

CHEM 4351
Forensic Chemistry Laboratory
Spring 2016 Course Syllabus

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Laboratory (CHEM 280) and Class Schedule (CHEM 253):
6:00-9:50pm Monday, Thursday
Office Hours: Friday 8:00-10:00AM, Hickory 282
Monday, Thursday 4:00-6:00PM, Hickory 282

Lectures:

Lecture 1 (1/21)	Error Analysis – Demo of propagation and sampling
Lecture 2 (1/25)	Quality Control and Assurance – ISO, ASCLD, LIMS
Lecture 3 (2/1)	Pharmacology/Toxicology – Metabolites, Body Processes
Lecture 4 (2/8)	Introduction to Illicit Drugs – Classification, Structure
Lecture 5 (2/15)	Chemistry of Dyes, Pigments, Inks
Exam 1 (2/22)	
Lecture 6 (2/22)	Petroleum Chemistry
Lecture 7 (2/29)	Gun Shot, Arson, and Explosives – Demo on Explosive Detection
Lecture 8 (3/7)	Chemical Poisons, Chemical Weapons, WMD
Lecture 9 (3/21)	Spectroscopy I – UV-Vis, IR, ATR
Lecture 10 (3/28)	Spectroscopy II – Raman, X-Ray, AA
Lecture 11 (4/4)	Applied Spectroscopy – Drug, Dye, Explosive Analysis
Exam 2 (4/11)	
Lecture 12 (4/11)	Chromatographic Separations – GC, HPLC, Electrophoresis
Lecture 13 (4/18)	Applied Chromatography – Drug, Explosive, Toxicology Analysis
Lecture 14 (4/25)	Mass Spectrometry I – EI, CI, GC-MS
Lecture 15 (5/2)	Mass Spectrometry II – ESI, MALDI, LC-MS, Direct Ionization
Lecture 16 (5/5)	Additional Instrumentation – Ion Mobility, ICP, Chemical Sensors
Exam 3 (5/9)	
Final Exam(5/9)	

Practical Laboratory Experiments:

Practical Laboratory Experiments are introduced below. The Table below assigns groups to dates. All experiments are on Thursdays in assigned rooms.

Lab 1: Accurate Solution Prep

Purpose: The goal of this lab is to gain an understanding of the importance of accurately and precisely preparing analytical solutions.

Lab 2: Thin-Layer Chromatography (TLC) – Analysis of Lipstick

Purpose: This lab will focus on the analysis of specific dyes by solid-liquid chromatography. The student will learn to extract a lipstick smear, process, and compare dyes with TLC.

Lab 3: Organic Chemical Spot Tests

Purpose: The objectives here are to instruct the students in the use common field spot tests for organic and gunshot residue. These chemistries will be introduced to help the students gain an understanding of the power and limitations of these quick tests.

Lab 4: Soil Examination

Purpose: To instruct the students in commonly utilized techniques for soil comparison analysis. This includes microscopy, pH, color, and density gradient measurements.

Lab 5: UV-Vis Spectroscopy - Analysis Food Dyes

Purpose: To introduce the student to common UV-Visible spectroscopy as applied to the analysis of food dyes. This lab will expand the student's knowledge of the use of dyes in food, as well as the commonality of the used dyes.

Lab 6: ATR-IR Spectroscopy - Analysis of Synthetic Fiber

Purpose: The goal of this lab is to use multiple instrumental methods to analyze a synthetic fiber. UV-Vis analysis for Dyes, Microscopy for fiber length and twist, and Fourier Transform Infrared Spectroscopy (FTIR) for synthetic composition will be employed to isolate the fiber sample.

Lab 7: Fluorescence Spectroscopy – Analysis of Petroleum

Purpose: The purpose of this lab is to utilize fluorescence as a screening tool to characterize and quantize petroleum waste or evidence. The student will compare an unknown sample to known petroleum references, and quantitate the amount present.

Lab 8: Raman Spectroscopy – Analysis of Inks, Pigments, and Dyes

Purpose: The purpose of this lab is to introduce the student to the differences between organic and inorganic dyes and pigments using the non-destructive mechanisms of Raman Spectroscopy.

