

San José State University  
/Chemistry Department  
Chem 055L, Quantitative Analysis Laboratory, Section **01**

Fall 2021

## Course and Contact Information

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<b>Office Hours:</b>	Monday & Wednesday 10:00 am – 10:30 am
<b>Class Days/Time:</b>	Monday & Wednesday 10:30 am - 1:20 pm
<b>Classroom:</b>	Duncan Hall, room 413
<b>Prerequisites:</b>	<b>Prerequisites:</b> listed in the SJSU Catalog: <a href="#">CHEM 55L</a>

## Course Description

Chem 055L Quantitative Analysis Laboratory. Introduction to theories and techniques of chemical analysis. Lab 6 hours. 4 units.

The purposes of this laboratory course and Chem 55 are to prepare students for working in a chemical analysis laboratory. Students will learn how to make a variety of chemical measurements and how to properly interpret the resulting data. Topics covered include acid/base and complexometric titrations, gravimetry, spectrophotometry, sample preparation, HPLC and voltammetry. Statistical concepts based on the normal distribution, such as confidence limits, t-tests, F-tests, and outlier testing will also be covered.

## IMPORTANT INFORMATION REGARDING FALL 2021 SEMESTER STRUCTURE

The first day of class (Monday August 23<sup>rd</sup>) you will be working on asynchronous, there **WILL NOT BE IN PERSON CLASS**. The first in-person class for everybody will be Wednesday August 25<sup>th</sup>.

On Monday August 23<sup>rd</sup>, at 10:30 (regular starting time) you will have access via CANVAS to all the safety materials required to take the “Safety quiz”. This quiz has to be passed (80% correct responses) **BEFORE** the first day of in person classes (Wednesday August 23<sup>rd</sup>).

Because of uncertainties due to COVID-19 the provided schedule is tentative. We will do our best to follow the tentative schedule for the semester. Please understand that we may need to change the plan at any time.

Every student enrolled in this section will meet twice per week, every Monday and Wednesday.

**During all in-person lab sessions, students will be required to wear a lab coat, lab goggles, and a facemask to prevent the spread of COVID-19.**

# Course Format

Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on Canvas Learning Management System course login website at <http://sjsu.instructure.com>. You are responsible for regularly checking with the messaging system through the [Spartan App Portal \(Enlaces a un sitio externo.\)](#) <http://one.sjsu.edu> (or other communication system as indicated by the instructor) to learn of any updates.

Each student **must** have access to a computer and fast internet. **A lab coat will be required for this course.** They can be found in the student bookstore and on Amazon.com.

# Course Goals

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

PLO#3 – Demonstrate understanding of core concepts and to effectively solve problems in analytical chemistry.

PLO#6 – Answer questions regarding safe practices in the laboratory and general chemical safety.

PLO#7 – Demonstrate safe laboratory skills (including proper handling of materials and chemical waste) for particular laboratory experiments.

## Course Learning Outcomes for Chemistry 55L

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

- CLO#1 – Perform accurate and precise analyses in the field of Analytical Chemistry
- CLO#2 – Keep records of all performed analyses in a manner which is required in a modern analytical laboratory.
- CLO#3 – Carry out statistical analysis and evaluate repeatability of obtained results.
- CLO#4 – Perform quantitative and qualitative analysis of known standards as well as unknown samples.
- CLO#5 – Identify, properly use, and care for equipment and supplies used in analytical laboratories.
- CLO#6 – Identify the requirements for the adequate protection of personnel from solvents and materials used in an analysis

# Required Textbook

Quantitative Chemical Analysis; D.C.Harris, same edition as Chem 55 lecture.

# Other Readings

Lab Manual: Chem 55L Quantitative Analysis Laboratory Manual: will be available online as part of CANVAS course.

# Other technology requirements / equipment / material

Lab Notebook: A laboratory notebook is required for all students. You can use a regular paper notebook or an electronic notebook (tablet, Ipad...).

All primary data must be taken in the notebook during lab experiment. After each experiment summary and resume pages must be prepared in the lab notebook. In many industry or research laboratories or research laboratories, the lab notebook can be used as a legal document, so good notebook habits are essential for success in science.

# Course Requirements and Assignments

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 laboratory instruction and work, completion of reports and studying for quizzes and exams.

## Experiments: In Chem 55L we will:

1. Discuss quantitative chemical analysis, statistics and error analysis, chemical equilibria, acid-base and buffer chemistry, basic spectrophotometry, chromatography and electrophoresis.
2. Conduct lab experiments in acid-base and EDTA titrimetry, flame and solution photometry, electrochemistry, high performance liquid chromatography and capillary electrophoresis.

