

LSC Use Only No: 267 LSC Action-Date: _____ UWUCC USE Only No. 05-25 UWUCC Action-Date: Apr 2/14/06 Senate Action Date: Apr 2/28/06

Curriculum Proposal Cover Sheet - University-Wide Undergraduate Curriculum Committee

Contact Person Michael A. Poage	Email Address mpoage@iup.edu
Proposing Department/Unit Geoscience	Phone 357-5627

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)
 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 226 Forensic Geology

2. Additional Course Designations: check if appropriate
 This course is also proposed as a Liberal Studies Course. _____ Other: (e.g., Women's Studies, Pan-African)
 _____ This course is also proposed as an Honors College Course.

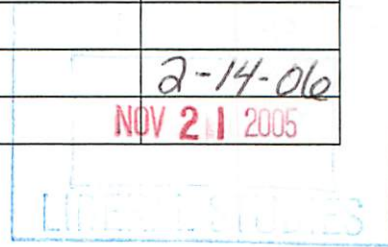
3. Program Proposals
 _____ New Degree Program _____ Program Title Change _____ Program Revision
 _____ New Minor Program _____ New Track _____ Other

Current program name: _____ Proposed program name, if changing: _____

4. Approvals

		Date
Department Curriculum Committee Chair(s)	<u>Michael Poage</u>	11/11/05
Department Chair(s)	<u>Wendene Richard</u>	11/11/05
College Curriculum Committee Chair	<u>[Signature]</u>	11/17/05
College Dean	<u>John D. Ed</u>	11/17/05
Director of Liberal Studies *	<u>Cheryl Shuler</u>	12-1-05
Director of Honors College *		
Provost *		
Additional signatures as appropriate: (include title)		
UWUCC Co-Chairs	<u>Gail Sedquist</u>	2-14-06

* where applicable



LIBERAL STUDIES COURSE APPROVAL, PARTS I-III: GENERAL INFORMATION CHECK-LIST

I. Please indicate the LS category(ies) for which you are applying:

LEARNING SKILLS:

First Composition Course Second Composition Course
 Mathematics

KNOWLEDGE AREAS:

<input type="checkbox"/> Humanities: History	<input type="checkbox"/> Fine Arts
<input type="checkbox"/> Humanities: Philos/Rel Studies	<input type="checkbox"/> Social Sciences
<input type="checkbox"/> Humanities: Literature	<input type="checkbox"/> Non-Western Cultures
<input type="checkbox"/> Natural Sci: Laboratory	<input type="checkbox"/> Health & Wellness
<input checked="" type="checkbox"/> Natural Sci: Non-laboratory	<input checked="" type="checkbox"/> Liberal Studies Elective

II. Please use check marks to indicate which LS goals are primary, secondary, incidental, or not applicable. When you meet with the LSC to discuss the course, you may be asked to explain how these will be achieved.

Prim Sec Incid N/A

 _____ _____
 _____ _____ _____
 _____ _____ _____

 _____ _____
 _____ _____ _____

A. Intellectual Skills and Modes of Thinking:

1. Inquiry, abstract logical thinking, critical analysis, synthesis, decision making, and other aspects of the critical process.
2. Literacy--writing, reading, speaking, listening.
3. Understanding numerical data.
4. Historical consciousness.
5. Scientific Inquiry.
6. Values (Ethical mode of thinking or application of ethical perception).
7. Aesthetic mode of thinking.

B. Acquiring a Body of Knowledge or Understanding Essential to an Educated Person

_____ _____ _____

C. Understanding the Physical Nature of Human Beings

_____ _____ _____
 _____ _____ _____

D. Collateral Skills:

1. Use of the library.
2. Use of computing technology.

III. The LS criteria indicate six ways that courses should contribute to students' abilities. Please check all that apply. When you meet with the LSC, you may be asked to explain your check marks.

1. Confront the major ethical issues that pertain to the subject matter; realize that although "suspended judgment" is a necessity of intellectual inquiry, one cannot live forever in suspension; and make ethical choices and take responsibility for them.
2. Define and analyze problems, frame questions, evaluate available solutions and make choices.
3. Communicate knowledge and exchange ideas by various forms of expression, in most cases writing and speaking.
4. Recognize creativity and engage in creative thinking.
5. Continue learning even after the completion of their formal education.
6. Recognize relationships between what is being studied and current issues, thoughts, institutions, and/or events.

