

CHEM 3451 Quantitative Analysis Fall 2022

Welcome to UNT!

As members of the UNT community, we have all made a commitment to be part of an institution that respects and values the identities of the students and employees with whom we interact. UNT does not tolerate identity-based discrimination, harassment, and retaliation. UNT's full Non-Discrimination Policy can be found in the UNT Policies section of the syllabus.

Course Description: CHEM 3451 **Quantitative Analysis** introduces students to the theory and practice of the quantitative aspects of the basic analytical chemistry. Topics to be discussed in lecture include solution preparation, statistical analysis, equilibrium calculations, titration analysis, electrochemistry, spectrophotometry, and introductory instrumental analysis.

(Notice: CHEM 3451 requires *extensive calculations* based on chemical equilibriums)

Course Objectives:

- Introduce Quantitative Analysis (QA) as a *measurement science* that bridges various scientific disciplines and applies to wide range of real-life applications.
- Enhance understanding of statistical analyses and quality assurance applications.
- Learn practical applications of various volumetric and gravimetric analyses.
- Introduction of modern instrumental analyses and its applications.

Instructor: Dr. Oliver Chyan,
Voice (940) 565-3463 , Chemistry Building, room 156
E-mail: Chyan@unt.edu*

**Preferred Communication mode, please add "QA" to your email subject for efficient search, like "QA: my question about exam #1".*

Super TA: Jatan Kumar Sharma [JatanSharma@my.unt.edu]

Required Text: "Quantitative Chemical Analysis", 9th edition, by Daniel C. Harris.

Class Schedule: Tuesday/Thursday, 9:30 - 10:50 AM.
Will meet in person in CHEM room 106

Office Hours: (Tuesday & Thursday, 2:00 -3:00 PM) (Zoom option is available)

TA Office Hours: (distributed over week days, to be announced)

Exams:

Three terms exams will be held on

Oct 4, Nov. 1, & Nov 29
(Tuesdays, 9:30 AM – 10:50 AM, at CHEM room 106).

Final comprehensive exam will be held on **Dec 15, 8-10 AM.**

Missing Exam: Plan your schedule accordingly. If you must miss an exam, permission (with proper documentation) must be obtained in advance. Medical absence requires proper doctor's statement and follow UNT Authorized Absence Policy.

<https://policy.unt.edu/sites/default/files/06.039%20Student%20Attendance%20and%20Authorized%20Absences.pdf>

Attendance Policy: **Class attendance is required and will be monitored periodically.** Students who miss the class are responsible for all the missed class materials that may not be addressed by the instructor in a subsequent class.

➤ **Phone Policy:** **No Smart Phone usages (like texting, web surfing etc.) or doing non-class related activities on laptops, during the class time. If urgent needs arise, you may exit to use phone outside the classroom.**

Homework: **Working the problems is very important** to achieve better understanding of materials taught and good grade in the class. **Extra credit (total 6 points)** will be given for the **completed homework submitted on time**, see later section for more info.

Grading Scale:

Final percent Average	Letter Grade
90 - 100 %	A
80 - 89 %	B
70 - 79 %	C
60 - 69 %	D
Below 60 %	F

Grade Reporting on Canvas: Canvas grade is for your convenience to check your course standing on exams and homework. Canvas reported grade may not be the final official grade reported to UNT Registrar, since other factors may need to be considered.

Please Note:

I reserve the right to make changes/modifications of the syllabus if needed.

CHEM 3451 Quantitative Analysis

Lecture Schedule (Fall 2022)

