

**San José State University**  
**College of Science, Dept. of Chemistry**  
**Chem 160, Physical Chemistry, Spring 2023**

**Course and Contact Information**

<b>Instructor:</b>	Gianmarc Grazioli, Ph.D. Preferred names: Dr. Grazioli or Dr. G
<b>Office Location:</b>	Office hours and all other meetings with Dr. Grazioli will take place via Zoom. A link to the designated office hours Zoom meeting is provided in the first module on the course homepage in Canvas. <b>NOTE:</b> The Zoom link for office hours is different from the one used for synchronous class meetings.
<b>Email:</b>	<a href="mailto:gianmarc.grazioli@sjsu.edu">gianmarc.grazioli@sjsu.edu</a>
<b>Office Hours:</b>	Tuesdays 11:00am – 12:00pm Thursdays 11:00am – 12:00pm Fridays 3:45pm – 4:05pm, or by appointment <b>Office hours Zoom link:</b> <a href="https://sjsu.zoom.us/j/99103232268">https://sjsu.zoom.us/j/99103232268</a>
<b>Class Days/Time:</b>	Tuesdays and Thursdays from 12:00 – 1:15pm, and Fridays 12:00 – 12:50 pm
<b>Classroom:</b>	The course is hybrid, but mostly online. Homework assignments and course materials can be accessed through the Canvas page for this course. <b><u>Exams will be given in-person in DH 351.</u></b> Regular class meetings (i.e. not exam days) will be held synchronously via Zoom, and video recordings will always be available to (re)watch later. Please note that the room, DH 351, is also available during class time for you to attend the Zoom session using your laptop, if you need to find a room in between in person classes. A link for logging into Zoom sessions for synchronous class meetings is provided in the first module on the course homepage in Canvas. <b>Class Zoom link:</b> <a href="https://sjsu.zoom.us/j/87379866173?pwd=SGRqQmdpNk9rTmpJd3plc1FGQy82QT09">https://sjsu.zoom.us/j/87379866173?pwd=SGRqQmdpNk9rTmpJd3plc1FGQy82QT09</a>
<b>Prerequisites:</b>	Chem 55, Phys 2B, Math 30 and Chem 120S (with grades of “C” or better, “C-“ not accepted)
<b>Credit:</b>	4 units

**Course Web Page**

Course materials such as syllabus, handouts, notes, assignment instructions, and any other materials can be found on [CANVAS](#). **You are responsible for regularly checking CANVAS to learn of any updates to the schedule and/or assignment deadlines.**

## Course Description

Introduction to the fundamental principles of physical chemistry. This includes thermodynamics, kinetics, quantum mechanics and spectroscopy.

## Course Learning Outcomes (CLOs)

The main learning outcomes for CHEM 160 students are as follows:

1. Explain and apply the concepts of thermodynamics, kinetics, quantum mechanics, and spectroscopy to chemical, physical, and biochemical systems.
2. Derive essential mathematical relationships in thermodynamics, kinetics, quantum mechanics, and spectroscopy.
3. Students will apply essential mathematical relationships to chemical, physical, and biochemical problems, including chemical and biochemical reactions and phase equilibria.
4. Students will evaluate physical and chemical systems to determine how to control these systems.

## Program Learning Objectives

This course addresses the following [BS/BA Chemistry Program Learning Objectives](#)

4. Demonstrate understanding of core concepts, methods and limits of scientific investigation to effectively solve problems in physical chemistry.

## Required Texts Textbooks

Required: "Physical Chemistry for the Life Sciences", 2<sup>nd</sup> Edition, Peter Atkins and Julio De Paula, W.H. Freeman and Company (2011). ISBN: 9781429231145.

**This is a low-cost class and book purchases/rentals are ~\$30. By keeping this text the cost of the course was reduced from \$200 to \$30. This is in compliance with California bill SB-1359; Low-cost course material bill (The Donahoe Higher Education Act).**

Not required: "Solutions manual to accompany Physical Chemistry for the Life Sciences", 2<sup>nd</sup> Edition, Charles Trapp and Marshall Cady, W.H. Freeman and Company (2011)  
ISBN:9780109600328

## Requirements for Online Lectures

This course will be run through Canvas and zoom. You will have certain technological and behavioral expectations.

## Technology Requirements

Students are required to have an electronic device (laptop, desktop, or tablet) with a camera and built-in microphone. The SJSU library has a [free equipment loan program](#) available for students for the semester. Students are responsible for ensuring that they have access to reliable WiFi during tests. If students are unable to have reliable WiFi, they must inform the instructor, as soon as possible

or at the latest one week before the test date to determine an alternative. See [LearnAnywhere website](#) for current WiFi options on campus.