Liberal Studies Course Approval Part IV

A. This course will be taught in one section by one instructor.

B. The career contributions of Sarah Andrews will provide this course with a unique women's perspective on forensic geology. Sarah Andrews is a highly successful geoscientist whose career combines petroleum geology and environmental geochemistry with journalism and novel writing. She is best known for her fictional works centering around forensic geology; titles include, "Tensleep", "Bone Hunter", "An Eye for Gold" and "Earth Colors". She has won many awards including the 1997 Rocky Mountain Association of Geologists Journalism Award for her "creative talents and successful marriage of the vocations of geologist and mystery novelist" and the 1999 American Association of Petroleum Geologists Journalism Award for "notable journalistic achievements in communications contributing to public understanding of geology". Students in the class will read "Earth Colors" (see C. below), a novel whose plot revolves around authentication of art pieces using the mineralogy and geochemistry of paint.

C. In addition to the textbook "Evidence from the Earth: Forensic Geology and Criminal Investigation", a number of non-textbook readings will be incorporated into the course. Included in these are "Earth Colors", a Sarah Andrews novel illustrating the use of mineralogy and geochemistry in art authentication. In addition, students will read summaries of case-studies in forensic geology including but not limited to:

Lombardi, G. (1999) The contribution of forensic geology and other trace evidence analysis to the investigation of the killing of Italian Prime Minister Aldo Moro: *Journal of Forensic Science*, v. 44, p. 634-642.

Murray, R.C. (1975) The geologist as private eye: *Natural History Magazine* (Feb.), p. 22-26.

Rapp, J.S. (1987) Forensic geology and a Colusa County murder: *California Geology*, p. 147-153.

D. This course will draw on elements of the geosciences pertinent to forensic science. As such, it will overlap in content with other courses designed specifically for majors such as GEOS 121 Physical Geology, GEOS 220 Mineralogy, GEOS 321 Geochemistry, and GEOS 333 Soils and Soil Geochemistry. The primary difference between this course and these courses is that Forensic Geology will be appropriate for students who will not be pursuing specific careers in that subject. In this sense, this course will share elements with many of the "survey" classes already taught as Liberal Studies courses (i.e. GEOS 101 Dynamic Earth, GEOS 221 Physical Resources of the Earth) in that it will cover a broad array of topics emphasizing their application to the growing field of forensic geology.

CHECK LIST -- NATURAL SCIENCES (Non-laboratory)

Knowledge Area Criteria which the course must meet:

- Treat concepts, themes and events in sufficient depth to enable students to appreciate the complexity, history and current implications of what is being studied; and not be merely cursory coverage of lists of topics.
- Suggest the major intellectual questions/problems which interest practitioners of a discipline and explore critically the important theories and principles presented by the discipline.
- Allow students to understand and apply the methods of inquiry and vocabulary commonly used in the discipline.
- Encourage students to use and enhance, wherever possible, the composition and mathematics skills built in the Skill Area of Liberal Studies.

Natural Science Criteria which the course must meet:

- Examine a body of knowledge of natural science that will contribute to an understanding of the natural world.
- Provide an understanding of the development of natural science theories and their modification.
- Teach students to formulate and test hypotheses.
- Provide an understanding of some of the "great moments" in the history of natural science and the individuals, including women and minorities, responsible for them.

Additional Natural Science Criteria which the course should meet:

- Encourage an appreciation of the complex interrelationship of natural science with the life of the individual.
- Develop in students the abilities necessary to cope with the consequences of natural science in the modern world.
- Develop an inquiring attitude consistent with the tenets of natural science, an attitude that is willing to expose fallacy on the basis of reason, that demands evidence for scientific assertions and yet is tolerant of hypotheses in the absence of contradictory evidence.