## Evaluation: Quizzes & Final Examination

### Quizzes:

- There will be three quizzes scheduled during the semester (see Semester Schedule). Quizzes may be online or in-person, depending on the evolution of COVID-19 pandemic.
- Each quiz will cover materials seen so far by all the students.

### Final Exam:

- Exam will be conducted on the date set up by SJSU (Wednesday, December 8 2021 9:45 AM-12:00 PM)
- Final exam will cover the material from all the experiments performed in Chem 55L laboratory and also materials cover during "Independent Work" Days, including theory, videos, powerpoints, additional resources and calculations for each experiment.
- Final exam may be in-person or on-line, depending on the evolution of Covid-19 pandemic).

### **IMPORTANT INFORMATION REGARDING ONLINE QUIZZES AND/OR FINAL EXAM:**

- **It is FORBIDDEN TO COMMUNICATE** in any way with individuals or classmates who could help you with the test at any point while taking this test.
- **It is FORBIDDEN TO PROVIDE** any information about the test such as the questions and/or answers to other classmates because I understand that helping others excel on their test is cheating.
- **If a student cheats while taking a ACTIONS WILL BE REPORTED** to the Department of Chemistry as stipulated in the Academic Integrity Policy (Academic Senate Policy F15-7).
- **Exam QUESTIONS POSTED TO CHEGG OR OTHER WEBSITES** will be identified. We will work with the appropriate authorities to obtain account information on anyone posting exam questions and/or using posted information.

### Chem 55L – Lab activities & experiments (see semester schedule for specific dates)

1. Check-in and preliminary operations
2. Reviewing Analytical Balances and Volumetric Glassware
3. Gravimetric determination of calcium in a solid sample.
4. EDTA determination of total hardness, calcium, and magnesium in brine sample.
5. Manganese determination by atomic absorption spectrometry using both calibration curve and standard addition methods.

6. Chromatography: principles and practical applications (these content will be covered on-line; dates to be determined during the semester).
7. Determination of limonin in orange juice by HPLC.
8. Titration of a mixture of phosphoric acid and sodium dihydrogen phosphate.

Check out of your lab locker on or before the last day of laboratory. Students failing to check out officially will be charged a fee for the Service Center to check out the locker.

During Independent Work days, we will cover the following topics: Good Laboratory Practices (GLP), Lab technique, Dimensional analysis, Use of excel sheets, Gravimetric and Dilution factors, Calibration curves without and with outliers, Chromatographic techniques.

## Chem 55 L Grading Information

- A 10-point penalty will be assigned for turning in reports after the due date.
- A 10-point penalty will be assigned for calculations that are wrong or report that is not in the correct format.
- It is possible to repeat a failed experiment; however, a new sample of unknown must be obtained from the instructor. A 10-point penalty will be assigned if the experiment has to be repeated.
- Each experiment will be graded for accuracy (difference between the value provided by manufacturer and value determined by student) and precision (determined by standard deviation of results).
- The Lab Notebook will be graded as follows: Daily report will be checked 3 random times for each student, each time is worth 50 points. Total 150 points. A missing or late lab report will result in a 10-point deduction. If pages are not signed there will be 5-point deduction.

### Points per Assignment - Planned

Determination of Ca by Gravimetry	100
Determination of Ca and Mg by EDTA	150
Determination of Mn in Steel by Solution Photometry and Atomic Absorption	200
Instrumental Analysis: Chromatography	200
Determination of limonin in orange juice by HPLC	100
Phosphates titration with pH meter	100
Quiz 1	100
Quiz 2	100
Quiz 3	100
Final	250
Lab notebook	150
<b>Total</b>	<b>1550</b>

## Example of the grading scale for the Hardness experiment

Key for Hardness		Key for Ca only	
Difference	Points	Difference %w/v	points
10 ppm	99	0.001	99
20 ppm	97	0.002	97
30 ppm	95	0.003	95
40 ppm	90	0.004	90
50 ppm	88	0.005	88
60 ppm	82	0.006	82

### Course Grading Scale\*,\*\*:

A+	97%-100%
A	93% - 96.99%
A-	90% - 92.99%
B+	87%-89.99%
B	83% - 86.99%
B-	80% - 82.99%
C+	77%-79.99%
C	73% - 76.99%
C_	70% - 72.99%

\*Safety Quiz point are not included in the final grade.

\*\* Based on the mean of the class performance the scale may be adjusted.

