



APPROXIMATE
CHEMISTRY 113
Spring 2017
Forensic Science

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Syracuse University

Revised 1/10/2017



COURSE DESCRIPTION AND PREREQUISITE SKILLS: Chemistry 113, Forensic Science, is focused upon the application of scientific methods and techniques to criminal justice and the law. Recent advances in scientific methods and principles have had an enormous impact upon law enforcement and the entire criminal justice system. In this course, scientific methods specifically relevant to crime detection and analysis will be presented. No prior chemistry instruction is required or assumed but the course should appeal to those who have also had high school chemistry. Emphasis is placed upon understanding the science behind the techniques used in evaluating physical evidence. Topics included in the course are blood analysis, organic and inorganic evidence analysis, microscopic investigations, hair analysis, DNA, drug chemistry and toxicology, fiber comparisons, paints, glass compositions and fragmentation, fingerprints, soil comparisons, and arson investigations, among others.

LEARNING GOALS: Scientific methods are radically changing the landscape of our criminal justice system. Increasingly, law enforcement and legal prosecution are reliant upon often complex and detailed scientific analysis of forensic evidence. This course is intended to provide an introduction to understanding the science behind crime detection. This will be accomplished by providing a rational basis for interpreting the scientific analysis of forensic evidence and through occasional relevant case studies. Laboratory exercises will include techniques commonly employed in forensic investigations.

LECTURES: The material covered in lecture will be illustrative rather than exhaustive. *You need to read the material in the text assigned **before** the lecture.* In lecture, alternate ways of understanding the material will often be presented. The examinations, however, will cover **both the assigned text and lecture materials** (whether or not they are specifically covered in lecture). Plenty of help is available to answer questions and provide assistance with problems.

Lecture times:

MW 5:15 to 6:35 PM LSB 001 (001 Life Sciences Building)

An **approximate** schedule of class lecture topics and the assigned text is included with this syllabus (please note that it is only an **approximate schedule**).

GRADING AND EXAMINATIONS: Final grades will be assigned based upon the three “hourly” exams given during the regularly scheduled class (60%), the final examination (20 %), and the laboratory grade (20 %) as follows;

Three Examinations + Final	4 x 20	=	80 %
Laboratory			<u>20 %</u>
			100 %

There will be NO MAKE-UP Examinations.

Exam Schedule:

Exam I: **Wed., February 15th (in class)**

Exam II: **Wed., March 22nd (in class)**

Exam III: **Wed., April 19th (in class)**

Final Exam: **Mon., May 8th, 5:15pm-7:15pm**

Any and all problems involving registration, scheduling, grade reporting or other clerical issues are best handled by emailing or talking with the undergraduate chemistry secretary, Beth Molloy located in the Main Chemistry Office 1-014 CST (Phone: 443-2851; email: eemolloy@syr.edu).

REQUIRED TEXTBOOKS: No textbook is required to be purchased for this course. Prof. Spencer’s textbook for the course will be available online *free of charge* to students in the class through blackboard (as pdf files). Other materials and labs will also be available online at the Blackboard site for the class. Labs must be downloaded and printed and brought to the lab meeting.

BLACKBOARD: Extensive use of SU's *Blackboard* course program will be made so you should become familiar with and routinely check the site for the course. The lecture notes are posted there just prior to each lecture (when possible and not precluded by privacy laws pertaining to forensic cases). Additional materials, such as the syllabus, more than half of the text chapters, POGILS, labs, announcements, interesting articles, and required supplemental materials, are also posted on the *Blackboard* site for the course.

TOP HAT ONLINE SYSTEM: All students must purchase a Top Hat License for the CHE 113 course by the end of the first week of classes. For information, see the page at the end of this syllabus for additional help.

Before the end of the first week of classes, please download and install Tophat on your cell phone, iPad, or similar device. We recommend setting up several devices for

Your join code is:

484824

Login to TopHat.com or use our mobile apps and enter this join code to participate

Students can also text in answers (SMS)

+1 (315) 636-0905

Great for poor WiFi or older phones

the use of Tophat to reduce the likelihood of technical problems. THM allows students to use a cell phone (text messaging), laptop, smartphone, iPad, or an iPod touch to participate in class. Regular attendance is expected and strongly encouraged for success in the course. Attendance will be recorded on a random sampling basis using the Top Hat online system in conjunction with a cell phone, smart phone, laptop computer, or ipod touch. support@tophat.com

The most up to date information for students:

1. Direct all of your Tophat questions to: support@tophat.com
2. **Student Academy**: videos and step-by-step walk-throughs of all things Top Hat (https://support.tophat.com/hc/en-us/categories/200000744-Student-Orientation?mkt_tok=3RkMMJWWfF9wsRoluK7AZKXonjHpfsX56%2B8pXKWxlMI%2F0ER3fOvrPUfGjI4CSsFqI%2BSLDwEYGJlv6SgFT7bDMapn07gFWRA%3D).
3. Consider adding this **Student Quick Start PDF** to your syllabus or course documents (also posted on Blackboard).

