Syllabus

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Instructor: Al Fischer, PhD
Office Hours: By appointment on Bookings (Meet on Teams)
Asking Questions: Ask general questions on Piazza
Email: dfischer@wcu.edu
Availability: Email, chat, 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. 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.

Additional Required Course Materials:

- Goggles 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 either Julia and Pluto or similar data processing notebook environment. Students will be required to submit their data files along with their lab notebooks so that they can be checked for accuracy. A lab notebook that does not compile will not be graded.

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-
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.

Submitting Work

Most assignments will be submitted electronically via Microsoft Teams. Unless otherwise specified, assignments are due at 23:59:59 on the due date (usually the day before lab).

- A file submission link or folder will be provided for each assignment. Assignments submitted through said URL are visible only by the instructor.
- Only one submission per group per assignment is necessary.
- 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 will either incur point deductions or 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 software. However:

- Assignments are accepted up to 7 days *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. Exceptions cannot be used on pass/fail assignments.
- 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.

Grading Technology

Some items may be graded by computer software. Any answers not in the specified format will not be graded. Written work may be checked for plagiarism using computer software. Plagiarism will NOT be tolerated (see policies in *Fine Print*, below). Due dates/times are computer-enforced.

COVID19 Policies

The lab portion of Instrumental Analysis will use a *Hybrid Web* format. Lab work and instrumental analyses will be completed in lab, but data processing and writing will be completed outside the laboratory. Students will work in groups of 2-3 in lab, and each group will be assigned a specific time of day to attend lab. If you do not attend during this time you will not be able to complete the lab. This is necessary to help maintain the room capacity requirements introduced to slow the spread of SARS-CoV-2. 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).
- Practice social distancing (maintain a distance of 2 meters from other individuals as much as possible).
- 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 grows or shrinks and recommended best-practices continue to develop.

Course Policies

Classroom Expectations: The shared learning space of the college classroom is built on respect for each other and each other's learning. Learning together means our actions can intentionally and unintentionally distract others from their learning goals. As responsible learners who respect the rights of others and vow to minimize avoidable distractions such as: non-academic technology use, coming in late, sleeping, off-topic discussions, doing other homework, eating, etc.

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.

Masking for a Friend: As the WCU Community Creed articulates, members of the WCU community are expected to live by high standards of academic and personal integrity and embrace their responsibility as a member of the Catamount community. In recognition of this responsibility, and in response to the best available science and current guidance from the Centers for Disease Control and Prevention, every student must wear a mask or other cloth face-covering that covers their nose and mouth while in this classroom. Students who do not have a mask will be asked to leave the classroom and only return when they follow this basic public health recommendation. Following this simple, science-based guideline will help ensure the safety of the entire Catamount community.

Note that masks do little to protect the person wearing the mask; rather, they minimize the chances that someone who is already sick will spread the disease to others. When you come to class in your mask, you're not only protecting your friends, peers, and instructors in the room with you, but also their friends, family, and loved ones, especially those in high-risk populations. Students who miss class because they are not wearing a maks will not be able to make up the work missed. Students who do not have masks can obtain them at the locations below:

- University Center - Main Information Desk (2nd floor)

- Hunter Library - Circulation Desk
- Belk Building – CET Dean's Office (Room 161)
- Health and Human Sciences Building – CHHS Dean's Office (Room 201)
- Biltmore Park Instructional Site – 3rd floor Information Desk

The mask/face covering requirement for students is an expectation of our student code of conduct and violations are subject to code of conduct proceedings and disciplinary action. Faculty and staff will communicate with the Department of Student Community Ethics regarding students who do not honor the requirement.

Special note for laboratory work: You must switch to a lab-use only mask when in lab. This mask should only be worn in lab and no where else and should be clearly marked as "lab use only". In the event of a chemical spill, splash, or other event than causes your mask to become contaminated, you should remove the mask and follow appropriate rinsing protocols to remove the contaminants from your skin, just as you would with any contaminated clothing.

Laboratory Behavior: 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. 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.

After-hours Instrument Access: You may occasionally want to conduct analyses outside of class time. The instrument lab is open from 9AM to 5PM 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. 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 isntructor 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 cancelled when the University has not officially closed.

