INVESTIGATING BODY  Math. & Nat.  COURSE, MAJOR, DEGREE or PROGRAM  A&S GLY 550  
(Area)  12-10-04  CATEGORY (NEW, CHANGE, DROP)

INSTRUCTIONS: This completed form will accompany the course application to the Graduate/Undergraduate Council(s) in order to avoid needless repetition of investigation. The following questions are included as an outline only. Be as specific and as brief as possible. If the investigation was routine, please indicate this. The term "course" is used to indicate one course, a series of courses or a program, whichever is in order. Return the form to Leonidas Bachas, Associate Dean, 275 Patterson Office Tower for forwarding to the Council(s). ATTACH SUPPLEMENT IF NEEDED.

1. List any modifications made in the course proposal as submitted originally and why.
   MINOR WORDING, TEXTUAL CHANGES.

2. If no modifications were made, review considerations that arose during the investigation and the resolutions.

3. List contacts with program units on the proposal and the considerations discussed therein.
   NOT APPLICABLE

4. Additional information as needed.

5. A&S Area Investigator Recommendation:
   APPROVE, APPROVE WITH RESERVATION, OR DISAPPROVE

6. A&S Council Recommendation:
   APPROVE, APPROVE WITH RESERVATION, OR DISAPPROVE

7. A&S Council Investigator, Dave Moecher  Date: 12-10-04

File: InvestigatorRpt
APPLICATION FOR NEW COURSE

1. Submitted by College of Arts and Sciences ____________________________ Date 11-07-04
   
   Department/Division offering course Geological Sciences ____________________________

2. Proposed designation and Bulletin description of this course
   
   a. Prefix and Number  GLY550  
   b. Title* Fundamental Geophysics

   *NOTE: If the title is longer than 24 characters (including spaces), write a sensible title (not exceeding 24 characters) for use on transcripts  n/a

   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

   Survey of active geophysical measurements and passive geophysical observations and their relation to Earth’s structure and composition. Investigation of the relationship between Earth’s elastic, potentiometric, and thermodynamic properties and traditional geophysical methods for measurement (e.g., gravity, magnetics, seismic, and heat flow). Material will help students improve their quantitative problem-solving abilities, but will also emphasize the visual learning skills commonly developed in the broader geology curricula. (MA 113, MA 114 suggested, PHY 211/213, or consent of instructor).

   h. Prerequisites (if any)

   MA113, PHY211 or 231, or consent of instructor

   i. May be repeated to a maximum of  n/a  

4. To be cross-listed as  n/a
   
   Prefix and Number ____________________________

   Signature, Chairman, cross-listing department ____________________________

5. Effective Date 2005 (semester and year)

6. Course to be offered  ☒ Fall  ☐ Spring  ☐ Summer

7. Will the course be offered each year? (Explain if not annually)  ☒ Yes  ☐ No

8. Why is this course needed?

   Geophysics is a traditional part of most geological science undergraduate and graduate programs. Future solutions for increasingly difficult earth-science problems (e.g., energy demand and natural hazard mitigation) require a fundamental understanding of Earth’s configuration and processes. This course is designed to expose students to quantitative elements required in solid-earth problem solving, but through careful clarification of certain quantitative abstractions that often intimidate students. A primary objective is to offer students in the geological and other physical sciences an appreciation for geophysics in the context of geology and the overall plate-tectonic paradigm. Physical attributes and complimentary visualization will be provided for developing and understanding the fundamental mathematical expressions. The course will apply basic mathematics and physics to general geological concepts in order to encourage students to employ quantitative measurements and appropriate constraints to the broader spectrum of the geological sciences.
9. a. By whom will the course be taught?  Dr. Edward Woolery and/or Dr. Shelley Kenner

b. Are facilities for teaching the course now available?  
   Yes  No
   If not, what plans have been made for providing them?

   n/a

   n/a
APPLICATION FOR NEW COURSE

10. What enrollment may be reasonably anticipated?  15

11. Will this course serve students in the Department primarily?  
   ☒ Yes  ☐ No

   Will it be of service to a significant number of students outside the Department?  
   ☒ Yes  ☐ No

   Geophysical methodology has broad applications outside traditional earth sciences; other disciplines that often utilize geophysics include Agronomy, Forestry, Anthropology/Archaeology, Civil Engineering, and Mining Engineering.

