

**San José State University**  
**Department of Chemistry**  
**Chem 55, Quantitative Analysis, Section 02, Fall, 2021**

**Course and Contact Information**

|                      |  |
|----------------------|--|
| Instructor:          | Prof. Madalyn Radlauer ( <i>she/her</i> )  |
| Office Location:     | DH 517   |
| Telephone:           | (408) 924-5482   |
| Email:               | madalyn.radlauer@sjsu.edu  |
| Office Hours:        | On Zoom: Wed. 3:30 pm – 4:30 pm<br>In person: Fri. 10:00 am – 11:00 am<br>Or by request (either in person or via Zoom)           |
| Class Days/Time:     | Fri. 1:00 pm – 2:40 pm   |
| Classroom:           | None; we will meet via Zoom  |
| Prerequisite:        | CHEM 1B (with a grade of "C" or better; "C-" not accepted)   |
| Learning Assistants: | Jenelyn Halog-Calimquim ( <i>she/her</i> ) jenelyn.halog-calimquim@sjsu.edu<br>and<br>David Ho ( <i>he/him</i> ) dat.ho@sjsu.edu |

**Course Website**

Course materials such as the syllabus, handouts, notes, assignment instructions, etc. can be found on [Canvas](https://sjsu.instructure.com/) (https://sjsu.instructure.com/). Our class periods will be over Zoom and the links can be found in the Canvas course. Plus videos, notes, and assignments will all be posted on Canvas, so you will likely be using it several times per week.

**Course Description** (from the [University Catalog](http://info.sjsu.edu/web-dbgen/splash/catalog.html): http://info.sjsu.edu/web-dbgen/splash/catalog.html)

Introduction to theories and techniques of chemical analysis.

**Course Format**

**Technology Intensive, Hybrid, and Online Courses**

Due to the COVID-19 pandemic, this course will be completely online. Both asynchronous and synchronous instruction will take place, so you will be required to attend class via Zoom as well as work through course modules on [Canvas](https://sjsu.instructure.com/) (https://sjsu.instructure.com/). Thus you will need a computer with reliable internet access. You will need to use your SJSU account to access class meetings as only authenticated users will have access. Because there will be a considerable amount of group work, it is required that you have a working microphone for class meetings. It would be great if you would also use your camera, but it is not required. Zoom virtual backgrounds are allowed as long as they are not distracting. If you have unmet technology needs, please see the [SJSU Work Anywhere](https://www.sjsu.edu/workanywhere/) website (https://www.sjsu.edu/workanywhere/) for assistance.

## Course Goals and Learning Objectives

The goal of this course is to provide an introduction to analytical chemistry including, but not limited to, statistical methods, dimensional analysis, concentrations, buffers and equilibria, and instrumentation.

### Program Learning Outcome (PLO)

Upon successful completion of this program,

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.

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.

### Course Learning Outcomes (CLO)

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

CLO 1: Analyze numerical problems relevant to chemical reactions, experiments, and tests and apply quantitative reasoning to accurately solve them with correct significant figures and units.

CLO 2: Use basic statistical methods to interpret analytical data.

CLO 3: Recognize and convert between various units in either equation or narrative form.

CLO 4: Describe analytical instrumentation, determine if the measurement from the instrument is an absolute or relative value, and understand what calibration or standardization is required for effective data analysis.

CLO 5: Give examples of analytical techniques that would help solve various scientific questions.

CLO 6: Draw connections between the material covered in this course and its applications in the students' chosen field of study.

## Texts/Readings

**Textbook** (recommended for course readings)

[\*Quantitative Chemical Analysis\*](#) by Daniel C. Harris and Charles A. Lucy (10<sup>th</sup> edition, 2020) Hardcover ISBN: 9781464135385.

*The eTextbook is available with the online homework via Achieve, so you do not need to purchase a separate copy of the textbook.*

**Online Homework** (required)

Required online homework is provided through Achieve. You will register for Achieve through the Canvas site which can be accessed on any computer, tablet, or smartphone. Instructions will be posted to the Canvas by the first week of school.

**Other References** (not required)

[\*Introduction to Spectroscopy\*](#) by Donald L. Pavia, Gary M. Lampman, George S. Krutz, James A. Vyvyan

*This text is also used in organic chemistry labs.*

## Library Liaison

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 proxy to do so. Check the Library website for information. The reference Librarian for Chemistry is Yen Tran and her email is [yen.tran@sjsu.edu](mailto:yen.tran@sjsu.edu).

