

Proposed Course: Forensic Geology and Homeland Security
Instructors: Dr. PA Candela and Dr. PM Piccoli

Prerequisites:

MATH 110 (college algebra), CHEM 131, GEOL 100 *or* permission of instructor

Rationale:

This course will wed classic forensic geology with the post 9-11 world of homeland security. Rather than follow the usual academically-driven list of topics found in forensic geology texts, this course will cover the scientific aspects of real world problems faced by first responders, their officials, and other investigators. The course will also fill an important void, namely, the scientific basis for dealing with hazards related to homeland security.

The course is aimed at advanced undergraduates with a good knowledge of high school math who are majoring in e.g., Criminal Justice, Government and Politics, Geography, Geology, or other sciences, or those otherwise considering employment in law enforcement, homeland security, or related professions. The fusion of forensic geology and homeland security is now emerging given that modern law enforcement training involves not just criminal investigative techniques, but also responses to hazards, and investigations of terrorist-related events. The course also provides background for citizens who are interested in understanding the fundamentals of how the earth sciences can be applied to problems in these areas.

The course will begin with a general introduction to forensic science, will move on to how the earth sciences inform forensic analysis, and then will cover issues and principles related to homeland security. The course also includes discussions of legal matters, as well as maps, trace analysis, the mechanics of plumes, and toxic releases. Finally, specific types of criminal and hazard events are discussed.

Text:

"Evidence from the Earth: Forensic Geology and Criminal Investigation "Raymond C. Murray.
Other reading are web-based.

Pedagogy:

The course will include lectures, readings, and discussion of readings. Written reports on readings will be graded. Homework problem sets, as well as worked examples in class, will aid students in the development of map skills, and will introduce students to simple but useful quantitative approaches to understanding the application of earth science principles to various criminal/homeland security issues. Problem sets will alternate with reading assignments. Laboratory demonstrations will be included. A written midterm and final will be required.

Weekly Topics (readings above and beyond the texts are listed below).

1. Introduction to Forensic Science

Readings: [A Study in Scarlet](#) by AC Doyle

Case study: [Forensic analysis: weighing bullet lead evidence](#). (2004) National Research Council (U.S.). Committee on Scientific Assessment of Bullet Lead Elemental Composition Comparison.

2. Introduction to Forensic Geology

Readings: Ruffell, A. and McKinley, J. (2004) Forensic Geoscience: applications of geology, geomorphology and geophysics to criminal investigations. *Earth Science Reviews* volume **69**, Pages 235-247.
(Overview of the history of Forensic Geology; deals with the scale of investigation from petrographic analysis to landforms).

3. 9/11, Terrorism, and Homeland Security

Readings: [Executive Order of 8 Oct 2001 Establishing the Office of HS](#)
[Executive Summary of the 9-11 Commission Report](#)
[Balancing Homeland Security and Individual Rights](#)

4. Maps and Mapping Exercises

Readings: [GIS with Hazmat Applications](#)

5. Laws of Search and Seizure, Rules of Evidence, Chain of Custody, and Criminal Procedure

Readings: “[Search and Seizure](#)” from [Findlaw.com](#)
Special Assignment: Go to a local courthouse and take notes on a criminal trial.

6,7,8. Mineralogy, soils, and trace evidence: microanalytical techniques, and uncertainty analysis

Readings: [Estimating the Uncertainty](#)
Case Studies: Fitzpatrick et al., Systematic Approach to Soil Forensics: Criminal Case Studies Involving Transference from Crime Scene to Forensic Evidence. p.105 -127. Criminal and Environmental Soil Forensics, by Ritz, Dawson and Miller, Springer, 2009.
Scenario: “[The Sandy Body](#)”, by Nelson Eby, University of Massachusetts at Lowell.

9,10,11. Tankers and Topography: Hazmat, spills, and dispersion

Readings: [The Wireless Information System for Emergency Responders from NIH:](#)
(Download and learn to use *WISER*)
[A GIS Enabled Air Dispersion Modeling Tool for Emergency Management](#)
[Simple Models of Gaussian Plumes](#)

12. Natural Hazards

Readings: [CITIZEN'S EMERGENCY RESPONSE TOOL KIT – NATURAL HAZARDS, \(from UMBC\)](#)

13. Drinking Water Security

Readings: [EPA guide to Drinking Water Supply Terrorism](#)
[Biological Warfare Agents as Threats to Potable Water](#)

14. Weapons, Weaponized Materials, and the Environment

Readings: [Degradation of Biological Weapons Agents in the Environment](#)
Case Scenarios in Terrorism:
<http://www.ottawa.drdc-rddc.gc.ca/docs/e/TEO-TM-2006-118.pdf>

15. Nuclear Forensic Science

Readings: [Introduction to Nuclear Forensic Science](#)
[ONLINE TEXT: Nuclear Forensic Science](#)
[Mineral Cathodoluminescence as a Forensic Tool](#)

ACADEMIC INTEGRITY: The University of Maryland has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student you are responsible for upholding these standards for this course. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism. For more information on the Code of Academic Integrity or the Student Honor Council, please visit <http://www.studenthonorcouncil.umd.edu/whatis.html>.

The University of Maryland is one of a small number of universities with a student-administered Honors Code and an Honors Pledge, available on the web at <http://www.jpo.umd.edu/aca/honorpledge.html>. The code prohibits students from cheating on exams, plagiarizing papers, submitting the same paper for credit in two courses without authorization, buying papers, submitting fraudulent documents, and forging signatures. The University Senate encourages instructors to ask students to write the following signed statement on each examination or assignment: "I pledge on my honor that I have not given or received any unauthorized assistance on this examination (or assignment)."

ACADEMIC ACCOMODATIONS: If you have a documented disability, you should contact Disability Support Services 0126 Shoemaker Hall. Each semester students with documented disabilities should apply to DSS for accommodation request forms which you can provide to your professors as proof of your eligibility for accommodations. The rules for eligibility and the types of accommodations a student may request can be reviewed on the DSS web site at http://www.counseling.umd.edu/DSS/receiving_serv.html.

Course Organization:

2 or 3 meetings per week (depending on time slot).
Mixture of lecture, discussion and laboratory demonstration.

Grading Scale

>90, A; 80-89, B; 70-79, C; 60-69, D; <60, F. "+" and "-" grades are given to the top and bottom two-point range, respectively, within each grade. Grading Scheme: Homework assignments (10 in number): 50%; midterm exam: 25%; non-cumulative final: 25%.

Course Evaluations: CourseEvalUM will be open for students to complete their evaluations for Spring 2010 courses between ####, and ###. Students can go directly to the [website](#) to complete their evaluations, beginning #####. You will be alerted about these dates and provided more information closer to that time, and students will be alerted via their official University e-mail account.

Students who complete evaluations for all of their courses in the previous semester (excluding summer), can access the posted results via Testudo's CourseEvalUM Reporting link for any course on campus that has at least a 70% response rate. You can find more information, including periodic updates, at the [IRPA course evaluation website](#).

NOTE: It is your responsibility as a student to completely read through and understand this syllabus. If you have questions about it, please contact Dr. Candela or Dr. Piccoli. You will be held responsible for following all requirements of this syllabus.