Master Course Syllabus

For additional course information, including prerequisites, corequisites, and course fees, please refer to the Catalog: https://catalog.uvu.edu/

Semester: Spring
Year: 2025
Course Prefix: CHEM
Course and Section #: 4005-202
Course Title: Instrumental Analysis Laboratory
Credits: 2

Course Description

This is a senior-level college lab course intended for Chemistry majors and others whose majors require a knowledge of the advanced principles of chemical measurement and instrumentation. Students will study modern instrumentation, analysis techniques and the theories behind them. Students will also continue to use data analysis techniques learned in CHEM 3000, which is a prerequisite for this course. Concurrent registration with the Instrumental Analysis (CHEM 4000) is required.

Course Attributes

This course has the following attributes:
☐ General Education Requirements
☐ Global/Intercultural Graduation Requirements
☐ Writing Enriched Graduation Requirements
☒ Discipline Core Requirements in Program
☐ Elective Core Requirements in Program
☐ Open Elective
Other: *Click here to enter text.*

Instructor Information

Instructor Name: Dr. Cory Larsen

Student Learning Outcomes

Upon successful completion of this course at Utah Valley University you will be able to:
1 Understand the operation of analytical instrumentation seen in a typical laboratory setting.
2 Understand and conduct laboratory experiments using advanced sample preparation and analytical instrumentation techniques.
3 Create and conduct independent experiments using advanced techniques.
4 Analyze and interpret the results of these experiments.
5 Write Lab Reports of a quality seen in an advanced academic/government/business laboratory setting.

Course Materials and Texts

Textbook: Skoog, D. A.; Holler, F. J.; Crouch, S. R. Principles of Instrumental Analysis, 7th Ed.; Cengage Learning, Boston MA, 2018. (Same as CHEM 4000 lecture)

Materials:
• Scientific calculator with log, ln, square root and scientific notation
• Computer with spreadsheet and word processing software
• Safety glasses
• Laboratory notebook (paper or electronic)

Course Requirements

Course Assignments, Assessments, and Grading Policy
Course Grading Policy (percent of total points available):
A 93-100
A- 90-93
B+ 87-90
B 83-87
B- 80-83
C+ 77-80
C 73-77
C- 70-73
D+ 67-70
D 63-67
D- 60-63
E less than 60

Course Assignments and Assessments:

Category	**Weight (% of grade)**
Participation	5
Laboratory Notebook	10
Lab Reports	45
Independent Project Execution	40

Participation

Your participation score will be based on your attendance, lab practices and laboratory preparedness.

Lab Reports
Lab reports will be due one week after the conclusion of each experiment, and turned in via Canvas.

Independent Research Project
Part of becoming a chemist is having the tools and confidence to work independently in the lab. You will be developing your own research project in the area of Analytical Chemistry as part of this course. The first step will be defining a problem you wish to address that utilizes the instrumentation available on campus. If you are conducting research with a faculty member, you must choose a research question or method development, and instrument that are different from your current work. Once your research area has been approved by your instructor, you will develop a "research methodology" which outlines the experimental procedures, equipment and supplies needed to conduct your work. Your instructor will work with you on the development of this document. You will then conduct your experiment, analyze your data, and evaluate your findings. Finally, you will present the research area, methodology and results/conclusions to your peers the last week of lab. Your grade will be based upon:

definition of problem, development of methodology, project execution, written report and presentation. Further details will be provided for you on Canvas.

Lab Notebook
Your notebook should contain all of your experimental procedures and raw data (unless the raw data is an electronic output from an instrument). Your notebooks will be collected and evaluate after completion of the first five experiments and at the conclusion of the course.

Required or Recommended Reading Assignments
None

General Description of the Subject Matter of Each Lecture or Discussion
Five experiments are planned for the first part of the semester to introduce each instrument type in the laboratory.

Instrumentation	**Title**
HPLC	Capsaicin content in hot sauces
GC-MS	Fingerprint composition
Fluorimeter	Quinine content in tonic water
UV-vis	Determination of silver nanoparticle size
MP-AES	Quantification of calcium and magnesium in milk

The remaining time in the semester is spent on independent research project execution.

Required Course Syllabus Statements

Generative AI
The *ethical* use of AI tools in this class is encouraged. AI programs are not a replacement for your human creativity, originality, and critical thinking. Writing, thinking, and researching are crafts that you must develop over time to develop your own individual voice. At the same time, you should learn how to use AI and in what instances AI can be helpful to you.
The use of generative AI tools (e.g. ChatGPT, CoPilot, etc.) is permitted in this course for the following activities:
• Brainstorming and refining your ideas;
• Fine tuning your research questions;
• Drafting an outline to organize your thoughts; and
• Checking grammar and style.

