

LSC Use Only Proposal No:
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Curriculum Proposal Cover Sheet - University-Wide Undergraduate Curriculum Committee

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Proposing Department/Unit Geoscience	Phone 724-357- 7650

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

1. Course Proposals (check all that apply)

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: **GEOS 490 Field Studies in Geology**

Proposed course prefix, number and full title, if changing:

2. Liberal Studies Course Designations, as appropriate

This course is also proposed as a Liberal Studies Course (please mark the appropriate categories below)

Learning Skills Knowledge Area Global and Multicultural Awareness Writing Intensive (include W cover sheet)

Liberal Studies Elective (please mark the designation(s) that applies – must meet at least one)

Global Citizenship Information Literacy Oral Communication
 Quantitative Reasoning Scientific Literacy Technological Literacy

3. Other Designations, as appropriate

Honors College Course Other: (e.g. Women's Studies, Pan African)

4. Program Proposals

Catalog Description Change Program Revision Program Title Change New Track
 New Degree Program New Minor Program Liberal Studies Requirement Changes Other

Current program name:

Proposed program name, if changing:

5. Approvals	Signature	Date
Department Curriculum Committee Chair(s)	<i>Kenneth S. Cole</i>	4/17/2014
Department Chairperson(s)	<i>Sen A. U</i>	4/22/14
College Curriculum Committee Chair	<i>Ann Koster</i>	10/17/14
College Dean	<i>Diane Huff</i>	10/20/14
Director of Liberal Studies (as needed)		
Director of Honors College (as needed)		
Provost (as needed)		
Additional signature (with title) as appropriate		
UWUCC Co-Chairs	<i>Gail Sedquist</i>	11/11/14

Received

OCT 23 2014

Liberal Studies

Part II. Description of Curricular Change

1. SYLLABUS OF RECORD

I. Catalog Description

GEOS 490 Field Studies in Geology

(var. 1-4cr)

Prerequisites: GEOS 301; permission of instructor

Field-based geologic research in a variety of locations across the United States and the world. Through hands-on application, students will learn how to formulate a field hypothesis, use field equipment to collect geologic observations and samples, keep a field notebook, and create visual depictions of field data in the form of maps or cross-sections.

II. Course Objectives

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

- 1) Identify and map a variety of rock outcrops in the field, including all major rock types.
- 2) Formulate hypotheses to explain rock distribution and test them through field observation.
- 3) Sample rock outcrops to capture distinctive features and facies, including field orientation.
- 4) Record field observations accurately through field journal notes, maps and cross-sections.
- 5) Interpret field areas in terms of their depositional, tectonic, and/or erosional history.
- 6) Create and complete their own research project, possibly leading to professional publication.

III. Course Outline

Note: this course will be offered at different locations in different years, with topics as diverse as recent volcanic eruptions in the Cascade Mountains, river flooding patterns along the California coastline, or the mega-earthquake history of Taiwan. Specific locations and details of travel are therefore not included in the course outline below. The hours given are representative for 3 credits; they will be prorated appropriately when the course is taken for a different number of credits.

A. Logistical Meeting

(2 hours)

A logistical meeting will be held far enough in advance of the trip so that students have time to obtain any required medical treatment, documents, gear, and equipment (e.g., immunizations, passports, international drivers licenses, hiking boots, back-pack, sleeping bag, foul-weather gear). This logistical meeting will also cover the course itinerary (e.g., mode of travel, number of weeks spent in field study, planned side trips to points of geologic interest). At this time, the instructor will assign course readings and field projects based on the number of credits being taken.

B. Field Preparation (5 hours)

A series of lectures and discussions will occur prior to and during travel to the designated field area. Readings from field guides will focus on understanding the general geologic setting of the research area, while discussions of recent scientific literature readings will address the nature of the scientific research being carried out by the students and professor working as a team.

C. Field Techniques (5 hours)

Once on location, the students will be taught as a class about any sampling and measurement techniques required for the specific research project being carried out. Field equipment will be tested and calibrated during this portion of the class, and students will learn how to use any associated software to visualize and interpret field data.

D. Field Research (30 hours)

The bulk of time at the field location will be spent carrying out the scientific research project. Depending on the nature of the study being conducted, this may include mapping, rock sampling, instrumental surveying, measuring sections, and/or drilling cores. During this portion of the class, students will pursue specific field assignments or objectives, some working together in small teams and others working semi-independently. For safety, all students will be paired with at least one other student or faculty member during their time in the field. All students will be assigned to keep field journals and record field observations in the form of maps, cross-sections, and/or computer-aided geographic information systems. Additional lectures and discussion of the geologic processes, history, and evolution of the region under study may be given at nights or at times when field work cannot be undertaken (i.e., inclement weather).

