LSC Use Only No:	LSC Action-Date:	UWUCC USE Only No.	UWUCC Action-Date:	Senate Action Date:
		10-58e.	App - 4/5/11	App 4/19/11

Curriculum Proposal Cover Sheet - University-Wide Undergraduate Curriculum Committee

Contact Person	Email Address
Kenneth S. Coles	kcoles@iup.edu
Proposing Department/Unit	**Phone**
Geosciences - Natural Sciences and Mathematics	7-5626

Check all appropriate lines and complete information as requested. Use a separate cover sheet for each course proposal and for each program proposal.

1. Course Proposals (check all that apply)

_X_ New Course _____ Course Prefix Change _____ Course Deletion

_____ Course Revision _____ Course Number and/or Title Change _____ Catalog Description Change

Current Course prefix, number and full title	*Proposed* course prefix, number and full title, if changing
	GEOS 323 Geophysics

2. Additional Course Designations: check if appropriate

_____ This course is also proposed as a Liberal Studies Course.

_____ This course is also proposed as an Honors College Course.

_____ Other: (e.g., Women's Studies, Pan-African)

3. Program Proposals

_____ Catalog Description Change _____ Program Revision

_____ New Degree Program _____ Program Title Change _____ Other

_____ New Minor Program _____ New Track

Current program name	*Proposed* program name, if changing

4. Approvals		**Date**
Department Curriculum Committee Chair(s)		11/3/10
Department Chair(s)		11/3/10
College Curriculum Committee Chair	Anne Rondo.	12/3/10
College Dean		12/3/10
Director of Liberal Studies *		
Director of Honors College *		
Provost *		
Additional signatures as appropriate: (include title)		
UWUCC Co-Chairs	Gail S Sechrist	4-5-11

* where applicable

Received
JAN 3 1 2011
Liberal Studies

Part II. Description of Curricular Change

1. SYLLABUS OF RECORD

I. Catalog Description

GEOS 323 Geophysics **3c-3l-4cr**

Prerequisites: PHYS 111, MATH 121, Grade of C or better in GEOS 201 and GEOS 202

An introduction to physics of the surface and interior of the solid Earth including earthquakes, propagation of earthquake waves, gravity field and interior structure, magnetic field and magnetic reversals, heat flow, geodesy, and tides. Techniques used for applied geophysical surveys are also examined.

II. Course Objectives

At the end of this course students will be able to:

1) Interpret and synthesize geophysical data in terms of the materials, structure, and history of Earth's interior.
2) Identify the types and paths of seismic waves that travel through Earth.
3) Explain the possible sources of magnetic and gravity anomalies.
4) Employ observations of flexure, rebound, and deformation of the crust to quantify flow in Earth's mantle.
5) Explain changes in Earth's magnetic field, rotation, and the Moon's orbit.
6) Choose appropriate geophysical survey techniques and evaluate resulting data.

III. Course Outline

Lecture

Part A (16 academic hours): Seismology

1. The wave equation
2. Refraction and reflection in the Earth; the shadow zone
3. Inverse theory
4. Inferred structure of the Earth
5. Multichannel seismic reflection techniques
6. Refraction surveys

Exam 1 (1 academic hour)

Part B (12 academic hours): Gravity and Rheology

1. Fields and field potentials
2. Gravity surveys and reduction to gravity anomaly
3. Gravity of crust and mantle; the geoid
4. Geodesy, deformation and vertical motions
5. Mantle viscosity; crustal flexure

Exam 2 (1 academic hour)

Part C (12 academic hours): Heat, Magnetism, and Friction

1. Flow equations; conduction and heat flow
2. Geotherms; metamorphism, melting, and convection
3. Spherical harmonics; description of current magnetic field
4. Secular variation; magnetic reversals; generation of the field
5. Magnetic and electrical resistivity surveys
6. Friction; history of lunar orbit

Final exam during final exam period (2 hours).