CHECK LIST -- LIBERAL STUDIES ELECTIVES

Knowledge Area Criteria which the course must meet:

- X Treat concepts, themes and events in sufficient depth to enable students to appreciate the complexity, history and current implications of what is being studied; and not be merely cursory coverage of lists of topics.
- X Suggest the major intellectual questions/problems which interest practitioners of a discipline and explore critically the important theories and principles presented by the discipline.
- X Allow students to understand and apply the methods of inquiry and vocabulary commonly used in the discipline.
- X Encourage students to use and enhance, wherever possible, the composition and mathematics skills built in the Skill Areas of Liberal Studies.

Liberal Studies Elective Criteria which the course must meet:

- X Meet the "General Criteria Which Apply to All Liberal Studies Courses."
- X Not be a technical, professional or pre-professional course.

Explanation: Appropriate courses are to be characterized by learning in its broad, liberal sense rather than in the sense of technique or preprofessional proficiency. For instance, assuming it met all the other criteria for Liberal Studies, a course in "Theater History" might be appropriate, while one in "The Craft of Set Construction" probably would not; or, a course in "Modern American Poetry" might be appropriate, while one in "New Techniques for Teaching Writing in Secondary Schools" probably would not; or, a course on "Mass Media and American Society" might be appropriate, while one in "Television Production Skills" probably would not; or, a course in "Human Anatomy" might be appropriate, while one in "Strategies for Biological Field Work" probably would not; or, a course in "Intermediate French" might be appropriate, while one in "Practical Methods for Professional Translators" probably would not.

Description of Curricular Change

1. SYLLABUS OF RECORD

I. Catalog Description

3 class hours

0 lab hours

GEOS 226 Forensic Geology

3 credit hours

Prerequisites: No Geoscience majors or minors.

3c-0l-3cr

An introduction to the use of geological information in criminal investigation.

Emphasizes the use of geochemistry, geochronology, geophysics, and soil characteristics in tracing the origins and history of criminal evidence as well as the development of new techniques for authenticating artifacts and art.

II. Course Objectives

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

- 1) Demonstrate knowledge of the present and historical role that geological evidence plays in solving criminal cases.
- 2) Demonstrate knowledge of the fundamentals of geology including plate tectonics and the generation of Earth's common rock types.
- 3) Use geologic maps to understand the distribution of rocks on the Earth's surface, and understand their relevance to forensic science.
- 4) Demonstrate knowledge of soil formation and types, soil mineralogy and chemistry and be able to use soil information as a forensic tool.
- 5) Explain the use of other types of geologic/geochemical evidence in forensic science including fossils, spores and pollen, and the geochemistry of cosmetics.
- 6) Demonstrate knowledge of environmental pollutants and the use of geochemical fingerprints in identifying their sources.
- 7) Explain the use of geochemical techniques to trace the origins of archaeological artifacts, authenticate the origins and provenance of gemstones and precious metals, and fingerprint paints used in ancient art.
- 8) Explain the fundamentals of isotope geochemistry and its use in age-dating and tracing the origins of criminal evidence.

III. Course Outline – 42 hours total

Part A (3 hours): History of Forensic Geology

1. Case studies
2. Forensic geology in the headlines
3. Forensic geology in fiction and on television

Part B (3 hours): Fundamentals of Geology

1. Plate tectonics and earth dynamics
2. Rocks and minerals and their occurrence
3. Types of geologic evidence, their description, measurement and sampling

Part C (3 hours): Rocks and Geologic Maps

1. Rock types and their geologic distribution
2. Geologic maps as a forensic tool
3. In-class Exercise: Geologic Maps and the Distribution of Rocks

Part D (6 hours): Soils as Forensic Evidence

1. Formation of soils, physical characteristics of soils, soil types
2. Soil mineralogy and chemistry
3. Case studies using soils as evidence
4. In-class Exercise: Fingerprinting Soils using Mineralogy

Part E (6 hours): Other Types of Geologic Crime Scene Evidence

1. Fossils
2. Spores and Pollen
3. Cosmetics

Mid-term Exam (1 hour)

Part F (5 hours): Geologic Evidence in Environmental Pollution Cases

1. Geochemical fingerprinting of groundwater contaminants
2. Tracing natural vs. anthropogenic contaminants
3. In-class Exercise: Tracing Contaminant Plumes Using Geochemistry

