

Physical-Inorganic Techniques Section

01 CHEM 146

Spring 2024 3 Unit(s) 01/24/2024 to 05/13/2024 Modified 01/23/2024

Contact Information

Instructor: Prof. Madalyn Radlauer

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pronouns: she/her/hers

Office Hours

Tuesday, 1:00 PM to 3:00 PM, ISB 254

or by appointment

Instructor (after Spring Break): Prof. Gilles Muller

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Course Description and Requisites

Application of advanced instrumental and preparative techniques to the study of structure, reactivity, and spectroscopy of inorganic and organic substances including materials. This is a capstone course. A grade of "C" or better is required for majors.

Lecture 1 hour/lab 6 hours.

Prerequisite(s): CHEM 100W, CHEM 113A, and CHEM 145 (with grades of "C" or better; "C-" not accepted) or instructor consent.

Letter Graded

Classroom Protocols

Respect

In the lab, we have to work in a shared space with shared resources and equipment. Please be respectful to one another and one another's ideas. If anything in the classroom makes you feel uncomfortable or disrespected, especially if it is something that I say or do, please bring it to my attention. You all are students, but you are people first and foremost, and the classroom should be a place you feel welcomed and respected.

Punctuality and Attendance

Please be on time to class; we will start at 9:00 am in ISB 240.

Please do not come to class if you do not feel well.

If for health (or other) reasons you cannot attend class in person, please email me (before the class period) and we can see if there is a way to arrange for you to make up the work.

Device use

You may want to have your laptop or tablet for notetaking, data analysis, accessing Canvas, accessing primary literature, etc. Note that it is very important that you take safety into account when you are using any device in the lab space. Also, please make sure that you're only using your devices for the coursework.

Lunch, etc.

I understand that the class period is long and goes over the lunch hour. You will be responsible for effectively using the lab time and thus it is up to your discretion when you would like to take a break for lunch. The only exception is that you must be present at the end of the class period to have your notebook and work space checked.

Email and Canvas Messages

I receive a lot of emails/messages, so to be sure that I see your email, all Chem 146 emails should have Chem 146 in the subject line. I will do my best to respond to class-related emails within 1 business day of receiving them, however, keep in mind that this may not always be possible. You can also message me via Canvas and I will target a similar turnaround time.

Collaborative Work

Some of the work for the course will be done with your classmates or using data from your classmates. Even so, everyone is responsible for their own work. Most importantly, plagiarism of any sort will not be tolerated. Students who do not submit their own work will receive a zero, and continuing to do so will result in a failing grade in the course.

Program Learning Outcomes Connected to this Course

This content of this course is intended to further develop the following Chemistry/Biochemistry PLOs.

- **Core Chemistry Ideas (Fundamentals)**

PLO 1.1 - Students will be able to identify, formulate, and solve a range of chemistry problems (fundamental to complex) through application of mathematical, scientific, and chemical principles.

PLO 1.2 - Students will be able to recognize, relate, and/or apply chemistry terms and concepts to propose and solve interdisciplinary and multidisciplinary real world problems.

- **Experimentation/Lab Practice**

PLO 2.1. Students will be able to develop an experiment to address a hypothesis using literature and execute the planned experiment using standard chemistry techniques.

PLO 2.2 Students will be able to acquire, record, and critically evaluate data through use of instrumentation and software, appropriate record keeping practices, figure preparation, and scrutiny of experimental results.

PLO 2.3 Students will be able to recognize and assess laboratory hazards, practice risk minimization, and conduct safe laboratory practices.

- **Community, Social, Societal Implications**

PLO 3.1 Students will be able to explore, critique, and reflect on how chemistry relates to society, culture, and issues of equity and ethics that shape their scientific beliefs and identities.

PLO 3.2 Students will be able to identify as scientists within the scientific community through constructing peer reviews, engaging in collaborations, and participating in mentorship.

- **Communication Skills**

PLO 4.1 Students will be able to design and deliver engaging presentations on diverse chemistry topics in a professional manner and with clear, concise organization that demonstrates mastery of the topic.

PLO 4.2 Students will be able to integrate research findings into a concise original written report that either analyzes collected data and obtained results or reviews and reflects on published scientific work.

PLO 4.3 Students will be able to identify an audience and construct a message tailored to that audience and act as a science ambassador by conveying the importance of the research or topic of study.

