



FORS 5445
Forensic Instrumental Analysis
Fall Semester 2017
4 credit hours

Professor: Dr. Madeleine Swortwood
Office: CFS 224
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Lecture Hours: T/R 9:00 – 10:20 am
Lab Hours: T 1:00 - 4:50 p.m.
Classroom / Lab: CFS 104 / CFS 219
Email: swortwoodm@shsu.edu

Office Hours (CFS 224):

Tuesday/Thursday: 10:30 a.m. – 12:30 p.m.
*Other times by appointment only

Office hours are subject to change with notice. I am always available at other times by appointment. I will be happy to respond to questions by email, but I reserve the right to answer class emails during office hours, so please plan accordingly.

Reference Textbooks:

Fundamentals of Analytical Chemistry, 7th or 8th edition, Douglas A. Skoog, Donald M. West, F. James Holler, Stanley R. Crouch, Crouch, Brooks/Cole, ISBN: 9780030355233, 2004.

Principles of Instrumental Analysis, 5th or 6th Edition, Douglas A. Skoog, F. James Holler, Stanley R. Crouch, ISBN: 0495012017, 2007.

Quantitative Chemical Analysis, 6th or 7th Edition, Daniel C. Harris, W. H. Freeman and Company, New York, ISBN: 0716770415, 2007.

Selected articles from CRCnetBASE, Journal of Forensic Science and Forensic Science International.

Course description

This is a practical course of forensic instrumental analysis. Students must have knowledge of basic organic and inorganic chemistry structures and physical properties, theory of electromagnetic radiation, basic chromatography, theory of

error, and statistics. The principles of spectroscopy, mass spectrometry, and chromatography will be emphasized in this course. Analytical method development, such as sampling, sample pre-treatment, extraction from biological and non-biological matrices, and interpretation of results, statistics, and quality assurance procedures will also be covered. Other advanced analytical instrumental topics will also be discussed.

An advanced knowledge of the scientific literature and the ability to integrate analytical instrumental theory into practical applications and research is required. From this course, students will develop independent learning skills and improve their technical writing skills.

Course Objectives

1. Students will be able to discuss fundamental principles, generalizations, and theories of analytical chemistry and instrumental methods of analysis, particularly in forensic applications of analytical instrumentation.
2. Students will recognize the importance of physical evidence concepts and quality assurance in forensic science and apply those concepts to laboratory experiments.
3. Students will interpret laboratory data, design laboratory experiments, and evaluate forensic casework as it relates to instrumental analysis.

Attendance Policy

Class attendance requirements will be followed in accordance with Academic Policy Statement 800401.

Grading Policy

	Topic	Marks
Exam 1 (9/14)	Quantitative Chemical Analysis/ Statistics	15%
Exam 2 (10/19)	Separation Science/ Chromatography	15%
Exam 3 (11/21)	Other Chromatographic Techniques (GC/MS) and FTIR	15%
Final Exam (12/7, 9:30 -11:30 am)	Comprehensive Exam	25%
Lab reports	See Lab Topics	20%
Lab Formal Report (11/28)	Comprehensive/ Proficiency Exam	10%

Final grades will be based upon the following scale: 90 and above: "A"; 80-89: "B"; <79: "C". Students should not count on a curve of the final grade. The instructor reserves the right to modify the grading scheme to accommodate for a missed test or final examination in extenuating circumstances. The instructor also reserves the right to assign a final exam grade of 0% should she deem the absence was not properly handled or was unjustified. Appeals will be handled in accord with University Policy Statement 900823, Academic Grievance Procedures for Students.

Make up exams

There are no makeup exams for this course unless approved by instructor.

