**UNIVERSITY OF KENTUCKY**
**APPLICATION FOR NEW COURSE**

Submitted by **College of Arts and Sciences** Date 09/09/2003

Department/Division offering course: **Geological Sciences**

2. Proposed designation and Bulletin description of this course:

(a) Prefix and Number **GLY 210** (b) Title* **Habitable Planet: Evolution of the Earth System**
(if applicable, subt. req.)

*NOTE: If the title is longer than 24 characters (including spaces), write a sensible title (not exceeding 24 characters) for use in transcripts: **Earth System Evolution**

(c) Lecture/Discussion hours per week **3** (d) Laboratory hours per week **0**

(e) Studio hours per week **0** (f) Credits **3**

(g) Course description: **Earth is a 4.55-billion-year-old planet undergoing continuous evolution. We will explore aspects of Earth's evolutionary changes that have affected both climate and life through time. The chemical and physical interactions between the solid Earth, the atmosphere, the hydrosphere, and the biosphere are investigated, providing the basis for understanding how Earth behave as a self-regulating system that controls the global environment. The effect of human activity on modern Global Change will also be emphasized.**

(h) Prerequisites (if any): **None**

(i) May be repeated to a maximum of **N/A** credits. (if applicable)

To be cross-listed as: **N/A**
Prefix & No. Signature, Chairman, cross-listing department

5. Effective Date: **Fall 2004** (semester and year)

6. Course to be offered **Fall**

7 Will the course be offered each year?
(Explain if not annually):

8. Why is this course needed: **Earth System Science is a rapidly developing interdisciplinary field that provides a framework for understanding both the natural and the anthropogenic aspects of global change. Global warming, ozone depletion, and loss of biodiversity are modern environmental issues that greatly concern the world's population. Analogues for these issues can be found throughout Earth history, contributing clues to how the planet might respond to global change in the future. An introductory class regarding the Earth as a dynamic system is uniquely capable of raising awareness and helping to understand the driving mechanisms that control our changing planet.**

9. (a) By whom will the course be taught? **Dr. Ana M. Carmo**

(b) Are facilities for teaching the course now available? **Yes**
If not, what plans have been made for providing them?

10 What enrollment may be reasonably anticipated? **100**

Will this course serve students in the Department primarily? **No**

Will it be of service to a significant number of students outside the Department? **Yes**
If so, explain

**Students looking for an introductory overview of Earth history will benefit from this class.**

Will the course serve as a University Studies Program course? **Yes**
If yes, under what Area? **Natural Sciences**

12. Check the category most applicable to this course:

traditional; offered in corresponding departments elsewhere;

____**X**___ relatively new, now being widely established

not yet to be found in many (or any) other universities

13. Is this course applicable to the requirements for at least one degree or certificate at the University of Kentucky? **Yes**

14. Is this course part of a proposed new program? **No**
If yes, which?

15. Will adding this course change the degree requirements in one or more programs?* **No**
If yes, explain the change(s) below:

16. Attach a list of the major teaching objectives of the proposed course, outline and/or reference list to be used.
**See attached proposal**

17. If the course is a 100-200 level course, please submit evidence (e.g., correspondence) that the Community College System has been consulted.
**See attached e-mail correspondence**

18. Within the Department, who should be contacted for further information about the proposed course?
Name/e-mail: **Ana M. Carmo , acarmo@uky.edu** Phone Extension: **257-1851**

*NOTE: Approval of this course will constitute approval of the program change unless other program modifications are proposed.

APPLICATION **FOR NEW** COURSE

**Signatures of Approval:**

| | |
|---|---|
| Frank R. Etherton<br>Department Chair | 5 Sept. 2003<br>Date |
| David Leep<br>Dean of the College | DEC 09 2003<br>Date |
| | OCT 14 2003<br>Date of Notice to the Faculty |
| Richa Hrizo<br>*Undergraduate Council | 3-2-2004<br>Date |
| *University Studies | Date |
| *Graduate Council | Date |
| *Academic Council for the Medical Center | Date |
| *Senate Council (Chair) | Date of Notice to University Senate |

*If applicable, as provided by the Rules of the University Senate

ACTION OTHER THAN APPROVAL

Rev 8/02

# GLY 210
## Habitable Planet: Evolution of the Earth System

Department of Geological Sciences, University of Kentucky
3 Credit Hours

## Course Proposal

**I) Course Description:** Earth is a 4.55-billion-year-old planet undergoing continuous evolution. We will explore aspects of Earth's evolutionary changes that have affected both climate and life through time. The chemical and physical interactions between the solid Earth, the atmosphere, the hydrosphere, and the biosphere are investigated, providing a basis for understanding how Earth behave as a self-regulating system that controls the global environment. The effect of human activity on modern Global Change will also be emphasized.

