

**FRSC 367–001: Forensic Chemistry (Lec/Lab) (3)**

**Meeting Times: MW 2:00 pm - 3:15 pm in SM 570 (lecture)/SM572 (lab)**

**Instructor: Dr. Sarah T. Stokes**

**Office: SM 514 F; Office Hours: W 9 am – 12 pm or by appt.**

**E-mail: sstokes@towson.edu**

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**Catalog Description:**

I Introduction to chemical and physical analyses used by a modern crime laboratory in the evaluation of physical evidence encountered in criminal acts. Areas of concentration will include drug analysis, toxicology, forensic serology, explosives analysis, arson examination, firearms and tool marks, latent prints and trace evidence. Emphasis will be placed on the value of such examinations as presented by the expert witness in a criminal trial. Three lecture hours. Prerequisites: CHEM 210 and (CHEM 330 or CHEM 332).

**Objective:**

In this class you will learn why and how a forensic crime laboratory operates. The analytical methods and theories supporting scientific crime investigation will be discussed, analyzed and applied through lab technique demonstrations followed by your hands-on practice of some techniques. Upon successful completion of this course you will have a better understanding of how Forensic Chemistry fits into the overall scheme of criminal investigations.

**Required Text:** Criminalistics 10th or 11th edition, Richard Saferstein  
Pearson Prentice Hall, Upper Saddle River, NJ, 2010. (any recent edition is acceptable).

**Teaching Methods:**

This class will be presented in a lecture/ discussion/ demonstration/ performance mode e.g. the instructor will explain and demonstrate (where applicable) the laboratory techniques for examining physical evidence. There will be hands-on laboratories. Power Point presentations, videos and other visual aids will be used during class. Text chapter reading assignments and journal articles will be assigned as appropriate (see schedule).

**IMPORTANT:** Students who fail to appear for the first two class sessions, or the first session of evening classes, may forfeit their space in class. Instructors have the right to release these spaces to other students wishing to add the class to their schedules. Students who lose their spaces must officially withdraw from the course through Enrollment Services to avoid earning an FX grade for non-attendance.

**Important Dates:**

August 26: 1<sup>st</sup> day of class. Change of schedule period begins.

September 2: Labor Day **NO CLASS!**

September 4: Change of Schedule period ends for full term (14 weeks). Last day to drop a course with no grade posted to academic record.

November 4: Last day to withdraw from full term courses with a grade of W. Last day to change to pass/fail option or audit options.

November 27 - December 1: Thanksgiving **TU CLOSED!**

December 9 – Last day of class.

December 16 – FINAL EXAM 3-5 pm SM 570

Tentative Semester Class Schedule by Week\*:

*For Laboratory, please wear closed-toed shoes and long pants or ankle-length skirt*

<b>Week of / Location</b>	<b>Topic</b>
1. 8/26 & 8/28	<ul style="list-style-type: none"> <li>• 1<sup>st</sup> Class meeting – syllabus</li> <li>• Introduction to Physical Evidence Concepts – Class and Individual Characteristics, Value of Class Evidence, Forensic Evidence and the Crime Scene, Chain of Custody, Evidence Submission, QA/QC at the crime scene and in the forensic lab, Common Types of Physical Evidence Encountered – Biological, Pathological, Chemical, etc. (Ch. 1-3)</li> </ul>
2. 9/4 QUIZ 1	<ul style="list-style-type: none"> <li>• 9/2 Labor Day – No class</li> <li>• Intro to mass spectrometry – requirements, continuous MS, cation and anion MS, resolution, sensitivity, continuous ion sources, ion transport, ion detectors, fragmentation patterns (Ch. 5 and prep for Dangerous Drugs Course)</li> </ul>
3. 9/9 & 9/11	<ul style="list-style-type: none"> <li>• <i>Lab – Pipetting Accuracy and Precision</i></li> <li>• MS requirements continued</li> </ul>
3. 9/16 & 9/18 QUIZ 2	<ul style="list-style-type: none"> <li>• <i>Lab – MS in the literature, Analyzing Quadrupole MS data, Collecting data on the LATOF MS</i></li> <li>• Continuous MS Quadrupole mass spectrometers, scan and SIM mode of operation, magnetic sector, ion cyclotron resonance, ion trap MS</li> </ul>
4. 9/23 & 9/25 QUIZ 3	<ul style="list-style-type: none"> <li>• <i>Lab – MS in the literature, Analyzing Quadrupole MS data, Collecting data on the LATOF MS</i></li> <li>• Pulsed MS ion sources, Time-of-flight</li> </ul>
5. 9/30 & 10/2	<p><b>EXAM I</b></p> <ul style="list-style-type: none"> <li>• Chemical spot tests (functional group presumptive tests) for drugs, overview drugs, chemical tests for explosives, microcrystalline tests (Ch. 8)</li> </ul>
6. 10/7 & 10/9 QUIZ 4	<ul style="list-style-type: none"> <li>• <i>Lab – Presumptive Color Tests of Drugs</i></li> <li>• <i>Lab – TLC of Drugs Lab</i></li> <li>• Chromatography: TLC, GC-MS, HPLC (Ch. 5)</li> </ul>
7. 10/14 & 10/16 QUIZ 5	<ul style="list-style-type: none"> <li>• <i>Lab – UV-Vis and FT-IR of Paints Spectroscopy Lab</i></li> <li>• Light Spectroscopy (Ch. 5)</li> <li>• UV-Vis, IR, Fluorescence, Raman, Sampling, Controls, Calibration, Limit of Detection, SOPs, Quality Control, Microspectrophotometry</li> </ul>
8. 10/21 & 10/23	Oral Presentations (10 minute ppt presentation per student on a forensics topics of interest, i.e. news article etc.)
9. 10/28 & 10/30	<p><b>EXAM II</b></p> <ul style="list-style-type: none"> <li>• Inorganic Poisons and Contaminants: Metals and inorganics, AA, ICP-MS, SEM (Ch. 6)</li> </ul>
10. 11/4 & 11/6 QUIZ 6	<ul style="list-style-type: none"> <li>• The Microscope (Ch. 7)</li> <li>• Stereomicroscopy, Compound Light Microscopy, Polarized Light Microscopy, Comparison Microscopy, SEM</li> <li>• Toxicology: Alcohol, drugs, poisons, metabolism, BAC, analysis and identification including GC-MS and FT-IR (Ch. 9)</li> </ul>
11. 11/11 & 11/13 QUIZ 7	<ul style="list-style-type: none"> <li>• <i>Microscopy Lab – Lab Safety, Light, Koehler Illumination, Stereomicroscopy of torn items, glass &amp; paint</i></li> </ul>

