

# Physical-Inorganic Techniques CHEM 146

Spring 2026 Section 01 In Person 3 Unit(s) 01/22/2026 to 05/11/2026 Modified 01/29/2026

## Contact Information

Instructor: Prof. Madalyn Radlauer

pronouns: she/her/hers

## 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.

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 and that anything that you are taking back out of the lab with you be decontaminated if necessary. Also, please make sure that you're only using your devices for the coursework.

## Lunch, etc.

I understand that the class runs for basically the whole day including 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.

## Generative AI

You may use generative AI tools such as ChatGPT to support your coursework in this class; in fact, I'm very interested to hear about the ways that you find it to be helpful. When using generative AI tools, always provide clear, thoughtful, and specific prompts, and carefully review all responses for accuracy,

completeness, and relevance before using them in your work. Remember, submitting AI-informed work under your name means that you stand behind its accuracy. When you use generative AI in any assignment, I ask that you indicate that and include the prompt(s) that you shared.

I will set some limitations on the use of generative AI tools because this course is about your individual learning and I want you to develop your critical thinking and data analysis skills, to practice science communication, and to share your perspectives on the science.

- Anything you submit you must have fully vetted and stand behind.
- Anytime you use generative AI tools, you must indicate what you used it for and include the prompt(s) you used
- Never put anyone of your classmate's work into generative AI tools
- Anything that asks for your perspective should be just that, not the perspective of generative AI
- Use generative AI only to support your own work, not to do the work for you, as this is likely going to lead to a lack of engagement and undermine the skill development we want for you in this course
- Reference: <https://www.media.mit.edu/publications/your-brain-on-chatgpt/>

## Program Information

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### 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

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

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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

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### 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 (goggles will be provided to you, but you can bring your own eye protection if you prefer); and a lab coat (provided to you).

## 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 Grace Skalinder and her email address is [grace.skalinder@sjsu.edu](mailto:grace.skalinder@sjsu.edu).

## References

There are no required texts for this course. Inorganic, physical, and analytical chemistry textbooks such as

- Inorganic Chemistry (<https://www.pearsonhighered.com/miessler5einfo/>) (<https://www.pearsonhighered.com/miessler5einfo/>) by Gary L. Miessler, Paul J. Fischer, and Donald A. Tarr (5th edition, 2014) ISBN: 9780321811059 and
- Introduction to Spectroscopy (<https://www.cengage.com/c/introduction-to-spectroscopy-5e-pavia-lampman-kriz-vyvyan/9781285460123/>) (<https://www.cengage.com/c/introduction-to-spectroscopy-5e-pavia-lampman-kriz-vyvyan/9781285460123/>) by Donald L. Pavia, Gary M. Lampman, George S. Kriz, and James A. Vyvyan (5th edition, 2015) ISBN: 9781305221796

may be useful for background information.

## Course Requirements and Assignments

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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 23, 2026.

## Discussion Posts

Canvas discussion posts 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 8, 2026) and the final version of your reports will be due by the end of the assigned exam time (10:30 am) on Friday, May 13, 2026. Together, these assignments will be worth 250 points (25%) of your grade.

## ✓ Grading Information

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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	

Grade	Range	Notes
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
<b>Class 1</b> 01/23/2026 9:00 AM - 3:40 PM	Introduction to course and safety training	Introduction to the course especially logistics, requirements and expectations, the syllabus, the safety information, and an overview of the projects  Complete lab check in, the safety quiz, and sign chemical SOPs  Introduction to the Short Projects