## Classroom Protocol

Penalties are imposed if an analysis must be repeated because of poor reported results or if results are reported after the announced deadlines. Adequate time is allotted to complete the assignments and to repeat some determinations. If because of illness or other reasons a student falls behind she or he may work during the second lab section if permission is obtained in advance from the instructor. HOWEVER, A STUDENT SHOULD NEVER WORK ALONE, AND AN INSTRUCTOR SHOULD BE WITHIN SHOUTING

DISTANCE. CELL PHONE CONVERSATIONS ARE NOT PERMITTED IN THE LAB. PLEASE EXIT TO THE HALLWAY IF YOU MUST MAKE OR RECEIVE A CALL.

*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) Persistent and disruptive late arrival to or early departure from class without permission.*
- e) Physical threats, harassing/bullying behavior, or personal insults (even when stated in a joking manner).*
- f) Use of personal electronic devices such as pagers, cell phones, PDAs in class, unless it is part of the instructional activity.*

# University Policies

## 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. See [University Policy S90-5](http://www.sjsu.edu/senate/docs/S90-5.pdf) at <http://www.sjsu.edu/senate/docs/S90-5.pdf>. More detailed information on a variety of related topics is available in the [SJSU catalog](http://info.sjsu.edu/web-dbgen/narr/catalog/rec-12234.12506.html), at <http://info.sjsu.edu/web-dbgen/narr/catalog/rec-12234.12506.html>. 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.

## 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](http://info.sjsu.edu/static/catalog/policies.html) section at <http://info.sjsu.edu/static/catalog/policies.html>. Add/drop deadlines can be found on the current academic year calendars document on the [Academic Calendars webpage](http://www.sjsu.edu/provost/services/academic_calendars/) at [http://www.sjsu.edu/provost/services/academic\\_calendars/](http://www.sjsu.edu/provost/services/academic_calendars/). The [Late Drop Policy](http://www.sjsu.edu/aars/policies/latedrops/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](http://www.sjsu.edu/advising/) at <http://www.sjsu.edu/advising/>.

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

[University Policy S12-7](http://www.sjsu.edu/senate/docs/S12-7.pdf), <http://www.sjsu.edu/senate/docs/S12-7.pdf>, 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.”
  - It is suggested that the greensheet include the instructor's process for granting permission, whether in writing or orally and whether for the whole semester or on a class by class basis.
  - 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.”

## Academic integrity

Your commitment, as a student, to learning is evidenced by your enrollment at San Jose State University. The [University Academic Integrity Policy S07-2](http://www.sjsu.edu/senate/docs/S07-2.pdf) at <http://www.sjsu.edu/senate/docs/S07-2.pdf> 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 [Student Conduct and Ethical Development website](http://www.sjsu.edu/studentconduct/) is available at <http://www.sjsu.edu/studentconduct/>.

## **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](http://www.sjsu.edu/president/docs/directives/PD_1997-03.pdf) at [http://www.sjsu.edu/president/docs/directives/PD\\_1997-03.pdf](http://www.sjsu.edu/president/docs/directives/PD_1997-03.pdf) requires that students with disabilities requesting accommodations must register with the [Accessible Education Center](http://www.sjsu.edu/aec) (AEC) at <http://www.sjsu.edu/aec> to establish a record of their disability.

## **Accommodation to Students' Religious Holidays**

San José State University shall provide accommodation on any graded class work or activities for students wishing to observe religious holidays when such observances require students to be absent from class. It is the responsibility of the student to inform the instructor, in writing, about such holidays before the add deadline at the start of each semester. If such holidays occur before the add deadline, the student must notify the instructor, in writing, at least three days before the date that he/she will be absent. It is the responsibility of the instructor to make every reasonable effort to honor the student request without penalty, and of the student to make up the work missed. See [University Policy S14-7](http://www.sjsu.edu/senate/docs/S14-7.pdf) at <http://www.sjsu.edu/senate/docs/S14-7.pdf>.

## **Student Technology Resources**

Computer labs for student use are available in the [Academic Success Center](http://www.sjsu.edu/at/asc/) at <http://www.sjsu.edu/at/asc/> located on the 1st floor of Clark Hall and in the Associated Students Lab on the 2nd floor of the Student Union. Additional computer labs may be available in your department/college. Computers are also available in the Martin Luther King Library. A wide variety of audio-visual equipment is available for student checkout from Media Services located in IRC 112. These items include DV and HD digital camcorders; digital still cameras; video, slide and overhead projectors; DVD, CD, and audiotape players; sound systems, wireless microphones, projection screens and monitors.