POGILS (PROCESS ORIENTED GUIDED INQUIRY LEARNING): We will be occasionally using a number of POGIL units during the semester that will range from home use to prepare (and review) to a small portion of the lecture period. During this time, the class will work in smaller groups to complete materials related to the topics on the lecture. Content and process from POGILs will be on exams so it is the responsibility of students to download materials prior to class, bring laptops to class on days scheduled for POGIL units, and understand the material covered.

LABORATORY: Wed (2:15 to 5:15 or 6:45 to 9:45) and Thurs. (2:00 to 5:00 or 6:30 to 9:30), beginning Jan. 25th. **There will be no Make-Up labs.** In order to pass CHE 113, a student must have a passing grade in the laboratory portion of the course. Attendance in laboratory is mandatory. As stated in the schedule of courses, the laboratory periods are 3 hours in length and, while some experiments will not require the total allotted time for completion, students are expected to arrive promptly at the beginning of the lab period and not leave until that particular experiment is completed. Students that arrive too late to complete the experiment in the allotted time and those that arrive on time but depart before the experiment is completed will receive a zero for the experiment. Arranging a second “event” requiring the student’s presence outside of CHE 113 laboratory during the scheduled lab period is **not allowed** by University rules.

CHE 113 Labs (in order):

- Safety Practices in the Forensics Lab
- Statistics Analysis Lab
- DNA: The Genetic Record Lab
- Blood Spatter Pattern Analysis Lab

- Fingerprint Collection and Interpretation Lab
- Forensic Anthropology Lab
- Separations and ID Lab
- Physical Properties of Glasses and Plastics Lab
- Forensic Entomology Lab
- Forensic Engineering Lab: Engineering a Bridge

MAJOR AND MINOR IN FORENSIC SCIENCE: Both a major and a minor is available in Forensic Science. These are offered to provide students with an understanding of the fundamental concepts and principles behind the application of scientific techniques to forensic investigations and to the criminal justice system. Recent advances in basic scientific research have had a rapid and dramatic impact in these fields and it is only through an understanding of these fundamental scientific concepts that the legal system may be effective in criminal investigations.

These degree programs offer a strong complement for people interested in criminal justice to major areas of study such as anthropology, biology, chemistry, physics, geology, psychology, engineering, pre-medicine and pre-professional degree programs.

Additional degree requirements can be found at: **Forensics.syr.edu** or talking with Dr. Spencer.

ACADEMIC INTEGRITY: Syracuse University's Academic Integrity Policy reflects the high value that we, as a university community, place on honesty in academic work. The policy defines our expectations for academic honesty and holds students accountable for the integrity of all work they submit. Students should understand that it is their responsibility to learn about course-specific expectations, as well as about university-wide academic integrity expectations. The policy governs appropriate citation and use of sources, the integrity of work submitted in exams and assignments, and the veracity of signatures on attendance sheets and other verification of participation in class activities. The policy also prohibits students from submitting the same work in more than one class without receiving written authorization in advance from both instructors. Under the policy, students found in violation are subject to grade sanctions determined by the course instructor and non-grade sanctions determined by the School or College where the course is offered as described in the Violation and Sanction Classification Rubric. SU students are required to read an online summary of the University's academic integrity expectations and provide an electronic signature agreeing to abide by them twice a year during pre-term check-in on MySlice. For more information about the policy, see <http://academicintegrity.syr.edu>.

DISABILITY STATEMENT REGARDING DISABILITY-RELATED ACCOMMODATIONS

Our institution values diversity and inclusion; we are committed to a climate of mutual respect and full participation. Our goal is to create learning environments that are usable, equitable, inclusive and welcoming. If there are aspects of the instruction or design of this course that result in barriers to your learning or accurate assessment or achievement, please notify this instructor as soon as

possible. Disabled students are also welcome to contact the disability service office to discuss a range of options to removing barriers in the course, including accommodations. To contact The Office of Disability Services, go to; <http://disabilityservices.syr.edu/current-students-2/> located at 804 University Ave, Third Floor or call 315-443-4498.