Course Goals

The goal of this course is to introduce physical and inorganic methodology, preparing students to understand and pursue related laboratory research. As a capstone course, this class will require students to integrate principles, theories, and methods learned in previous courses throughout the major. It will involve

writing and presentations, building the students' ability to effectively communicate scientific data and ideas. To that end, I will provide feedback on each of your assignments and part of your success in the course will be measured by your ability to integrate that feedback into later assignments.

Course Learning Outcomes (CLOs)

Upon successful completion of this course, students will be able to:

CLO 1: Make predictions in a laboratory setting based on concepts from general, physical, analytical, and inorganic chemistry courses. (Pre-lab and proposal assignments)

CLO 2: Determine, execute, and troubleshoot synthetic and analytical experimental procedures found in the scientific literature safely and efficiently. (Pre-lab and in-lab assignments)

CLO 3: Evaluate and discuss the results of a project. (Write-up and final report/presentation assignments)

CLO 4: Develop a short research proposal based on literature precedent, and persuade reviewers (the instructor and fellow classmates) of its merits through written and oral presentations. (Proposal assignments)

Course Materials

Equipment

You will need a bound, lined laboratory notebook (a partly used notebook with at least 30 unused pages is acceptable); a calculator or device with a calculator; lab glasses or goggles; and a lab coat. The lab coat and a pair of lab goggles will be provided for you, but you will need to bring your own if you prefer lab glasses.

Library Resources

You should have a student library account with the King Library that allows you access the library electronic databases. If you plan to access the library services from off-campus, you may need to obtain a password and/or set up VPN to do so. Check the Library website for information. The reference Librarian for Chemistry is Ann Agee and her email address is ann.agee@sjsu.edu (<mailto:ann.agee@sjsu.edu>).

References

Inorganic, physical, and analytical chemistry textbooks such as Inorganic Chemistry (<https://www.pearsonhighered.com/miessler5einfo/>) by Gary L. Miessler, Paul J. Fischer, and Donald A. Tarr (5th edition, 2014) ISBN: 9780321811059 may be useful for background information.

Course Requirements and Assignments

Graded work in this course will include Canvas discussion posts and quizzes as well as assignments on two short projects and on one larger proposal/project. As the semester progresses you will get grades and feedback on your assignments. To succeed in this course it is important to read the feedback and incorporate it in your later assignments. As with anything in the course, the instructor will be available to answer any questions or clarify points in the grading and feedback.

Safety: Quiz and SOPs

Before you can do any work in the lab, you must both pass a safety quiz with a score of 80% or higher and sign SOPs for the chemicals we are using in the lab. The safety quiz will be given during class on Friday, January 26, 2024.

Discussion Posts and Quizzes

Canvas discussion posts and quizzes will account for 50 points (5%) of your grade.

Lab Safety, Technique, and Notebooks

There will be assessments of the quality of your lab safety, technique, and notebook keeping for each project totaling to 150 points (15%) of your grade.

Pre-Lab Notes

Before you start on a project in the lab you will need to present Pre-Lab Notes indicating your preparedness. These will account for 150 points (15%) of your grade.

Short Project Write-ups

For the two short projects, you will have brief write-ups that share and discuss your results and conclusions. These will account for 150 points (15%) of your grade.

Proposal Assignments: Form, Presentation, Critiques, and Responses

For the Catalysis Project, you will come up with an original proposal that you will present to the class. You will also have a proposal form to fill out that is just shared with me. During the proposal presentations, you will write brief reviews and these will be shared anonymously with your classmates. Everyone will write a short response to the reviews to practice responding to reviewers, which is an important skill when you are trying to publish or fund research. Combined, these assignments will account for 250 points (25%) of your grade.

Final Project: Report and Presentation

The final reports and presentations on the Catalysis Project will serve as the culminating experiences of this course. Your presentations will be given on the last day of class (May 10, 2024) and the final version of your reports will be due by the end of the assigned exam time (9:30 am) on Thursday, May 16, 2024. Together, these assignments will be worth 250 points (25%) of your grade.

✓ Grading Information

All assignments should be submitted on or before the assigned deadline, but I will do my best to be accommodating for unforeseen circumstances if I receive appropriate communication. Please contact me with as much of a heads up as possible (ideally before the assignment deadline) if you have to miss an assignment and we can discuss the situation.