## **SJSU Writing Center**

The SJSU Writing Center is located in Clark Hall, Suite 126. All Writing Specialists have gone through a rigorous hiring process, and they are well trained to assist all students at all levels within all disciplines to become better writers. In addition to one-on-one tutoring services, the Writing Center also offers workshops every semester on a variety of writing topics. To make an appointment or to refer to the numerous online resources offered through the Writing Center, visit the [Writing Center website](http://www.sjsu.edu/writingcenter) at <http://www.sjsu.edu/writingcenter>. For additional resources and updated information, follow the Writing Center on Twitter and become a fan of the SJSU Writing Center on Facebook. (Note: You need to have a



QR Reader to scan this code.)

## **SJSU Counseling Services**

The SJSU Counseling Services is located on the corner of 7<sup>th</sup> Street and San Fernando Street, in Room 201, Administration Building. Professional psychologists, social workers, and counselors are available to provide consultations on issues of student mental health, campus climate or psychological and academic issues on an individual, couple, or group basis. To schedule an appointment or learn more information, visit [Counseling Services website](http://www.sjsu.edu/counseling) at <http://www.sjsu.edu/counseling>.

**SAFETY:** Strict adherence to laboratory safety rules is required. You must pass a quiz on safety rules. Wearing eye protection is mandatory. See, ADDENDUM TO ALL CHEMISTRY DEPARTMENT GREENSHEETS.

## **EMERGENCIES/EVACUATIONS**

If you hear a continuously sounding alarm or are told to evacuate by Emergency Coordinators (colored badge identities), walk quickly to the nearest stairway (end of each hall). Take your personal belongings with you as you may not be immediately allowed to return. Follow instructions of Coordinators. Be quiet so you can hear. Once outside, move away from the building. Do not return to the building unless the Police or Coordinators announce that it is permissible. If an alarm should occur during an exam or quiz, please attempt to give your instructor the paper or if taking test on line please attempt to save the test.

# Chem55L / Analytical Chemistry Laboratory, FALL 2021, Section 01

## TENTATIVE Course Schedule

The schedule is subject to change with fair notice, announced in the class and on CANVAS web site.

Date	Topics, Readings, Assignments, Deadlines
M August 23	On-line review of safety contents and Safety Quiz <b>IMPORTANT: Safety quiz has to be taken and passed on Canvas website before Wednesday August 25th (First experimental day)</b>
W August 25	Check-in and preliminary operations (glassware, balances, pipettes and burettes).
M August 30	Gravimetric determination of calcium in a solid sample.
W September 1	Gravimetric determination of calcium in a solid sample.
M September 6	LABOR DAY – CAMPUS CLOSED
W September 8	Gravimetric determination of calcium in a solid sample. EDTA determination of total hardness, calcium, and magnesium in brine sample. Manganese determination in steel sample.
M September 13	REPORT DUE: Gravimetric Determination of Ca in a solid sample EDTA determination of total hardness, calcium, and magnesium in brine sample. Manganese determination in steel sample.
W September 15	EDTA determination of total hardness, calcium, and magnesium in brine sample. Manganese determination in steel sample.
M September 20	EDTA determination of total hardness, calcium, and magnesium in brine sample. Manganese determination in steel sample. Manganese determination in steel sample.
W September 22	Manganese determination in steel sample.
M September 27	<b>QUIZ 1</b> REPORT DUE: EDTA determination of total hardness, Ca <sup>2+</sup> and Mg <sup>2+</sup> in a brine sample
W October 4	Manganese determination in steel sample.
M October 11	Chromatography: principles and practical applications
W October 13	Manganese determination in steel sample.
M October 18	Manganese determination in steel sample.

Date	Topics, Readings, Assignments, Deadlines
W October 20	Manganese determination in steel sample. Phosphates titration.
M October 25	QUIZ 2 REPORT DUE: Manganese determination in steel sample
W October 27	Phosphates titration.
M November 1	Phosphates titration.
W November 3	Chromatography: principles and practical applications
M November 8	Excel: how to prepare a calibration curve.
W November 10	Phosphates titration. Determination of limonin in an orange juice by HPLC
M November 15	Determination of limonin in an orange juice by HPLC
W November 17	Determination of limonin in an orange juice by HPLC
M November 22	QUIZ 3 REPORT DUE: Phosphates & Chromatography
W November 24	Non instructional day ( <i>Thanksgiving</i> )
M November 29	Reports & Calculations Review
W December 1	Last Day of the laboratory – CHECK OUT DAY
M December	Individual study / Online office hours
W December 8	Final Exam: Wednesday December 8, 2021 (9:45 am – 12:00 pm)