	<ul style="list-style-type: none"> <li>Trace Evidence: Polymers, Paint, Glass, Hair, Fiber, Plastic, Paper, Soil (Ch. 13-15)</li> </ul>
12. 11/18 & 11/20 QUIZ 8	<ul style="list-style-type: none"> <li>Lab – FT-IR of Inks Lab, alcohol, and plastics</li> <li>Arson and Explosives (Ch. 14-15): Combustion, flames and fires, heat transfer methods (finding point of origin), detonation, collection of ignitable liquids in lab, passive and active headspace analysis, solvent extraction, etc., ignitable liquid analysis using GC and GC-MS, weathering process of burned ignitable liquids, how to reproduce burn sample for comparison analysis, categories of ignitable liquids, ASTM standards, low and high explosives, analysis and identification methods including FT-IR, GC-MS, SEM, etc.</li> </ul>
13. 11/25	<b>EXAM III</b> Thanksgiving Break 11/27-12/1
14. 12/2 & 12/4	Oral Presentations
15. 12/9	<ul style="list-style-type: none"> <li>Monday class will finish remaining topics as needed and review.</li> </ul> <p><b>Comprehensive Final Exam (2 hours) Monday, 12/16/19, 3:00 pm - 5:00 pm SM 570</b></p>

**\*Instructor may email additional topics or schedule changes.**

**Attendance:** All classes are considered equally important and full attendance is expected.

**Testing and Grading:** Grades for this class will be based on quizzes (dates noted on above schedule, no makeups), laboratory assignments, notebook and reports, oral presentations, three exams and a comprehensive final. If different from the syllabus, the dates for the exams will be announced at least one week in advance. No makeup exams or final exam will be given, unless in special emergency as defined by the university. There will be no extra-credit opportunities.

**Grade Points (1000 points total):**

Quizzes=50 points (Best 5 of 8 quiz scores; in case of absences, I will use best 5 scores). No makeups for quizzes.)

Oral Presentations=150 points (75 points per presentation)

Laboratory/Assignments=250 points

Exam I=100 points

Exam II=100 points

Exam III=100 points

Final Exam=250 points

**Grading Scale:**

Grade assignment will be based percent of achieved points above on the standard graduate student system: A = 930 points or above (>93.0%), A- = 900 – 929 points (90.0-92.9%), B+ = 870-899 points (87.0-89.9%), B=869-830 points (83.0-86.9%), B-=829-800 points (80.0-82.9%), C+=799-770 points (79.9-77.0%), C=700-76.9 points (70.0-76.9%), D+=699-670 points (67.0-69.9%), D=669-600 points (60.0-66.9%), F= less than 600 points (<60.0%).

**Copyright Notice:**

Your instructor retains all copyrights to all original materials distributed in this course (including, but not limited to, hard copies and electronic copies of lecture slides, notes, practice problems, worksheets, assignments, lab materials, and exams). Reposting, selling, or otherwise distributing these materials in any fashion at any time is prohibited.