## **Recording Zoom Classes**

This course or portions of this course (i.e., lectures, discussions, student presentations) will be recorded for instructional or educational purposes. The recordings will only be shared with students enrolled in the class through Canvas. The recordings will be deleted at the end of the semester. If, however, you would prefer to remain anonymous during these recordings, then please speak with the instructor about possible accommodations (e.g., temporarily turning off identifying information from the Zoom session, including student name and picture, prior to recording).

Students are not allowed to record without instructor permission. Students are prohibited from recording class activities (including class lectures, office hours, advising sessions, etc.), distributing class recordings, or posting class recordings. Materials created by the instructor for the course (syllabi, lectures and lecture notes, presentations, etc.) are copyrighted by the instructor. This university policy (S12-7) is in place to protect the privacy of students in the course, as well as to maintain academic integrity through reducing the instances of cheating. Students who record, distribute, or post these materials will be referred to the Student Conduct and Ethical Development office. Unauthorized recording may violate university and state law. It is the responsibility of students that require special accommodations or assistive technology due to a disability to notify the instructor

## **Proctoring Software and Exams**

Exams will be proctored in this course through Respondus LockDown Browser. Please note it is the instructor's discretion to determine the method of proctoring. If cheating is suspected the proctored videos may be used for further inspection and may become part of the student's disciplinary record. Note that the proctoring software does not determine whether academic misconduct occurred, but does determine whether something irregular occurred that may require further investigation. Students are encouraged to contact the instructor if unexpected interruptions (from a parent or roommate, for example) occur during an exam.

## **Library Liaison**

Anne Marie Engelsen, [annemarie.engelsen@sjsu.edu](mailto:annemarie.engelsen@sjsu.edu)

## **Course Requirements and Assignments**

### **Flipped Classroom**

Parts of this course will apply a "flipped classroom" modality, in which lecture videos will be placed on the Canvas site, to be watched before attending the in-person zoom meeting. You are expected to watch these videos and take thorough notes *before* each lecture. It is very important you watch and comprehend the pre-class videos! It may require multiple viewings to absorb the concepts and mathematical descriptions. Remember, functions for pausing, rewinding, speeding up and slowing down the video are there for you, make use of them!

## Reading

The course schedule indicates the lecture topics and the chapters in Atkins and De Paula that are relevant to these topics for each week. You are expected to read these chapters *before* each lecture. It is very important to read the material in the text! It may require multiple readings of the text to absorb the concepts and mathematical descriptions. Not everything in the text will be covered in the lecture. Likewise, some material covered in lecture may not be found in the text. The text is intended to be a primary reference for the material covered in the course.

## Homework / Problem Sets

Homework problems will be posted on Canvas with problems relevant to the lectures that are important, interesting and challenging. Homework problems will reflect similar questions on the exams. You are encouraged to work with others on homework assignments, but be sure that you are able to solve the problems on your own for exams. Homework keys will be posted on the CHEM 160 Canvas page. Homework problems include both text book problems and the supplemental problems assigned for oral presentations. You will be responsible for any problems in Atkins and De Paula with respect to exams.

## Oral Exams

Another graded component that will be included in this course are oral exams via Zoom. Although not limited to homework problems, typical oral exams for this course will consist of you showing me homework problems that you have completed and explaining to me the steps you took to solve it. The motivation behind these assignments is to ensure that you really do understand the work you submitted as homework. **I strongly encourage you to work together on homework assignments**, but I want to make sure you really understand the work you are turning in and not just copying a classmate's work. So, if your friend helps you figure out a homework problem, make sure you understand why that solution is correct because you may need to explain your answer on a future oral exam!

## Solving Physical Chemistry Problems Requires Practice

It is difficult to learn physical chemistry by simply attending lectures and reading the book. Lectures are, by their nature a supplement to the text and will help introduce you to the concepts that are necessary for **problem solving**, which is **the key** to learning physical chemistry. Therefore, this requires that you take on the responsibility of working through problem sets. You need to spend at least 4-5 hours weekly practicing problems.

Homework is due, submitted through canvas, on the due date. Evaluation of homework sets will be done on a "spot-check" basis, with students being responsible for all assigned problem sets but only one or two representative problems will be thoroughly evaluated. Students will be responsible for comparing their work with the provided answer keys. There will also be a completion component. Late homework will not be accepted penalty-free. Students unable to turn in their assignment in class have until midnight the due date to get it to the instructor, with a sliding penalty scale where they get deducted -0% for the first late, -20% for the second late, -40% for the third late, etc.

