

Course Syllabus: CH 633X Hypothesis, Evidence, and Argument in Organic Chemistry (2 credits)

Detailed course description:

The purpose of the course is to immerse the student in the tools of scientific method as applied to current research topics. The student chooses a topic unrelated to the student's thesis research on which there is active research (as evidenced by more than 20 publications within the past three years from two or more research groups). The choice is made in consultation with the instructor. The topic must not have been covered in a review article in that time frame; exceptions can be made for review articles that are either tangential to the central focus of the topic, or concentrate on a small subset of the literature pertinent to the topic. It is expected that older background material from monographs, earlier review articles and older primary literature will also need to be included to develop a full understanding of the topic. The student will, as part of the initial literature review, develop and apply skills in using modern database search tools. The student is also expected to practice critical analysis of the publications related to the topic. It is expected that the student will spend 30-40 hours searching and reading the relevant literature.

The student will write an 8-10 page summary and analysis of the topic. While this will necessarily include some discussion of older background material (particularly in justifying the importance of the topic to current research in organic chemistry), it is expected that the bulk of the written report will emphasize the more recent experiments. A full description of all experimental work reported is not expected, but the student should provide a description of how original authors designed and interpreted experimental data to arrive at their conclusions. Particularly where competing hypotheses exist concerning the topic, the student should explain the basis for these, and how experimental findings are used to support or refute them. It is expected that the student will need to make at least one major revision of the written summary after receiving feedback from the instructor. Writing the written summary should take 10-20 hours.

The student will then make an oral presentation of about an hour about the topic. The title of the talk will be published at least one week in advance in the regular Chemistry Department seminar schedule. The talk will be open to the public. The talk may diverge from the written summary, but it should contain the same essential elements: enough background for a scientifically literate audience to appreciate the current relevance of the topic; description of competing hypotheses related to the topic, and the key experimental evidence that reflects the viability of such hypotheses and the utility of methodology described in the literature. The student is encouraged to make use of any presentation media appropriate to the subject matter; the instructor will guide the student in making such choices. It is expected that composition of the oral presentation (and related media) and practice presentations will take 10-15 hours.

The student will make her/himself available to the audience for a question-and-answer period after the talk. It is expected that individuals in the audience may seek further information on material not discussed in depth. Also, the student is expected to have sufficient recall of the literature covered to formulate responses to hypothetical inquiries. The discussion period is expected to last 20-30 minutes.

A panel of organic chemists in the Department of Chemistry will forward written comments about the written and oral presentations to the instructor, who will in turn summarize these and pass them on to the student with the final grade. The letter grade will be based on the written and oral presentations, and on the quality of responses in the discussion period. Aspects of the grade will include the depth and completeness of the literature survey, identification of key scientific issues, importance of the topic to current research directions in the field, and the depth of understanding displayed by the student in the presentations and discussion. Professionalism in writing the summary and presentation media (as evidenced by proper English usage, grammar, spelling and punctuation, as well as appropriate choice of graphical elements) and in making the oral presentation is expected and will also factor into the grade.

A student may take this course twice, provided that different topics are chosen.

A. Instructional objectives and student learning outcomes of the course.

The student will:

- Investigate a topic of recent interest in the current scientific literature. They will thereby become familiar with current techniques of library and electronic database searching, and apply knowledge gained in the prerequisite course (Advanced Organic Chemistry) to evaluate a topic of significance to the organic chemistry community.
- Critically analyze the literature they read, in order to choose elements for written and oral presentation based on the importance of specific experiments and the need to provide a cohesive narrative.
- Construct oral and written presentations that convey the basis for hypotheses presented in the literature on the subject topic, the experimental data that supports or refutes these hypotheses, and the train of argument that represents the best current understanding of the topic.
- Absorb sufficient detail from the literature to be able to answer specific questions on details that time limits may have precluded from their oral presentation, and to intelligently propose outcomes in instances or applications for which no experimental data now exist.

B. Assessment and evaluation of student performance.

A panel of organic chemists in the Department of Chemistry will forward written comments about the written and oral presentations and discussion to the instructor, who will use them to arrive at the final grade. The letter grade will be based on the written and oral presentations, and on the quality of responses in the question-and-answer period. Aspects of the grade will include the depth and completeness of the literature survey, identification of key scientific issues, importance of the topic to current research directions in the field, and the depth of understanding displayed by the student in the presentations. Professionalism in writing the summary and presentation media (as evidenced by proper English usage, grammar, spelling and punctuation, as well as appropriate choice of graphical elements) and in making the oral presentation is expected and will also factor into the grade.

Grading guidelines based on expected learning outcomes:

A: The student exhibited excellence in all aspects of the exercise. The topic was of intense

current interest and importance; the literature survey was complete; critical analysis of the published data and interpretation by the student was clearly evident; the written report was succinct yet informative; the oral presentation was professional and engaging; and the student handled questions with a clear ability to think on his/her feet and use the published data to quickly formulate responses to these questions.

A-, B+: The student exhibited excellence in all aspects of the exercise, but had a minor flaw or flaws which noticeably detracted from the impact of the presentations. Examples include (but are not limited to) excessive grammatical or spelling errors in the written report; errors or other problems with presentation aids; overlooking one or more minor literature citations; use of distracting mannerisms in the oral presentation; inability to adequately respond to a question from the audience.

B: Satisfactory completion of all aspects of the exercise, with one or more significant but correctable flaws. Examples might include omission of a significant paper or papers from the literature review; evidence of inadequate understanding of the literature in either the presentation or in response to questions; insufficient professionalism in either the written or oral reports; inadequate critical analysis of published data and interpretation. (Note: a B is the lowest acceptable grade in a course applied to graduate degrees in Chemistry.)

B-, C+, C, C-: Significant deficiencies in any of the areas of the exercise that reveal the failure to attain one or more of the learning goals.

D: Completion of both written and oral reports, but with either reflecting a deficiency that calls into question the student's mastery of prerequisite material and/or ability to communicate in a professional manner.

F. Failure to complete either the oral or written presentation.

C. Summary of content and process skills

See detailed course description, above.