Religious Policies: SU's religious observances policy, found at supolicies.syr.edu/emp_ben/religious_observance.htm, recognizes the diversity of faiths represented in the campus community and protects the rights of students, faculty, and staff to observe religious holy days according to their tradition. Under the policy, students are provided an opportunity to make up any examination, study, or work requirements that may be missed due to a religious observance **provided they notify their instructors before the end of the second week of classes.** For fall and spring semesters, an online notification process is available through MySlice/Student Services/Enrollment/My Religious Observances from the first day of class until the end of the second week of class.

Accommodations only include the holiday itself and **do not** cover travel days. Accommodations and related support services such as exam administration are not provided retroactively and must be requested in advance.

SUPPORTING STUDENTS' ACADEMIC SUCCESS

Many weekly office hours are available to provide assistance with the material presented in the class. These are posted on Blackboard and students are welcome to attend any session. Other times can be arranged by emailing Prof. Spencer directly.

MISCELLANEOUS:

- (1) Students who may need special consideration due to a physical or learning disability should see Prof. Spencer as soon as possible. **No provisions** will be made if notified **after** examinations.
- (2) No student will be refused admission because he or she is unable to participate in a course requirement because of his or her religious holy day requirements. Again, you must make provisions with Prof. Spencer **before** such absences. According to University policy, "an opportunity to make up examinations and other class work [due to religious observances] will be provided...if the **instructor is notified in writing one week before the absence.**" [see syllabus statement above]
- (3) Excuses from class - especially lab - for medical reasons will only be given if such absences are advised by a health care provider or the Health Center based upon clinical findings and prescribed treatment recommendations. Verification

must be made in writing. Such absences will be verified by the Chemistry Department staff.

- (4) Attendance in classes is expected. Unannounced attendance checks may be taken during the semester. Attendance, especially participation the POGILs, **will** impact your grade.
- (5) This class will be using Turnitin, a plagiarism prevention system. The ease of using the internet has made it very easy for students to “cut and paste” material into papers that they are writing without proper citation. I will submit all/some/ papers that you write in this class to Turnitin, a service that identifies “matched text.” I will then interpret the originality report, based on your writing capability and writing style. In this class, you will also be given the opportunity to submit your own papers to Turnitin to check that all sources you have used are properly acknowledged and cited. Note that all submitted papers will be included as source documents in the Turnitin.com reference database, solely for the purpose of detecting plagiarism of such papers.

CHEMISTRY 113

Approximate Schedule (ONLY APPROX.),

Professor James T. Spencer, S 2017

Week	Topic	Text ¹	POGIL	Lab W or Th
Wed., Jan. 18	Introduction to Forensic Science And Evidence and the Law in Forensic Science	JTS Chapter 1	Historic Dev. of Forensic Science	None
Mon., Jan. 23 Wed., Jan. 25	Evidence and the Law in Forensic Science and The Crime Scene and Physical Evidence I The Crime Scene and Physical Evidence II	JTS Chapter 1 and 2 JTS Chapter 3	Crime Scene and Physical Evidence	Safety Lab
Mon., Jan. 30 Wed., Feb 1	Science vs. Pseudo-Science Microscopy	JTS Chapter 3 JTS Chapt. 4	Pseudo-Science	Statistics Lab
Mon., Feb. 6 Wed., Feb. 8	Forensic DNA Forensic DNA	JTS Chapt. 5 JTS Chapt. 5	DNA	DNA Lab
Mon., Feb. 13 Wed., Feb. 15	Serology EXAM I	JTS Chapt. 6 JTS Chapt. 5	Blood Typing	Blood Spatter
Mon., Feb. 20 Wed., Feb. 22	Exam Review and POGIL for Chapter 7 External Anatomical Evidence	JTS Chapt. 7 JTS Chapt. 7	Fingerprints	Fingerprint Lab
Mon., Feb. 27 Wed., Mar. 1	Internal Anatomical Evidence Internal Anatomical Evidence	JTS Chapt. 8 JTS Chapt. 8	Human Forensic Anatomy	Anthropology Lab
Mon., Mar. 6	Forensic Anthropology	JTS Chapt. 9	Skulls, Hips and Femurs	Separations/I D Lab