## Group Work

A considerable amount of class time will be used to discuss material and work through representative problem sets in small groups. Though attendance will not be taken, participation and engagement will be included within your grade as a single problem set.

## Lecture Exams and Final

**Some topics have been covered in General Chemistry courses. Review that course material and exams!** Three midterm exams (100 points each), will be given approximately every fourth week. Dates for the exams are on the course schedule (On this syllabus below and on Canvas). There will be no make-ups for lecture exams. Should you miss an exam because of illness or equally compelling reasons, you should inform me of the fact as soon as possible, and hopefully before the exam is given. You will need to provide me with written evidence (doctor's note, police report, etc.) for your excuse. If I accept your excuse, I will use the score on the final as your missing exam score. An unexplained or unsatisfactory excuse for missing an exam will result in a grade of zero.

## Grading

Your performance in the course will be evaluated as follows:

Problem Sets	75 pts.
Oral Exams	75 pts.
Midterm Exam 1	100 pts.
Midterm Exam 2	100 pts.
Midterm Exam 3	100 pts.
Final Exam	150 pts.
<b>Total</b>	<b>600pts.</b>

**Failure to take the final will result in a failing grade (F) for the course.** The following scale indicates the letter grade has a function of the percentage of points received per student. I reserve the right to adjust the scale downward if conditions warrant, but will not raise the minimum required for any particular grade. Standard rounding practices apply.

Grade	Percent (%)
A	≥ 93.0
A-	92.9 – 88.0
B+	87.9 - 84.0
B	83.9 – 79.0
B-	78.9 – 75.0
C+	74.9 – 69.0
C	68.9 – 65.0
C-	64.9 – 60.0
D	59.9 – 50.0
F	< 50

## University Policies

Per [University Policy S16-9](#), 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](#). Make sure to visit this page, review and be familiar with these university policies and resources.

### Dropping and Adding

Students are responsible for understanding the policies and procedures about add/drop, grade forgiveness, etc. Refer to the current semester's [Catalog Policies](#) section. Add/drop deadlines can be found on the current academic year calendars document on the [Academic Calendars webpage](#). The [Late Drop Policy](#) is available at <http://www.sjsu.edu/aars/policies/latedrops/policy/>. Students should be aware of the current deadlines and penalties for dropping classes. Information about the latest changes and news is available at the [Advising Hub](#).

### Academic integrity

Your commitment, as a student, to learning is evidenced by your enrollment at San Jose State University. The University [Academic Integrity Policy S15-7](#) requires you to be honest in all your academic course work. Executive order 1098 also outlines student conduct and honesty policies and can be found on the student conduct website. Faculty members are required to report all infractions to the office of Student Conduct and Ethical Development. Please see the [Student Conduct and Ethical Development website](#) for more information.

Instances of academic dishonesty will not be tolerated. Cheating on exams or plagiarism (presenting the work of another as your own, or the use of another person's ideas without giving proper credit) will result in a failing grade and sanctions by the University. For this class, all assignments are to be completed by the individual student unless otherwise specified. Any text, diagram, chart or data that is not the product of the student author must cite a reference for the source as appropriate. This includes (but is not limited to) material taken from reference books, tables, primary research literature, laboratory manuals and computer programs. Failure to adhere to the principles that protect the academic integrity of this course will be dealt with according to the policies and procedures of the Department of Chemistry, the College of Science and San Jose State University.

## **Workload**

SJSU classes are designed such that in order to be successful, it is expected that students will spend a minimum of 45 hours for each unit of credit (normally three hours per unit per week), including preparing for class, participating in course activities, completing assignments, and so on. More details about student workload can be found in [University Policy S12-3](#).

## **Class Attendance**

Attendance will not be taken in lecture, but you are responsible for all announcements and material presented during class. Lecture material does not necessarily reiterate text material. It is a serious mistake either to depend on a classmate's notes or exclusively on the textbook. To succeed in this course it is essential to attend class, perform the readings prior to class and complete the assigned homework. The instructor is not responsible for covering material you missed due to unexcused absences.

NOTE that [University policy F69-24](#) states that "Students should attend all meetings of their classes, not only because they are responsible for material discussed therein, but because active participation is frequently essential to insure maximum benefit for all members of the class. Attendance per se shall not be used as a criterion for grading."

