Department of Chemistry

CHEM 010 – Introduction to Forensic Science
Fall 2014
Section XX (X:XXpm – X:XXpm), Roger Bacon 226

Instructor:	**Dr. Jason Hofstein**
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School of Science Mission Statement (*http://www.siena.edu/pages/2005.asp)*
The School of Science strives to provide a current foundation in the elements of scientific method, theory, applicability and laboratory practice that will encourage the student to acquire an in-depth appreciation of the scientific endeavor. Science and Mathematics have contributed greatly to humanity and will remain central to human progress and awareness in the new millennium.

As a liberal arts, learning community we recognize the central place of science in human endeavor and practice a problem solving, hands-on approach that allows the Siena student to observe, analyze and apply solutions. As a Franciscan, Catholic community we also encourage a commitment to the use of science in solving the complex and ever changing problems that stem from worldwide human activities.

Course Description
CHEM 010 – Introduction to Forensic Science, A course that serves as an introduction to the basic principles of forensic science. The purpose of this course is to provide students with an understanding of forensic science by examining the current techniques and instrumentations that are commonly used to analyze chemical, physical and biological evidence. This course will cover the basic science (the chemistry, physics and biology) that is required to understand these analytical techniques, but it assumes no prior science background from the students. In addition, this course will also examine the societal impact brought about by the advance of forensic science in various aspects of American society, including law, culture and media. This course is designed to fulfill part of (1) the School of Science Core requirement for School of Liberal Arts and School of Business students, as well as Business and Social Science track Computer Science students. This course can also be taken more than once so long as it is verified that there is sufficiently different content semester to semester. (ATTR: ARTS, CDN)

Rationale and Objectives

This course is designed to provide a basic foundation in the field of forensic chemistry for those students in the humanities, social sciences, or communication arts and those thinking of pursuing a criminal justice degree. Without having to major in chemistry, the student is allowed to experience the various analytical and instrumental methods used in investigating crimes.

Upon successful completion of this course, the student will:

1) Describe chemical concepts, apply chemical rules and solve chemical problems related to the characteristics of matter, the periodic table, scientific instruments, basic atomic theory and electron structure, ionic and covalent bonding, basic reactions, solutions, structure of covalent compounds and organic chemistry.
2) Apply the basic concepts of chemistry to understand topics in forensic science including: examining a crime scene and collecting evidence, forensic analysis of drugs, fibers, glass, fingerprints, arson residue, and other types of evidence.
3) Describe how forensic science is portrayed in fiction, compare that to the forensic science presented in the text and analyze how this is related to something called the "CSI effect".

Readings

Text: Saferstein, R. **Criminalistics:An Introduction to Forensic Science,** 10th Ed., Prentice-Hall, Inc., NY, 2013.

Performance Evaluation

Attendance/Homework/Question Sheets:	20%
In-class projects:	30%
Term Paper (1-2):	30%
Participation	10%
Final Exam:	20%

Letter grades will be assigned using the following system:

90%-100% = A, 80%-90% = B, 70%-80% = C, 60%-70% = D, 10-60% = D- (DON'T TEST ME)
Half-letter grades (A-, B+, etc.) will be given only if there is a need to do so.

My Teaching Methodology ***(Short description of style or characteristics used in class)***

The primary teaching methods used in this course are in-class discussion, short writing assignments, essays, in-class and out-of-class projects, and in-class presentations will be used as a metric for participation, grasp of knowledge, and mastery of technique. To achieve success in this course, you must attend class. While the writing component of the course is significant, it is used to gauge your knowledge of the chemistry topic being discussed, as well as your ability to write what you think.

Course Policies

Attendance policy

Do not miss class. You are responsible for all announcements and material covered in class, whether or not you were present. Attendance is required and a head count will be done visually at the start of all lectures. You

will be allowed one unexcused absence, but after that, all absences must be accompanied by a doctor's note or suitable evidence of extraordinary circumstance. If you know that you will be absent for a known reason (scheduled sporting event [TEAM members only – intramurals do not count}, class trip, etc.), please notify me one week in advance. **Excessive absence from lecture will negatively impact your performance in this course and ultimately your final grade**.

1. **Late assignments** – one letter grade per day late. More than three days = 0.

2. **Revising assignments** – you can seek a regrade on anything **once** during the semester, and if my comments are assimilated, your grade will reflect that…

3. **Missed demonstrations/lectures** – you are on your own.

4. **E-mail** – I can be reached at jhofstein@siena.edu.

5. **BlackBoard site** – I will be using the course BlackBoard site to communicate with the class, collect essays and other assignments (which all must be word-processed).

6. **Quality of written/in-class work** – Rubrics will be distributed that will tell you how I will grade your writing/in-class work.

7. **Presentations** – I will distribute the guidelines governing in-class presentations later in the semester.

8. **School closings** – In the event that the school is closed, I will more than likely be able to send the class an email, so monitor your account. General rule: if the school is closed as of 2:30pm, and our class starts at 4, class is cancelled.

9. **Student athletes** – See the attendance policy. All I ask is that you communicate your schedule to me. I do not like surprises when it comes to two-a-days…

10. **Cell Phone Usage – Cell phone use is <u>prohibited</u> in class.** Please see http://www.siena.edu/pages/3607.asp

11. **Academic Integrity Policy** - Academic dishonesty will not be tolerated. Students who commit such acts expose themselves to punishments as severe as dishonorable dismissal from the College. The following quote is from the Siena College Catalog:

    "Academic dishonesty can take different forms, including, but not limited to: cheating [dishonesty in a test situation], plagiarism [dishonesty in the presentation of written materials], and computer abuse. In any situation in which a student is unsure of what constitutes academic dishonesty, it is the student's responsibility to raise the question with his or her instructor."