Composition-Condition Marks: Proper mastery of the English language will be considered when assessing written work. A student whose written work fails to meet acceptable standards will be assigned a composition-condition (CC) mark by the instructor on the final grade report. All undergraduates who receive two CC

grades prior to the semester in which they complete 110 hours at WCU are so notified by the registrar and are required to pass English 300 or English 401 before they will be eligible for graduation. This course must be taken within two semesters of receiving the second CC and must be passed with a grade of C (2.0) or better. Students needing assistance with writing are encouraged to get help from WaLC. All written work submitted for this class may be checked with SafeAssign.

Civil Discourse at Western Carolina: Consistent with WCU's core values and our campus creed, the WCU community accepts the freedoms and responsibilities of our shared community. WCU encourages all to clearly express their own views while at the same time seeking to understand the varieties of style, identity, and opinion that are held in any diverse community. In order for us to sustain a learning environment that promotes and values freedom of expression, we have a shared charge to accept personal responsibility for our actions, reactions, and speech, while seeking to learn from the actions, reactions, and speech of others.

Institutional Policies

Course Recording and Broadcasting: Students may make visual or audio recordings (Recording) of any class related content, using any approved recording device (e.g., smart phone, computer, digital recorder, etc.) upon the **prior permission of the instructor** and subject to the following restriction(s). The Recording, along with the video capture of visible course materials (e.g., visible PowerPoint slides and/or visible lecture notes), shall be limited to the student's personal, course related, educational use and shall be subject to all applicable copyright laws and institutional policies. The student may not transfer, transmit, or otherwise disseminate the Recording to any third party, including classmates, without the permission of the instructor. Any violation of these restrictions, or any other restriction verbally communicated by the instructor, may subject the student to the provisions of the WCU Academic Integrity Policy, the WCU Code of Student Conduct or both.

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, by email, or at http://accessibility.wcu.edu/.

Academic Integrity Policy and Reporting Process: This policy addresses academic integrity violations of undergraduate and graduate students. Students, faculty, staff, and administrators of Western Carolina University strive to achieve the highest standards of scholarship and integrity. Any violation of the Academic Integrity Policy is a serious offense because it threatens the quality of scholarship and undermines the integrity of the community. While academic in scope, any violation of this policy is by nature, a violation of the Code of Student Conduct and will follow the same conduct process (see ArticleVII.B.1.a.). If the charge occurs close to the end of an academic semester or term or in the event of the reasonable need of either party for additional time to gather information timelines may be extended at the discretion of the Department of Student Community Ethics (DSCE).

Instructors have the right to determine the appropriate academic sanctions for violations of the Academic Integrity Policy within their courses, up to and including a final grade of "F" in the course in which the violation occurs.

Definitions:

- *Cheating*: Using, or attempting to use, unauthorized materials, information, or study aids in any academic exercise.
- *Fabrication*: Creating and/or falsifying information or citation in any academic exercise.
- *Plagiarism*: Representing the words or ideas of someone else as one's own in any academic exercise.
- *Facilitation*: Helping or attempting to help someone to commit a violation of the Academic Integrity Policy in any academic exercise (e.g. allowing another person to copy information during an examination).

Undergraduate and Graduate Academic Integrity Process: Additional information is available on the Student Success website under Student Community Ethics: http://www.wcu.edu/experience/dean-of-students/academic-integrity.aspx.

Student Resources

Writing and Learning Commons (WaLC): The Writing and Learning Commons (WaLC), located in Belk 207, writing tutoring and online writing and learning resources for all students. To view schedules and make appointments for any of these services, visit tutoring.wcu.edu or call 828-227-2274.

Math Tutoring Center: The Mathematics Tutoring Center (MTC) in Stillwell 455 provides drop-in tutoring for math courses and math-related content across the curriculum. Tutoring is available on a drop-in basis, MTWR 9:00am-9:00pm and Friday 9:00am-5:00pm. For more information, please visit http://mtc.wcu.edu/ or contact us at 828–227–3830.

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).

Syllabus Updates

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.