

Spring 2026 CHEM 470 Syllabus: Independent Study and Research

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Course Description: Scientific investigation on an individual basis under the supervision of a faculty member. Extensive reading, experimental work, and development of research techniques and skills.

Course Introduction: Students will be assigned specific research goals in consultation with the supervising faculty member that are commensurate with the student's academic level, experience in primary research, and the number of credit hours to be completed. The topic of each student's research project will be determined by the supervising faculty member and will be designed as a collaborative part of the faculty member's overall research program.

Format of Instruction: The minimum expectation for one hour of lab credit in the chemistry department is 3 hours each week. However, real research is different than the teaching labs associated with other courses because we will be trying to discover something new, as opposed to repeating a perfected experiment. As a result, research is typically more time intensive. A minimum of 5-6 hours each week is a more realistic expectation of the effort and time required to make significant progress on your research project. These hours may take the form of in-person laboratory work, data collection/analysis, literature analysis, research meetings, etc. to be determined by the supervising faculty member.

Students will meet with supervising faculty member upon the commencement of the course to discuss: 1) literature research/revision required to familiarize the student with the foundational topics of their assigned research project; 2) specific research goals for the term (calibrated to correlate with the number of credit hours and prior experience); 3) expectations for the recording of research experiments performed and the results thereof; 4) procedures for data analysis/processing and presentation of data to a professional audience; 5) expectations for a summative reflection upon completion of the term.

Students will meet regularly (at least once per week) with the supervising faculty member to discuss ongoing research progress, next steps, and to ensure proper recording and processing of experimental results. In

addition to individual meetings with the faculty mentor, you will be expected to attend weekly research group meetings. At these meetings we will work on a variety of activities including mechanism, synthesis, or spectroscopy problems; present literature reviews, and you will be expected on occasion to present your lab results (typically students will present at group meeting approximately once a month).

Upon completion of the term, each student will complete and submit a reflective assignment to describe: 1) specific skills and techniques acquired over the term; 2) specific research accomplishments; 3) future directions for the assigned research; 4) plans for dissemination of research results. The length and specific format of the reflective assignment is to be determined by the supervising faculty member, and to be discussed with the student at the beginning of the term, and must include, at a minimum, the following three UCC assessment activities:

- summarize their primary research results, explain the conclusions that can be drawn from their results, and explain how these results contribute to the larger research goals of the laboratory
- connect their specific research project to the broader chemical field and explain how this field affects society
- identify at least two other published articles that directly contribute to the field in which they work

Students will meet with their faculty mentor upon completion of the term to discuss reflective paper, future research plans, and potential future research collaboration.

Texts & Supplies: There is no textbook assigned for independent research. However, investigating the chemical literature is an essential part of any research project. This means you will need to be familiar with using search tools like *Web of Science* and *SciFinder*. You may also need to check out books from Bracken or request articles using the Interlibrary Loan Service: <https://lib.bsu.edu/forms/ill.php>

As with any lab in the BSU chemistry department you must wear clothing that completely covers all skin below the torso, wear a lab coat, and have lab goggles covering your eyes when you are working in the lab. Nitrile gloves are also available and it is highly recommended that you use these anytime you are handling chemicals or equipment in the lab.

Student Learning Outcomes: CHEM 470 is a high impact practices course (undergraduate research).

- Students will explain relevant issues within the context of the course or project.
- Students will apply high-impact skill sets to their field of study.

Attendance: CHEM 470 doesn't have a set meeting schedule, and is flexible based on the availability of the students and faculty mentor. A tentative schedule for in-lab research will be planned out at the initial meeting between student and mentor at the beginning of the term. While the schedule doesn't need to be exact from week to week, consistent time spent in the lab each week will lead to better productivity than trying to cram in most of your work for the semester in a few weeks at the beginning or end of the academic term.

Assessment: Your grade in CHEM 470 will be determined based on:

- consistent time spent working on your project (time spent in lab and on literature review)
- attendance and participation in group meeting
- a carefully documented laboratory notebook
- monthly research reports presented at group meeting
- a final paper summarizing your work, documentation of the acquired data and results, what you have learned, and conclusions about what might be done next to continue to move the project forward.

University Statement: We are committed to ensuring that all members of the community are welcome, through valuing the various experiences and worldviews represented at Ball State and among those we serve. We promote a culture of respect and civil discourse. If you need course adaptations or accommodations because of a disability, please contact the instructor of record as soon as possible. Ball State's [Disability Services](#) office coordinates services for students with disabilities; documentation of a disability needs to be on file in that office before any accommodations can be provided. Disability Services can be contacted at 765-285-5293 or dsd@bsu.edu.

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