

**San José State University**  
**Department of Chemistry**  
**Physical-Inorganic Techniques, CHEM 146, Spring 2023**

<b>Instructor:</b>	Prof. Gilles Muller
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<b>Email:</b>	Via Canvas and/or <a href="mailto:gilles.muller@sjsu.edu">gilles.muller@sjsu.edu</a> ( <i>preferred means of contact</i> )
<b>Office Hours:</b>	Fridays 8:00 am – 9:00 am ( <i>other times by appointment</i> )
<b>Class Days/Time:</b>	Fridays 9:00 am – 3:40 pm
<b>Classroom:</b>	DH 010
<b>Prerequisites:</b>	CHEM 100W, CHEM 113A, CHEM 145 (with grades of "C" or better; "C-" not accepted) or instructor consent.

### Course Website

Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on [Canvas](https://sjsu.instructure.com/) (<https://sjsu.instructure.com/>). In addition, all assignments will be submitted via Canvas. You are responsible for regularly checking with the messaging system in Canvas to learn any updates.

### Course Description (from the course catalog)

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.

### Course Goals and Learning Objectives

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.

### Program Learning Objectives (PLO)

CHEM 146 will address the following [chemistry department program learning objectives](https://www.sjsu.edu/chemistry/academic-programs/undergraduate-programs/undergraduate-plo.php) (<https://www.sjsu.edu/chemistry/academic-programs/undergraduate-programs/undergraduate-plo.php>):

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 #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.

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 Learning Outcomes (CLO)**

The main student learning objectives for CHEM 146 students are as follows:

CLO #1 – Make predictions in a laboratory setting based on concepts from general, physical, analytical, and inorganic chemistry courses.

CLO #2 – Determine, execute, and troubleshoot synthetic and analytical experimental procedures found in the scientific literature safely and efficiently.

CLO #3 – Evaluate and discuss the results of a project.

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.

### **Texts/Readings**

#### **Textbook**

No textbook is required for this course.

**Other References** (not required, these may provide further clarification of various topics)

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 (5<sup>th</sup> edition, 2014) ISBN: 9780321811059 may be useful for background information.

Primary literature will be essential for the projects in this course. You should have a student library account with the King Library that allows you access the [library electronic databases](https://libguides.sjsu.edu/az.php) (<https://libguides.sjsu.edu/az.php>) such as [SciFinder](https://scifinder.cas.org/) (<https://scifinder.cas.org/>). If you plan to access the library services from off-campus, you may need to obtain a password and/or proxy to do so. Check the Library website for information.

#### **Library Liaison**

The reference Librarian for Chemistry is Anne Marie Engelsen and her email is [annemarie.engelsen@sjsu.edu](mailto:annemarie.engelsen@sjsu.edu).

**Other Technology/Equipment/Material Requirements** (more details in lab manual)

You will need a bound, lined laboratory notebook (a partly used notebook with at least 20 unused pages is acceptable); a calculator; lab glasses or goggles; and a lab coat. These are all needed for the first day of lab.

## Course Requirements and Assignments

Graded work in this course will include quizzes; instructor evaluation of your lab technique, especially with regards to safety and your lab notebook; and assignments on the spectroscopic project. Two of these assignments will be completed with a lab partner or group, indicated as “joint.” 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.

Assignments	Points	Percent of Grade
<b>Quizzes</b> (5 points each, safety and plagiarism)	10	<b>2.5 %</b>
<b>Lab technique, safety, notebook</b>	50	<b>12.5 %</b>
<b>Spectroscopy Project</b>		<b>85 %</b>
Proposal form (written)	40	
Proposal presentation (oral)	90	
Critiques of proposals	15	
Response to reviews	15	
Final report (written, joint)	90	
Final presentation (oral)	90	
<b>Total joint</b>	<b>400</b>	

*Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally three hours per unit per week) for instruction or preparation/studying or course-related activities including but not limited to internships, labs, clinical practica. Other course structures will have equivalent workload expectations as described in the syllabus.*

## Final Examination or Evaluation

The final reports and presentations on the project will serve as the culminating experiences of this course. Your presentations will be given on the last day of class (May 12, 2023) and the final version of your spectroscopy project report will be due by 7:15 am on Thursday, May 18, 2023.

## Grading Policy and Criteria

Letter grades will follow a traditional curve, the top 3% earning a plus grade and the bottom 3% earning a minus grade within each decade: 96.0-100% (A+), 92.0-95.9% (A), 88.0-91.9% (A-), 84.0-87.9% (B+), 80.0-83.9% (B), 76.0-79.9% (B-), 72.0-75.9% (C+), 68.0-71.9% (C), 64.0-67.9% (C-), 60.0-63.9% (D+), 56.0-59.9% (D), 52.0-55.9% (D-), below 52% (F). The instructor reserves the right to lower the grading curve at the end of the semester if he deems it to be appropriate.