IV. Evaluation Methods

All students will be graded based on the following components of evaluation:

Participation in field activities and discussions:	30%
Accuracy and detail of field notebooks	25%
Quality and detail of project reports	25%
Quality and accuracy of data visualization	20%

Evaluation methods will apply equally to all students in the class. Students will work in collaborative teams, with a larger share of the organizational and leadership role for each team assigned to students enrolled for higher numbers of credits. Specific team responsibilities will be assigned by each course instructor based on the field area and type of research being done.

V. Example Grading Scale

The final grade will be assigned based on the semester average using the scale: 90-100%=A; 80-89%=B; 70-79%=C; 60-69%=D and below 60%=F.

VI. Attendance Policy

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

VII. Required Textbook(s), Supplemental Books and Readings.

Textbooks, field guides and/or other supplemental readings will be assigned by the instructor as appropriate for the specific field location and type of rock being studied. Students will be given these reading assignments at least one month prior to the start of the course, so they can download or purchase their assigned reading materials before the departure date of travel.

VIII. Special Resource Requirements.

This course will be offered off the IUP campus and will involve travel to and from the field location as well as living and field study expenses while taking the course. The costs of living and travel will generally be subsidized by alumni donations to the Next Generation Field Fund, a dedicated fund in the IUP Foundation that was created to support student geologic field work. Students must purchase a 10X hand lens and geologic hammer for field study. These typically run \$5-20 depending on quality. Students must also purchase hiking, camping and other gear as appropriate for the field area and obtain any necessary immunizations and travel documents.

IX. Bibliography

In addition to field guides and journal articles specific to the research projects being carried out in each field area chosen for this course, the following resources will be used to ensure effective field-based learning for all students:

- Burger, H. Robert, Anne Sheehan, and Craig Jones (2006) *Introduction to Applied Geophysics: Exploring the Shallow Subsurface*. Norton & Company, 600 pp.
- Coe, Angela L. Ed. (2010) *Geological Field Techniques*. Wiley-Blackwell, 336 pp.
- Jerram, Dougal and Nick Petford, (2011) *The Field Description of Igneous Rocks* (2nd Ed.) Wiley, 256 pp.
- Lisle, Richard J., Peter Brabham, and John W. Barnes (2011) *Basic Geological Mapping (Geological Field Guide)*. Wiley, 230 pp.
- Maley, Terry S. (2005) *Field Geology Illustrated: Mineral Land Publications*, 704 pp.
- May, C. L., L. S. Eaton, and S. J. Whitmeyer (2009) Integrating student-led research in fluvial geomorphology into traditional field courses: A case study from James Madison University's field course in Ireland. In *Field Geology Education: Historical Perspectives and Modern Approaches* v. 461, p. 195.
- Milson, John and Asger Eriksen (2011) *Field Geophysics* (4th Ed.) Wiley, 304 pp.
- McClay, Ken (1991) *The Mapping of Geological Structures*: Geol. Soc. London, 168 pp.
- Mogk, David and Charles Goodwin (2012) Learning in the field: Synthesis of research on thinking and learning in the geosciences. *Geological Society of America Special Papers*, v. 486, p. 131-163.
- Pavlis, Terry L., Richard Langford, Jose Hurtado, and Laura Serpa. (2010) Computer-based data acquisition and visualization systems in field geology: Results from 12 years of experimentation and future potential. *Geosphere* v. 6, n. 3, p. 275-294.

- Petcovic, Heather L., Julie C. Libarkin, and Kathleen M. Baker. (2009) An empirical methodology for investigating geocognition in the field. *Journal of Geoscience Education* v. 57, p. 316-328.
- Reynolds, Stephen J. (2012) Some important aspects of spatial cognition in field geology. *Geological Society of America Special Papers* v. 486, p. 75-77.
- Spencer, Edgar (2006) *Geologic Maps: A Practical Guide to the Preparation And Interpretation of Geologic Maps*. Waveland Press, 145 pp.
- Tucker, Maurice (2011) *Sedimentary Rocks in the Field* (4th Ed.) Wiley, 288 pp.

