Course Syllabus: CJFS 3425

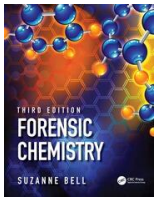
Forensic Chemistry

Term Year

1.0 Course Information

Location: DSC 205 **Time:** TR; 12:50 – 2:20 pm
Credit Hours: 4 Credits **Course Prerequisite(s):** CHEM 1140 & CJFS 3400 *or* CHEM 3450

1.1 Required Texts/Items



Title: Forensic Chemistry, 3rd Ed. 2022.
Authors: Bell.
ISBN: 9781138339842

Additional, selected literature will be provided to the student electronically via Canvas. Students are also required to conduct additional literature research using Hamline library resources to complement the material covered in class and expand his/her knowledge in the assigned topics.

2.0 Instructor and Contact Information

Instructor: Dr. Jamie Spaulding
Contact: 📧 jspaulding02@hamline.edu 📱 (651) 523–22374
Office: GLC 219W **Office Hours:** M, 12–2pm; R, 2:30–4pm
Note: I also maintain an open door policy, feel free to stop by my office.

3.0 Course Description

This course will survey applications of chemistry in forensic science. Students will evaluate the current state of analytical sensors and sampling devices applied in forensic science and law enforcement, including a) sampling devices for solid, liquids and gaseous materials, b) spectroscopy (UV-VIS, FTIR, Raman, SEM (imaging and EDS), u-XRF, LIBS), c) mass spectrometry (GC-MS, LC-MS, ICP-MS), and d) chromatography (GC and LC). Emphasis will be given to the understanding of the operating principles, capabilities, limitations, orthogonal relationships among techniques, and applications to different disciplines of forensic chemistry (*e.g.,* inks, firearm discharge residues, glass, paint, tape, fibers, explosives, fire debris, counterfeit pharmaceuticals, and drugs).

3.1 Course Learning Objectives

Upon successful completion of this course, students will be able to:

1. Design and apply proper procedures and policies regarding the collection, transfer, handling, analysis, and disposal of evidence.
2. Describe the common/key methods of forensic chemical analyses.
3. Demonstrate knowledge of figures of merit and uncertainty of measurement.
4. Evaluate common data interpretation methods and critique the application of ASTM classification schemes in casework.
5. Apply the theory and operation of the various chemical instruments used in a typical crime laboratory.
6. Explain how physical evidence is recognized, collected, examined, and interpreted.

3.2 Hamline Plan Learning Objectives (W)

This course fulfills the writing (W) requirements of the Hamline Plan.Upon completion of a course focused intentionally on Writing, students will be able to:

1. Employ writing process strategies appropriate to the writing task and audience.
2. Demonstrate analytical insight and depth.
3. Articulate a compelling central idea or purpose.
4. Establish a clear and logical organizational structure.
5. Provide appropriate evidence and support for ideas.
6. Use stylistic strategies appropriate to audience, genre, and purpose.
7. Control the mechanics of readable sentences.

4.0 Course Assessment

Assignment	**Points Possible**
Assignments (25 pts x 4)	100
Lab Reports (50 pts x 8)	400
Notebook Inspection (50 pts x 2)	100
Active Engagement	50
Midterm Exam	150
Final Exam	200
Total Points	**1000**

Letter Grade Distribution:

			A	93-100%	≥930	A-	90-92%	900-929
B+	87-89%	870-899	B	83-86%	630-669	B-	80-82%	800-829
C+	77-79%	770-799	C	73-76%	630-669	C-	70-72%	700-729
D	67-69%	670-699	D	63-66%	630-669	D-	60-62%	600-629
F	<60%	≤599						

5.0 Course Policies

5.1 Grading

All work is due at the start of class on the date indicated in the schedule listed below. Work submitted after the due date will be docked 15% initially and an additional 10% every day thereafter, weekends included. Late work will not be accepted five (5) days after the deadline. Grades will be maintained in Canvas. Students are responsible for tracking their progress throughout the semester and notifying the instructor of any errors.

If at any point you feel that your work has not been properly graded, you may request a re-grade within one week of receiving the grade.