Week	Date (class #)	Topic	Note
1	Aug. 30	Intro: Analytical Process & Measurements (Ch 0,1) Tools of the Trade (Ch 2)	No Quant Labs @ 1st week (Aug 29 -Sept 2)
2	(#3, #4)	Experimental Error (Ch 3) Statistics (Ch 4)	QA Labs start @ 2nd week Except Sec 301 starts 9/12
3	(#5, #6)	Statistics (Ch 4)	
4	(#7, #8)	Quality Assurance & Calibration (Ch 5) Chemical Equilibrium (Ch 6)	
5	(#9, 10)	Titration Begin (Ch 7)	
6	Oct 4 (#12)	(Exam #1) Ch. 1, 2, 3, 4, 5 (Tuesday) Activity & Systematic Treatment (Ch 8)	25% grade
7	(#13, #14)	Monoprotic Acid-Base Equilibria (Ch 9) Polyprotic Acid-Base Equilibria (Ch 10)	
8	(#15, #16)	Acid-Base Titrations (Ch 11)	
9	(#17, #18)	EDTA Titrations (Ch.12) Fundamental of Electrochemistry (Ch.14)	
10	Nov 1 (#20)	(Exam #2) Ch. 6-11 (Tuesday) Electrodes & Potentiometry (Ch.15)	30% grade
11	(#21, #22)	Redox Titrations (Ch.16) Spectrophotometry + Spectrophotometers (Ch 18, 20).	
12	(#23, #24)	Atomic Spectroscopy (Ch 21)	
13	(#25)	Intro: Mass Spec & Anal. Separation (Ch. 22, 23) Thanksgiving Break	
14	Nov 29 (#27)	(Exam #3) Ch. 12, 14, 15, 16, 18, 20 (Tuesday) Intro of Mass Spec & Anal. Separation (Ch. 22, 23)	30% grade
15	(#28, #29) Dec 8	Gas Chromatography, HPLC (Ch. 24-25) Pre-Finals Days (Class Review for Final Exam)	
16	Dec. 15 Thursday	Final Exam (Comprehensive) (8-10 am)	15% grade

Tips on How to do well in CHEM 3451

1. **Team study** is a proven effective way to do well in this class. Find a COVID-safe way, make friends and work together now!
2. **Pre-view** (i.e. read ahead, preview lecture related materials on Canvas) the chapter(s) before attending the class, **especially for new concepts like statistical analysis, etc.**
3. **Get familiar with your textbook!** Look what is included in Appendixes D, E, F, G, H, I; *Solutions to Exercises (S1-); *Answers to Problems (AN1-).
4. To excel in Quantitative Analysis (*Analytical Chemistry*) requires **1) understanding the important concepts, 2) apply them to “hand-on” problem solving exercises** that often requires calculations with chemical equilibrium concepts.
5. **Our lecturing time is rather limited. Both important concepts and selected examples will be covered** in the class. However, do not expect all types of questions tested will be covered exactly in the class. It is simply **NOT** possible to cover all types of calculations and problems within the limited class time. **It is your responsibility to work on all problems as described in 6 and 7 below.** We will be happy to provide as much help possible per requests.
6. **What will be tested from textbook?** Study chapter examples (covered the answer, verify your understanding of the problem, *Do you know how to solve the problems?*). Do the Test Yourself after each chapter examples. Practice on Exercises and verify the answers at the end of the book. Work on Assigned Problems and verify with answers from a solution manual. Mark/collect those problems you have difficulty with for the quick review/practice right before the exam.

7. What will be tested other than textbook?

- a. Study “practicing quizzes” (will provide more info on Canvas)
 - b. Lecture examples (**take notes**)
8. **Most of exam problems (>70%) will be taken from 6 and 7.** Exam questions may not copy exactly, but will be similar. Remaining 20-30% will be from lecture examples and other sources.
9. **Practice before exam:** Before the exam, make up a simulated exam (put in some of those marked problems you have difficulty earlier) and give yourself one hour and half on the simulated exam.
10. **Helpful tip! After each exam,** make sure you understand the relevant subjects you may miss and can really do the old exam problems. **Make good correction notes** will be handy for the comprehensive final exam, where some selected old exam questions with slight modification may be tested again.

NOTICE FOR CHEM 3452 (QUANT LAB)*

Most LAB starts on the 2nd week of Sept. 6 (Tuesday)

(1st lab: *Check in/Lab Safety*)

Except, Quant Lab SEC 301 will meet on 3rd week (Sept. 12)

(will do both 1st & 2nd labs on 9/12)

Notice: More than 15 minutes late will be counted as lab absence.

***(Quant. Lab. CHEM 3452 is a separate course with separate instructors)**

Extra Credit for your work on assigned problems.

Extra credit: 0.5 point bonus for each completed homework handed in.

You can earn a total of **6.0 bonus points added directly to your final grade.**

[For example, final grade of **76(C)** becomes **82(B)**].

Submit your completed homework by Canvas for extra homework credit. No extra credit for late homework or direct copy from solution manual.

When: due **each Saturday 5PM** as scheduled below.

