1. Course number: Chem 113

2. Full Course Title: Catching Criminals with Chemistry

3. Catalog Description:

This course will allow students to investigate how chemistry can be applied to solving crimes. The nature of physical evidence will be discussed, along with the chemical techniques used to gather and analyze that evidence. The course will also introduce students to the legal aspects surrounding the introduction of evidence into a court of law, thus providing an interdisciplinary focus for those interested in science and law. By combining case studies with applicable technology, students will gain a heightened understanding of the important roles that chemistry plays in forensic science. Three lecture and three laboratory hours per week. This course does not count towards the chem major or minor (FSNC).

4. Prerequisites: (1) semester of high school chemistry

5. Hours of credit: 1 unit

6. Estimate of student enrollment: ~30

7. By Whom and When: Dr. Will Case; Course will be offered every other Fall semester

8. Staffing Implications: Currently, this course can be taught with current staffing. This course would satisfy (3) of my (4) teaching units each semester that it is offered.

9. Adequacy of Resources: The department has the necessary instrumentation needed for this course (GC-MS, IR, UV-Vis, HPLC). All chemicals needed for the course could be easily purchased. A small supply budget (~$500) would be needed for chemicals and supplies.

10. Relation to Chemistry Curriculum: This course would introduce students to the instrumentation and techniques commonly employed by forensic chemists. The course will teach students how chemical evidence is collected, analyzed, and presented in a court of law. The course will also provide an additional general education elective that students can use to fulfill their FSNC requirement.

11. Department Approval: The course was approved on 11/12/09 by the chemistry department at our weekly department meeting.
12. **Purpose and Rationale:** 1) Enable students to learn chemical techniques that are applied to solving crimes. 2) To provide students with an understanding of the legal aspects associated with collecting evidence and using it a court of law. 3) To allow students to think more critically about forensic science in the context of the media and society, and to allow them to distinguish between what forensic chemists actually do vs. their portrayal in popular culture.

13. **Brief Outline of the Course:**

**I. Introduction to Forensic Science**

- Terminology
- History & Development of the Field
- Roles of a Forensic Chemist

**II. “Tools of the Trade”: Examining Forensic Evidence Through Chemistry**

**(A) “Wet Lab” Techniques in Forensic Chemistry**

- Introduction to Physical Properties
  - Density
  - Metric System
  - Refractive Index
- Qualitative Analysis in Forensic Chem

**(B) Instrumental Methods of Analysis in Forensic Chemistry**

- Chromatography
  - GC
  - HPLC
  - Thin Layer
- Spectroscopy
  - IR
  - UV-Vis
  - Fluorescence
  - Mass Spec
- Electrophoresis
  - DNA Analysis
- Density and (RI) of Glass Fragments
- Soil Analysis
- Analysis of Accelerants by Headspace GC
- Restoring Serial Numbers on Metals (Redox)
- Spot Tests for Drug Analysis
- Identification of Textile Fibers through Stains & Solubility.
- Blood Alcohol by GC w/ TCD
- Separation of Ink Dyes by TLC (Fraudulent Document Analysis)
- Analysis of Accelerants by Headspace GC
- Analysis of Salicylates and Quinines Absorbance/Fluorescence Spectroscopy
- Identification of Drugs & Poisons by Infrared Spectroscopy
- Heavy Metal Poisons by AA Spectroscopy
- DNA Fingerprinting/PCR Amplification
III. Using Chemistry in the Courtroom

- Collecting Evidence (Police/CSI)
- Chain of Custody
- Legal Aspects of Presenting Chemical Evidence in the Courtroom

IV. Practicum

-Fake crime scene will be staged; Students will collect evidence, analyze, and use to “catch a criminal.”

14. Sign-offs for items 8 & 9:

Staffing (Dona Hickey)
Library Resources (Departmental Library Liaison—Melanie Hillner)
Classroom Technology (Kevin Creamer)
Classrooms (Susan Howson)
International Education Committee* (Uliana Gabara) Not Applicable

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