## **Consent for Recording of Class and Public Sharing of Instructor Material**

[University Policy S12-7](#) requires students to obtain instructor's permission to record the course and the following items to be included in the syllabus:

- "Common courtesy and professional behavior dictate that you notify someone when you are recording him/her. You must obtain the instructor's permission to make audio or video recordings in this class. Such permission allows the recordings to be used for your private, study purposes only. The recordings are the intellectual property of the instructor; you have not been given any rights to reproduce or distribute the material." ○ In classes where active participation of students or guests may be on the recording, permission of those students or guests should be obtained as well.
- "Course material developed by the instructor is the intellectual property of the instructor and cannot be shared publicly without his/her approval. You may not publicly share or upload instructor generated material for this course such as exam questions, lecture notes, or homework solutions without instructor consent."

## **General Expectations, Rights and Responsibilities of the Student**

As members of the academic community, students accept both the rights and responsibilities incumbent upon all members of the institution. Students are encouraged to familiarize themselves with SJSU's policies and practices pertaining to the procedures to follow if and when questions or concerns about a class arises, as discussed in [University Policy S90-5](#). More detailed information on a variety of related topics is available in the [SJSU catalog](#). In general, it is recommended that students begin by seeking clarification or discussing concerns with their instructor. If such conversation is not possible, or if it does not serve to address the issue, it is recommended that the student contact the Department Chair as a next step.

## **Campus Policy in Compliance with the American Disabilities Act**

If you need course adaptations or accommodations because of a disability, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. [Presidential Directive 97-03](#) requires that students

with disabilities requesting accommodations must register with the [Accessible Education Center](#) (AEC) to establish a record of their disability.

### **SJSU Peer Connections**

Peer Connections, a campus-wide resource for mentoring and tutoring, strives to inspire students to develop their potential as independent learners while they learn to successfully navigate through their university experience. You are encouraged to take advantage of their services which include coursecontent based tutoring, enhanced study and time management skills, enhanced critical thinking strategies, decision making and problem-solving abilities, and campus resource referrals.

In addition to offering small group, individual, and drop-in tutoring for a number of undergraduate courses, consultation with mentors is available on a drop-in or by appointment basis. Workshops are offered on a wide variety of topics including preparing for the Writing Skills Test (WST), improving your learning and memory, alleviating procrastination, surviving your first semester at SJSU, and other related topics. A computer lab and study space are also available for student use in Room 600 of Student Services Center (SSC).

Peer Connections is located in three locations: SSC, Room 600 (10th Street Garage on the corner of 10<sup>th</sup> and San Fernando Street), at the 1st floor entrance of Clark Hall, and in the Living Learning Center (LLC) in Campus Village Housing Building B. Visit [Peer Connections website](#) for more information.

### **Chemical Safety**

[CHEM 120S Chemical Safety Seminar](#) is a required course for all chemistry majors and minors. The additional [Safety Training](#) is a requirement/prerequisite for CHEM 180/298, if working in a wet/chemical research lab. Please visit the [Safety Training website](#) to sign up for more information.

### **Safe and Respectful Community**

We hope that the classroom and laboratory will serve as an environment that will promote learning and the development of new ideas, as well as be a safe and respectful community. Behavior that interferes with the normal academic function in a classroom or lab is unacceptable. Students exhibiting this behavior will be asked to leave the class. 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) Yelling at classmates and/or faculty.
- d) Physical threats, harassing/bullying behavior, or personal insults (even when stated in a joking manner).

**Disclaimer:** All readings, assignments, due dates, exam dates, and any other course materials are subject to change to best serve the needs of the students and the course. Any changes will be announced via email or Canvas announcement.

## CHEM 160 / Physical Chemistry, Spring 2023, Course Schedule

The following schedule of lecture topics is tentative and subject to change at the instructor's discretion. Readings should be completed **before** the lecture.

Week	Date	Readings from Atkins and De Paula, Topics for Lectures, Exams
1	Jan 26 Jan 27	Syllabus, Mathematics Fundamentals, Gen Chem Review
2	Jan 31 Feb 2 Feb 3	Chapter 1. The First Law of Thermodynamics
3	Feb 7 Feb 9 Feb 10	Chapter 2. The Second Law of Thermodynamics
4	Feb 14 Feb 16 **Feb 17††	Chapter 3. Phase Equilibria
5	Feb 21 Feb 23 Feb 24	Tues – Chapter 3. Phase Equilibria (cont'd) and Review <b>Thurs – Midterm Examination 1</b> Fri – Review of Thermodynamics
6	Feb 28 Mar 2 Mar 3	Chapter 4. Chemical Equilibrium
7	Mar 7 Mar 9 Mar 10	Chapter 6. The Rates of Reactions

