

CHEM 3451 Quantitative Analysis Fall 2026

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: Professor Oliver Chyan, E-mail: Chyan@unt.edu
Chemistry Building, room 156

TA: Anushka Perera AnushkaPerera@my.unt.edu
Chemistry Building, room 177

Required Text: "Quantitative Chemical Analysis", 10th edition, by Daniel C. Harris & Charles A. Lucy

Class Schedule: Tuesday/Thursday, 9:35 - 10:55 AM.
Class meets in CHEM room **106**

Office Hours : Monday – Friday (Dr. Chyan + TAs) (drop an email if you can or just show up)

Monday –	10 am – 12 pm	Khanh Tran	(RM 174)	KhanhTran5@my.unt.edu
Tuesday –	1 pm – 2 pm	Shyam Nair	(RM 174)	ShyamNair@my.unt.edu
Tuesday –	2 pm – 3 pm	Dr. Chyan	(RM 156)	
Wednesday-	2:30 pm – 3:30 pm	Anushka Perera	(RM 177)	AnushkaPerera@my.unt.edu
Thursday –	2 pm – 3 pm	Dr. Chyan	(RM 156)	
Friday –	1 pm – 2 pm	Shyam Nair	(RM 174)	ShyamNair@my.unt.edu

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 non-class related Smart Phone usages (like texting, web surfing etc.) or doing non-class related activities on laptops, during class time. If urgent needs arise, you may exit to use phone outside the classroom.

Exams:

Three-term exams (25% each) will be held on

Sept 8, Oct 1, & Nov 19

(* Catch-up Quiz Oct 15, for improving grade*)

Final comprehensive exam (25%) date (Dec 10, 8AM – 10AM).

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. ([06.039 Student Attendance and Authorized Absences](#))

Grade Improving Opportunities:

- 1) **Optional homework**, earning up to **4.8 points** to the overall exam grade average. (see more details later in this syllabus)
- 2) **Mid-semester grade-catch-up quiz (Oct 15):** details will be announced later.
- 3) **Term grade = Overall exam grade average + Extra homework credit (max. 4.8 points).**

Grading Scale:

Final percent Average (Term Letter Grade)

90-100 = (A), <90 - 80 = (B), <80 - 70 = (C), <70 - 60 = (D), Below 60 % = (F).

***Grade Reporting on Canvas is not final:** 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 2026)

Week	Date (class #)	Topic	Note
1	Aug. 17 (#1, #2)	Intro: Analytical Process & Measurements (Ch 0,1) Tools of the Trade (Ch 2)	
2	(#3, #4)	Experimental Error (Ch 3) Statistics (Ch 4)	QA Labs start @ 2 nd week (Aug 24-27)
3	(#5, #6)	Statistics (Ch 4) Quality Assurance & Calibration (Ch 5)	
4	Sept. 8	(Exam #1) Ch. 1, 3, 4 Quality Assurance & Calibration (Ch 5)	25% grade No Quant Labs @ 4 th week
5	(#9, #10)	Chemical Equilibrium (Ch 6) Activity & Systematic Treatment (Ch 8)	
6	(#11, 12)	Monoprotic Acid-Base Equilibria (Ch 9) Polyprotic Acid-Base Equilibria (Ch 10)	25% grade
7	Oct. 1	(Exam #2) Ch. 5, 6, 8, 9 Acid-Base Titrations (Ch 11)	
8	(#15, #16)	Acid-Base Titrations (Ch 11) EDTA Titrations (Ch.12)	
9	(#17, #18) Oct. 15	Fundamental of Electrochemistry (Ch.14) (Midterm quiz: Grade catch up opportunity)	TBA
10	(#19, #20)	Electrodes & Potentiometry (Ch.15)	
11	(#21, #22)	Spectrophotometry (Ch 18) Spectrophotometers (Ch 20)	
12	(#23, #24)	Atomic Spectroscopy (Ch 21) Intro: Mass Spec & Anal. Separation (Ch. 22, 23)	Nov 6, Last Drop date
13	(#25, #26)	Gas Chromatography, HPLC (Ch. 24-25)	
14	Nov. 19 (#28)	(Exam #3) Ch. 10, 11, 12, 14, 15 Gas Chromatography, HPLC (Ch. 24-25)	25% grade
15	Nov 23-27	(UNT FALL BREAK, no class meets)	
16	Dec 1 Dec 3	Catch-up and Class Review for Final Exam Pre-Finals Days	
17	Dec 10 8 – 10 AM	Final Exam (Comprehensive)	25% 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 including *Solutions to Exercises ; *Answers to Problems .**
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 be copied 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. **Making 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)

