



SACRAMENTO
STATE

Course Change Proposal Form A



Academic Group (College): NSM	Academic Organization (Department): GEOLOGY	Date: March 1, 2007
Type of Course Proposal: New <u>XX</u> Change ___ Deletion ___	Department Chair: DAVE EVANS	Submitted by: DAN DEOCAMPO
Does this course fulfill a requirement for single-subject or multiple subject credential students? Yes ___ No <u>XX</u>	For Catalog Copy: Yes <u>XX</u> No ___ CCE: Yes ___ No ___	Semester Effective: Fall <u>XX</u> Spring __, 2007

This course replaces experimental course Subject Area (prefix) and Catalog Number (course number):	n/a
This Catalog Number (course number) is being replaced:	n/a

Change from:

Subject Area (prefix) & Catalog No. (course no.):	Title:	Units:
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Change to:

Subject Area (prefix) & Catalog No. (course no.): GEOL 135	Title: Forensic Geology	Units: 3
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JUSTIFICATION:

The purpose of this course is to provide students with an understanding of the scientific methods used to apply geological principals to forensic problem solving. In the criminal justice, disaster/accident, and environmental forensic professional communities, geological techniques are increasingly important for the reconstruction of events, solving of crimes, and determination of criminal and civil liability. This course will therefore provide interesting and useful perspectives for future professionals and the public at large. This course will be targeted toward non-science majors, and will be proposed as an upper-division General Education course in Area B1.

NEW COURSE DESCRIPTION: (Not to exceed 80 words, and language should conform to catalog copy. See <http://www.csus.edu/acafl/univmanual/crspsl.htm> - Guidelines for Catalog Course Description)

Survey of geological approaches to forensic investigation. Origin and distribution of rocks, soils, and sediments in California and North America. Origin and microanalysis of minerals, microfossils, pollen, and spores. Environmental forensics and investigating pollution. Geophysics and remote sensing. Geology of the urban environment. Modern analytical technique. Case studies in criminal justice, national security, and environmental contamination. Satisfies area B1 General Education requirement.

Note:

Prerequisite: **None**

Corequisite:

CAN (California Articulation Number):

Graded: Letter <u>X</u> Credit/No Credit ___	Instructor Approval Required? Yes ___ No <u>X</u>
Course Classification (e.g., lecture, lab, seminar, discussion): Lecture (3 units)	Title for SIS+/CMS (not more than 30 characters) Forensic Geology
Cross Listed? Yes ___ No <u>X</u>	If yes, do they meet together and fulfill the same requirement, and what is the other course.

How Many Times Can This Course be Taken for Credit? 1

FOR NEW COURSE PROPOSALS OR SUBSTANTIVE CHANGES ONLY:

Description of the Expected Learning Outcomes: Describe outcomes using the following format: "Students will be able to: 1), 2), etc."
See the example at <http://www.csus.edu/acaf/example.htm>

Students will be able to

- 1) Comprehend the major geological processes that produce the common earth materials encountered in everyday life.
- 2) Comprehend the major geological techniques used in forensic investigation.
- 3) Evaluate evidence availability and determine the appropriate application of geological techniques in forensic investigation.
- 4) Comprehend how geological techniques have been used in various case studies of criminal justice, national security, disaster/accident scenes, and environmental contamination.

****Attach a list of the required/recommended course readings and activities [Note: it is understood that these are updated and modified as needed by the instructor(s).] This attachment should be forwarded only to your Dean's office, not Academic Affairs.**

Assessment Strategies: A description of the assessment strategies (e.g., portfolios, examinations, performances, pre-and post-tests, conferences with students, student papers) which will be used by the instructor to determine the extent to which students have achieved the learning outcomes noted above:

There will be mid-term and final examinations, including essay questions.
There will be bi-weekly written homework assignments.

For whom is this course being developed?

Majors in the Dept ___ Majors of other Depts ___ Minors in the Dept ___ General Education X Other ___
Is this course required in a degree program (major, minor, graduate degree, certificate)? Yes ___ No X
If yes, identify program(s):

Does the proposed change or addition cause a significant increase in the use of College or University resources (lab room, computer facilities, faculty, etc.)? Yes ___ No X

We will offset the addition of one section of this course by removing one section of Oceanography (Geol 130), therefore producing no net increase in required resources.

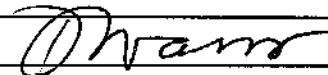
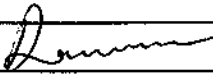
If yes, attach a description of resources needed and verify that resources are available.

Indicate which department or programs will be affected by the proposed course (if any). _____

The Department Chair's signature below indicates that affected programs have been sent a copy of this proposal form.

Approvals: If proposed change, new course or deletion is approved, sign and date below. If not approved, forward without signing to the next reviewing authority, and attach an explanatory memorandum to the original copy.