    It is also each student's responsibility to be familiar with the student guidelines on academic honesty, "Academic Integrity and the Siena Student," which can be found in Siena Life.

Students suspected of violating academic integrity will be referred to the Academic Integrity Committee for final determination.

I helped write this policy. We will use Turnitin when the need calls for it to see if plagiarism is committed. Bottom line, don't cheat.

12. **Accommodations Policy**
    Siena College is deeply committed to ensuring that students with documented disabilities are provided with the resources and supports necessary to effectively address their individual educational needs. Students with disabilities in need of accommodations pertaining to courses must first register with the Director/Office of Services for Students with Disabilities (OSSD) at 518-783-4239. To register with OSSD, a student must complete a data sheet, release form, and provide current, comprehensive documentation of her/his disability as defined by Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 (ADA). Upon receipt of written notification from the Director (OSSD) of the accommodation/s that a student needs for a particular course, the faculty member will work in collaboration with the student (and the Director of the OSSD, as needed) to address this request to the fullest extent possible. As part of this process, a student requesting course accommodations must meet with each course instructor no later than the first week of class. For more information, students can view online the Siena College Academic Policy Manual section entitled: "Student Registration with the Office of Services for Students with Disabilities" located under the Academic Affairs section @ http://www.siena.edu/academics/policies/policymanual/.

13. **Emergency Preparedness**
    Take your text and a copy of the syllabus home with you in the event of a college closure. Continue with readings and assignments according to the course schedule; some assignments may be posted on Blackboard or sent to you via e-mail. If possible, online office hours will be established. Information regarding the status of the College's status and reopening schedule may be monitored on the Siena website, www.siena.edu.

Topics to be Covered:

Chapter 1. Introduction. Definition and Scope of Forensic Science. History and Development of Forensic Science. The Organization of a Crime Laboratory. The Functions of the Forensic Scientist. Other Forensic Science Services.

Chapter 2. The Crime Scene. Processing the Crime Scene. Legal Considerations at the Crime Scene.

Chapter 3. Physical Evidence. Common Types of Physical Evidence. The Significance of Physical Evidence.

Chapter 4. Physical Properties: Glass and Soil. The Metric System. Physical Properties. Comparing Glass Fragments. Glass Fractures. Collection and Preservation of Glass Evidence. Forensic Characteristics of Soil.

Collection and Preservation of Soil Evidence.

Chapter 5. Organic Analysis. Elements and Compounds. Selecting an Analytical Technique. Chromatography. Spectrometry. Mass Spectrometry (MS).

Chapter 6. Inorganic Analysis. Evidence in the Assassination of President Kennedy. The Emission Spectrum of Elements. Atomic Absorption Spectrophotometry. The Origin of Emission and Absorption Spectra. Neutron Activation Analysis. X-Ray Diffraction.

Chapter 7. The Microscope. The Compound Microscope. The Comparison Microscope. The Stereoscopic Microscope. The Polarizing Microscope. The Microspectrophotometer. The Scanning Electron Microscope (SEM).

Chapter 8. Hairs, Fibers, and Paint. Morphology of Hair. Identification and Comparison of Hair. Collection of Hair Evidence. Types of Fibers. Identification and Comparison of Man-Made Fibers. Collection of Fiber Evidence. Forensic Examination of Paint. Collection and Preservation of Paint Evidence.

Chapter 9. Drugs. Drug Dependence. Narcotic Drugs. Hallucinogens. Depressants. Stimulants. Anabolic Steroids. Drug-Control Laws. Drug Identification. Collection and Preservation of Drug Evidence.

Chapter 10. Forensic Toxicology. Toxicology of Alcohol. The Role of the Toxicologist. Techniques Used in Toxicology. The Significance of Toxicological Findings. The Drug Recognition Expert.

Chapter 11. Forensic Aspects of Arson and Explosion Investigations.

The Chemistry of Fire. Searching the Fire Scene. Collection and Preservation of Arson Evidence. Analysis of Flammable Residues. Types of Explosives. Collection and Analysis of Explosives.

Chapter 12. Forensic Serology. The Nature of Blood. Forensic Characterization of Bloodstains. Stain Patterns of Blood. Principles of Heredity. Forensic Characterization of Semen. Collection of Rape Evidence.

Chapter 13. DNA: A New Forensic Science Tool. What Is DNA? DNA at Work. Replication of DNA. Recombinant DNA: Cutting and Splicing DNA. DNA Typing. Mitochondria DNA. The Combined DNA Index System. The Collection and Preservation of Biological Evidence for DNA Analysis.

Chapter 14. Fingerprints. History of Fingerprinting. Fundamental Principles of Fingerprinting Classification of Fingerprints. Classification of Fingerprint Identification Systems. Methods of Detection Fingerprints. Preservation of Developed Prints. Digital Imaging of Fingerprint Enhancement.

Chapter 15. Firearms, Tool Marks, and Other Impressions.

Bullet Comparisons. Cartridge Cases. Automated Firearm Search Systems. Gunpowder Residues on the Hands. Serial Number Restoration. Collection and Preservation of Firearm Evidence. Tool Marks. Other Impressions. Other Impressions.

Chapter 16. Document and Voice Examination. Handwriting Comparisons. Collection of Handwriting Exemplars. Typewriting Comparisons. Photocopier, Printer, and Fax Examination. Alterations, Erasures, and Obliterations. Other Document Problems. Voice Examinations.

References:

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