12. Will the course serve as a University Studies Program course?  
   ☐ Yes  ☒ No

   If yes, under what Area?  11/a

13. Check the category most applicable to this course
   ☒ traditional; offered in corresponding departments elsewhere;
   ☐ relatively new, now being widely established
   ☐ not yet to be found in many (or any) other universities

14. Is this course applicable to the requirements for at least one degree or certificate at the University of Kentucky?  
   ☒ Yes  ☐ No

15. Is this course part of a proposed new program:
   If yes, which?  11/a

16. Will adding this course change the degree requirements in one or more programs?*  
   ☐ Yes  ☒ No

   If yes, explain the change(s) below
   n/a

17. Attach a list of the major teaching objectives of the proposed course and outline and/or reference list to be used.

18. If the course is a 100-200 level course, please submit evidence (e.g., correspondence) that the Community College System has been consulted.  ☐ Check here if 100-200.

19. If the course is 400G or 500 level, include syllabi or course statement showing differentiation for undergraduate and graduate students in assignments, grading criteria, and grading scales.  ☒ Check here if 400G-500.

   Within the Department, who should be contacted for further information about the proposed course?

   Name  Edward W. Woolery  Phone Extension  257.3016

*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:

Department Chair

Dean of the College

18 Nov, 2004

Date

DEC 10 2004

Date

NOV 22 2004

Date of Notice to the Faculty

*Undergraduate Council

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 3/04
GLY550 Fundamental Geophysics
Department of Geological Sciences, University of Kentucky
3 Credit Hours
Syllabus

Instructor Information:
Dr. Edward W. Woolery, Assistant Professor
Room 309 Stone Research Building
Phone: 257-3016
Email: woolery@uky.edu
Office Hours: 9:30 – 10:30 a.m. MWF

Course Description: Survey of active geophysical measurements and passive geophysical observations, and their relation to Earth’s structure and composition. Investigation of the relationship between Earth’s elastic, potentiometric, and thermodynamic properties and traditional geophysical methods for measurement (e.g., gravity, magnetics, seismic, and heat flow). Material will help students improve their quantitative problem-solving abilities, but will also emphasize the visual learning skills commonly developed in the broader geology curricula. (MA 113, MA 114 suggested, PHY 211/213, or consent of instructor).

Course Need: Geophysics is a traditional part of most geological science undergraduate and graduate programs. Future solutions for increasingly difficult earth-science problems (e.g., energy demand and natural hazard mitigation) require a fundamental understanding of Earth’s configuration and processes. This course is designed to expose students to quantitative elements required in solid-earth problem solving, but through careful clarification of certain quantitative abstractions that often intimidate students. A primary objective is to offer students in the geological and other physical sciences an appreciation for geophysics in the context of geology and the overall plate-tectonic paradigm. Physical attributes and complimentary visualization will be provided for developing and understanding the fundamental mathematical expressions. The course will apply basic mathematics and physics to general geological concepts in order to encourage students to employ quantitative measurements and appropriate constraints to the broader spectrum of the geological sciences.

Major Teaching Objectives: Upon completion of this course, students will be able to:
1) Demonstrate basic understanding of geophysical measurement techniques.
2) Explain how geophysical observations provide constraints on Earth’s gross structure and composition.
3) Comprehend observations on earth’s physical processes and synthesize a coherent model of earth processes.
4) Formulate and execute appropriate problem-solving strategies.
5) Utilize quantitative analysis in their particular interests and studies of the Earth.
6) Communicate, orally and in writing, the theory and application of geophysical methods.
Course Outline:

Topic

1. Course Introduction: Geophysical Techniques, Interpretation, and Whole Earth Knowledge
2. Plate Tectonics
   a. Major geophysical divisions of the Earth’s interior
   b. Types of plate boundaries
   c. Geophysical manifestations along plate boundaries
   d. Constraints offered by geophysical observations; case histories
3. Seismic Waves
   a. Elastic waves
   b. Controlled-source techniques
4. Seismic Refraction Interpretation
   a. Interpretation models
   b. Tectonic interpretation of refraction profiles
   c. Case histories
5. Seismic Reflection
   a. Acquisition arrays and geometries
   b. Processing
   c. Waveform analysis
6. Structural and Tectonic Interpretation of Seismic Reflection Profiles
   a. Structure in profile
   b. Seismic expression of tectonic settings; case histories
7. Earthquake Seismology
   a. Earthquake characteristics
   b. Earthquakes and plate tectonics; case histories
   c. Probe of Earth’s interior
8. Gravity and Isostasy
   a. Gravity anomalies
   b. Gravity measurement
   c. Isostatic models
   d. Case histories
9. Magnetics
   a. Earth’s field
   b. Magnetization of Earth materials
   c. Magnetic anomalies
   d. Paleomagnetics
10. Heat Flow
    a. Heat sources and transfer within the Earth
    b. Heat flow across Earth’s surface
    c. Heat flow and tectonics