Part G (6 hours): Geologic Evidence in Fraud Cases

1. Archaeology: tracing the geologic origins of artifacts
2. Gemstone and mining fraud: fingerprinting provenance of gemstones and precious metals
3. Art Fraud: geochemistry of historical paints from different geographic regions

Part H (9 hours): Isotope Geochemistry and the Tracing of Criminal Evidence

1. Isotopes and mass spectrometry
2. Isotopic fingerprints in criminal evidence such as soils, drugs and petroleum products etc.
3. Geologic age dating of evidence as a forensic tool
4. In-class Exercise: Tracing the origins of illegal drugs using isotopic fingerprinting

The final exam will be held during the scheduled final exam period.

IV. Evaluation Methods

The final grade for this class will be determined as follows:

Exam 1 (30%): The first exam will be held at the beginning of the eighth week of the semester and will cover the history of forensic geology, rocks and geologic maps, soils as forensic evidence, and other types of geologic crime scene evidence.

Final Exam (40%): This will be a cumulative final exam and include material covered on the first exam as well as geologic evidence in environmental pollution cases, geologic evidence in archaeology, gemstone and art fraud cases, and isotope geochemistry as a tool used to track the origins of criminal evidence.

Quizzes (10%) will be given periodically throughout the course.

Critique of non-textbook reading with respect to material covered in class (5%)

In-class exercises illustrating the utility of geologic evidence in criminal and environmental cases will contribute 15% of the total points awarded for this class. These one hour in-class exercises will be designed such that students must synthesize material covered in lecture and apply their knowledge to the interpretation of geological or geochemical evidence with respect to a hypothetical investigation.

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

V. Attendance Policy

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

VI. Required textbooks, supplemental books and readings

Murray, R.C. (2004) *Evidence from the Earth: Forensic Geology and Criminal Investigation*, Missoula, Montana: Mountain Press.

Andrews, S. (2004) *Earth Colors*, St. Martin's Minotaur Publishing: New York, 304 p.

In addition, approximately five articles will be assigned as required reading throughout the semester. These might include:

Edwards, H.G.M., (1999) Art works studied using IR and raman spectroscopy. In *Encyclopedia of Spectroscopy and Spectrometry*, J.C. Lindon, G.E. Tranter and J.L. Holmes (eds.), London: Academic Press, p. 2-17.

Horrocks, M. and Walsch, K.J. (2001) Pollen on grass clippings: Putting the suspects at the scene of the crime: *Journal of Forensic Science*, v. 46, p. 947-949.

Lombardi, G. (1999) The contribution of forensic geology and other trace evidence analysis to the investigation of the killing of Italian Prime Minister Aldo Moro: *Journal of Forensic Science*, v. 44, p. 634-642.

- Murray, R.C. (1975) The geologist as private eye: *Natural History Magazine* (February), p. 22-26.
- Rapp, J.S. (1987) Forensic geology and a Colusa County murder: *California Geology*, p. 147-153.

The following will be held on reserve as supplemental reading:

- Pye, K. and Croft, D.J eds. (2004) *Forensic geoscience: Principles, techniques and applications*, Bath, U.K.: Geological Society Publishing House.

VII. Special requirements

There are no special resource requirements for this course.

VIII. Bibliography

- Lee, H. (2002) *Cracking Cases*, Amherst, N.Y.: Prometheus Books.
- McCrone, W.C., Chartier, D., and Weiss, R. (1988) *Scientific detection of fakery in art*, Bellingham, WA: International Society for Optical Engineering.
- Moenssens, A.A. et al. (1995) *Scientific evidence in civil and criminal cases*, 4th ed., New York: Foundation Press.
- Murray, R.C. and Tedrow, J.C.F. (1975) *Forensic geology: Earth sciences and criminal investigation*, New Brunswick, N.J.: Rutgers University Press.
- Murray, R.C. (2004) *Evidence from the Earth: Forensic Geology and Criminal Investigation*, Missoula, Montana: Mountain Press.
- Pye, K. and Croft, D.J eds. (2004) *Forensic geoscience: Principles, techniques and applications*, Bath, U.K.: Geological Society Publishing House.
- Saferstein, R. (2001) *Criminalistics: An introduction to forensic science*, 7th ed., Upper Saddle River, N.J.: Prentice Hall.
- Thornton, J.I. (1986) *Forensic soil characterization; Forensic Science 1.*, Heidelberg: Springer-Verlag.
- Thorwald, J. (1967) *Crime and science: The new frontier in criminology*, New York: Harcourt Brace Jovanovich.
- Wehrenberg, J.P. (1988) *Manual for forensic mineralogy*, Missoula, MT: Northwest Association of Forensic Scientists.