## Course Requirements and Assignments

Graded work will include pre-class questions, discussion posts, in-class worksheets, post-class quizzes, online homework, two “take-home” exams, and one comprehensive final exam, which all contribute to the course learning outcomes. Dates for the exams are in the Course Schedule below. All relevant dates are also posted to Canvas. Exams and assignments in the course will be weighted as follows:

| <b>Assignments</b>                | <b>Points</b> |
|-----------------------------------|---------------|
| Pre-class Questions               | 65            |
| Discussion Posts                  | 140           |
| In-class Worksheets               | 112           |
| Post-class Quizzes                | 153           |
| Online Homework                   | 130           |
| 2 Midterm Exams (100 points each) | 200           |
| Final Exam                        | 200           |
| <b>Total</b>                      | <b>1000</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, preparation/studying, or course related activities, including but not limited to internships, labs, and clinical practica. Other course structures will have equivalent workload expectations as described in the syllabus.

## Weekly Workflow

| Weekday       | Activities   |
|---------------|--|
| Friday        | Class! Short lecture and In-class Worksheets in groups and as a whole class; Post-class quiz will be posted after class; submit worksheet scan by midnight   |
| before Monday | Materials for the week will be posted, including the lecture video, all assignments (other than the Post-class Quiz), discussion prompts, recommended reading, and extra online problems if you want more practice |
| Monday        | Post-class Quiz due by midnight  |
| Wednesday     | Online Homework (on previous class’s material), Pre-class Questions, and Discussion Posts due by midnight  |

## Final Examination or Evaluation

The Final Exam is comprehensive and will have a range of question styles that will be similar to the other assignments and exams in the course. It will be administered online during the SJSU scheduled final exam time.

## Grading Information

### Determination of Grades

Points will be distributed as described in Course Requirements and Assignments above. I will not curve because I believe that everyone can succeed in this course. I may, at the end of the course, linearly shift the scale. I will only shift it to benefit you. The course grade will be determined from the resulting average of the point total as follows:

| <u>Percentage of Total Points</u> | <u>Final Course Grade</u> |
|-----------------------------------|---------------------------|
| 96 and above                      | A+                        |
| 92 to 95.9                        | A                         |
| 88 to 91.9                        | A-                        |
| 84 to 87.9                        | B+                        |
| 80 to 83.9                        | B                         |
| 76 to 79.9                        | B-                        |
| 72 to 75.9                        | C+                        |
| 68 to 71.9                        | C                         |
| 64 to 67.9                        | C-                        |
| 60 to 63.9                        | D+                        |
| 56 to 59.9                        | D                         |
| 52 to 55.9                        | D-                        |
| less than 52                      | F                         |

### Course Modules

The course is organized into modules on Canvas. We will work our way through about 1 module per week. These modules will lay out the required video(s) and recommended reading before each class period and there will be pre-class questions and graded discussion posts for you to complete prior to class that will help me organize class time to best serve learning. Class will include some lecture, some problem-solving as a class, and some group work. Each class period we will tackle the worksheet that is in the module. There is a brief quiz in each module for you to take after class. There will also be one online homework assignment for each module. The two take-home midterm exams will cover large sections of the course and are not tied to a single module. The final exam is cumulative.

### Canvas Discussions

The Canvas Discussions will have three parts each week: (1) an opportunity to ask a question, (2) a prompt specific to that week's material, and (3) a chance for you to respond to a post from one of your classmates. You will have to do either part 1 or 2 as well as part 3 to receive full credit (for completeness). You are, of course, encouraged to do all three parts and to get more deeply involved in the discussion by responding to more posts, but this is not required for credit. Your discussion posts and responses will be due by Wednesday at midnight each week. The reason for this deadline is so that I can use some of the questions and comments to help build the lecture portion for Friday's class.

### Pre-class Questions

The Pre-class Questions will be due by Wednesday at midnight each week. These will typically be multiple choice and will rely on the material covered in the lecture video. They might also be right out of the week's recommended reading. ;) They will be graded for accuracy.

### **In-class Worksheets**

Worksheets will be posted to the module before class. You will need to access the worksheet for class. You do not have to print it out, but I will try to format it so that you can do your work directly on the worksheet if you choose to print it or annotate it on a tablet. These worksheets will be graded for participation. This will be measured in two ways. First, the LAs and I will drop into your breakout rooms to check in and offer assistance. I expect you to use this time to engage with the material and work together. Second, you will take a photo and upload your work to Canvas right after class. You do not need to complete the worksheet to get credit, but I recommend that you complete all of the worksheets as these are intended to help you learn the material.

### **Post-class Quizzes**

Starting right after class, you will have access to the Post-class Quiz in the module. It will be brief and cover things from the pre-class video and reading as well as from the in-class lecture and worksheet. These quizzes will be very short and must be completed before the next module's pre-class questions will be available to you. These quizzes will be graded for accuracy.

### **Online Homework**

Online homework via Achieve will be assigned for each module. One great thing about Achieve is that you will get immediate feedback on your work. Note that the questions I have chosen from Achieve may approach problems in a different way than I present in class or may provide answers in a different format than you have seen before. Keep in mind that neither is "wrong" or "right", they are simply different ways to present the material. The online homework is also very particular about significant figures and units. The online homework will be graded for accuracy, but you will get multiple attempts on each question with only a slight penalty.