**Your grades for all the assignments will be posted on Canvas. You have only 9 days from the day a grade is posted to ask for a regrade. I will not do regrades after nine days have passed.**

\*Please note no late submission will be accepted, and will result in a zero grade for that assignment. Being **on time and participation are critical** and students are **responsible for material missed in any lectures or discussions** (some of which may not be in the text). Late assignments **are not to be accepted** without good cause (e.g., medical and family issues), requiring documentation, or involve unforeseen class issues (e.g., instructor sick day).

Plagiarism and any other cheating will not be tolerated, leading to a minimum penalty of an F for the particular assignment and, given the proper circumstances, an F or equivalent for the entire course. See SJSU plagiarism policy, interactive tutorial and the relevant quiz (<https://libguides.sjsu.edu/plagiarism>).

*Incompletes: An incomplete will only be given under the following circumstances: (1) you have completed at least two-thirds of the course work with a grade of C or better, and/or (2) the reason that you cannot complete the course is due to an extreme emergency with appropriate documentation.*

*Students who wish to receive an incomplete and have not fulfilled the above requirements will receive a grade appropriate to their totals. If you decide to quit the class without taking the final exam, you will receive a WU grade, equivalent to an F with the option to repeat the class. Consult with your advisor and/or refer to SJSU Course Catalog for specific details.*

## **Classroom Protocols**

Be on time to class. This semester we will have class periods in person. It is your responsibility to keep track of when and where you need to be. There are no additional times to make-up lab work because of the COVID limitations. You must be present at each of your assigned lab periods in order to complete the work required for this course. Similarly, no make-up sessions will be available for oral presentations. That said, under unavoidable circumstances, students are required to provide explanations for missed class time in writing with supporting documentation. In addition, contact me ASAP so that we can figure out an accommodation.

Device use in class generally should be limited to use of calculators or note taking, though as we move through the course and rely more on the primary literature, you may want to access papers or work on reports on a laptop.

I hope that the classroom will serve as an environment that will promote learning and the development of new ideas, as well as be a safe and respectful community in person and online. Behavior that interferes with the normal academic function in the lab is unacceptable. Students exhibiting this behavior will be asked to leave the class and will not be given the opportunity to make up the time. The university has a [brochure on student conduct](https://www.sjsu.edu/studentconduct/docs/SJSU-SCED-Brochure-English.pdf) that you can view at <https://www.sjsu.edu/studentconduct/docs/SJSU-SCED-Brochure-English.pdf>. Examples of such behavior include:

- a) Persistent interruptions or using disrespectful adjectives in response to the comments of others.
- b) The use of obscene or profane language.
- c) Persistent and disruptive late arrival to or early departure from virtual class without permission.
- d) Physical threats, harassing behavior, or personal insults (even when stated in a joking manner).
- e) *Other inappropriate behavior e.g. yelling directed at classmates and/or faculty.*
- f) Use of personal electronic devices such as pagers, cell phones, PDAs in virtual class, unless it is part of the instructional activity

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.

## **Safety Quiz**

After the first day of class you will need to take and pass a course-specific safety quiz with a score of 80% or higher to remain enrolled in the course. This should be easily accomplished based on your participation in our class safety discussion and your previous lab safety training.

## Laboratory Sessions

Students **MUST** adhere to safety regulations outlined during our safety discussion at all times. Persistent failure to adhere to safety protocols will result in a failing grade or removal from the course. Experiments unrelated to the assigned project will not be allowed in the laboratory under any circumstances, and students engaging in such experiments will be withdrawn from the laboratory immediately.

## Email Policy

I receive a lot of emails, 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, especially during high volume times (e.g. around exams). Please try not to wait until the last minute to ask questions via email. I may also be slower to respond to emails late at night or over the weekends. Office hours are the best way to get timely answers to more complicated questions.

## Equipment

You will be assigned an individual locker of equipment for your use during this course. You will be checked into your locker during the first two lab periods by the instructor, and sign an acknowledgement that you have all of your equipment. You are responsible for keeping track of all of the contents of your drawer. If you lose or break any item, you will be assessed a replacement fee at the end of the semester, so be careful with your equipment. It is possible to complete this course with a relatively small bill for expendable items: it is also possible to end up with a >\$100 bill. At the end of each lab period, make sure you have collected all your locker items before leaving.

When you check in, you will be given a coded check out pad from the storeroom. You may use this pad to check out additional equipment from the storeroom which may be required for a particular experiment. **Note that certain equipment items checked out must be returned the same day to avoid a late fee.** Remember, the code on your pad is assigned to you only, don't lose it, or someone else can check out items which will be charged to you. The Service Center will give you a document detailing their policies – read these carefully and make sure you understand the rules.