Teaching Outcomes:

Upon completion of this course, students should be able to:

1) Demonstrate knowledge of geophysical measurements by describing how, where, and why these data are used.
2) Communicate effectively the difference between geophysical measurements and constraints.
3) Evaluate problems requiring geophysical data and employ the applicable procedure(s) for adequate solution.
4) *Comprehend* and *synthesize* the fundamental physical processes and their relationship with plate tectonics and other geological phenomena.

5) *Demonstrate* an awareness and appreciation of quantitative necessity in the future of earth sciences.

6) *Describe* classic case histories of geophysical measurements used to define Earth structure and composition.

**Proposed Grading Distribution:**

**Differentiation of undergraduate and graduate students:** Graduate and undergraduate students, as required by the university, are evaluated by different standards in all 400G and 500 level courses. In this course, this rule manifests itself in a topical report(s). The topical report(s) for the graduate students includes a written and oral component. Graduate student written reports must be more in depth, longer, and contain more references. The Graduate student report must consist of 2000 words and have at least 12 primary references. The Graduate student oral component will include a professional 10-minute presentation followed by a 5-minute question and answer period. For undergraduates the written report must consist of 1300 words and have at least 6 primary references. No oral component is required for the Undergraduate student.

The grade for the course will be computed from the following components and their respective weights:

**GRADUATE STUDENTS:**

- Exam 1: 20%
- Exam 2: 20%
- Homework: 15%
- Written/Oral Report: 20%
- Final Exam: 25%

**UNDERGRADUATE STUDENTS:**

- Exam 1: 25%
- Exam 2: 25%
- Homework and Written Report: 25%
- Final Exam: 25%

Letter grades will be assigned based on the final computed grade as follows:

- $\geq 90\%$: A
- $\geq 80\%$ and $< 90\%$: B
- $\geq 70\%$ and $< 80\%$: C
- $\geq 60\%$ and $< 70\%$: D
- $< 60\%$: E

**Homework:**

Unless otherwise stated, homework assignments are due at the beginning of the class period ONE WEEK following the class period that the homework is assigned. Homeworks will consist of analytical problem solving and reports (oral and written) of literature reviews. Appropriate titles on tables and graphs are required. The first sheet of each assignment should include a header similar to the following example:

I.M. Dunn

GLY 550

Fundamental Geophysics

Topic: Gravity and Isostasy

Page 1 of 4

HW #5

Topic: Gravity and Isostasy

15 Sept. 2005
Be sure to number and include your name on all pages of your submitted assignment. Points will be deducted for work that is not sufficiently documented for the grader to understand calculations or problem solving logic, or is illegible/poorly written. The purpose of the homework format is to prepare the student for reporting/communicating relevant information in a style most often used by industry.

**Cheating and Plagiarism:**
In the unlikely event that an occurrence of cheating or plagiarism occurs, it will be dealt with according to University Rules (i.e., minimum punishment is an “E” in the course).

**Late Submissions:**
Homework assignments will not be accepted, if they are submitted after the class period in which they are due.

**Unexcused Absences:**
Note that the following are acceptable reasons for excused absences under University of Kentucky Senate Rules (S.R.): 1) serious illness; 2) illness or death of family member; 3) University-related trips (S.R. 5.2.4.2.C); 4) major religious holidays; 5) other circumstances that the instructor finds to be “reasonable cause for nonattendance.” University Senate Rules may be found at http://ukcc.uky.edu/%7Esenate. The burden of proof for verification of an excused absence is on the student, and the instructor retains the right to ask for sufficient documentation. It is preferable to notify the instructor in advance of any planned absences. If you do not notify the instructor prior to your absence, you must do so within one week (S.R. 5.2.4.2.D). When there is an excused absence, the student will be given the opportunity to make up missed work and/or exams. No opportunity will be given the opportunity to make up missed work and/or exams in the event of an unexcused absence.

**Possible References**


**Kearny, P. and Vine, F., Global Tectonics: Blackwell Scientific, 1990**


**Turcotte, D. and Schubert, G., Geodynamics: John Wiley and Sons, 1982.**