<u>Week of</u>	<u>Due date</u>	<u>Chapters</u>
2 nd week	Sept. 10	Chapters 1, 2
3 rd week	Sept. 17	Chapter 3
4 th week	Sept. 24	Chapter 4
5 th week	Oct. 1	Chapter 5
6 th week	Oct. 8	Chapter 6, 7
7 th week	Oct. 15	Chapter 8,
8 th week	Oct. 22	Chapter 9
9 th week	Oct. 29	Chapter 10
10 th week	Nov. 5	Chapter 11
11 th week	Nov. 12	Chapter 12
12 th week	Nov. 19	Chapter 14
13 th week	Dec 3	Chapter 15

Assigned Homework Problems

Quantitative Chemical Analysis

by Daniel C. Harris (9th edition)

•Fundamental Skills

(Assigned Problems)

Ch. 0	The Analytical Process	None
Ch. 1	Chemical Measurements	3-5 (means 3 to 5; = 3, 4, 5), 13-15, 18. 20-27, 29-31, 33-37
Ch. 2	Tools of the Trade	1, 2, 5, 6, 16-22 , 24, 25, 28
Ch. 3	Experimental Error	1-7, 9-18, 20-22
Ch. 4	Statistics	1-3, 9, 11-15, 17-24 , 26, 31, 35
Ch. 5	QA and Calibration	1-8 , 10, 12, 13, 18, 22, 23, 25, 26, 29, 30
Ch. 6	Chemical Equilibrium	1-4, 6-8, 10, 14-16, 19-22, 28-30, 33-36, 38, 39, 44-52

•Titrimetric Methods of Analysis

Ch. 7	Titration Begins	1-8 , 10, 11, 13, 17, 19, 22, 26
Ch. 8	Activity & Systematic Treatment	1, 2, 4, 5, 7, 10, 11, 13, 16-20 , 23, 25
Ch. 9	Monoprotic Acid-Base Equilibria	1-3, 5-8, 11-13 , 18, 21-23 , 26, 29, 30, 32, 34, 36, 39-40 , 42, 43
Ch. 10	Polyprotic Acid-Base Equilibria	3, 4, 6, 12-21 , 24, 25, 29, 30, 38, 40, 41
Ch. 11	Acid-Base Titrations	1-4 , 6, 8, 12-14 , 18, 19, 23, 24, 25, 27, 29, 31, 36, 37, 42, 45, 49, 50, 58, 60, 62
Ch. 12	EDTA Titrations	1-3 , 6, 7, 14, 16, 23, 24, 27-29, 32-34 , 36, 37

•Electroanalytical Methods of Analysis

Ch. 14	Fundamentals of Electrochemistry	5-10 , 12, 14-18, 21-23, 28-32 , 37, 39, 40, 42, 43, 46, 49
Ch. 15	Electrodes and Potentiometry	1, 2, 5, 8, 9, 12, 21, 22, 24, 25, 31-35
Ch. 16	Redox Titrations	1-4, 7-11 , 13, 14, 17-19, 22-27 , 29, 30, 33

Technical Assistance

UNT IT Help Desk

Email:

helpdesk@unt.edu

Live Chat:

<https://it.unt.edu/helpdesk/chatsupport>

Phone: 940-565-2324

In Person: Sage Hall, Room 330

Hours and Availability: Visit <https://it.unt.edu/helpdesk> for up-to-date hours and availability

For additional support, visit [Canvas Technical Help](https://community.canvaslms.com/docs/DOC-10554-4212710328) (<https://community.canvaslms.com/docs/DOC-10554-4212710328>)

[Canvas Technical Requirements](https://clear.unt.edu/supported-technologies/canvas/requirements) (<https://clear.unt.edu/supported-technologies/canvas/requirements>)

Student Support Services

UNT provides mental health resources to students to help ensure there are numerous outlets to turn to that wholeheartedly care for and are there for students in need, regardless of the nature of an issue or its severity. Listed below are several resources on campus that can support your academic success and mental well-being:

- [Student Health and Wellness Center](https://studentaffairs.unt.edu/student-health-and-wellness-center) (<https://studentaffairs.unt.edu/student-health-and-wellness-center>)
- [Counseling and Testing Services](https://studentaffairs.unt.edu/counseling-and-testing-services) (<https://studentaffairs.unt.edu/counseling-and-testing-services>)
- [UNT Care Team](https://studentaffairs.unt.edu/care) (<https://studentaffairs.unt.edu/care>)
- [UNT Psychiatric Services](https://studentaffairs.unt.edu/student-health-and-wellness-center/services/psychiatry) (<https://studentaffairs.unt.edu/student-health-and-wellness-center/services/psychiatry>)
- [Individual Counseling](https://studentaffairs.unt.edu/counseling-and-testing-services/services/individual-counseling) (<https://studentaffairs.unt.edu/counseling-and-testing-services/services/individual-counseling>)