**II) Importance:** Earth System Science is a rapidly developing interdisciplinary field that provides a framework for understanding both the natural and the anthropogenic aspects of global change. Global warming, ozone depletion, and loss of biodiversity are modern environmental issues that greatly concern the world's population. Analogues for these issues can be found throughout Earth history, contributing clues to how the planet might respond to global change in the future. An introductory class regarding the Earth as a dynamic system is uniquely capable of raising awareness and helping to understand the driving mechanisms that control our changing planet.

**III) Teaching Goals and Learning Outcomes:**

The course content and teaching strategies will be designed to a) develop the notion that processes operating on Earth's surface act together to control climate, ocean and atmospheric circulation, and the recycling of the elements such as carbon and b) increase student knowledge of geological history and of major geologic processes such as plate tectonics and continental drift as they relate to past global change.

Students that have completed this course will be able to:

1) Understand in general the dynamics of the evolution of the Earth system;
2) Explain how climate varied through Earth history and what were the major driving mechanisms of past global change;
3) Differentiate mechanisms that regulate both short- and long-term global change;
4) Differentiate human-induced from natural global change;
5) Recognize and explain the current signs of global change;
6) Infer the timeframe of both human-induced and natural global change.

**IV) Course outline:**

**List of Topics (based on textbook by Kump, Kasting, and Crane, 1999)**

1. The Earth System:
    a. Global energy balance
    b. Atmospheric circulation
    c. Ocean circulation
    d. The solid Earth: plate tectonics
2. Recycling of the elements
    a. Photosynthesis and Nutrients
    b. The short term carbon cycle
    c. The long term carbon cycle
3. Long-term climate regulation
    a. The Geologic Time
    b. Formation of the Solar System
    c. Formation of atmosphere and ocean
    d. Causes of long-term climate change
    e. Climates of the past 200 Million Years
4. Evolution of the atmosphere
    a. Pre-biotic atmosphere
    b. The origin of life
    c. The effect of life on the early atmosphere
    d. The rise of atmospheric oxygen and ozone
    e. Oxygenation of the deep ocean
5. Biodiversity through Earth's history
    a. Biodiversity
    b. The fossil record of biodiversity
    c. Mass extinction
6. Pleistocene glaciation
    a. Geologic evidence of glaciation
    b. Glacial climate feedback
7. Short-term climate variability
    a. The Holocene
    b. Present day climate variability: El Niño Southern Oscillation
    c. Global warming and human threat to biodiversity
    d. Future climate change
8. Earth compared to the Earthlike planets in the Solar System

**V) Possible textbooks**

Kump, L. R., Kasting, J. F., and Crane, R. G., The Earth System, First Edition, Prentice Hall, Inc., 1999.

Mackenzie, F. T., Our changing Planet: An introduction to Earth System Science and Global Environmental Change, Third Edition, Prentice Hall, Inc., 2003.

**VI) Other reference books**

Broecker, W., How to Build a Habitable Planet, 1988. Lamont-Doherty Geological Observatory of Columbia University. Eldigio Press, LDGO Box #2, Palisades, New York 10964.

Jacobson, M., Charlson, R., Rodhe, H., and Orians, G., Earth System Science: From Biogeochemical Cycles to Global Change, Academic Press, 2000.

Lunine, J. I., Earth: Evolution of a Habitable World, Cambrige University Press, 1998.

**Grading:**

- Overall course grade conversion key:
  - 90 and above = A
  - 80-89 = B
  - 70-79 = C
  - 60-69 = D
  - Below 60 = E
- Grade components:

| | |
|---|---|
| Midterm exam #1: | 25% of course grade |
| Midterm exam #2: | 25% of course grade |
| Assignments: | 20% of course grade |
| Final exam: | 30% of course grade |