CHEM 370 Lab Syllabus

Instructor: Al Fischer, PhD
Office Hours: By appointment; see my availability and schedule an appointment on Calendly. You will be able to choose to meet on Zoom or at my office during scheduling. (No need to email or ask - just schedule!)
Asking Questions: Ask general questions on Piazza
Email: dfischer@wcu.edu
Availability: Email, Piazza, and office hours are the best ways to find me; my devices turn on Do Not Disturb at 9 PM.

Overview

This course is an introduction to instrumental analysis in the chemistry lab. Students will be introduced to components of the "analyst's toolbox" through real-world scenarios, including spectroscopy, mass spectrometry, and chromatography. Students will conduct sample preparation, instrument calibration, and qualitative and quantitative analysis using UV-visible spectroscopy (UV-vis), gas-chromatography/mass spectrometry (GC-MS), high-performance liquid chromatography (HP-LC), flame atomic absorption spectroscopy (FAAS), and Fourier-transform infrared spectroscopy (FT-IR). Throughout the semester, students will also work to develop skills related to reproducible data analysis, scientific communication, and collaboration in the laboratory. Prerequisites include CHEM-232 (Quantitative Analysis) and CHEM-242 (Organic Chemistry II).

Student Learning Outcomes

To achieve a satisfactory grade, students will:

1. Relate a theoretical, mechanical, and practical understanding of chemical instrumentation.
2. Combine concepts from Quantitative Analysis, Organic Chemistry, and General Chemistry with instrumental theory and programmatic data analysis to demonstrate accurate, reproducible qualitative and quantitative analysis of complex samples.
3. Communicate analysis questions, methods, results, and conclusions using written word, pictorial figures, and data tables.
4. Participate effectively in group projects.
5. Demonstrate safe laboratory practices.
6. Critically evaluate peer work.

Required Course Materials

Text Book: Granger, R. M., Yochum, H. M., Granger, J. N., & Sienerth, K. D. (2017). *Instrumental Analysis*. Oxford University Press. (WCU rental book available at bookstore)

Alternative Book: Harvey, D. *Analytical Chemistry 2.1* Chem Libre Texts (Free online!)

Lab Manual: All lab activities are posted online

Technology: Students will need a laptop computer meeting Chemistry and Physics' minimum computer requirements. Students will be required to use Julia + Pluto and may wish to install these on their computer; both are freely available for for all operating systems. Alternatively, student may use Julia + Pluto via WCU's STEM VCAT (officially supported option for the course). A web browser and internet connection capable of streaming video will be necessary for submitting homework assignments and accessing course materials.

The program OpenChrom allows you to process chromatographic and mass spectrometric data on your personal computer. This is not required but can speed up your data processing.

We will use Piazza for class discussion. The system is highly catered to getting you help fast and efficiently from classmates and your instructor. Rather than emailing questions to the teaching staff, I encourage you to post your questions on Piazza. If you have any problems or feedback for the developers, email team@piazza.com. Find our class page at here.

Additional Required Course Materials:

- Goggles or safety glasses rated for chemical protection
- Nitrile gloves
- Appropriate clothing: closed-toed shoes, long pants, hair tie for long hair
- Permanent, felt-tipped marker (e.g. a Sharpie®)
- A laptop computer meeting Chemistry and Physics' minimum computer requirements.
- A lab-use only face mask to prevent spread of coronavirus.

Most materials are available from the WCU bookstore; goggles are also available from the WCU Chemistry Club (these goggles are recommended over cheaper ones). A lab coat is optional.

Lab Notebooks and Data Analysis

Lab notebooks will be completed electronically using Julia and Pluto. Students will be required to submit their data files along with their lab notebooks so that notebooks can be checked for accuracy. A lab notebook that does not compile will not be graded. *Lab notebooks should be filled out in lab!*

Grading

Your grade is tied directly to the student learning outcomes for the course. Each SLO will be assessed as below. Each assignment will be categorized by SLO and used to assess your progress in achieving that objective. Your final grade will be determined by calculating the weighted average (out of 100) across all SLOs using the weightings listed in parentheses. If you are unsure how to calculate your grade please ask your instructor.