Lab 9: Atomic Emissions – Analysis of Trace Metals

Purpose: The objective of this lab is to determine the metal composition of bullet lead. The student will learn to distinguish bullet lots and manufacturers from analytical differences in their elemental composition.

Lab 10: Gas Chromatography – EI Mass Spectrometry (GC-MS) – Analysis of Arson Accelerants

Purpose: The objective of this lab is to determine accelerants from a burned fiber source. The student will learn to prepare a head space sample for analysis with a GC.

Lab 11: Gas Chromatography (GC) – Analysis of Plasma for Ethanol and other VOCs

Purpose: The goal of this lab is to determine the concentration of volatiles, specifically ethanol, from a synthetic plasma solution. The student will learn how to process a plasma sample and prepare an aqueous injection for GC analysis.

Lab 12: High Performance Liquid Chromatography (HPLC) – Ink Analysis and Dating

Purpose: This lab is intended to illustrate HPLC's uses for document ink analysis. The student will learn how to process a document and analyze the ink for chemical changes to determine correction of the document and dating.

Lab 13: LC-Electrospray Ionization (ESI) MS – Analysis of a Drug Mixture

Purpose: The intention of this lab is to separate a drug mixture, utilize MS/MS, and quantitate. The student will learn the proper way to handle evidence through multiple steps and days, and retain analytical accuracy.

Laboratory

Grp	1/28	2/4	2/11	2/18	2/25	3/3	3/10	3/24	3/31	4/7	4/14	4/21	4/28
1	1	2	3	4	5	6	7	8	9	10	11	12	13
2	2	3	4	1	6	7	8	9	5	11	12	13	10
3	3	4	1	2	7	8	9	5	6	12	13	10	11
4	4	1	2	3	8	9	5	6	7	13	10	11	12
5	1	2	3	4	9	5	6	7	8	10	11	12	13
6	2	3	4	1	5	6	7	8	9	11	12	13	10
7	3	4	1	2	6	7	8	9	5	12	13	10	11
8	4	1	2	3	7	8	9	5	6	13	10	11	12

Final Exam – May 9, 2016 6:00pm-8:00pm

Required Exam for FS Students: All students in the UNT Forensic Science Program are required to take the Forensic Science Aptitude Test (FSAT) which will be administered in the Forensic Chemistry course of the Spring semester. Please submit to Dr. Verbeck a check for \$50 made out to “ABC Registrar” and the completed Request for ABC Examination Sheet Form by January 29th. Any student who does not sit for the exam will not receive their Forensic Science certification

Suggested Readings **

1. Forensic Science Handbook, Vol 1,2,3, R. Saferstein, Ed., Pearson Prentice Hall.
2. Skoog, Holler, and Nieman, Principles of Instrumental Analysis, Saunders College Publishing.
3. Karger, Snyder, and Horvath, An Introduction to Separation Science, John Wiley and Sons Publishing.
4. Cannon, J., Pharmacology for Chemists, Oxford University Press.

**Note: The Suggested Readings will be on hold at the library or in my office.

Grading Policy:

3 Lab Exams (100 pts/each), 1 Final Exam (100 pts) and 13 Lab Reports (50 pts/each). Your final grade will be a sum of each lab and exams divided by 10. (Total = 300+100+650= 1050)

Guaranteed Course Grade: A-90.0%, B-80.0%, C-70.0%, D-60.0%, F<60.0%

Lab Notebook:

Your lab notebook is an analytical notebook and will be graded as such. The notebook must contain page numbers (not written in by you). It will be completed with black or blue ink only. All correction in the notebook will be marked out with a single line and initialed and dated. Any figures taped into the notebook will be initialed across an edge, touching insert, tape, and notebook page. The notebook will include your procedure, data, results, and conclusions. The notebook will be collected twice during the semester and labs graded. Remember, this is an analytical lab. All numbers will have the correct significant figures and units, and all graphs and tables will be properly labeled.

Additional Information:

1. According to University policy, the grade of I (incomplete) cannot be given as a substitute for a failing grade in a course.
2. Statement of ADA Compliance: The chemistry department cooperates with the Office of Disability Accommodations to make reasonable accommodations for qualified students with disabilities. If applicable, please present your request along with an official written verification from the ODA before the end of the first week of classes.