***In Case of Emergency:***

In the event of a University-wide emergency course requirements deadlines and grading schemes are subject to changes that may include alternative delivery methods, alternative methods of interaction with the instructor, class materials, and/or classmates, a revised attendance policy, and a revised semester calendar and/or grading scheme. In the case of a University-wide emergency, please refer to the following about changes in this course:

1. Web Site: [www.towson.edu](http://www.towson.edu)
2. Telephone Number(s)
3. TU Text Alert System: This is a service designed to alert the Towson University community via text messages to cell phones when situations arise on campus that affect the ability of the campus to function normally.

Sign up: <http://www.towson.edu/adminfinance/facilities/police/campusemergency>

***Cell Phones and Pagers:***

Cell phone usage in the class meeting/lab is strictly prohibited. If you need to take a call in case of emergency (e.g., sick child, parent care, etc.), exit the classroom to the adjacent hallway.

***Students with Disabilities:***

This course is in compliance with Towson University policies for students with disabilities. Students with disabilities are encouraged to register with Disability Support Services (DSS), 7720 York Road, Suite 232, 410-704-2638 (Voice) or 410-704-4423 (TDD). Students who expect that they have a disability but do not have documentation are encouraged to contact DSS for advice on how to obtain appropriate evaluation. A memo from DSS authorizing your accommodation is needed before any accommodation can be made.

***Chemistry Department Statement on Classroom Diversity and Inclusion***

The students, faculty, and staff at Towson University represent a diverse and vibrant community of learners and scholars. As a community, we value the unique contributions of each individual and promote active participation in all aspects of the learning process by each community member. Your instructor supports Towson University's goal of fostering a diverse and inclusive educational setting. Your instructor strives to create a classroom environment built upon the principles of mutual respect and support. Toward this end, all members participating in this course are expected to demonstrate respect for all other members of the class. If you feel these expectations have not been met, please speak with your instructor or the designated diversity liaison, Dr. Cindy Zeller ([czeller@towson.edu](mailto:czeller@towson.edu)). For further information regarding the diversity and inclusion policies of Towson University, please see the Towson University Commitment to Diversity, the Fisher College of Science and Mathematics Diversity Action Website, and the Chemistry Department Diversity Action Plan.

***Course repeat policy:*** "Students may not repeat a course more than once without prior permission of the Academic Standards Committee."

***Student Academic Integrity Policy (TU 03.01.00):***

The Towson University Code of Conduct prohibits "all forms of dishonesty including cheating (and) plagiarism." Plagiarism is copying the words of another or the use of ideas of another without proper citation. Plagiarism can result from copying an entire document to inappropriate paraphrasing. In order to avoid plagiarism, the use of words or ideas of another without proper citation, it is imperative to consciously think about what you have read and what you are trying to write. In scientific literature, we do not normally use direct quotes from the primary resources that we are using to gather our information. It is important to paraphrase the ideas and conclusions obtained from the primary literature and rewrite them in your own words. One method to assure that you will not plagiarize is to take notes on each of your primary resources and then write the paper based on your notes, not from the references. Your paper will summarize the works of others, not directly quote from them. If you have any questions about plagiarism and correct citations see <http://cooklibrary.towson.edu/avoidingPlagiarism.cfm> for further examples and methods to correct the problems. The consequences of cheating or plagiarism will be a failing grade of 0 points for the assignment and may result in failure of the course. Plagiarism, fabrication, falsification, cheating, complicity in academic dishonesty, abuse of academic materials, multiple submissions of the same work or part thereof for multiple courses/assignments, will not be tolerated and will result in a failing grade of 0 for that assignment and may result in failure of the course.

***Academic Dishonesty Policy: All types of Academic Dishonesty are deplorable and will be dealt with accordingly. Please read and familiarize yourself with the University Academic Dishonesty Policy, found at the link below. Plagiarism, obtaining aid from or giving aid to another student as well as obtaining aid through electronic devices or notes constitutes cheating and will result in failure of the course.***

<http://inside.towson.edu/generalcampus/tupolicies/documents/03-01.00%20Student%20Academic%20Integrity%20Policy.pdf>

**Laboratory Policy for Pregnant Students**

Pregnant students should consult their physicians for advice on whether or not to perform experiments in the laboratory. Students are encouraged to provide their physician with a list of the chemicals that they might be exposed to while in lab. They should also check the MSDS sheets (available in the Department) to be aware of the hazards of the chemicals. If a student is advised against performing laboratory work, then faculty must make accommodations for the student. Any accommodations should comprise a workload that is approximately equivalent to the regularly scheduled laboratory work. These accommodations may include:

- performing "dry" experiments only, in a place free from exposure to ongoing experiments;
- performing the wet chemistry at a later date;
- receiving an incomplete grade in the course pending completion of experimental work