Contributions to Your Grade

1. (25%) Relate a theoretical, mechanical, and practical understanding of chemical instrumentation.
   - Assessed by written quizzes and/or face-to-face examinations.
2. (25%) Combine concepts from Quantitative Analysis, Organic Chemistry, and General Chemistry with instrumental theory and programmatic data analysis to demonstrate accurate, reproducible qualitative and quantitative analysis of complex samples.
   - Assessed by inspection of lab notebooks for accuracy, thoroughness, and data quality.
3. (25%) Communicate analysis questions, methods, results, and conclusions using written word, pictorial figures, and data tables.
   - Assessed by peer and instructor review of technical reports for accuracy and clarity.
4. (10%) Participate effectively in group projects.
   - Assessed by peer and instructor evaluation.
5. (10%) Demonstrate safe laboratory practices.
   - Assessed by an ability and willingness to follow standard safety protocols.
6. (5%) Critically evaluate peer work.
   - Assessed by participation in peer-review exercises.

Grading Scale

Number Range	Letter Grade
97-100	A+
93-96.9	A
90-92.9	A-

Number Range	Letter Grade
87-89.9	B+
83-86.9	B
80-82.9	B-
77-79.9	C+
73-76.9	C
70-72.9	C-
67-69.9	D+
63-66.9	D
60-62.9	D-
<60	F

These grades indicate levels in quality from excellent to unsatisfactory. Students are responsible for knowing class attendance, withdrawal, and drop-add policies and procedures.

Turning Things In

Most assignments will be submitted electronically. Unless otherwise specified, assignments are due at 23:59:59 on the due date and late work is not accepted. A list of anticipated assignments is available in the Canvas site for the course, but is subject to change as needed.

Submitting Assignments

When turning in assignments:

- Files should be uploaded to each assignment page on Canvas.
- Files should be of the types and quantity specified in the assignment.
- Files should be given a clear, logical filename that reflects the assignment name.
- Files may be sorted automatically by a computer. Therefore, any files not named appropriately, not in the specified format, or submitted elsewhere (e.g. email) may not be graded.
- Any electronic assignments turned in via hardcopy will not be graded.

Submissions that do not follow these guidelines may incur point deductions.

Late Work

Late work is not accepted in this course. Due dates are automatically enforced by Canvas. However:

- Assignments are accepted *early* and students are encouraged to submit assignments before the deadline. Extra credit of 5% per assignment is granted for assignments submitted more than 24 hours early!
- Each student is granted one exception to the late policy. You must fill out a late work exception form to use your exception. You may use this exception for any reason, but bear in mind future exceptions aren't guaranteed. All work, regardless of whether an exception has been used, must be turned in no later than the last day of classes prior to finals week.
- If you experience *extenuating circumstances* (e.g. a medical emergency, professionally diagnosed illness, or death in the family) or a *university-sponsored absence* you may ask to be considered for an extension on a case-by-base basis. Communication of the issue to your instructor and identification of when you plan to turn in the assignment are important in such circumstances. For university-sponsored absences, exceptions should be arranged *before* your absence or will not be granted.

Course Policies

COVID-19: At the time of this writing, it is expected that all lab activities will occur in person. During all in-person meetings, students *must*:

- Wear a face mask at all times (must be 'lab use only' - see "Masking for a Friend" statement below). See WCU's mask policy for more information.
- Practice good hygiene practices and follow CDC guidelines to minimize spread of COVID19.
- Avoid coming to class if you experience and cold, flu, or COVID19 symptoms, have been diagnosed with COVID19, or have been in contact with someone who's tested positive for COVID19 within the last 14 days.

Note that these policies are subject to changes as the COVID19 pandemic continues to develop.

Laboratory Behavior: Students are expected to attend each lab period and participate fully in that day's activity. Students should respect the rights of others and minimize avoidable distractions.

Never bring food or drink into the laboratory. This includes sealed bottles and items inside backpacks – leave them outside the lab! Do not chew gum, use tobacco products, or apply cosmetics in the lab. Do not place personal items inside fume hoods or where they may come into contact with chemicals. Keep walkways clear of chairs, bookbags, etc. (place them in cubbies!). Wash your hands before leaving lab, and never wear gloves or lab coats outside the lab!

The sparing use of cell phones during lab sessions is permitted but discouraged. If you must, please use your cell phone outside the laboratory, and never leave an experiment unattended to do so! Likewise, do not place your cellphone in a fume hood or on a chemical bench!