5.2 Attendance and Make-Up Policy

Consistent with Hamline University guidelines, students absent from regularly scheduled examinations because of authorized university activities or extenuating circumstances (major family situation, hospitalization or other serious issues, religious observance, etc.) will have the opportunity to take them at an alternate time. Please inform the instructor as soon as possible in such an event to arrange extensions prior to absence.

5.3 Active Engagement

Students will be assessed on their ability to respond orally in real time to in-class questions and discussions. Students are expected to make informed and constructive contributions to the in-class discussions, and to maintain an environment that is respectful and inclusive. Differences of opinion are expected and welcome, but should be expressed in a courteous manner. Cell phones are not to be used unless instructed to do so. Talking during lectures will also reduce participation grades.

5.4 Assessments

Exams based on the reading and lectures will be throughout the course. You must be present for all quizzes, the midterm, and the final. You may review your exam once it has been graded by contacting the instructor.

5.5. Lab Reports and Notebook

A lab notebook is required to be kept by all students. Students shall bring a bound laboratory notebook during laboratory days to document experimental all activities, data, observations, results, and conclusions. The notebook should document activities in a contemporaneous manner and assist in writing the scientific reports for the lab. Students are also required to use a laptop or tablet equipped with Microsoft Excel or Google Sheets to conduct analysis of the data collected in the laboratory. If you are unable to do so, please coordinate with a classmate. Students are responsible for

proper use of instrumentation, materials, and supplies provided during the laboratory exercises, as per instructor recommendations.

A formal scientific laboratory report is to accompany each lab. Please refer to the example lab report on in the lab manual for formatting. Note that you must strictly adhere to this format as you complete the lab report. Failure to follow this format will result in significant point reduction.

5.6 Technology/E-Mail Policy

It is the student's responsibility to ensure that their computer is functioning and have backed up important documents. A problem with technology is not an acceptable reason for missed or late work. Important notices and corrections of errors will be sent to the Hamline email distribution list for the class to provide the fastest dissemination of the information. The instructor will make every effort to respond within one day to emailed questions or concerns.

6.0 Academic Honesty

Students in the Department of Criminal Justice and Forensic Science are held to the most stringent professional code of ethics; violations can seriously jeopardize future employment prospects. The integrity of the classes offered by any academic institution solidifies the foundation of its mission and cannot be sacrificed to expediency, ignorance, or blatant fraud. While I do not expect to encounter cheating or plagiarism this semester, it is important that you know the consequences. Cheating, plagiarism, or other forms of academic dishonesty are not tolerated. *Failing to cite a source correctly in writing is plagiarism!* Academic integrity is essential to a positive teaching and learning environment. All students enrolled in University courses are expected to complete coursework responsibilities with fairness and honesty. Failure to do so by seeking unfair advantage over others or misrepresenting someone else's work as your own, can result in disciplinary action. The Academic Honor Code Statement of Purpose reads as follows:

6.1 Academic Honor Code Statement of Purpose

Every member of the Hamline University community – students, faculty, administrators, and staff – is responsible for upholding the highest standards of academic integrity at all times. The assumption that academic work is an honest reflection of one's knowledge and skills is fundamental to the integrity of Hamline University and to the value of a Hamline diploma. If students at an institution of higher education develop a reputation for receiving grades based on honest work, GPAs and academic degrees held by all students from that institution are valued more highly. The faculty subscribe to standards of academic honesty in their research and teaching. Every person in the University is responsible for adhering to the principles of the Academic Honor Code.

6.2 Violations and Sanctions

Violations of the Academic Honor Code will be dealt with seriously. If a student is accused of engaging in academic dishonesty in a class, the faculty member may decide on a sanction for the student (*e.g.,* assign a failing grade for an exam or the course). The student will be informed of the alleged violation, the evidence upon which the allegation is based, and the sanction to be imposed. The faculty member will file a violation form with the Office of the Dean where the course is housed, which will maintain a permanent record of reported student violations. Students may appeal to the Chair of the Department in which the class is housed. Should a student be dissatisfied with the decision of the Department Chair, the student may appeal to the appropriate academic Dean. The decision from that office will be final. Sanctions for students found to have engaged in academic dishonesty may include:

- Failing or receiving a lower grade on an exam, paper, or assignment
- Failing or receiving a lower grade for a course
- Academic suspension or expulsion

Please refer to the Academic Honor Code and Student Conduct Code online for the definitions of acts considered to fall under academic dishonesty and possible ensuing sanctions and further details.