Wed., Mar. 8	Forensic Ecology	JTS Chapt. 10		
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Week	Topic	Text ¹	POGIL	Lab W or Th
Mon., Mar. 13 Wed., Mar. 15	Spring vacation – No Classes (Mar. 12 - 20)			
Mon., Mar. 20 Wed., Mar. 22	Forensic Ecology and Review EXAM II	JTS Chapt. 10	From Maggots to Murder	Density and Refractive Index Lab
Mon., Mar. 27 Wed., Mar. 29	Overview of Forensic Chemistry and Forensic Spectroscopy Toxicology/Medicinal Chemistry	JTS Chapt. 12.1- 12.2 JTS Chapt. 13	Chromatogra phy and Spectroscopy	Forensic Entomology
Mon., Apr. 3 Wed., Apr. 5	Toxicology/Medicinal Chemistry Mineralogical, Soil, Residue and Paint	JTS Chapt. 13 JTS Chapt. 15.2- 15.4	Medicinal Soil, Residue and Paint	Failure Reconstructio n: Bridge Engineering
Mon., Apr. 10 Wed., Apr. 12	Explosives and Arson Overview of Physical Measurements Firearms and Ballistics	JTS Chapt. 14 JTS Chapt. 15/16	Arson and Explosives	
Mon., Apr. 17 Wed., Apr. 19	Firearms and Ballistics EXAM III	JTS Chapt. 16	Overview of Physical Measurement	
Mon., Apr. 24 Wed., Apr. 26	Forensic Document, Palaography, Audio, Photographic, and Video Analysis Forensic Psychology	JTS Chapt. 17 JTS Chapt. 19	Handwriting and Voice	
Mon., May 1	Finish up remaining work and Review			

2017 Final Exam: Mon., May 8th, 5:15pm-7:15pm

Chemistry 113 LABORATORY

Safety is the MOST important issue that you will deal with this semester. Take the laboratory and its risks seriously. Understanding these risks and minimizing them is the best way to avoid accidents. If you follow these guidelines and stay alert to possible hazards, your experience in this course should be a safe and productive one.

SAFETY GLASSES MUST ALWAYS BE WORN IN LAB!!

Rules and Regulations

1. You will work in pairs in the laboratory, but you are required and responsible for doing your own laboratory write-up.
2. Students are expected to complete their lab on their assigned day and hand-in the laboratory write-up at the end of the laboratory that same day. If a student wants to switch days one week, permission must be obtained from one of the TAs at least one week before the scheduled lab.
3. CHE 113 laboratory is scheduled for 3 hours. Attendance is mandatory. Each student is expected to present at the start of the laboratory, during this time the experimental set-up and safety procedures for each lab is discussed by the TAs. Students who show up late will be penalized.
4. A student may leave the laboratory after completing the experiment, clean-up, and the laboratory write-up (making sure to have each lab initialed and dated by a TA before leaving or it will be considered late).
5. Leaving early before completing the laboratory will result in a grade of zero for the experiment. The student is reminded that committing to another course, internship, etc. which overlaps the CHE 113 lab is a violation of University regulations.
6. Late labs will be penalized. After five days you will receive a zero for the lab.
7. Each person is responsible for wiping down his/her work area with a damp sponge or paper towel and washing all glassware with soap and water at the end of each lab period.
8. If you are in violation of any safety guidelines, you will be asked to remedy the situation only once. The next time you will be asked to leave lab for that day. There will be no make-up labs.

Safety Guidelines

1. Safety glasses must be worn at all times while in lab. You will be given one warning. If it happens a second time you will be asked to leave lab and you will receive a zero for the lab.
2. Do not wear contacts in lab. Wear your glasses.
3. If glassware breaks and/or chemicals spill, inform the TA. Do not try and clean the spill and/or glass yourself.
4. If you cut/burn yourself and/or spill anything on your clothing and/or skin in lab, inform the TA immediately.
5. Long hair must be tied back.
6. Avoid wearing loose clothing and jewelry.
7. Wash your hands before leaving lab and going to the bathroom.
8. Do not sit on the lab benches.
9. Do not eat or drink in lab at any time.
10. No open-toed shoes, sandals or shorts may be worn in lab at any time.
11. Use the disposable gloves provided when required and change them frequently.

Hazards - The main potential hazards in the laboratory are fire and exposure to toxic and/or reactive substances. Though toxicity and reactivity of compounds varies tremendously, an excellent policy is to handle EVERY chemical with respect and caution. Be aware that you may be exposed to chemicals in several ways: inhalation, skin contact (some chemicals go right through the skin), and ingestion.