In an effort to maintain a productive work environment for all students, please refrain from playing music, videos, etc., in the classroom/laboratory.

Proper Laboratory Attire: Students must arrive to lab wearing appropriate attire. Students without appropriate attire will be asked to leave and will not be able to complete the activity for the day (and will be counted absent).

- Wear eye protection at all times (whenever you are in the room).
- Wear closed-toed shoes that fully cover your feet up to the ankle at all times.
- Wear long pants that extend over the top of your shoes at all times.
- Wear a hair tie for long hair.
- Never wear tank tops, sleeveless shirts, shorts, or sandals.

After-hours Instrument Access: You may occasionally want to conduct analyses outside of class time. The instrument lab is open from 8AM to 4PM M-F; please plan your work to fit within that time (it's OK to start a run at the end of the day and leave it to run overnight). If you are completing work outside of class you must work with a lab partner who is also familiar with the instrument you're working on. *Never work in the lab alone!* Likewise, please refrain from bringing guests into the instrument lab unless they have specifically passed the instrument safety training. If you will require significant help on the instrument please schedule a time to meet with your instructor or the Instrumentation Specialist in advance.

Pregnancy: Certain chemicals can have severe harmful effects on unborn children. Any student who is pregnant or might have become pregnant and wished to avoid these hazards should notify her TA or instructor before conducting any laboratory work so that proper safety precautions can be taken.

Attendance: Please email your instructor *ahead of time* if you encounter circumstances that absolutely prevent you from making it to lab on time. Attendance to all class periods is mandatory. Absences from group work sessions may incur a loss of points up to a zero for the assignment and deductions in the student's participation grade.

If you experience any symptoms of COVID-19, cold, flu, or other contagious sickness please do NOT come to class! Likewise, do not attend if you have been in contact with someone who has tested positive for COVID-19 or is suspected to have COVID-19. Please maintain diligent communication with your instructor during these situations and appropriate accommodations will be made.

Inclement Weather: Please check the University website for campus closings during times of bad weather. Your safety is a priority when traveling. Use common sense when attempting to get to campus and notify

your instructor if you are unable to safely make it. Announcements will be made via e-mail if class must be canceled when the University has not officially closed.

Institutional Policies

Course Recording and Broadcasting: Course recording is bound by University Policy 122. Students should request prior permission of their isntructor before recording and class meetings.

Accommodations for Students with Disabilities: Western Carolina University is committed to providing equal educational opportunities for students with documented disabilities and/or medical conditions. Students who require accommodations must identify themselves as having a disability and/or medical condition and provide current diagnostic documentation to the Office of Accessibility Resources. Please contact the Office of Accessibility Resources, 135 Killian Annex, (828) 227-3886 or by email. Visit the OAR website at http://accessibility.wcu.edu/ for more information.

Academic Integrity Policy and Reporting Process: This course follows the guidelines set forth in WCU's Academic Integrity Policy. Refer to the policy for specific rules and sanctions!

Written work may be checked for plagiarism using computer software. Plagiarism will NOT be tolerated and will by handled according to WCU's academic honesty policy.

Community Vision for Inclusive Excellence: All members of the WCU community are expected to embrace WCU's mission of inclusive excellence. See the Community Vision for Inclusive Excellence.

Resources

Getting Help

WCU provides many resources to help students succeed. *All* students are encouraged to take advantage of resources such as the library and tutoring centers, regardless of their academic standing! A few are listed below.

- **Office Hours and Piazza** - don't hesitate to ask your instructor and classmates for help! See the top of this document for more information.
- **Writing and Learning Commons (WaLC)** for help and feedback on writing. Visit tutoring.wcu.edu or call 828-227-2274.
- **Math Tutoring Center** for help with calculations and math. For more information, visit mtc.wcu.edu or call 828–227–3830.

University Dates

- **Academic Calendar** The University academic calendar can be found at here. It includes dates for all breaks, University closures, final exams, etc.
- **Final Exam:** The University final exam schedule can be found on the Registrar's webpage. Note there is no final exam for the lab portion of Chem 370 (but there may be for the lecture portion).

This syllabus and the course schedule are subject to revision as needed. Students will be notified of changes and are responsible for adhering to the modifications.