Course Analysis Questionnaire

Section A: Details of the Course

- A1. This course is a Liberal Studies course and is designed only for non-majors. The content of this course reflects growing recognition of the importance of geological and geochemical evidence in forensic science. Although the content of the course will draw on some material covered in greater depth in other Geoscience courses [GEOS 220 Mineralogy; GEOS 332 Geochemistry; GEOS 333 Soils and Soil Geochemistry], prerequisites for these classes preclude enrollment by Liberal Studies students. This course might be included in a minor in Forensic Science currently being developed.
- A2. This course does not require changing the existing content of any other course or requirements for any program.
- A3. This course has never been offered in the Geoscience Department, and to the best of my knowledge has not been offered in any other department.
- A4. This course is not a dual-level course.
- A5. This course cannot be taken for variable credit.
- A6. Many universities are currently offering Forensic Geology courses. Examples include:
- SUNY Buffalo: Topics in Forensic Geology*
 - Sul Ross State University: Forensic Geology*
 - Salem State University: Forensic Geology*
 - Norwich University: Forensic Geology*
 - University of Reading, United Kingdom: Forensic Geology and Analysis*
 - Southern Illinois University: Forensic Geology*
 - Wesleyan College: Forensic Geology*
- A7. 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. This course will be taught by one instructor from the Geoscience Department.
- B2. There is no direct overlap between the content of this course and that of other courses currently offered in other departments. CRIM 374 Environmental Crime and Justice address criminological solutions to environmental problems, the nature of environmental offenders and victims, and different approaches to achieving environmental justice. The content of this proposed course does not overlap with CRIM 374, however five hours of this course will focus on the types of geological and geochemical evidence used to fingerprint environmental contaminants, using classic case studies in forensic geoscience as examples.
- B3. This course will not be cross-listed with any other department.
- B4. Seats in this course will be made available to students in the School of Continuing Education.

Section C: Implementation

- C1. Faculty resources are adequate to teach this course. Dr. Poage will incorporate this course into his selection of introductory and upper-level courses. This course will not specifically displace any of Dr. Poage's current courses, but rather represents an additional option for the Geoscience Department's Liberal Studies offerings. This course will be counted as one preparation and three hours of equated workload.
- C2. There are no additional resources needed to teach this course; library materials are adequate.
- C3. No resources for this course are currently funded by a grant.
- C4. The department expects that this course will be offered every other year. There are no seasonal restrictions.
- C5. We anticipate offering a single section of this course in a given semester.
- C6. Student enrollment for this course will be limited by the size of the room where the class is offered.
- C7. No professional society recommends enrollment limits or parameters for this course.
- C8. Not applicable.

Section D: Miscellaneous

No additional information is necessary.

Letters of Support or Acknowledgment

Attached is a letter of support from Dr. Dennis Giever, Chair of the Criminology Department.

IUP I-Mail: Message from InBox Folder

Reply Reply All Forward Delete Close Unread Flag Add Address Folders Compose Rules Settings Log Out Help

Next Unread Back To Folder Copy To Move To Print

From: "Dennis Giever" <dgiever@iup.edu>
Subject: RE: Forensic Geology course proposal
Date: Mon, 3 Oct 2005 11:36:41 -0400
To: "Michael A Poage" <mpoage@iup.edu>

Michael,

I think a course on Forensic Geology is a great idea!! My department would support your efforts.

As a side note, we have talked with a number of departments about developing an interdisciplinary minor in forensics. This course would fit very nicely into such a minor. Would your department be interested in such a venture? Psy. has developed a new course and there are other courses either planned or on the books that might fit together nicely. It would just be a matter of getting everyone together on the same page.

Let me know your thoughts.

Dennis

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