Course Analysis Questionnaire

Section A: Details of the Course

A1 This course is designed as a controlled elective for junior and senior geology majors in all degree tracks. This course fills a need for students going on to industrial or academic research institutions by teaching them how to conduct an actual research project on a topic of current scientific interest. Existing courses either teach students the fundamental techniques of how to study rock outcrops in the field (GEOS 303 Field Geology) or introduce students to the known geologic setting and evolution of a particular region (GEOS 401-402 Northern Rockies Seminar and Field Workshop, GEOS 403-404 Newfoundland Seminar and Field Workshop, GEOS 405-406 American Southwest Seminar and Field Workshop, GEOS 407-408 Carbonate Geology Seminar and Field Workshop).

This course will focus on conducting an actual scientific research project, usually part of or closely related to a particular faculty member's research portfolio. Working cooperatively in small groups and as individuals, students will learn how to map and sample field outcrops in order to produce actual research results suitable for writing grants and publications. Students will often participate in presenting the research at professional conferences following the field research. Joint faculty-student research is a well-documented high-impact practice for student retention and a stated strategic goal at the division, college and department level.

Table One: Summary of IUP's current strategic focus on joint faculty-student research

IUP Unit	Strategic Goal
Academic Affairs Divisional 2014- 2016 Strategic Priorities	Goal 4. Improve IUP's competitiveness by encouraging the development or continued improvement of programs and practices that promote technological innovation and/or that encourage collaboration among faculty and between faculty and students.
College of Natural Sciences & Math 2012-13 Priorities	Promote and Support Faculty/Student Research. Increase research activity through support for faculty who mentor undergraduate and graduate student research, build shared instrumentation laboratories, and resource interdisciplinary research clusters.
Geoscience Dept. Student Learning Outcome Plan	Student Learning Goal III. Students will develop specific professional skills needed for field and lab research, including rock & mineral identification and interpretation; spatial data analysis and map interpretation; and computer spreadsheet analysis, statistics or mathematical modeling.

A2 This course requires no changes in content of existing courses or program requirements.

A3 This course is being offered on a trial basis this coming summer as GEOS 481 Research Studies in Geology. We expect a small number of students (5-6) to take part.

A4 This will not be a dual-level course.

A5 This is a variable credit course, with the number of credits taken determined by the student in conjunction with their academic advisor. All students will be evaluated on the same grading basis (participation, field journal, project completion). We expect students to assist each other informally and work cooperatively in small field teams. A larger share of the organizational and leadership role for each field team will be assigned to students enrolled for higher numbers of credits. Specific field team responsibilities will be assigned by each course instructor based on the field area and type of research being done.

A6 Other geology undergraduate programs that offer a similar field research class include:

Stanford University. Geology 190 Research in the Field (3 units)

SUNY Oneonta. GEOL 343 Field Studies of Plate Boundaries (3 cr)

University of Wisconsin-Whitewater. Geology 492 Field Studies in Geology (Var.1-3 units)

Western Michigan University. GEOS 4380 Field Studies in Geology (3 credits)

Of special note is Kutztown University of Pennsylvania, a fellow PASSHE institution, which offers two similar courses to encourage on-going student-faculty research in geology:

GEL 368 / 369 - Research in Geology I and Research in Geology II

This course involves field, laboratory and library research on a topic of geological nature.

The work will be supervised by a faculty member and the research topic will be acceptable to both the supervising faculty member and the student. The combined credit total for Research in Geology I and II is up to 6 semester hours. Prerequisites: 12 semester hours of geology courses and consent of the instructor.

In addition, the IUP Biology Department offers a similar class called BIOL 490 Field Studies in Biology, upon which our class is modeled.

A7 The ability to map and sample rocks in field exposure, along with other professional field skills such as water and soil sampling, are a major focus of many state professional geologists licensure exams, including the one required by the state of Pennsylvania for Professional Geologist (P.G.) licensure. The National Association of State Boards of Geology publishes a handbook for aspiring Professional Geologists that summarizes the standards they have promulgated for state licensure. Appendix A of that handbook shows that Field Methods and Remote Sensing make up roughly 30-35% of their test blueprints (sample exams).