At the end of the semester, you must clean out your locker, replace all broken equipment or glassware, and have the instructor sign the check-out form. If this process is not completed fully, you may be charged a fee to clean and refurbish your locker (also, if you drop the class, you must checkout no later than May 13 to avoid this fee).

## Reagent Requests

Request for reagents for the next week's lab session must be made by 5:00 PM on the preceding Monday. If a request is not received by that time, it will be assumed no additional reagents are needed, other than those already available in the lab. Every effort will be made to honor reagent requests.

## Collaborative Work

The majority of the lab work will be done with a partner or in a group of three. Group members are responsible for the equitable division of labor. If there is a problem regarding contribution (or lack thereof) from your lab partner, please bring this to my attention as soon as it becomes an issue. There are only 15 class meetings, though each is roughly 7 hours, so we must be vigilant. If I notice that any student does not appear to be pulling their weight, I will address the group at my discretion. Every member is required to maintain their own laboratory notebook and only three of the graded assignments will be turned in jointly: the written reports for the projects. For these assignments, all members of the group will receive the same grade unless an issue has previously been brought to my attention.

## University Policies

Per [University Policy S16-9](http://www.sjsu.edu/senate/docs/S16-9.pdf) (<http://www.sjsu.edu/senate/docs/S16-9.pdf>), relevant information to all courses, such as academic integrity, accommodations, dropping and adding, consent for recording of class, etc. is available on Office of Graduate and Undergraduate Programs' [Syllabus Information web page](http://www.sjsu.edu/gup/syllabusinfo/) at <http://www.sjsu.edu/gup/syllabusinfo/>.

**Tentative Course Schedule, Chem 146, Spring 2023** (check Canvas for updates and pdf files)

Week	Date	Topics, Readings, Assignments, Deadlines
1	F 01/27	First day of class (meet in DH-505 at 9:00 am) - Course introduction and review of syllabus, safety session, plagiarism discussion, keeping a good notebook discussion, spectroscopy project descriptions and assignments, introduction to library research and discussion of literature, and lab check-in SJSU library resources session by Librarian Anne Marie Engelsen (starting at 2:00 pm in the Library, MLK 213, <a href="https://library.sjsu.edu/floor-plans/king-library-floor-plans?f=2-4">https://library.sjsu.edu/floor-plans/king-library-floor-plans?f=2-4</a> ) <i>Safety quiz completion due before or by 11:59 pm on Feb 02*</i> <i>Prerequisite course documentation due before or by 11:59 pm on Feb 02*</i>
2	F 02/03	Start spectroscopy project proposal plan Continue lab check-in, spectroscopy project description and assignments, group assignments, UV-Vis spectroscopy discussion <i>Plagiarism tutorial completion due before or by 11:59 pm on Feb 09*</i>
3	F 02/10	Continue spectroscopy project proposal plan Fluorescence and phosphorescence spectroscopy discussion
4	F 02/17	Determine spectroscopy project plan discussion with check-in Luminescence spectroscopy from metal systems discussion
5	F 02/24	Writing a paper, supporting information and what you can learn from it Determine final spectroscopy project plan <i>Spectroscopic project proposal form due before or by 11:59 pm on March 02*</i> <i>Spectroscopic project proposal oral presentation PowerPoint document due before or by 11:59 pm on March 02*</i>
6	F 03/03	<b><i>Spectroscopic project proposal oral presentation - day 1 (9:00 am – 3:40 pm)</i></b> <i>Recommending spectroscopic project proposal to be funded assessment due before or by 5:00 pm on March 03*</i>
7	F 03/10	Start spectroscopy project How research gets funded, how to constructively review others' work, and how to respond to reviewers <i>Critiques of spectroscopic project proposals due before or by 11:59 pm on March 16*</i>
8	F 03/17	Continue spectroscopy project
9	F 03/24	In-person library activity – scientific literature & review of critiques of spectroscopic project proposal <i>Response to critiques of spectroscopic project proposals due before or by 3:40 pm on March 24*</i>
	F 03/31	<i>Spring Recess - no class, campus closed</i>
10	F 04/07	Continue spectroscopy project
11	F 04/14	Continue spectroscopy project
12	F 04/21	Continue spectroscopy project
13	F 04/28	Continue spectroscopy project

Week	Date	Topics, Readings, Assignments, Deadlines
14	F 05/05	Finish spectroscopy project with check-in <i>Spectroscopic project oral presentation PowerPoint document due before or by 11:59 pm on May 11*</i>
15	F 05/12	Last day of class - Clean up and check-out, turn in lab notebooks for grading <i>Spectroscopic project oral presentation – day 1 (9:00 am – 3:40 pm)</i>
Final	F 05/18	<b>Final Report</b> in lieu of Final Exam due on May 18 by 07:15 am*

\* Assignment files are always due before or by the given time on the date stated (loaded on Canvas)