The use of generative AI tools is not permitted in this course for the following activities:
• Writing a draft of a writing assignment (unless this is the purpose of the assignment).
• Writing entire sentences, paragraphs or papers to complete class assignments.
• Generating responses to exam questions.

You are responsible for the information you submit based on an AI query (for instance, that it does not violate intellectual property laws, or contain misinformation or unethical content). Your use of AI tools must be properly documented and cited in order to stay within university policies on academic honesty. Any student work submitted using AI tools should clearly indicate what work is the student's work and what part is generated by the AI. In such cases, no more than 25% of the student work should be

generated by AI. If any part of this is confusing or uncertain, please reach out to me for a conversation before submitting your work.

Using Remote Testing Software

☒ This course does not use remote testing software.

☐ This course uses remote testing software. Remote test-takers may choose their remote testing locations. Please note, however, that the testing software used for this may conduct a brief scan of remote test-takers' immediate surroundings, may require use of a webcam while taking an exam, may require the microphone be on while taking an exam, or may require other practices to confirm academic honesty. Test-takers therefore shall have no expectation of privacy in their test-taking location during, or immediately preceding, remote testing. If a student strongly objects to using test-taking software, the student should contact the instructor at the beginning of the semester to determine whether alternative testing arrangements are feasible. Alternatives are not guaranteed.

Required University Syllabus Statements

Accommodations/Students with Disabilities

Students needing accommodations due to a permanent or temporary disability, pregnancy or pregnancy-related conditions may contact UVU Accessibility Services at accessibilityservices@uvu.edu or 801-863-8747.

Accessibility Services is located on the Orem Campus in BA 110.

Deaf/Hard of Hearing students requesting ASL interpreters or transcribers can contact Accessibility Services to set up accommodations. Deaf/Hard of Hearing services can be contacted at DHHservices@uvu.edu

DHH is located on the Orem Campus in BA 112.

Academic Integrity

At Utah Valley University, faculty and students operate in an atmosphere of mutual trust. Maintaining an atmosphere of academic integrity allows for free exchange of ideas and enables all members of the community to achieve their highest potential. Our goal is to foster an intellectual atmosphere that produces scholars of integrity and imaginative thought. In all academic work, the ideas and contributions of others must be appropriately acknowledged and UVU students are expected to produce their own original academic work.

Faculty and students share the responsibility of ensuring the honesty and fairness of the intellectual environment at UVU. Students have a responsibility to promote academic integrity at the university by not participating in or facilitating others' participation in any act of academic dishonesty. As members of the academic community, students must become familiar with their rights and responsibilities. In each course, they are responsible for knowing the requirements and restrictions regarding research and writing, assessments, collaborative work, the use of study aids, the appropriateness of assistance, and other issues. Likewise, instructors are responsible to clearly state expectations and model best practices.

Further information on what constitutes academic dishonesty is detailed in UVU Policy 541: *Student Code of Conduct*.

Equity and Title IX

Utah Valley University does not discriminate on the basis of race, color, religion, national origin, sex, sexual orientation, gender identity, gender expression, age (40 and over), disability, veteran status, pregnancy, childbirth, or pregnancy-related conditions, citizenship, genetic information, or other basis protected by applicable law, including Title IX and 34 C.F.R. Part 106, in employment, treatment, admission, access to educational programs and activities, or other University benefits or services. Inquiries about nondiscrimination at UVU may be directed to the U.S. Department of Education's Office for Civil Rights or UVU's Title IX Coordinator at 801-863-7999 – TitleIX@uvu.edu – 800 W University Pkwy, Orem, 84058, Suite BA 203.

Religious Accommodation

UVU values and acknowledges the array of worldviews, faiths, and religions represented in our student body, and as such provides supportive accommodations for students. Religious belief or conscience broadly includes religious, non-religious, theistic, or non-theistic moral or ethical beliefs as well as participation in religious holidays, observances, or activities. Accommodations may include scheduling or due-date modifications or make-up assignments for missed class work.

To seek a religious accommodation, a student must provide written notice to the instructor and the Director of Accessibility Services at accessibilityservices@uvu.edu. If the accommodation relates to a scheduling conflict, the notice should include the date, time, and brief description of the difficulty posed by the conflict. Such requests should be made as soon as the student is aware of the prospective scheduling conflict.

While religious expression is welcome throughout campus, UVU also has a specially dedicated space for meditation, prayer, reflection, or other forms of religious expression.