In case an accident occurs, report it immediately! Do not try to hide anything out of embarrassment - you will be making the situation worse, endangering yourself and others. Let the instructors decide on the proper course of action. Those not involved should clear the area.

The following is taken in part from “The Organic Chem Lab Survival Manual”, by James W. Zubrick. Please excuse the jokes he uses, I will not claim any responsibility for them.

SAFETY FIRST, LAST, AND ALWAYS

Disobeying safety rules is not at all like flouting many other rules. You can get seriously hurt. No appeal. No bargaining for another 12 points so you can get into medical school. Perhaps as a patient, but certainly not as a student.

1. Find out how you would get medical help, if you needed it. (The stockroom has limited first aid; otherwise have your T.A. call the Health Center.)
2. Always wear your goggles. Eye injuries are extremely serious, but they can be mitigated or often prevented if you keep your goggles on at all times. There are several types of eye protection available, some acceptable, some not, according to the local, state, and federal laws. I like the clear plastic jobbers that leave an unbroken red line on your face when you remove them. Sure they fog up a bit, but the protection is superb. Also, think about getting chemicals, or chemical fumes trapped under your contact lenses. Then don't wear them to lab. Ever.
3. Touch not thyself. Not a biblical injunction, but a bit of advice. You may have gotten chemicals on your hands, in a concentration that is not noticeable. Sure enough, up go the goggles for an eye wipe with the fingers. Enough said.
4. There is no "away". Getting rid of chemicals is a very big problem. (Throw all waste in appropriately labeled jars)
5. Bring a friend. If you have a serious accident when you are all by yourself, you might be unable to get help before you fall over. Don't work alone; don't work at unauthorized times.
6. Don't fool around. Chemistry is a serious business. Don't be careless or clown around the lab. You can hurt yourself or other people. Try not to be somber about it; just serious.
7. Drive defensively. Work in the lab as if someone else were going to have an accident that might affect you. Keep the goggles on because someone else is going to point a loaded, boiling test tube at you. Someone else is going to spill hot, concentrated acid on your body. Get the idea?
8. Eating, drinking, smoking in the lab. Are you kidding? Eat in a chem lab?? Drink in a chem lab??? Smoke, and blow yourself up!!!!
9. Keep it clean. Work neatly. You don't have to make a fetish out of it, but try to be neat. Clean up spills. Turn off burners or water or electrical equipment when not in use.
10. Where it's at. Learn the location and proper use of the fire extinguishers, fire blankets, safety showers, and eyewashes.
11. Make the best-dressed list. No open-toed shoes or sandals. No loose-fitting cuffs on pants or shirts. Keep the midsection covered. Tie back that long hair. A small investment in a lab coat can pay off, projecting that professional touch. It gives a lot of protection.

ACCIDENTS WILL NOT HAPPEN

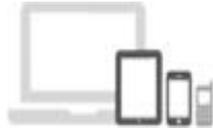
That's the attitude you should hold while working in the laboratory. You are NOT going to do anything, or get anything done to you, that will require medical attention. If you do get cut, and the cut is not serious, wash the area with water. If there's serious bleeding, apply direct pressure with a clean, preferably sterile dressing. For a minor burn, let cold water run over the burned area. For chemical burns to the eyes or skin, flush area with lots of water. In every case get to see a physician.

If you have an accident, tell your instructor immediately. Get help! This is no time to worry about your grade in lab. If you put your grades ahead of your personal safety, be sure to see a psychiatrist after the internist finishes.



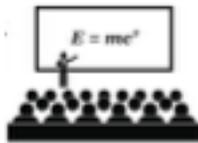
Keeping Classes Classy
Student Guide

Hi! Your professor is using Top Hat this term to make lectures more fun and effective.



Top Hat is web-based so you can use **ANY** device to participate in class, ask questions, give feedback, and access review tools.

How it Works



Profs activate attendance, poll questions,



Track your performance in the Student Gradebook

Your join code is:

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Login to TopHat.com or use our mobile apps and enter this join code to participate

Students can also text in answers (SMS)

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Great for poor WiFi or older phones

GET STARTED

Part of your final grade will be evaluated through Top Hat, so it's important to register.

- 1.) Register: Check your email for an **invitation** to join your course in Top Hat and follow the link to make an account.
- 2.) Subscribe
- 3.) Access:

Support

Have any questions or trouble accessing Top Hat? We can help:

support@tophat.com

Find more detailed user guides at: **support.tophat.com**