QA LABs start on the 2nd week of August 24 (Monday)‡

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

*** No completed Lab Safety Module on Canvas = No lab access**

‡ 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: 0.4 point bonus for each chapter homework handed in.

You can earn a total of **4.8 bonus points** added directly to your final grade.

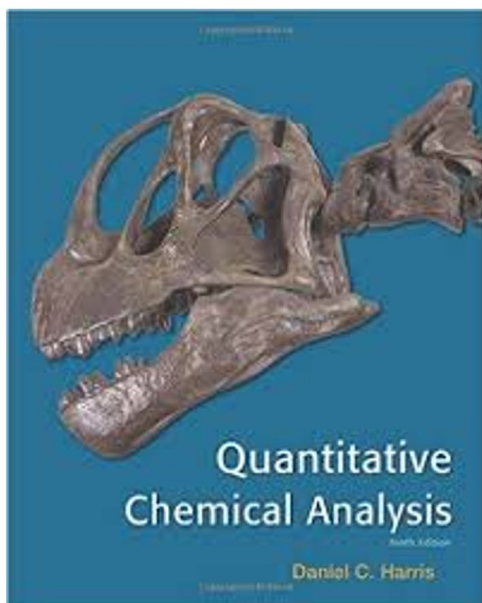
[For example, final grade of **78(C)** becomes **82.8 (B)**].

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

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

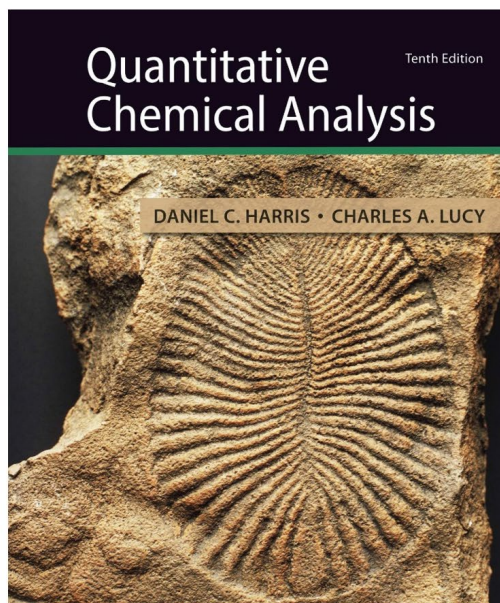
<u>Week of</u>	<u>Due date</u>	<u>Chapters</u>
2 nd week	Aug 29	Chapter 1
3 rd week	Sept. 5	Chapter 3
4 th week	Sept. 12	Chapter 4
5 th week	Sept. 19	Chapter 5
6 th week	Sept. 26	Chapter 6
7 th week	Oct. 3	Chapter 8
8 th week	Oct. 10	Chapter 9
9 th week	Oct. 17	Chapter 10
10 th week	Oct. 24	Chapter 11
11 th week	Oct. 31	Chapter 12
12 th week	Nov. 7	Chapter 14
13 th week	Nov. 14	Chapter 15

Textbook: "Quantitative Chemical Analysis", 10th Edition,
by Daniel C. Harris & Charles A. Lucy