Signatures:

	Date
Department Chair: 	4-9-07
College Dean or Associate Dean: 	4-9-07
CPSP (for school personnel courses ONLY)	
Associate Vice President and Dean for Academic Programs	

CONDITIONAL APPROVAL 4/12/07

Distribution: Academic Affairs (original), Department Chair and College Dean. Dean's office to send original after approval to Academic Affairs, at mail zip 6016. An electronic copy must also be sent.

**G.E. Course Proposal for
AREA B: The Physical Universe and its Life Forms**

Subarea: B1 Physical Science

Department GEOLOGY

Course Number GEOL 135

Course Title Forensic Geology

Units 3

Contact Person Dan Deocampo

Phone 8-9319

I. A.

SEE ATTACHMENT

I. B.

SEE SYLLABUS (ATTACHMENT)

Common and Distinct Components to Multiple Sections

If multiple sections of GEOL 135 are taught, they will all use the same text book and reading list. The exams and homework questions will be similar across sections, but with enough distinction to discourage plagiarism.

I. C. 1)

Frequent written homework assignments allow for regular evaluation of the extent to which Area B1 objectives are being met. These assignments will also contribute to the writing requirement as an upper division GE course. Homework assignments will focus on integration of material presented in lecture and readings, and application to every day life. These written homework assignments, in addition to essay questions on exams, will meet the writing requirements of an upper division GE course.

I. C. 2)

The Geology Department collects course syllabi at the start of each semester for review. The course also has a designated course coordinator (Dan Deocampo) who will be responsible for the content and the adherence to GE Area B1 objectives.

II. A.

No prerequisites are listed for this course. This course is a general survey of techniques and cases in Forensic Geology spanning the many fields of geology, including, as listed above, Plate tectonics, Quaternary geology, mineralogy, micropaleontology, palynology, geophysics, and many others. In addition to showing the importance of geological approaches to forensic investigation, this course demonstrates the diversity of scientific approaches in geology that are used in many other areas of society.

II. B.

This course will provide an overview of many different topics in modern geology. Although the context of this overview is the application of geology to forensic investigation, the topics of discussion will be broad and widely-ranging, spanning many different sub-fields in Earth science. For example, the course will explore fundamental concepts such as the geology of North America and California, and many other topics in geology. Although many highly technical sub-fields will be examined, the purpose is not to learn details of technical applications of the sub-fields, but rather to provide an overview of the diversity of geologic approaches to forensic. These geological perspectives are valuable not only to forensic investigations, but also to many other areas of society.

II. C.

This course will explore fundamentals of many different areas in modern geology, and nature of the observable scientific evidence produced by these processes. We will use fundamental principles of plate tectonics, evolution, soil development, and other geologic sciences, to see how earth materials vary around us.

II. D.

This course will be highly interdisciplinary, relying on recent and ongoing scientific advances in fields of mineralogy, micropaleontology, environmental geochemistry, and many others. Although this is framed in the context of applied, forensic investigation, the foundation of such investigations rest on these scientific advances, many of which have been made in quite recent years.

II. E.

Application of the scientific method is made particularly accessible for GE students in cases of forensic investigation. This is partly due to the rigorous demands of the modern criminal justice system, which seek unambiguous conclusions, but it is also because the chains of logic and hypothesis-testing are intriguing and exciting to a wide audience. We can therefore use this opportunity to emphasize the importance of the scientific method and the advances in geologic understanding and results of applications in society that it has produced. In case studies ranging from environmental forensics at the scene of the World Trade Center collapse on 9/11, to geophysical location of clandestine graves, we will emphasize examples of the rigorous use of the scientific method, with clear articulation of the limitations thereof.

II. F.

Bi-weekly written homework assignments will be assigned. Essay questions on examinations will be assigned.

II. G.

See syllabus

Instructor

Office Hours

Catalog Description

Survey of geological approaches to forensic investigation. Origin and distribution of rocks, soils, and sediments in California and North America. Origin and microanalysis of minerals, microfossils, pollen, and spores. Environmental forensics and investigating pollution. Geophysics and remote sensing. Geology of the urban environment. Modern analytical technique. Case studies in criminal justice, national security, and environmental contamination. Satisfies area B1 General Education requirement.

Prerequisites

None

Learning Objectives

Students who are successful in this course will be able to

- Identify and describe the geological processes that produce the common earth materials encountered in everyday life.
- Describe and critique the major geological techniques used in forensic investigations.
- Evaluate evidence availability and determine the appropriate application of geological techniques in forensic investigation.
- Synthesize a variety of scientific techniques to make defensible inferences from geological data.
- Articulate and illustrate (as appropriate) how geological techniques have been used in various case studies of criminal justice, national security, disaster/accident scenes, and environmental contamination.
- Place selected case studies in their proper geologic setting and infer the type of data that might be valuable in a forensic investigation.