Laboratory Exercises (3 academic hours each)

Week 1:	Wave tracing in Earth
Week 2:	Operation of a seismograph
Week 3:	Locating earthquakes from seismograms I
Week 4:	Locating earthquakes from seismograms II
Week 5:	Multichannel reflection interpretation
Week 6:	Interpreting gravity anomalies
Week 7:	Lab Midterm Exam
Week 8:	Mantle viscosity
Week 9:	Flexure and flow in the mantle
Week 10:	Heat flow at plate boundaries and plate interiors
Week 11:	Magnetic anomalies and interpretation
Week 12:	Interpretation of paleomagnetic data
Week 13:	History of Earth's rotation and Moon's revolution
Week 14:	Lab Final Exam

IV. Evaluation Methods

Each component of the course will contribute to final grade as follows:

Exam 1	20%
Exam 2	20%
Final Exam	20%
Laboratory Exercises	10%
Laboratory Midterm Exam	15%
Laboratory Final Exam	15%
Total	100%

V. The final grade for this course will be determined using the following schedule:
A=90-100%; B=80-89%, C=70-79%, D=60-69%, F=<60%

VI. Attendance Policy

The attendance policy will conform to IUP's undergraduate course attendance policy.

VII. Required textbooks, supplemental books and readings

Fowler, C.M.R. (2005) *The Solid Earth: An Introduction to Global Geophysics* (2nd edition): Cambridge University Press, Cambridge, England, 685 p.

VIII. Special resource requirements

There are no special resource requirements for this course.

IX. Bibliography

In addition to the required textbook and supplemental readings from current literature, the following will be used to develop the course curriculum:

Aki, Keiiti, and Richards, Paul. (2009) *Quantitative seismology*, 2nd edition: University Science Books, Sausalito, Calif., 700 p.

Clancy, Edward P. (1968) *The tides: Pulse of the Earth*: Doubleday, Garden City, N.Y., 228 p.

Dohr, Gerhard. (1981) *Applied geophysics: Introduction to geophysical prospecting*: Wiley, New York, 231 p.

Garland, George D. (1965) *The Earth's shape and gravity*: Pergamon Press, Oxford, 183 p.
Kaufman, Alexander A. (2009) *Principles of the magnetic methods in geophysics*: Elsevier, Amsterdam, 301 p.
Parasnis, D. S. (1986) *Principles of Applied Geophysics*: Chapman and Hall, London, 402 p.
Rao, B. S. Rama and Murthy, I. V. R. (1978) *Gravity and magnetic methods of prospecting*: Arnold-Heinemann, New Dehli, 392 p.
Shearer, Peter M. (2009) *Introduction to seismology*: Cambridge University Press, Cambridge, England, 396 p.
Stacey, Frank D. and Davis, Paul M. (2008) *Physics of the Earth*, 4th edition: Cambridge University Press, Cambridge, England, 552 p.
Stein, Seth, and Wysession, Michael. (2003) *An introduction to seismology, earthquakes, and Earth structure*: Blackwell Pub., Malden, Mass., 498 p.

2. COURSE ANALYSIS QUESTIONNAIRE

Section A: Details of the Course

A1. How does this course fit into the programs of the department? For which students is the course designed? Explain why this course cannot be incorporated into an existing course.
This course will introduce students to the theory and methods of physics that are widely employed in study of the Earth by professional geologists. This course fills a significant gap in the elective offerings for the existing Geology and Environmental Geology tracks of the Geology major. This course is also required for the proposed Energy Resources Track. Geology majors and minors are expected to constitute most of those taking the course; other students who meet the prerequisites are welcome. A new course is required to cover the topics and techniques in sufficient detail for students to learn how to apply them in practice.

A2. Does this course require changes in the content of existing courses or requirements for a program?
This course does not require changing the existing content of any other courses or requirements for any program.

A3. Has this course been offered at IUP on a trial basis?
This course has never been offered in the Geoscience Department.

A4. Is this course to be a dual-level course?
This course is not a dual-level course.

A5. If this course may be taken for variable credit, what criteria will be used to relate the credits to the learning experience of each student?
This course cannot be taken for variable credit.

A6. Do other higher education institutions currently offer this course? If so, please list examples.
The majority of higher education institutions with programs in geology or earth sciences offer a course with a similar curriculum. Examples include:

Dartmouth College - EARS 64 Geophysics
Amherst College - Geology 41 Environmental and Solid Earth Geophysics
Bowdoin College - Geology 265 Geophysics
Montana State University - GEO 439 Geophysics

A7. Is the content, or are the skills, of the proposed course recommended or required by a professional society, accrediting authority, law or other external agency?

No professional society, accrediting authority, law or other external agency recommends or requires any specific content or skills for this course.