Tentative Schedule of Lectures and Labs

Week	Topic
Week 1 (8/24)	Introduction to forensic instrumental analysis
Week 2 (8/29, 8/31)	Revisit analytical chemistry/ quantitative analysis
Week 3 (9/5, 9/7)	Revisit quantitative chemical analysis/ introduction to statistics
Week 4 (9/12, 9/14)	Unit Completion/ Exam 1 on 9/14
Week 5 (9/19, 9/21)	Quantitative Chemical Analysis/ Statistics / Chromatography
Week 6 (9/26, 9/28)	Molecular spectroscopy / UV/Vis
Week 7 (10/3, 10/5)	Infrared spectroscopy (IR)
Week 8 (10/10, 10/12)	Separation Science/ Chromatography
Week 9 (10/17, 10/19)	Introduction to Mass Spectrometry / Exam 2 on 10/19
Week 10 (10/24, 10/26)	FTIR
Week 11 (10/31, 11/2)	Liquid chromatography (HPLC + Ion chromatography)/ Capillary electrophoresis
Week 12 (11/7, 11/9)	Ion mobility spectroscopy
Week 13 (11/14, 11/16)	Other Chromatographic Techniques (GC/MS)
Week 14 (11/21, 11/23)	Exam 3 on 11/21 / No class 11/23 (Thanksgiving)
Week 15 (11/28, 11/30)	Last Week of class / Other forensic techniques
Week 16 (12/7)	Final exam 12/7 (9:30 a.m.-11:30 a.m.)

Labs:

Intro (9/5)	Safety, lab techniques and fundamentals, simple calculations and ChemStation
1 (9/19)	Measurements/Uncertainty Lab Separation/Extractions Methods
2 (9/26)	Quantitative Analysis of Organic Molecules by UV/Vis Spectroscopy Chromatographic Techniques (TLC)
3 (10/3)	Evidence Handling/GCMS Familiarization- Sample Preparation and Qualitative Identification of an Unknown
4 (10/10)	Analytical Separations: Understanding Extraction Techniques and qualitative identification using FTIR
5 (10/17)	Presumptive vs. Confirmatory Testing/ Color Tests
6 (10/24)	Qualitative Analysis of a Drug Cocktail by Gas Chromatography/Mass Spectrometry
7 (10/31)	Thin-layer chromatography (TLC) for the qualitative and semi-quantitative
8 (11/7)	Ion Mobility Spectroscopy for Trace Narcotics/Explosives Detection
9 (11/14)	LC-MS Demonstration
10 (11/21)	No physical Lab- Blood alcohol assignment/ Thanksgiving Break
Final (11/28)	Lab Proficiency Exam

Examinations and Assignments

There will be one written final examination, in accordance with university policy. The final examination is *comprehensive* and may be based upon any information from anytime during the course. The written final examination will be composed of multiple-choice questions, true-false questions, fill in the blank questions, and/or s h o r t answer questions. The final examination and tests may be composed of any combination of the aforementioned question types or may be composed of only two or three of the question types. In addition to the written examination there will be a final laboratory-based proficiency test. This proficiency test will consist in the analysis of one of various types of evidence. Evidence will be analyzed to determine the presence of substances of forensic interest. Students will be required to apply their acquired knowledge to process this evidence and analyze it using techniques that are widely accepted by the scientific community.

Assignments will be given as needed and will be announced in class and online.

Assignments are due at the beginning of class on the due date. The instructor reserves the right to refuse late work, but will make reasonable accommodations for students who experience unfortunate circumstances.

If a student is absent from the laboratory he/she may not be given an opportunity to make up the laboratory exercise, even if prior notice has been given to the instructor. No make-ups will be given for the final exam unless arrangements have been made prior to the exam date. It is the student's responsibility to monitor the accuracy of the grades. Deadlines for assignments, lab reports and other important announcements such as test times and locations will be announced either in class or by email. As a result, students *must* read their SHSU email in order to remain current.

Student Academic Policies

Policies concerning Attendance, Academic Honesty, Disabled Student and Services for Disabled Students, and Absences on Religious Holy days may be found at: <http://www.shsu.edu/dept/academic-affairs/aps/aps-students.html>

Use of Telephones and Text Messagers in Academic Classrooms and Facilities

<http://www.shsu.edu/dept/academic-affairs/aps/aps-curriculum.html>

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