

RESEARCH METHODS IN CHEMISTRY CHEM 200

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Course Description

This course is designed to improve the ability of graduate students to research and interpret the chemical literature. Students work through a series of exercises in preparation for a major writing project such as a thesis proposal/chapter. Exercises include analysis of primary research articles, peer review of student writing samples, and presentation of scientific information. These activities will improve students' understanding of how scientific questions are developed and posed through proposals and dissemination of research results.

Course Information: Lecture, 3 hours per week. Classes will incorporate some traditional lecture, in conjunction with library database/resource information, peer discussion/review, and student presentations.

Prerequisite: Acceptance and enrollment in the Chemistry graduate program.

Textbook information:

- **Required:**
 1. Davis, H.B.; Tyson, J.F.; Pechenik, J.A. (2010) *A Short Guide to Writing About Chemistry*, Addison-Wesley, Boston, MA. ISBN 9780205550609
 2. *The ACS Style Guide* (2006), (Coghill, A.M., Garson, L.R., Eds.), American Chemical Society, Washington, DC. ISBN 9780841239999 (Available free of charge with Saclink log-in at <http://pubs.acs.org/isbn/9780841239999>)
- We will be also be utilizing primary chemical literature as a source of information.

Attendance: Attendance in class is **mandatory**. If you must miss class for an acceptable reason (*ie* illness), a doctor's note or some other evidence of a valid excuse will be required. You are still responsible for completing the work missed. **One unexcused absence for the semester will result in a failing grade in the course.**

Learning outcomes

The learning outcomes for this course align with one or more (depending on the student's writing project) of the following Chemistry Graduate Program Goals:

- Student will analyze and synthesize experimental research in chemistry drawn from contemporary primary chemical literature.
- Student will formulate thesis topic, explain its significance and propose the methodology to be used in the thesis topic research.
- Student will demonstrate proficiency in scientific writing which includes:
 - Ability to interpret and synthesize primary research literature related to the student's thesis topic
 - Ability to write a coherent narrative that explains the significance of the thesis research with regard to the primary research literature
 - Ability to report original research results in a coherent narrative
 - Ability to explain and defend conclusions drawn from original results in narrative form

By the end of the semester, students will be able to:

1. Search the chemical literature proficiently and thoroughly using library databases such as Scifinder Scholar, or PubMed
2. Demonstrate proficiency in scientific writing in several formats including abstracts, research proposals, and reports involving original research.
3. Accurately and thoroughly analyze and describe research presented in the primary chemistry research literature, including how the experimental design relates to the hypothesis being studied.
4. Prepare and present scientific topics orally utilizing commercially available presentation software such as Powerpoint.
5. Complete a writing project (research proposal, introductory thesis chapter, results/discussion thesis chapter).

Grading

Grades will be based on the following criteria:

Written assignments	30%
Major written assignment	30%
Peer review assignments	20%
Oral presentations	20%

Tentative Schedule: This schedule only includes the major assignments for the semester. There will be smaller ancillary assignments that will also be made as needed.

Jan. 27th (Week 1): Written/oral presentation requirements of the CSUS Chemistry M.S. Program
Introduction to scientific writing and how to formulate a working hypothesis

- **Assignments:**

- Go to the CSUS website for the Office of Graduate Studies. Download the thesis template and useful guides found there. <http://www.csus.edu/gradstudies/CurrentStudents/Thesis-Project-Dissertation/Templates-and-Guides.html>
- Go to the CSUS website for Information Resources and Technology. Download the latest version of Endnote to your computer. <http://www.csus.edu/irt/Software/index.html>
- **Reading for next week:** Chapters 1-3 (Short guide), Scientific papers (ACS Style), References (ACS Style)

Feb. 3rd (Week 2): Elements of a primary research article
Reference types, bibliographies and the use of Endnote

Feb. 10th (Week 3): Meet in the library-room 2024

- Learn how to search library databases and develop effective search techniques
- **Assignment:**
 - **Searching the chemical literature** (will focus on searching for thesis topic).
 - **Worksheet/List of 10 literature references-due week 4**
 - **Reading for next week-** Chapter 13 (Short guide)

Feb. 17th (Week 4): Introduction to Powerpoint and how to design an effective oral presentation, informative outlines

- **Assignment:**

- **Outline of thesis proposal/chapter –due week 5**
- **Reading for next week-**paper #1, Chapter 8 (Short Guide), Peer review (ACS Style)

Feb. 24th (Week 5): Group discussion of a primary research article, writing summaries, peer review

- **Assignments:**

- **Group presentation-paper #1 (week 6)**
- **Individual 2 page synopsis of paper #1, due week 6**

- Mar 3rd (Week 6):** Group presentations of primary research articles (15 minutes each)
- **Assignments:**
 - **Peer review of individual paper synopses**
 - **Reading for next week:** Chapters 9-11 (Short Guide)
 - **Thesis proposal/chapter-1st draft, due week 9, Tuesday April 1st by 5 PM**
- Mar 10th (Week 7):** Elements of scientific writing-Abstract and Introduction
- **Assignments:**
 - **Reading for next week:** Chapters 4, 5 (Short Guide)
 - **Literature seminar abstract, due week 8**
- Mar 17th (Week 8):** Elements of scientific writing-Editing
- **Assignments:**
 - **Peer review of the literature seminar abstract**
- Mar 31st (Week 9):** **Cesar Chavez Day-No Class**
Due: Thesis proposal/chapter-1st draft, Tuesday, April 1st by 5 PM
- Apr 7th (Week 10):** Elements of scientific writing-Materials and methods
- **Assignments:**
 - **Table of contents thesis proposal/chapter-due week 11**
 - **Peer review of 1st draft thesis proposal/chapter**
 - **2nd draft of thesis proposal/chapter-due week 12**
- Apr 14th (Week 11):** Elements of scientific writing-Results and discussion
- Apr 21st (Week 12):** Elements of scientific writing-Grant proposals
- **Assignments:**
 - **Outline of final presentation, due week 13**
 - **Peer review of 2nd draft thesis proposal/chapter**
 - **Reading for next week:** Ethics in Scientific Publication (ACS Style)
- Apr 28th (Week 13):** Ethics in chemistry
- May 5th & May 12th (Weeks 14-15):** Individual Powerpoint presentations on thesis background (20 minutes each)
Due Week 15: Final draft of thesis proposal/chapter to be submitted to major advisor