Section B: Interdisciplinary Implications

B1. Will this course be taught by instructors from more than one department?

This course will be taught by one instructor from the Geoscience Department.

B2. What is the relationship between the content of this course and the content of courses offered by other departments?

There is some overlap between the content of this course and that of PHYS 112, however GEOS 323 will focus more on specific geoscience applications than PHYS 112.

B3. Will this course be cross-listed with other departments?

This course will not be cross-listed with any other department.

B4. Will seats in this course be made available to students in the School of Continuing Education?

Seats in this course will not be available to students in Continuing Education.

Section C: Implementation

C1. Are faculty resources adequate?

Faculty resources are currently adequate to teach this course. This course will be counted as one preparation and six hours of equated workload.

C2. What other resources will be needed to teach this course and how adequate are the current resources?

a. Classroom space is currently adequate to teach this course.
b. There is no special equipment required to teach either the lecture of laboratory portions of this course.
c. There may be small amounts of consumable supplies required for the laboratory portion of the class. These are either already available in the Geoscience Department or are sufficiently inexpensive that they can be covered by the department budget.
d. Library materials are currently adequate for this course.
e. There will be no additional travel expenses.

C3. Are any of the resources for this course funded by a grant?

No resources for this course are currently funded by a grant.

C4. How frequently do you expect this course to be offered?

The department expects that this course will be offered once every two years (see attached program revision). There are no seasonal restrictions.

C5. How many sections of this course do you anticipate offering in any single semester?

We anticipate offering a single section of this course in a given semester.

C6. How many students do you plan to accommodate in a section of this course?
We plan to accommodate no more than twenty-four students in a section of this course. This is the maximum number of students that can be accommodated in the Geoscience Department's teaching laboratory rooms.

C7. Does any professional society recommend enrollment limits or parameters for a course of this nature?
No professional society recommends enrollment limits or parameters for this course.

C8. Not applicable.

Section D: Miscellaneous
None.

Part III. Letters of Support or Acknowledgment
The attached email was sent to the Physics Department who replied indicating support for this proposal.

Reply Reply To All Forward Delete This is Spam

Subject: Re: Requesting letter of support for new Geoscience track and course
From: Devki N Talwar
Date: 10/20/10 09:38 AM
To: Michael A Poage
Cc: talwar@iup.edu, kmarkel@iup.edu

Hello Michael,
The Physics Department will support the Geoscience Department's BS Geology/Energy Resources Track - requiring your students taking PHYS 111/121 and PHYS 112/122 courses as part of their Liberal Studies Rwequirements or Major Required Courses.

Thanks

Devki Talwar

On Mon, 18 Oct 2010 13:57:08 -0400
"Michael A Poage" <mpoage@iup.edu> wrote:

> *Dear Dr. Talwar, The Geoscience Department is proposing a new Energy Resources Track (see attached proposal) within our B.S. Geology degree program. The proposed track will require one or two semesters of Physics coursework (PHYS 111-121; 112-122; students may choose two semesters of Physics and one semester of Chemistry or vice-versa) as part of its Liberal Studies Requirements or Major Required Courses. In addition, the new track lists PHYS 112-122 and 342 as Controlled Electives. These physics requirements and controlled electives are nearly identical to those of our current Geology and Environmental tracks. We are requesting a letter of support from the Department of Physics with regard to the inclusion of these PHYS courses in our new Energy Resources Track. The modern field of geoscience requires a fundamental quantitative understanding of physical processes, and our students' education is greatly enhanced by including physics coursework in our curriculum. To help gauge the potential impact on your department, we anticipate that the addition of this new track will result in a modest increase in Geoscience majors of at most 10-15 students per year.*
>
> *As part of the proposed Energy Resources Track, we are also proposing a new course GEOS 323 Geophysics (see attached proposal). This course will require PHYS 111 as a prerequisite, however this should not generate additional demand for PHYS 111 as all geoscience students who will be taking GEOS 323 will have to take PHYS 111 for their major anyway. In any case, we wish to duly inform you of this new course and to suggest that it may be appropriate for Physics students in your B.S. in Applied Physics-Geology Track. Thank you for consideration of this request. Should you have any questions or concerns, please do not hesitate to contact me at mpoage@iup.edu or 7-5627. Sincerely, Michael Poage*
> *Chair, Geoscience Department Curriculum Committee*

Take Address