9th Edition*

***Different Assigned homework
Numbers (workable, your decision)**



10th Edition

**Study your Textbook closely.
Preferred**

6

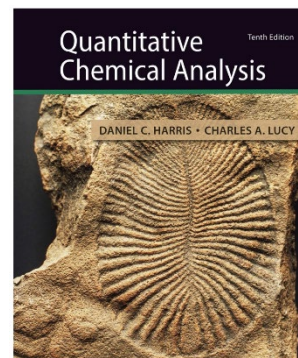
Note:

- 1) Just Textbook (hard copy of PDF) will do. No need to buy the whole package from publisher.
- 2) If you use 9th edition, you need to borrow from others to do the correct assigned homework in 10th edition for hand-in extra credit.

Assigned Homework Problems

Quantitative Chemical Analysis

by Daniel C. Harris & Charles A. Lucy (10th edition)



•Fundamental Skills

(Assigned Problems)

Ch. 0	The Analytical Process	None
Ch. 1	Chemical Measurements	3, 4, 12, 14, 17, 19-23 (including 19, 20, 21, 22, 23) , 28, 31, 32, 34, 35
Ch. 2	Tools of the Trade	1, 2, 5, 6, 17-21 , 29
Ch. 3	Experimental Error	1, 2, 4, 6, 10, 12, 14, 16, 18
Ch. 4	Statistics	1-3 , 9, 11, 12, 14-16 , 18-24 , 32, 33
Ch. 5	QA and Calibration	1-4 , 7, 9, 11, 14, 15, 21, 25, 26, 28, 32
Ch. 6	Chemical Equilibrium	1, 4, 8, 10, 14-16 , 19, 21, 29-31 , 35, 36, 39, 44, 46, 48, 50

•Titrimetric Methods of Analysis

Ch. 8	Activity & Systematic Treatment	1, 2, 4, 5, 10, 11, 13, 16-18 , 21, 25
Ch. 9	Monoprotic Acid-Base Equilibria	3, 5, 7, 10, 16, 24, 26, 27, 29, 31, 33, 37
Ch. 10	Polyprotic Acid-Base Equilibria	3, 4, 6, 12, 14, 16, 19, 21, 24, 38, 40, 41
Ch. 11	Acid-Base Titrations	1-4 , 6, 12-14 , 18, 19, 23, 24, 25, 31, 36, 37, 43, 50, 57
Ch. 12	EDTA Titrations	1-3 , 6, 7, 14, 16, 22, 25, 26, 29, 30, 35

•Electroanalytical Methods of Analysis

Ch. 14	Fundamentals of Electrochemistry	5-9 , 13, 15-18 , 28-31 , 37, 40
Ch. 15	Electrodes and Potentiometry	1, 2, 8, 12, 21, 22, 24, 25, 31-33

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>)

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>)
- [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/>)

Course Policies

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.

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.

Unauthorized Aids During Examinations and Assessments

Students may use only those materials and resources that are expressly authorized by the instructor for a particular examination or assessment. Touching, holding, or accessing any unauthorized aid during the examination period constitutes a violation of the Student Code of Conduct, regardless of whether the aid is used.

Any item that may be considered an unauthorized aid must be kept out of view and in a closed container (e.g. zipped backpack, buttoned purse, etc.) during the entirety of the examination or assessment.

Unless specifically authorized in writing by the instructor, prohibited aids include, but are not limited to:

- Mobile phones and smartphones
- Smartwatches and fitness trackers with communication, recording, or internet capabilities
- Tablets, laptops, and other computing devices
- Earbuds, headphones, and other audio devices
- Smart glasses, cameras, recording devices, and wearable technology
- Artificial intelligence (AI) tools, chatbots, and other generative AI technologies
- Notes, textbooks, study guides, formula sheets, or reference materials
- Any other device, material, or resource not expressly permitted by the instructor

Students are responsible for clarifying any questions about permitted materials before the examination begins.

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)

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 the UNT Learning Management System (LMS) 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://policy.unt.edu/policy/07-012) (<https://policy.unt.edu/policy/07-012>) to learn more.

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.