Other student support services offered by UNT include

- [Registrar](https://registrar.unt.edu/) (<https://registrar.unt.edu/>)
- [Financial Aid](https://financialaid.unt.edu/) (<https://financialaid.unt.edu/>)
- [Student Legal Services](https://studentaffairs.unt.edu/student-legal-services) (<https://studentaffairs.unt.edu/student-legal-services>)
- [Career Center](https://studentaffairs.unt.edu/career-center) (<https://studentaffairs.unt.edu/career-center>)
- [Multicultural Center](https://edo.unt.edu/multicultural-center) (<https://edo.unt.edu/multicultural-center>)

- [Counseling and Testing Services](https://studentaffairs.unt.edu/counseling-and-testing-services) (<https://studentaffairs.unt.edu/counseling-and-testing-services>)
- [Pride Alliance](https://edo.unt.edu/pridealliance) (<https://edo.unt.edu/pridealliance>)
- [UNT Food Pantry](https://deanofstudents.unt.edu/resources/food-pantry) (<https://deanofstudents.unt.edu/resources/food-pantry>)

Academic Support Services

- [Academic Resource Center](https://clear.unt.edu/canvas/student-resources) (<https://clear.unt.edu/canvas/student-resources>)
- [Academic Success Center](https://success.unt.edu/asc) (<https://success.unt.edu/asc>)
- [UNT Libraries](https://library.unt.edu/) (<https://library.unt.edu/>)
- [Writing Lab](http://writingcenter.unt.edu/) (<http://writingcenter.unt.edu/>)
- [MathLab](https://math.unt.edu/mathlab) (<https://math.unt.edu/mathlab>)

Course Policies

COVID Policy

- If a student has tested positive for COVID or has been directly exposed to someone who tested positive, they should follow current CDC guidelines: <https://www.cdc.gov/coronavirus/2019-ncov/your-health/isolation.html> This will be treated the same as any other illness for the purposes of excused absences. You can find the university's COVID guidance on the UNT Healthalerts web page.
- If the student must be absent for COVID-related reasons, the student must follow the university's Authorized Absence Policy, which requires that student make a request in writing to the instructor and provide evidence to substantiate that it is an illness-related absence. <https://policy.unt.edu/sites/default/files/06.039%20Student%20Attendance%20and%20Authorized%20Absences.pdf>

Attendance

Students are expected to attend class meetings regularly. It is important that you communicate with the professor and the instructional team prior to being absent, so you, the professor, and the instructional team can discuss and mitigate the impact of the absence on your attainment of course learning goals. Please inform the professor and instructional team if you are unable to attend class meetings because you are ill, in mindfulness of the health and safety of everyone in our community.

UNT Policies

Academic Integrity Policy

Academic Integrity Standards and Consequences. According to UNT Policy 06.003, Student Academic Integrity, academic dishonesty occurs when students engage in behaviors including, but not limited to cheating, fabrication, facilitating academic dishonesty, forgery, plagiarism, and sabotage. **Note: talking to a neighbor or using a smartphone or other WIFI connected devices during an exam will be regarded as cheating.** A finding of academic dishonesty may result in a range of academic penalties or sanctions ranging from admonition to expulsion from the University.

ADA Policy

UNT makes reasonable academic accommodation for students with disabilities. Students seeking accommodation must first register with the Office of Disability Accommodation (ODA) to verify their eligibility. If a disability is verified, the ODA will provide a student with an accommodation letter to be delivered to faculty to begin a private discussion regarding one's specific course needs. Students may request accommodations at any time, however, ODA notices of accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of accommodation for every semester and must meet with each faculty member prior to implementation in each class. For additional information see the [ODA website \(https://disability.unt.edu/\)](https://disability.unt.edu/).

Prohibition of Discrimination, Harassment, and Retaliation (Policy 16.004)

The University of North Texas (UNT) prohibits discrimination and harassment because of race, color, national origin, religion, sex, sexual orientation, gender identity, gender expression, age, disability, genetic information, veteran status, or any other characteristic protected under applicable federal or state law in its application and admission processes; educational programs and activities; employment policies, procedures, and processes; and university facilities. The University takes active measures to prevent such conduct and investigates and takes remedial action when appropriate.