Breakdown

Grade	Range	Notes
A plus	96 and above	
A	92 to 95.9	
A minus	88 to 91.9	
B plus	84 to 87.9	
B	80 to 83.9	
B minus	76 to 79.9	
C plus	72 to 75.9	
C	68 to 71.9	
C minus	64 to 67.9	
D plus	60 to 63.9	
D	50 to 59.9	
F	less than 50	

University Policies

Per [University Policy S16-9 \(PDF\)](http://www.sjsu.edu/senate/docs/S16-9.pdf) (<http://www.sjsu.edu/senate/docs/S16-9.pdf>), relevant university policy concerning all courses, such as student responsibilities, academic integrity, accommodations, dropping and adding, consent for recording of class, etc. and available student services (e.g. learning assistance, counseling, and other resources) are listed on the [Syllabus Information](https://www.sjsu.edu/curriculum/courses/syllabus-info.php) (<https://www.sjsu.edu/curriculum/courses/syllabus-info.php>) web page. Make sure to visit this page to review and be aware of these university policies and resources.

Course Schedule

The schedule below includes both what we will do in class and assignment deadlines. Note that assignments should be turned in by the start of class on the day they are listed. Please reach out to me ahead of time if you will need an extension for any reason.

When	Topic	Notes
Class 1 01/26/2024 9:00 AM - 3:40 PM ISB 240	Introduction to course and safety training	Introduction to the course especially logistics, the syllabus, the safety information, and an overview of the projects. Complete the safety quiz and sign chemical SOPs.
Class 2 02/02/2024 9:00 AM - 3:40 PM ISB 240	Lab orientation, review 1st project and proposal assignments	Assignment due: Pre-Lab Notes for your first Short Project. Class time: We will confirm that everyone has the needed equipment and do locker check-ins as well as administer 2nd attempts for safety quizzes, if necessary. I will meet with each cohort (A and B) to discuss your first Short Project and share some feedback on your Pre-Lab Notes. We will also discuss the Catalysis Project and associated assignments. There will be time to either start your first Short Project or start your proposal.
Class 3 02/09/2024 9:00 AM - 3:40 PM ISB 240	Short Project A	Assignment due: Proposal Discussion #1
Class 4 02/16/2024 9:00 AM - 3:40 PM ISB 240	Short Project A	
Class 5 02/23/2024 9:00 AM - 3:40 PM ISB 240	Short Project A	Assignment due: Pre-Lab Notes for your 2nd Short Project If you complete your 1st Short Project before the end of class today, you can work on your Write-up, start on your 2nd Short Project, or use the time for your proposal. When you complete your 1st Short Project, please share your notebook with me for review (can be done this week or next week).
Class 6 03/01/2024 9:00 AM - 3:40 PM ISB 240	Short Project B	Assignment due: Graded Discussion for your 1st Short Project, Proposal Discussion #2

When	Topic	Notes
Class 7 03/08/2024 9:00 AM - 3:40 PM ISB 240	Short Project B	Assignment due: Write-up for your 1st Short Project
Class 8 03/15/2024 9:00 AM - 3:40 PM ISB 240	Short Project B	Assignment due: Proposal Form If you complete your 2nd Short Project before the end of class today, you can work on your Write-up or use the time for your proposal. When you complete your 2nd Short Project, please share your notebook with me for review (can be done this week or next week).
Class 9 03/22/2024 9:00 AM - 3:40 PM ISB 240	Proposal Presentations	Assignment due: Graded Discussion for your 2nd Short Project, Proposal Presentation, Proposal Reviews
Class 10 03/29/2024 9:00 AM - 3:40 PM ISB 240	Final Project Planning	Assignments due: Write-up for your 2nd Short Project, Response to Proposal Reviews, Final Project Discussion
Spring Break 04/05/2024	No class	
Class 11 04/12/2024 9:00 AM - 3:40 PM ISB 240	Final Project	
Class 12 04/19/2024 9:00 AM - 3:40 PM ISB 240	Final Project	
Class 13 04/26/2024 9:00 AM - 3:40 PM ISB 240	Final Project	

When	Topic	Notes
Class 14 05/02/2024 9:00 AM - 3:40 PM ISB 240	Final Project	
Class 15 05/10/2024 9:00 AM - 3:40 PM ISB 240	Final Presentations	Assignment due: Final Presentation
Assigned final exam time 05/16/2024 9:30 AM - 9:30 AM	Final Reports Due	Assignment due (by 9:30 am): Final Project Report