7.0 Social Justice Statement

Hamline University is committed to social justice. I concur with that commitment and expect to maintain a positive learning environment based upon communication, mutual respect, and non-discrimination. Our University does not discriminate on the basis of race, sex, age, disability, veteran's status, religion, sexual orientation, color, or national origin. Any suggestions as to how to further such a positive and open environment in this class will be appreciated and given serious consideration. See the Wesley Center website for further details.

8.0 Special Accomodations

If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class, please advise me and make appropriate arrangements with Steve Anderson; Director of Disability Resources (651-523-2740, West Hall 108) as soon as possible to discuss accommodations. Please see the Disability Resources website for further details. If you have already arranged accommodations through Disability Resources, please ensure submission of your accommodation letter within the first two weeks of class. Accommodations will only be provided after the letter is submitted to me and with sufficient lead-time for me to arrange testing or other accommodations. Although I will receive the letter electronically, I expect you to initiate a conversation with me about the accommodations.

9.0 Adverse Weather Statement

In the event of inclement or threatening weather, everyone should use his or her best judgment regarding travel to and from campus. Safety should be the main concern. If you cannot get to class because of adverse weather conditions, you should contact me as soon as possible. Similarly, if I am unable to reach our class location, I will notify you of any cancellation or change as soon as possible (1 hour before class starts) via email to prevent you from embarking on any unnecessary travel. If you cannot get to class because of weather conditions, I may make allowances relative to required attendance policies, as well as any scheduled activities.

10.0 Tentative Course Outline

Please note that this schedule is subject to change at the discretion of the instructor.

Week	Date	Content/Material
1	8/29	*Introduction to Forensic Chemistry* Course Overview
	8/31	*Sampling Strategies* Review of Statistics (Basic & Multivariate)
2	9/5	*Figures of Merit in Analytical Forensic Science:* Signals and Noise, Signal to Noise ratio (SNR), Limit of Detection (LOD), Limit of Quantitation (LOQ), Sensitivity and Selectivity
	9/7	
3	9/12	*Uncertainty of Measurement* Propagation of Error
	9/14	*Examination of Physical Evidence* Microscopy
4	9/19	*Lab 1: Microscopy* **Assignment 1 Due**
	9/21	*Introduction to Spectroscopy 1* Molecular Absorption and Electronic Transitions- UV/VIS Principles and Forensic Applications
5	9/26	
	9/28	*Introduction to Spectroscopy 2* Vibrational and Rotational Spectroscopy - FTIR, NIR and Raman Forensic Applications
6	10/3	
	10/5	*Lab 2: ATR-FTIR* **Assignment 2 Due**
7	10/10	*Introduction to Gas Chromatography* Concepts of Chromatographic Separations, Column Compositions; Common Detectors and Forensic Applications
	10/12	
8	10/17	*Mass Spectrometry* Quantitation and Interpretation of Forensic Samples
	10/19	*Lab 3: MS Interpretation*
9	10/24	**Midterm Exam**
	10/26	*Intro to Controlled Substances* Classification, Common Drugs of Abuse, and Scheduling
10	10/31	*Seized Drugs 1:* Cocaine
	11/2	*Seized Drugs 2:* Heroin
11	11/7	*Lab 4: Screening using Color Tests*
	11/9	*Seized Drugs 3:* Alkaloids

Week	Date	Content/Material
12	11/14	*Lab 5: Microcrystal Tests*
	11/16	*Seized Drugs 4:* Non-alkaloids
13	11/21	*Elemental Analysis of Trace Evidence* Glass, Tapes, Propellants, and GSR *Lab 6: Interpretation of LA-ICP-MS Results* **Assignment 3 Due**
	11/23	
14	11/28	*Lab 7: Scanning Electron Microscopy*
	11/30	*Examination of Physical Evidence* Microscopy
15	12/5	*Arson Investigation/Ignitable Liquid Residues* Pyrolysis, Background, and GC/MS Interpretation **Assignment 4 Due**
	12/7	
Finals	9/26	**Final Exam** *Lab 8: Casework Practicum Due*