Appendix 2
ASBOG FG and PG Test Blueprints
Number and Percent of Items by Domain

CONTENT DOMAINS	FG#	FG%	PG#	PG%
A. Field Methods & Remote Sensing	32	29.1	28	35.0
B. Mineralogy, Petrology, Petrography, & Geochemistry	15	13.6	2	2.5
C. Sedimentology, Stratigraphy, & Paleontology	11	10.0	3	3.8
D. Geomorphology	7	6.4	5	6.3
E. Structural Geology & Tectonics	10	9.1	2	2.5
F. Geophysics & Seismology	4	3.6	4	5.0
G. Hydrogeology	27	24.5	20	25.0
H. Engineering Geology	3	2.7	9	11.3
I. Mineral, Petroleum, & Energy Resources	1	0.9	7	8.8
TOTALS	110	100.0	80	100.0

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Section B: Interdisciplinary Implications

- B1 This course will not be taught by instructors from more than one department.
- B2 There is no relationship between the content of this course and the content of any other course offered at IUP.
- B3 This course will not be cross-listed with other departments.

Section C: Implementation

- C1 Faculty resources are adequate to teach this class at the current time. The course will be taught on as-needed basis during summer or winter sessions, depending on the location of the field research site. Faculty members who wish to teach the course will bring a proposal to

the department that shows how their research location and current project can be used to support a variety of student-centered research projects. Faculty workload will be assigned as part of each department's summer or winter teaching rotation, based on the number of students and credit hours taken.

C2 **Space:** Since this is an off-campus course, there is no need for campus teaching space.

Field Equipment: Any field equipment required for the research will generally be provided by the faculty member supervising the course, through prior grant or start-up funding. In cases where equipment must be leased or rented, faculty members must show that they have support from either internal or external funding sources as part of their proposal to teach the course.

Laboratory Supplies and Consumable Goods: Sampling bags, acid bottles for rock testing, and other inexpensive field supplies will be purchased using existing departmental funds

Library materials: Nothing special will be needed.

Travel Funds: The creation of this course was partially inspired by the recent initiation of a new IUP foundation fund designed specifically for the support of student field work and joint student-faculty field research. Funded by generous contributions from alumni and friends of the Geoscience Department, the Next Generation Field Geology Fund is intended to directly support student field-based learning activities. In addition to a significant initial contribution, this fund has received pledges for annual contributions that will ensure significant financial support for future field studies. We anticipate being able to use these funds to support the travel and living costs of the students who take this course each time it is offered.

C3 None of the resources for this course are grant-funded.

C4 This course will be offered on an occasional basis, as faculty research interests permit. It will be taught only during the winter or summer term, so that the long fieldwork period does not disrupt other classes being taken by the students.

C5 No more than one section of this course will be offered at a time.

C6 No more than 10 students can be adequately supervised in intensive field research by a single professor. All students will be required to submit an application to gain instructor permission to enroll in the class. The following criteria will be used to select students for enrollment: student G.P.A., number of geoscience courses taken by the student, existing research being done with the faculty member in charge, number of credits of field study requested by the student, physical ability to carry out the proposed field research (if applicable).

C7 We are not aware of any parameters or enrollment guidelines for this course.

C8 This is not a distance education course.

Section D: Other Miscellaneous Information

We have attached a detailed description of the Next Generation Field Fund that will support the bulk of travel and living expenses for students enrolled in this course.

Part III. Letters of Support or Acknowledgement

No letters of support from other programs or departments are required for this proposal.

NEXT GENERATION FIELD FUND IUP GEOSCIENCE DEPARTMENT

Through generous contributions from alumni and friends of the Geoscience Department, a new Foundation for IUP account was established to directly support student field-based learning activities: the Next Generation Field Geology Fund. In addition to a significant initial contribution, we have received pledges for annual contributions that will ensure significant financial support for our field studies programs well into the future!

Each year, the department offers a regional field trip to provide students with field-based training and analysis in different geological settings across North America. Our current rotation involves field courses studying the depositional processes of modern and ancient coral reefs of the Florida Keys, the deserts and mountain ranges of the American Southwest, tectonic formations and ancient strata near Newfoundland, and the rugged landscape of the Northern Rockies. A more local field course is also offered in the Appalachians using IUP as the home base for a series of short field excursions.

“Field studies usually involve long van rides and low-cost camping to reduce the financial burden to our students and their parents,” said Steve Hovan, chair of the Geoscience Department. “But we know that some students still struggled to make tuition payments, and these trips were simply not affordable. With this new fund, we will now be able to offer *all* of our students a high-quality field-based learning experience—without any additional cost beyond tuition.”

The Next Generation Field Fund will also offer new opportunities for field studies. For instance, in Summer 2014, a selected number of students will travel to the Pacific Northwest to collect rock samples and map geological features in the volcanic mountains of Oregon as part of a new field-investigations course taught by Nick Deardorff. The department intends to use the funds to offer as many opportunities as possible for our majors—the next generation of geologists.