When	Topic	Notes
<b>Class 2</b> 01/30/2026 9:00 AM - 3:40 PM	Short Project 1/2	Assignment due: Pre-Lab Notes for Short Project 1/2 (please submit by noon on Thursday, 1/29/2026)  Seminar: Background for the CURE and associated assignments  Lab time: Check-off on pre-lab preparations. Administration of 2nd attempts for safety quizzes, if necessary. Work on Short Project 1/2
<b>Class 3</b> 02/06/2026 9:00 AM - 3:40 PM	Short Project 1/2	Assignment due: Proposal Discussion #1  Seminar: Synthetic techniques, choosing scale, identifying hazards, and additional preparations for a day of (organometallic) research  Lab time: Short Project 1/2
<b>Class 4</b> 02/13/2026 9:00 AM - 3:40 PM	Short Project 1	Seminar and Lab time: Complete Short Project 1/2  During class time, I will also have 20-minute meeting slots for each of you to check in with me about your proposals.  When you complete your 1st Short Project, please share your notebook with me for in-class review
<b>Class 5</b> 02/20/2026 9:00 AM - 3:40 PM	Short Project 2/1	Assignments due: Pre-Lab Notes for Short Project 2/1 (please submit by noon on Thursday 2/19/2026) and Short Project 1/2 Discussion  Seminar: Catalysis and what I often find frustrating about the catalysis literature  Lab time: Short Project 2/1
<b>Class 6</b> 02/27/2026 9:00 AM - 3:40 PM	Short Project 2/1	Assignments due: Proposal Discussion #2 and Short Project 1/2 Write-up  Seminar: Air and water-free techniques: the Schlenk line vs the glovebox  Lab time: Short Project 2/1  During class time, I will also have 20-minute meeting slots for each of you to check in with me about your proposals.
<b>Class 7</b> 03/06/2026 9:00 AM - 3:40 PM	Short Project 2/1	Assignment due: Proposal form  Seminar: Schlenk line demo and hands-on practice  Lab time: Complete Short Project 2/1  When you complete your 2nd Short Project, please share your notebook with me for in-class review

When	Topic	Notes
<b>Class 8</b> 03/13/2026 9:00 AM - 3:40 PM	Proposal Presentations	Assignment due: Proposal Presentation (send me your presentation before the start of class), Proposal Reviews (due at the end of the proposal presentations)  Seminar: How research gets funded, how to constructively review others' work, and how to respond to reviewers  Lab time: Proposal Presentations and Reviews, any remaining clean up from short projects, determine which proposed projects we will pursue
<b>Class 9</b> 03/20/2026 9:00 AM - 3:40 PM	CURE Project Planning	Assignments due: Short Project 2/1 Discussion and Write-up  Seminar: Chat – about writing papers and keeping up to date on the literature  Lab time: CURE Project planning - ensure we have all of the needed chemicals and equipment, write out procedures for your planned experiments (including scale), write a schedule for your planned experiments, and confirm with me
<b>Class 10</b> 03/27/2026 9:00 AM - 3:40 PM	CURE project	Assignments due: Response to Proposal Reviews, CURE Project Discussion  Seminar: Chat – about going to conferences and networking  Lab time: CURE project
<b>Spring Break</b> 04/03/2026	No class	
<b>Class 11</b> 04/10/2026 9:00 AM - 3:40 PM	CURE Project	Seminar: Meeting the new NMR instrument  Lab time: CURE project
<b>Class 12</b> 04/17/2026 9:00 AM - 3:40 PM	CURE Project	Seminar: NMR spectroscopy 2.0: experiments you may not have heard of, parameters you may never have altered, and "no D" NMR spectra  Lab time: CURE project and visit to CoS Student Research Day
<b>Class 13</b> 04/24/2026 9:00 AM - 3:40 PM	CURE Project	Seminar: Chat – about paths after your degree at SJSU  Lab time: CURE project

When	Topic	Notes
<b>Class 14</b> 05/01/2026 9:00 AM - 3:40 PM	CURE Project	Seminar: Chat – about the course and what you’re going to take away from it  Lab time: CURE project (last day)
<b>Class 15</b> 05/08/2026 9:00 AM - 3:40 PM	Final Presentations	Assignment due: Final Presentation (please send me your presentation files before class)  Final Presentations will be open to the department and any visitors you want to invite  After: Clean up and check out of lab
<b>Assigned final exam time</b> 05/13/2026 10:30 AM - 10:30 AM	Final Reports Due	Assignment due (by 10:30 am): CURE Project Report