New Course Request

1. School/Division: School of Science
2. Academic Subject Code: GEOL-G
3. Course Number: 306 (must be cleared with University Enrollment Services)
4. Instructor: R. Jeffrey Swope
5. Course Title: Earth Materials

6. First time this course is to be offered (Semester/Year): Fall, 2007
7. Credit Hours: Fixed at 4 or Variable from ________ to ________
8. Is this course to be graded S-F (only)? Yes _____ No _____ X
9. Is variable title approval being requested? Yes _____ No _____ X
10. Course description (not to exceed 50 words) for Bulletin publication: Prerequisites: G110 and C106.
   The physical and chemical properties of Earth materials, and the chemical processes which have altered them to cause Earth to evolve to its present state. This course covers properties of minerals and their identification, genesis of igneous, metamorphic and sedimentary rocks, interactions between solid Earth and the hydrosphere, and interactions between humans and the solid Earth.

11. Lecture Contact Hours: Fixed at 3 or Variable from ________ to ________
12. Non-Lecture Contact Hours: Fixed at 4 or Variable from ________ to ________
13. Estimated enrollment: 15 of which 0 percent are expected to be graduate students.
14. Frequency of scheduling: Annual Will this course be required for majors? Yes
15. Justification for new course: Introductory major course for Bachelor of Science in Environmental Science
16. Are the necessary reading materials currently available in the appropriate library?
17. Please append a complete outline of the proposed course, and indicate instructor (if known), textbooks, and other materials.
18. If this course overlaps with existing courses, please explain with which courses it overlaps and whether this overlap is necessary, desirable, or unimportant.
19. A copy of every new course proposal must be submitted to departments, schools, or divisions in which there may be overlap of the new course with existing courses or areas of strong concern, with instructions that they send comments directly to the originating Curriculum Committee. Please append a list of departments, schools, or divisions thus consulted.

Submitted by: [Signature]
Date: 1/7/07
Department Chairman/Division Director

Dean of Graduate School (when required): [Signature]
Date: ________

Approved by: [Signature]
Date: 2/4/07
Dean

Chancellor/Vice-President: [Signature]
Date: ________

University Enrollment Services: [Signature]
Date: ________

After School/Division approval, forward the last copy (without attachments) to University Enrollment Services for initial processing, and the remaining four copies and attachments to the Campus Chancellor or Vice-President.
I. Title: Earth Materials  
Course #: GEOL G306  
Instructor: Swope  
Prerequisites: Geology G110, Chemistry C106

II. Course Description:  
The physical and chemical properties of Earth materials, and the chemical  
processes which have altered them to cause Earth to evolve to its present state.  
This course covers properties of minerals and their identification, genesis of  
igneous, metamorphic and sedimentary rocks, interactions between solid Earth  
and the hydrosphere, and interactions between humans and the solid Earth.  
Prerequisites: Geology 110, Chemistry 106

III. Educational Objectives:  
Earth Materials is a course designed to acquaint you with the tools used by  
geologists and environmental scientists to describe and understand the origin of  
minerals and rocks, and interactions between the solid Earth and the hydrosphere.  
This course will use a combination of directed discussion, hands-on laboratory  
work, and independent study to help you:  
- Apply basic chemical thermodynamics and actualistic principles to interpret  
environments of mineral and rock formation  
- Explain physical interactions between the hydrosphere and lithosphere  
- Explain chemical fractionation associated with weathering reactions  
  leading to the diversity of soils, sediments, and metamorphic rocks  
- Associate the dynamics of the rock cycle with geochemical cycles.  
Achieving these objectives will increase your understanding of geology as a  
physical science. In the process, you will improve your ability to think in  
quantitative as well as qualitative terms, and to critically analyze data and physical  
models relevant to understanding complex and as yet incompletely understood  
Earth processes.

Supplemental Objectives for Prospective Earth Science Teachers  
Earth Materials will help to prepare you to teach earth and space science at the middle  
school and/or high school level. The objectives of this course include topics central to  
understanding earth science, and therefore will prepare you to meet Indiana Professional  
Standards Board Standard #1 for teachers of science:

The teacher of science understands the central concepts, tools of inquiry, and the  
history and nature of science in order to create learning experiences that make  
these aspects of science meaningful for the student.

The central concepts of earth science that you will learn in this course are  
identified in the NRC National Science Education Standards:

ENERGY IN THE EARTH SYSTEM  
Internal sources of energy  
The outward transfer of Earth's internal heat
GEOCHEMICAL CYCLES
The existence of chemical elements in different chemical reservoirs
Movement of matter between reservoirs is driven by the Earth’s internal energy
Physical and chemical changes accompanying movement of matter

Your laboratory work and independent study in this course will also acquaint you with the analytical and computational tools used in earth science. I will continually encourage you to think about how to translate these aspects of earth science in a meaningful and challenging way to your fellow students, as preparation to translate them to your middle school and/or high school students in the future.

IV. Course Content:

Week 1. Structure, composition and classification of minerals and rocks
Week 2. Atomic structure and crystal chemistry
Week 3. Crystal chemistry - Oxides and silicates
Week 4. Minerals in Rocks
Week 5. Mineral stability - Phase diagrams
Week 6. Igneous Rocks - Composition and origin
Week 7. Igneous Rocks and Earth’s interior
Week 8. Solid Earth and the hydrosphere – Rock weathering
Week 9. Formation and evolution of soils
Week 10. Sedimentary cycles – Composition and origin of clastic rocks
Week 11. Sedimentary cycles – Composition and origin of carbonate rocks
Week 12. Metamorphic rocks – Composition and origin
Week 13. Solid Earth and the hydrosphere – Dynamic geochemical cycles
Week 14. Economics of Earth materials - Mining
Week 15. Economics of Earth materials – Mining waste and reclamation
Week 16. Toxicity of Earth materials – Minerals and human health

V. Recommended Texts and Supplementary Reading:


VI. Evaluation and Grading:

Your grade in this course is based on the following activities:


2 lecture exams 30%
laboratory reports 30%
homework 20%
case study 20%

You will receive comments and suggestions on all your work, but credit only for work submitted on time.

VII. **Cheating and Plagiarism**
As a student in this course, you must not use or attempt to use unauthorized assistance, materials, or information in any class activity. Cheating specifically includes allowing others to conduct research or to prepare work for you without advance authorization from the instructor. You must not make any unauthorized use of materials obtained from commercial companies or from files of papers prepared by other persons. It is cheating to collaborate with others on a class activity or project and submit a copy of an exercise, computer program, computations, or a written report which is represented explicitly or implicitly as your individual work. It is plagiarism to adopt or reproduce ideas, words, or statements of another person without appropriate acknowledgment. You must give credit and acknowledge another person's actual words or ideas, either oral or written in text or electronic form, and you must credit facts or data borrowed from another person, including all facts or data acquired from print or electronic resources.