CHEM 449W: Chemistry Research Methods
Syllabus for Fall 2014

Instructor: Chriss E. McDonald **Office:** 233 Heim

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Meeting Time: Monday, 3:15 – 4:05 in Seminar Room (215). Also an average of 12 hours/week arranged with your research advisor

Course Description: This course focuses on the nature and practice of chemistry. Students will conduct research into a particular chemical problem with a faculty research advisor and will discuss their research at a weekly seminar. A report on their research will be written.

Text: *The ACS Style Guide: A Manual for Authors and Editors*, 3nd ed.; Coghill, A.; Garson, L. Eds.; American Chemical Society: Washington, DC, 2006.

Writing-Intensive Course: CHEM 449 is designated as a W-course, meaning that it will partially fulfill your writing-intensive graduation requirement. Writing intensive courses include instruction on writing, and students in these courses complete at least ten pages of formal writing and fifteen pages of informal writing. Formal writing assignments in this course include the annotated bibliography, the research summary and the final paper. Informal writing assignments include free-writing exercises, peer reviews of presentations, and drafts of the paper.

Learning Goals: Students who successfully complete this course will:
1. be able to search Scifinder and access the primary literature;
2. gain experience in conducting original chemical research;
3. be able to communicate the results of their research both orally and in written form.

Department of Chemistry learning goals that are supported by this course:
1. Exhibit integrative, problem-solving skills, such as experimental design, data manipulation, an d data interpretation;
2. Understand and use modern chemical instrumentation;
3. Search the chemical literature, evaluate the results of the search, and access desired research materials;
4. Demonstrate responsible conduct in the laboratory including laboratory safety and ethical research practices.

This course supports the Mission of the College:
The mission of Lycoming College is to provide a distinguished baccalaureate education in the liberal arts and sciences within a coeducational, supportive, residential environment.

Learning Differences and Disabilities:
Lycoming College provides academic support for students who officially disclose diagnosed learning, physical and psychological disabilities. If you have a diagnosed disability and would like to seek accommodations, please contact Jilliane Bolt-Michewicz, Assistant Dean of

Academic Services / Director of the Academic Resource Center. Dean Bolt-Michewicz will help you arrange for appropriate academic accommodations. She can be reached by calling 570-321-4050, emailing michewicz@lycoming.edu, or visiting her office (Academic Resource Center, 3rd Floor of Snowden Library).

Grading Criteria (all grades assigned in consultation with research advisor):

Annotated Bibliography	10%
Poster	10%*
Colloquium	15%*
Final Paper	20%
Resume, Cover Letter and Research Summary	5%
Paper drafts and practice talks	5%
Effort in Lab and Library Research	20%
Notebook and Spectra	5%
Laboratory Technique	10%
	100%

*assigned in consultation with all chemistry faculty

Grading Standard:

A **Mastery of essential elements and related concepts, plus demonstrated excellence or originality.**
B Mastery of essential elements and related concepts.
C Acceptable knowledge of essential elements and related concepts.
D Minimal knowledge of essential elements.
F Unsatisfactory progress.

Note: A student who habitually misses deadlines will have their grade reduced by one letter.

Attendance: The student will pursue a research project under the direction of a faculty member in the Department of Chemistry (or an internship off campus). The student is expected to commit an average of 12 hours per week to the research project. This time will be divided between laboratory work and time spent reading the literature and planning the laboratory work. Attendance at the weekly seminar is mandatory and each unexcused absence will result in a 5% reduction of the final grade. A maximum of one excused absence (must be documented by a note from physician, Dean, etc.) will be granted.

Literature Search and Literature Review: We will explore methods for searching the chemical literature. The student will search the primary chemical literature for articles pertinent to his or her research topic. These articles will form the basis of an annotated bibliography and a literature review that will be written and ultimately included in the final research paper.

Research Presentations: The student will present an overview of the project at the first presentation of the semester. At subsequent meetings, the student will report on the progress made on the project since the previous meeting. Although these presentations will be somewhat informal, the student is expected to discuss the research in an appropriate manner (the student should be well-prepared, knowledgeable about the project, able to describe the work in a professional manner, and able to answer student and faculty questions regarding the project). Faculty and students in attendance will evaluate these presentations.

Laboratory Technique: The student will be evaluated on the mastery of techniques relevant to the project. Included in this category are the skills necessary for the maintenance of laboratory equipment, laboratory hygiene, and safety.

Effort in the Laboratory and Literature Research: This takes the form of the student's commitment to the research project with regard to both the time and thought dedicated to the research. This includes evaluation of the student's comprehension of the project and intellectual input as determined by discussions with the research advisor regarding the status of the project.

Laboratory Notebook: The student will maintain an accurate and detailed laboratory notebook (hard-bound, all entries made in ink) and an organized file of spectral data. The notebook and the spectral data will be turned in to the research advisor at the end of the semester.