### **Extra Practice Problems**

In addition to the graded Achieve homework, I will post an extra set of practice problems from for each module. These will not be graded, but I have often gotten requests for more practice problems, so here they are!

### **Recommended Reading**

In each module, I will post recommended reading from the book. While this is not required, it offers you another way to learn the material.

### **Take-home Midterms**

We will have two take-home midterms that will each be available on Canvas for a single week, though once you start the test, you will have 2 hours to complete it. They will be administered as "quizzes" in Canvas and will be completely open note and open book (though not open internet) and you will get document of useful equations to use for each test. More specifics will be shared leading up to each test.

### **Missed Exams or Assignments**

The difficult circumstances of the past year and a half have not gone away and I am aware that the havoc in our world has forced us to work and learn under various stressors. This may make it more difficult for you to maintain a steady schedule and you may need to miss class or an assignment at some point in the semester. If this is the case, please contact me ahead of class time and with as much of a heads up as possible and we can discuss the situation. The more heads up you can give me, especially with regards to missing exams or assignment deadlines, the better. I will do my best to be accommodating.

### **Classroom Protocol**

As a show of respect to your fellow classmates and me, please be on time to class; we will start at 1:00 pm on Zoom. Please find a place where you will be able to use your microphone and webcam. I expect everyone to be

able to use their microphones for discussions so that you can participate during the class period, especially in the breakout rooms. I would also love to see people's videos so that I'm not just talking to names in black boxes, but I understand that demands on internet might be too high or there may be distractions in the background. Please also participate with reactions and chats, I will use those as well. Virtual backgrounds are acceptable as long as they are not distracting.

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. 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.

### **Email policy**

I receive a lot of emails, so to be sure that I see your email, all Chem 55 emails should have Chem 55 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.

### **University Policies**

Per [University Policy S16-9](#), 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 [Syllabus Information web page](#) (<https://www.sjsu.edu/curriculum/courses/syllabus-info.php>). Make sure to visit this page to review and be aware of these university policies and resources.

## Quantitative Analysis, Chem 55, Fall 2020, Course Schedule

The tentative course calendar below includes weekly course content, midterm exam dates, and the date for the final exam. Dates may be subject to change, but prior to this, fair notice will be given during class and through Canvas. The recommended reading from our primary textbook, Quantitative Chemical Analysis, 10<sup>th</sup> edition, will be listed on the Canvas site along with each module.

Note: In your general chemistry courses (Chem 1A and 1B), you covered a range of topics that are essential to this course including, but not limited to, significant figures, SI units, stoichiometry, calculating concentrations, acid-base equilibria, buffers, and titrations. We will review some aspects of these topics and we will use them as a foundation for describing more complicated (and exciting) topics. Please review your general chemistry notes and do not hesitate to ask questions as they come up during lecture, office hours, workshop, or at CoSAC. Please also refer to the Preparatory Videos module for additional review.

### Tentative Course Schedule

| Week | Date  | Topics, Readings, Assignments, Deadlines   |
|------|-------|--|
| 1    | 8/20  | <b>First day of classes</b> Introduction to course and course resources, breakout session to get to know your groups |
| 2    | 8/27  | Dimensional analysis and error analysis (Module 1)   |
| 3    | 9/3   | Statistics (Module 2)  |
| 4    | 9/10  | Statistics (Module 2)  |
| 5    | 9/17  | Monoprotic acid-base equilibria and ionic compounds in solution (Module 3)   |
| 6    | 9/24  | Polyprotic acid-base equilibria and systematic treatment of equilibria (Module 4)                                    |
| 7    | 10/1  | Polyprotic acid-base equilibria and systematic treatment of equilibria (Module 4)                                    |
| 7    |       | <b>Take-home midterm exam 1 available, see Canvas for further instructions</b>                                       |
| 8    | 10/8  | Buffers and determining the major species in solution (Module 5)   |
| 9    | 10/15 | Acid-base titrations (monoprotic and polyprotic) (Module 6)  |
| 10   | 10/22 | Complex titrations (Module 7)  |
| 11   | 10/29 | Relative vs absolute measurements and calibration curves and standardization (Module 8)                              |
| 12   | 11/5  | Spectroscopy with an emphasis on absorption spectroscopy (Module 9)  |
| 12   |       | <b>Take-home midterm exam 2 available, see Canvas for further instructions</b>                                       |
| 13   | 11/12 | Analytical separations and chromatography (Module 10)  |
| 14   | 11/19 | Chromatography calculations and resolution of peaks (Module 11)  |
| 15   | 11/26 | <b>Thanksgiving weekend, no class meeting</b>  |
| 16   | 12/3  | Connecting analytical methods to scientific questions (Module 12)  |
|      | 12/14 | <b>Assigned final exam time is 12:15 – 2:30 pm</b>   |