puzzle of the Continents* (LD); *The Birth of a Theory* (VCR)
Rock Cycle: *The Rock Cycle* (LD); *Mass Wasting* (VCR)
Water Cycle: *The Hydrologic Cycle* (LD); *Running Water I* (VCR); *Groundwater* (VCR)
The Oceans: *Physical Oceanography* (LD)

Part 2: The Biosphere
Terrestrial Systems: *The Ecology of the Forest* (VCR)
Aquatic Systems: *Plants in the Scheme of Things* (VCR)
Origin and Early Evolution of Life: *Geologic Time* (VCR)
Later Evolutionary Events: *Evolution Through Time* (VCR)

Part 3: Climate Change and Human Impacts
Atmospheric Circulation: *Sun, Sunlight, and Weather Patterns* (VCR)
Short-term Climatic Effects: *The Return of the Child: The Effects of El Niño* (VCR)
Carbon Dioxide and Climate: *The Greenhouse Effect* (LD)
Ozone: Hole in the Sky: *Ozone Layer* (VCR)

VCR = Video cassette; LD = Laser disk (both available at the Reserve Desk of the library)

PROJECT ASSIGNMENTS

1. Being a Concerned Citizen (Due date: Feb. 22; 5% of grade)
As a concerned citizen, you wish to express your thoughts about an environmental issue that is important to you. You may do this in one of two ways; either (1) write a letter to one of your state or federal elected representatives, or (2) write a letter to a newspaper. You are not expected to mail this letter, although you may if you wish. Rather, you should submit it for grading. The guidelines for the letter are: Pick a single topic of public concern related to environmental issues, decide your stance on this issue, research the topic so that you will have an informed opinion, then write a letter of about 150-200 words as if you were writing to one of your elected representatives or to the editor of a newspaper. Your grade will be based both on the quality of your writing and on the content. The topic of the letter should be relevant to the recipient. A letter to an elected representative should deal with an issue that may come to a vote in the legislative body. A letter to a newspaper can deal with an issue of general public concern, even if elected officials can do nothing about it.

2. Astronomical Cyclicity (Due date: Mar. 27, 2003; 5% of grade)
The Earth's position with respect to the sun slowly oscillates in a cyclic manner over a span of many thousands of years. One of these cycles concerns the shape of the Earth's orbit, which varies from an elliptical path to almost circular. During the course of this gradual shifting, the distance between the sun and Earth changes. Another cycle involves the tilt or inclination of the Earth's axis of rotation. The Earth's rotational axis is inclined to its orbital plane by an average of 23 1/2 degrees, but this inclination oscillates from about 22 1/2 to 24 1/2 degrees, or about a 2-degree range. The latitudes from 23 1/2 North to 23 1/2 South represent the portion of the Earth where the sun is directly overhead during some part of the year. The northernmost position, 23 1/2 degrees North Latitude, is called the Tropic of Cancer and is reached on about June 21, the Northern Hemisphere's longest day of sunshine. Because of the changing tilt of the Earth's axis, the position of the Tropic of Cancer will change over time.
Discussion question: How do you think the Earth's climate (especially regarding temperature or heat distribution) might be affected by the change in inclination of its axis? That is, compare the heat distribution (i.e., temperature ranges or seasonality over the Earth) for an axial tilt of 22 1/2 degrees to the heat distribution when the tilt is 24 1/2 degrees. In your discussion, describe the significance of the axial tilt to Earth's overall climate, then consider how the climate will change when the tilt increases and decreases. Your discussion should be about 150-200 words (a typed page).

3. Environmentally Sound Business Plan (Due date: Last Class Day; 15% of grade)
Your company has just purchased a beautiful tropical island as a business venture. The company has not decided on the type of business to be developed on the island, and it has given you the assignment of making a recommendation. In addition to recommending a business venture, your company wants you to discuss all the important environmental concerns that must be considered and planned in establishing the business. In selecting a business and developing it for minimal impact on the environment, you must consider the following circumstances: (1) many jobs will have to be filled by the native population, who now live in villages and subsist on fish, fruits, and nuts; some consideration should be given to allow the natives to maintain their culture; (2) the island is mountainous, covered by a virgin rain forest, and is surrounded by well-developed coral reefs; (3) additional factors to consider include, but are not limited to: clearing of land; loss of natural habitats; increased erosion; construction of buildings and roads; water supplies; power supplies; traffic; waste disposal; marine and land life; cultural impact.
Your assignment: select a business that can logically be based on the island (a resort is logical; an automobile factory is not), and write a plan that describes the development that is required and how impacts to the environment and the natives will be minimized. Page limit is 10 typewritten pages of text; additional pages should be used for appropriate maps and diagrams of the planned layout.