Poster: The student will construct a poster using Power Point that describes the project in terms of its literature underpinnings, experimental design, results, and conclusions. Input on the quality of this final product will be solicited from the entire faculty of the Department of Chemistry. We reserve the right not to display posters that do not meet our standards.

Colloquium: The student will present his/her research in the form of a chemistry colloquium near the end of the semester. This will utilize Power Point. A practice talk will be given to the class at least 2 days before the colloquium. Input on the quality of this final product will be solicited from the entire faculty of the Department of Chemistry.

Final Paper: The student will prepare a written report on the research project. The report will be written in standard ACS style (refer to papers published in the *Journal of the American Chemical Society*) and will include a brief abstract, an introduction, background material (literature review), results and discussion, conclusions, an experimental section, and references. We will address the particulars of each section in class. Drafts of the sections will be due throughout the semester to both me and your research advisor. Three drafts of the final paper (weeks 14, 15, 16) are included because we've found that these are typically needed to end up with a satisfactory product. Input on the quality of this final product will be solicited from the your faculty advisor.

Academic Integrity: Be aware that in accordance with the College's policy on academic honesty, any work you submit must be your own. Any instances of plagiarism will be severely penalized.

Chemistry Research Methods Course Schedule, Fall 2014

Everything you turn into me also turn in simultaneously to your research advisor

Week	Date	Topic	Readings and Preparation for Class	Student Presentation
1	8/25	Course overview, discussion with research advisors	Chp. 1 (ethics)	
2	9/1	Literature search background Literature search: Scifinder	Discuss project with research advisor. Choose search terms	
3	9/8	Structure searching with Scifinder Free-writing exercise: project summary	Choose substructures to be searched in consultation with research advisor, Review what you've learned about your project	
4	9/15	Discussion: Writing an introduction / literature review, editing references, annotated bibliography Using chemical drawing programs	Chp.2 and 3 in text Refer to Chapter 14 for info on citing references	**Background talks:** SEJ, RCM
5	9/22	Writing the research summary, resume, and cover letter. **Due:** Annotated bibliography (W 9/24)	Refer to Chp. 4 (writing style) and Chp. 9 (grammar)	**Background talks:** AHK, BJE, TRW
6	9/29	Discussion: Writing the experimental section **Due:** 1st draft of introduction / literature review (W 10/1) **Due:** resume, cover letter, and research summary (F 10/3)	Refer to Chp. 13 (experimental conventions)	
7	10/6	Meet briefly for questions/feedback **Due:** 2nd draft of introduction/literature review (F 10/10)	Refer to Chp. 9, 10,11for info on how to properly use/present numbers, chemical names, and symbols.	
8	10/13	**Due:** 1st draft of sample experimental (W 10/15)		

Week	Date	Topic	Readings and Preparation for Class	Student Presentation
9	10/20	Writing the results and discussion section** free-writing exercise: results and discussion	Refer to Chapters 3 and 4 (grammar, punctuation, etc.), review what you've accomplished in the lab to this point	
10	10/27	Preparing for a poster presentation, *PowerPoint* **Due:** 2nd draft of experimental (W 10/29) **Due:** poster images in drawing program (F 10/31)	Refer to Chapter 15,16 for info on how to properly include illustrations and tables.	**Current results talks:** SEJ, RCM
11	11/3	Writing an abstract, organization of a colloquium presentation		**Current results talks:** AHK, BJE, TRW
12	11/10	Troubleshooting posters **Due**: draft of poster (W 11/12)		
13	11/17	Practice talks for colloquia (RCM, SEJ)		**Colloquium:** RCM, W, 11/19 SEJ, F, 11/21
14	11/24	**Due:** Finished poster (M 11/24) **Due:** 1st draft of final paper (T 11/25)		
15	12/1	Practice talks for colloquia (AHK, BJE, TRW) **Due:** "polished near final" draft of final paper (F 12/5)		**Colloquium:** AHK, W, 12/3 BJE, TRW, F, 12/5
16		**Due:** final draft of paper (Th 12/11, this is a hard and fast deadline)		

**I'll be happy to review a draft of your R and D section at your convenience (not required until draft of final paper T 11/25 of week 14 though).
**Also happy to review a 2nd draft of your research summary at any point.

http://www.youtube.com/watch?v=_RaRC6YuYCQ

There is no strife, no prejudice, no national conflict in outer space as yet. Its hazards are hostile to us all. Its conquest deserves the best of all mankind, and its opportunity for peaceful cooperation many never come again. But why, some say, the moon? Why choose this as our goal? And they may well ask why climb the highest mountain? Why, 35 years ago, fly the Atlantic? Why does Rice play Texas?

We choose to go to the moon. We choose to go to the moon in this decade and do the other things, not because they are easy, but because they are hard, because that goal will serve to organize and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one which we intend to win, and the others, too.

It is for these reasons that I regard the decision last year to shift our efforts in space from low to high gear as among the most important decisions that will be made during my incumbency in the office of the Presidency.