Required Read List & Textbook:

1) Course Pack of papers including

- Bull, P.A., Parker, A., and Morgan, R.M., 2006. The forensic analysis of soils and sediment taken from the cast of a footprint. *Forensic Science International*, vol. 162, p. 6-12.
- Deocampo, D.M., and Orr, W., 2006. Geochemistry of environmental lead in Sacramento, California. *Geological Society of America Abstracts with Programs*, vol. 38, p. 152.
- Mildenhall, D.C., Wiltshire, P.E.J., and Bryant, V.M., 2006. Forensic palynology: why do it and how it works. *Forensic Science International*. vol. 162, p. 163-172.
- Murray, R.C., 2004. *Evidence from the Earth: Forensic Geology and Criminal Investigation.*, Mountain Press Publishing, Missoula, Montana, 226 pp.
- Nobes, D.C., 2000. The search for “yvonne”: a case example of the delineation of a grave using near-surface geophysical methods. *Journal of Forensic Sciences*, vol. 45, p. 715-721.
- Ruffell, A., and Wiltshire, P., 2004. Conjunctive use of quantitative and qualitative X-ray diffraction analysis of soils and rocks for forensic analysis. *Journal of Forensic Sciences*, p. 49-56.

- Ruffell, A., and McKinley, J., 2005. Forensic geoscience: applications of geology, geomorphology and geophysics to criminal investigations. *Earth Science Reviews*, vol. 69, p. 235-247.
- Schumm, S.A., 1998. *To interpret the earth: ten ways to be wrong*. Cambridge University Press, 143 pp.
- Wiltshire, P.E.J., 2003. Pollen and related botanical evidence - its recent contribution to forensic investigations. In: Pye, K., and Croft, D.J. (eds.). *Forensic Geoscience: Principles, Techniques, and Applications*. Special Publication 232, Geological Society, London, p. 51-74.

- 2) Tarbuck, E.J., F.K. Lutgens and K.G. Pinzke, 1997. *Applications and Investigations in Earth Science* (5th ed.).

Grading:

Homework 25% of course grade

Students are required to submit a total of 8 brief written reports throughout the semester (about one every 2 weeks). The format of these reports will vary: some will be case study summaries, some will require comparing and contrasting case studies, some will be in the form of legal briefs supporting a particular point of view. These reports are a substantial percentage of the course grade, and students should devote an appropriate amount of time to preparing the reports. Reports should be word processed and free of grammatical and spelling errors.

Late reports will be accepted but penalized by a letter grade.

Exams 75% of course grade

There will be two in-class exams and a final for this course, each contributing 25% to the course grade. The exams will be multiple choice (60% of each exam), written short answers (25% of each exam) and essay (15% of each exam).

Weekly Topical Outline

- Week 1:** Introduction to forensic investigation. Forensic geology prior to the 20th century. The method of multiple working hypotheses and the limitations of science.
- Week 2:** Geology of North America. Geologic time. Plate tectonics. Classification and distribution of rocks.
- Week 3:** Geology of California. Tertiary and Quaternary evolution of California. Distribution of rocks, soils, and sediments in California. Petrographic techniques.
- Week 4:** Mineral occurrences in natural and artificial environments. Rock-forming minerals. Environments and types of sand. Case: Naturally Occurring Asbestos in the Sierra Foothills.
- Week 5:** Microanalysis of minerals. Basic crystallography. X-ray diffraction analysis. Case: Mineralogy in a crime-scene footprint cast.
- Week 6:** Forensic Micropaleontology. Classification and environments of diatoms, phytoliths, ostracodes, and foramenifera. Electron microscopy.
- Week 7:** Forensic Palynology: pollen and spores. Case: Diatom analysis in a drowning victim.
- Week 8:** Forensic geophysics. Ground penetrating radar and the detection of clandestine graves.
- Week 9:** Remote sensing. Detecting ground disturbance. Case: Human-induced subsidence in California's Central Valley.
- Week 10:** Remote sensing and international relations. Case: Genocide and "ethnic cleansing" in Yugoslavia and Rwanda.
- Week 11:** Environmental forensics. Basic principles of contaminant hydrogeology.
- Week 12:** Geochemical techniques. Detection of illegal toxics release by remote sensing and on-site investigation.
- Week 13:** Case: environmental forensics at Ground Zero, 9/11. Post-9/11 asbestos and air-quality monitoring.
- Week 14:** Forensic geology and the hunt for international terrorists. Geology of Afghanistan and Pakistan. Forensic geologic investigation of photographic evidence.
- Week 15:** Geology of the urban environment. Air, water, and soil pollution. Case: Soil lead in Sacramento.