

San José State University
Department of Chemistry
CHEM 55, Quantitative Analysis, Section 02, Fall, 2022

Course and Contact Information

Instructor:	Prof. Madalyn Radlauer (<i>she/her</i>)
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Office Hours:	Mondays 2:30 pm – 3:30 pm Fridays 10:00 am – 11:00 am Or by request
Class Days/Time:	Fri. 1:00 pm – 2:40 pm
Classroom:	DH 135
Prerequisite:	CHEM 1B (with a grade of "C" or better; "C-" not accepted)
Learning Assistant:	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/). Even though our class periods will be in person, 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

Flipped Course

Learning quantitative analysis requires problem solving practice and using class for this practice is a more effective use of our time together than lecture. During class, you will work with me, our Learning Assistant, David Ho, and your classmates to engage with the material through worksheets containing word problems associated with the week's material. To allow you to prepare for class, the lecture material has been made into edited videos that are available through the Canvas modules. As described in detail in the "Start Here" module on Canvas, the course will have a repeating pattern each week of content and assessment including lecture videos, discussion boards, group work, and short assignments. While this might be a different format from many of your other classes, I believe you will quickly find the benefits of the active learning experience offered here.

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 (10th 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, ISBN: 9781319483494. 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 Anne Marie Engelsen and her email is annemarie.engelsen@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:

Assignments	Points
Start Here Module Assignments	10
Pre-class Questions (5 points each, Canvas)	65
Discussion Posts (10 points each, Canvas)	140
Worksheets (10 points each, Class time)	140
Post-class Quizzes (10 points each, Canvas)	150
Online Homework (10 points each, Achieve)	130
2 Take-home Exams (100 points each, Canvas)	200
Final Exam (In-person)	200
Total	1035
Will be graded out of	1000

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
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) due by midnight
Before Friday's class	Pre-class questions and discussion posts due
Friday	Class! In-class Worksheets in groups and as a whole class; Post-class quiz will be posted after class

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 take place in our normal classroom during the 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 plus
92 to 95.9	A
88 to 91.9	A minus
84 to 87.9	B plus
80 to 83.9	B
76 to 79.9	B minus
72 to 75.9	C plus
68 to 71.9	C
64 to 67.9	C minus
60 to 63.9	D plus
56 to 59.9	D
52 to 55.9	D minus
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 to help you prepare. Class will include problem-solving in groups and as a class. 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 two parts each week both due by class on Friday. For the first part, the LA and I will devise a topic specific prompt for you to respond to or you can ask one or more specific questions about the week's material. The second part will require that you respond to at least one post from your classmates. Discussion posts will be graded based on participation.

Pre-class Questions

The Pre-class Questions will be due by class on Friday. 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. It will be formatted so that you can do your work directly on the worksheet. I will have printed copies for everyone in class (though if you prefer to work on a tablet or similar, let me know and I won't waste the paper printing it). The LA and I will come around to groups to check in and offer assistance. I expect you to use this time to engage with the material and work together. These worksheets will be graded for participation. 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. Keys for the worksheets will be posted on the page for that week in the Canvas module.

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 lecture video and reading as well as from the in-class worksheet. These quizzes will be short, but challenging. They 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. This is not required, but it offers you another way to learn the material.

Take-home Exams

We will have two take-home exams 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 are all expected to work alone on these exams. To help you prepare, you will get a document of relevant equations to use for each test that you are encouraged to annotate so that it can help you during the exam. More specifics will be shared leading up to each test.

Missed Exams or Assignments

The difficult circumstances of the past >2 years 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. Even if you cannot give me a heads up, reach out. 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 sharp. Please do not come to class if you do not feel well. Email me and the LA, David Ho, and we can set up one of two options for you.

1. If you would like to attend class virtually, we can set up a Zoom meeting *as long as you email the LA and myself at least 10 minutes before class starts.*
2. We can get notes sent to you and arrange for you to make up any group work.

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.

COVID-19 Related Policies

Masks are REQUIRED in the classroom and they must cover both your nose and mouth. I have a toddler who is not yet fully vaccinated, so even if SJSU lifts its mask mandate, I will continue to require masks in the classroom for the entire semester. Anyone not wearing a mask will not be allowed to attend class.

For the time being, SJSU is not requiring social distancing, so that we can do group work in person. If this changes, we may have to go at least partly online in order to do group assignments without having to yell across the room.

All students coming to campus for College of Science classes must go through the College of Science COVID training. This primarily includes watching a video prepared by the Safety Team and reading the SJSU Adapt Plan.

Everyone at SJSU is required to be fully vaccinated and boosted against COVID-19.

If you have COVID symptoms, a positive COVID test, or are exposed to someone who tests positive for COVID, DO NOT COME TO CAMPUS. Email me and I will send you a follow up email with the appropriate protocols to follow. I will do my best to make accommodations so that your progress and grade are not negatively affected should this occur.

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 2022, 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, 10th 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	8/19	<i>First day of classes</i> Introduction to course and course resources, breakout session to get to know your groups
2	8/26	Dimensional analysis and error analysis (Module 1)
3	9/2	Statistics, Part I (Module 2)
4	9/9	Statistics, Part II (Module 2)
5	9/16	Monoprotic acid-base equilibria and ionic compounds in solution (Module 3)
6	9/23	Polyprotic acid-base equilibria and systematic treatment of equilibria, Part I (Module 4)
7	9/30	Polyprotic acid-base equilibria and systematic treatment of equilibria, Part II (Module 4)
7		<i>Take-home exam 1 available, see Canvas for further instructions</i>
8	10/7	Buffers and determining the major species in solution (Module 5)
9	10/14	Acid-base titrations (monoprotic and polyprotic) (Module 6)
10	10/21	Complex titrations (Module 7)
11	10/28	Relative vs absolute measurements and calibration curves and standardization (Module 8)
12	11/4	Spectroscopy with an emphasis on absorption spectroscopy (Module 9)
12		<i>Take-home exam 2 available, see Canvas for further instructions</i>
13	11/11	<i>Veteran's Day, no class meeting</i> Chromatography, Part I (Module 10) will be available on Canvas
14	11/18	Chromatography, Part II (Module 10)
15	11/25	<i>Thanksgiving weekend, no class meeting</i>
16	12/2	Connecting analytical methods to scientific questions (Module 11)
	12/9	<i>Assigned final exam time is 12:15 – 2:30 pm</i>