

# CHEM 449W: Chemistry Research Methods

## Syllabus for Fall 2009

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**Meeting Time:** Monday, 3:15 – 4:05 in Seminar Room (215). Also 10-12 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*, 3<sup>rd</sup> 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.

### Grading Criteria:

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	<u>10%</u>
	100%

**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.

**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 2009

Everything you turn into me also give to your research advisor

<u>Date</u>	<u>Week</u>	<u>Topic</u>	<u>Readings and Preparation for Class</u>	<u>Student Presentation</u>
	1	Course overview, discussion with research advisors	Chp. 1 (ethics)	
	2	Literature search background Literature search: Scifinder	Discuss project with research advisor. Choose search terms	
	3	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	Discussion: Writing an introduction / literature review, editing references, annotated bibliography Using IsisDraw	Chp.2 and 3 in text Refer to Chapter 14 for info on citing references	<b>Background talks:</b> BMB, CAH, TKL
	5	Writing the research summary, resume, and cover letter. <b>Due:</b> Annotated bibliography (W) <b>Due:</b> 1 <sup>st</sup> draft of introduction / literature review* (F)	Refer to Chp. 4 (writing style) and Chp. 9 (grammar)	
	6	Discussion: Writing the experimental section <u>Bring notebook and spectra/data</u> <b>Due:</b> resume, cover letter, and research summary (W)	Refer to Chp. 13 (experimental conventions)	
	7	Workshop: Writing the experimental section <u>Bring notebook and spectra/data</u> <b>Due:</b> 2nd draft of introduction/literature review (W)	Refer to Chp. 9, 10,11for info on how to properly use/present numbers, chemical names, and symbols.	
	8	<b>Due:</b> 1st draft of sample experimental (W)		

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| <b>9</b>  | Writing the results and discussion section* *<br>free-writing exercise: results and discussion<br><b>Due:</b> 2 <sup>nd</sup> draft of research summary (F)           | Refer to Chapters 3 and 4 (grammar, punctuation, etc.), review what you've accomplished in the lab to this point          |   |
| <b>10</b> | Preparing for a poster presentation,<br><i>PowerPoint</i><br><b>Due:</b> 2 <sup>nd</sup> draft of experimental (W)<br><b>Due:</b> poster images in Isis/Chem Draw (F) | Refer to Chapter 15,16 for info on how to properly include illustrations and tables.<br>Washington State PP prep document | <b>Current results talks:</b><br>BMB, CAH, TKL      |
| <b>11</b> | Writing an abstract, organization of a colloquium presentation  |   |   |
| <b>12</b> | Troubleshooting posters<br><b>Due:</b> draft of poster (W)  |   |   |
| <b>13</b> | <b>Due:</b> Finished poster presentation (W)  |   |   |
| <b>14</b> | Practice talk (TKL)<br><b>Due:</b> 1 <sup>st</sup> draft of final paper (W)   |   | <b>Colloquium:</b><br>TKL, F, 12/4                  |
| <b>15</b> | Practice talks for colloquia (BMB, CAH)<br><b>Due:</b> "polished near final" draft of final paper (F)   |   | <b>Colloquium:</b><br>BMB, W, 12/9<br>CAH, F, 12/11 |
| <b>16</b> | <b>Due:</b> final draft of paper (Th, this is a <u>hard and fast</u> 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 W of week 14 though).

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.

John F. Kennedy, President of the U.S. (of A.), Rice University, 9/12/62