Emergency Notification & Procedures

UNT uses a system called Eagle Alert to quickly notify students with critical information in the event of an emergency (i.e., severe weather, campus closing, and health and public safety emergencies like chemical spills, fires, or violence). In the event of a university closure, please refer to Canvas for contingency plans for covering course materials.

Retention of Student Records

Student records pertaining to this course are maintained in a secure location by the instructor of record. All records such as exams, answer sheets (with keys), and written papers submitted during the duration of the course are kept for at least one calendar year after course completion. Course work completed via the Canvas online system, including grading information and comments, is also stored in a safe electronic environment for one year. Students have the right to view their individual record; however, information about student's records will not be divulged to other individuals without proper written consent. Students are encouraged to

review the Public Information Policy and the Family Educational Rights and Privacy Act (FERPA) laws and the University's policy. See UNT Policy 10.10, Records Management and Retention for additional information.

Acceptable Student Behavior

Student behavior that interferes with an instructor's ability to conduct a class or other students' opportunity to learn is unacceptable and disruptive and will not be tolerated in any instructional forum at UNT. Students engaging in unacceptable behavior will be directed to leave the classroom and the instructor may refer the student to the Dean of Students to consider whether the student's conduct violated the Code of Student Conduct. The University's expectations for student conduct apply to all instructional forums, including University and electronic classroom, labs, discussion groups, field trips, etc. Visit UNT's [Code of Student Conduct](https://deanofstudents.unt.edu/conduct) (<https://deanofstudents.unt.edu/conduct>) to learn more.

Rules of Engagement

Rules of engagement refer to the way students are expected to interact with each other and with their instructors. Here are some general guidelines:

- While the freedom to express yourself is a fundamental human right, any communication that utilizes cruel and derogatory language on the basis of race, color, national origin, religion, sex, sexual orientation, gender identity, gender expression, age, disability, genetic information, veteran status, or any other characteristic protected under applicable federal or state law will not be tolerated.
- Treat your instructor and classmates with respect in any communication online or face-to-face, even when their opinion differs from your own.
- Ask for and use the correct name and pronouns for your instructor and classmates.
- Speak from personal experiences. Use "I" statements to share thoughts and feelings. Try not to speak on behalf of groups or other individual's experiences.
- Use your critical thinking skills to challenge other people's ideas, instead of attacking individuals.
- Avoid using all caps while communicating digitally. This may be interpreted as "YELLING!"
- Be cautious when using humor or sarcasm in emails or discussion posts as tone can be difficult to interpret digitally.
- Avoid using "text-talk" unless explicitly permitted by your instructor.
- Proofread and fact-check your sources.
- Keep in mind that online posts can be permanent, so think first before you type.

See these [Engagement Guidelines](https://clear.unt.edu/online-communication-tips) (<https://clear.unt.edu/online-communication-tips>) for more information.

Access to Information - Eagle Connect

Students' access point for business and academic services at UNT is located at: my.unt.edu. All official communication from the University will be delivered to a student's Eagle Connect account. For more information, please visit the website that explains Eagle Connect and how to forward e-mail [Eagle Connect](https://it.unt.edu/eagleconnect) (<https://it.unt.edu/eagleconnect>).

Student Evaluation Administration Dates

Student feedback is important and an essential part of participation in this course. The student evaluation of instruction is a requirement for all organized classes at UNT. The survey will be made available during weeks 13, 14 and 15 of the long semesters to provide students with an opportunity to evaluate how this course is taught. Students will receive an email from "UNT SPOT Course Evaluations via IASystem Notification" (no-reply@iasystem.org) with the survey link. Students should look for the email in their UNT email inbox. Simply click on the link and complete the survey. Once students complete the survey they will receive a confirmation email that the survey has been submitted. For additional information, please visit the [SPOT website](http://spot.unt.edu/) (<http://spot.unt.edu/>) or email spot@unt.edu.

Survivor Advocacy

UNT is committed to providing a safe learning environment free of all forms of sexual misconduct. Federal laws and UNT policies prohibit discrimination on the basis of sex as well as sexual misconduct. If you or someone you know is experiencing sexual harassment, relationship violence, stalking and/or sexual assault, there are campus resources available to provide support and assistance. The Survivor Advocates can be reached at SurvivorAdvocate@unt.edu or by calling the Dean of Students Office at 940-5652648.