Week	Date	Readings from Atkins and De Paula, Topics for Lectures, Exams
8	Mar 14 Mar 16 Mar 17	Chapter 7. The Rates of Reactions
9	Mar 21 Mar 23 Mar 24	Tues – Chapter 7. The Rates of Reactions (cont'd) and Review <b>Thurs – Midterm Examination 2</b> Fri – Review of Kinetics
10	Mar 28 Mar 30 Mar 31	<b>SPRING RECESS</b>
11	Apr 4 Apr 6 Apr 7	Chapter 9. Microscopic Systems and Quantization
12	Apr 11 Apr 13 Apr 14	Chapter 10. The Chemical Bond
13	Apr 18 Apr 20 Apr 21	Chapter 10. The Chemical Bond (cont'd) Chapter 11. Macromolecules and Self-assembly
14	Apr 25 Apr 27 Apr 28	Tues – Chapter 11. Macromolecules and Self-assembly (cont'd) <b>Thurs – Midterm Examination 3</b> Fri – Review of Quantum Mechanics
15	May 2 May 4 May 5	Chapter 12. Optical Spectroscopy and Photobiology
16	May 9 May 11 May 12	Chapter 12. Optical Spectroscopy and Photobiology (cont'd) Chapter 13. NMR and EPR
	<b>May 18</b>	<b>Final Examination: 09:45 – 12:00</b>

### Important Dates

\*\* Feb 20 Last day to drop without an entry on permanent record ("W") is Feb. 20<sup>th</sup>.

†† Feb 20 Last day to add classes and register late is Feb. 20<sup>th</sup>

**May 18** Final Examination 9:45am – 12:00pm

A list of SJSU student resources is given on the following pages.

## SJSU Student Resources:

### **CAPS**

It is estimated that 1 in 4 people will have a mental health struggle in their life. There are campus resources available for free to help:

<https://www.sjsu.edu/counseling/>

### **Academic Advising**

<https://www.sjsu.edu/aars/index.html>

### **Canvas Student Support**

<https://www.sjsu.edu/ecampus/teaching-tools/canvas/index.html>

### **UndocuSpartan Student Resource Center**

The UndocuSpartan Student Resource Center (USRC) is invested in creating educational opportunities that will further the success of UndocuSpartans at SJSU. The center works alongside undocumented/AB 540 students and allies to create a campus community that is welcoming and inclusive of all students regardless of their immigration status.

<https://www.sjsu.edu/undocuspartan/>

### **Spartan Food Pantry**

The Spartan Food Pantry is a walk-in, full-service, staffed, food assistance program offering non-perishable goods, fresh produce, and refrigerated items to eligible students.

<https://www.sjsu.edu/sjsucares/get-assistance/spartan-food-pantry.php>

### **SJSU Cares Housing Insecurity Assistance Request Form**

[https://cm.maxient.com/reportingform.php?SanJoseStateUniv&layout\\_id=12](https://cm.maxient.com/reportingform.php?SanJoseStateUniv&layout_id=12)

## **ADDENDUM TO ALL CHEMISTRY DEPARTMENT GREENSHEETS**

*(Except Chem 291 Sections)*

**Revised August 2018**

### University Policy

Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. will be available on the Office of Graduate and Undergraduate Programs' Syllabus Information Web Page at <http://www.sjsu.edu/gup/syllabusinfo/>

### **CHEMICAL SAFETY – all courses**

Chem 120S is a required course for all chemistry majors and minors and a prerequisite for all Chem 180/298 research.

### **EMERGENCIES AND EVACUATIONS – all courses**

If you hear a continuously sounding alarm, or are told to evacuate by Emergency Coordinators (colored badge

identification), walk quickly to the nearest stairway (end of each hall). Take your personal belongings, as you may not be allowed to immediately return. Follow instructions of Emergency Coordinators. Be quiet so you can hear. Once outside, move away from the building. Do not return to the building unless the Police or Emergency Coordinators announce that you may.

**STUDENTS REGISTERED WITH THE ACCESSIBLE EDUCATION CENTER – all courses**

Campus policy in compliance with the Americans with Disabilities Act: "If you need course adaptations or accommodations because of a disability, or if you need special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. Presidential Directive 97-03 requires that students with disabilities requesting accommodations must register with DRC to establish a record of their disability."

**ACADEMIC INTEGRITY STATEMENT – all courses** (from the Office of Student Conduct and Ethical Development):

"Your own commitment to learning, as evidenced by your enrollment at San José State University, and the University's Academic Integrity Policy requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the Office of Student Conduct and Ethical Development. The policy on academic integrity can be found at [http://sa.sjsu.edu/student\\_conduct](http://sa.sjsu.edu/student_conduct)