

CHEM 3451 Quantitative Analysis

Spring 2023

Course Description: CHEM 3451 (Quantitative Analysis, QA) introduces students to the theory and practice of the quantitative aspects of basic analytical chemistry. Topics to be discussed include solution preparation, statistical analysis, equilibrium calculations, titration analysis, electrochemistry, spectrophotometry, and introductory instrumental analysis. (Note: Quant. Lab. CHEM 3452 is a separate course)

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

Course Objectives:

- Introduce QA as a *measurement science* that bridges a wide range of scientific disciplines.
- Enhance understanding of statistical terminology and its QA applications.
- Provide practices of volumetric and gravimetric analysis.
- Apply equilibrium concepts in chemical analysis
- Introduce modern instrumental analysis.

Instructor: Prof. Guido Verbeck
Hickory Hall, Room 001
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Required Text: "Quantitative Chemical Analysis", **10E edition**, by Daniel Harris, Charles Lucy.

Class Schedule: Tuesday/Thursday, 4:00-5:20 PM
CHEM 106

Office Hours: (Tuesday & Thursday, 3:00 – 4:00 PM) or by appointment

Exams: Three-term exams will be held on Tuesdays of **Feb. 14, April 4, May 2** (100 points each). Please plan accordingly. The lowest test score will be dropped for the final grade provided you take ALL three exams and receive >50% on EVERY exam and complete homework.

The final exam (100 points) will be comprehensive (**Finals: Tuesday, May 9 – 1:30 – 3:30 pm**)

Please note: If UNT is closed on the test date, then the test will be moved to the next class date that UNT is open.

Missing Exam: Plan your schedule accordingly. If you must miss an exam due to a University-approved absence, please see the instructor and discuss the needed accommodations. Permission (with proper documentation) must be obtained in advance. Medical absence requires a proper doctor's statement.

Homework: (100 pts) Working on the problems is very important to achieve a better understanding of the materials taught and a good grade in the class. **Homework (handwritten, but not photocopied pages, show details of your work) is due as below. Late submission will not be allowed.**

Upload your completed homework as a pdf file to Canvas by class time on due date (8 points each, can earn 112 points/100 points)

Homework problems:

Week 1: (due Jan. 24) Chap. 0: 1, 2, 4 Chap. 1: 5, 7, 8, 10, 19, 24, 30, 31, 35.
Week 2: (due Jan. 31) Chap. 2: 8, 12, 14, 25 Chap. 3: 4, 6, 12, 18.
Week 3: (due Feb. 7) Chap. 4: 2, 5, 15, 23, 35 Chap. 5: 9, 16, 23, 28, 33.
Week 4: (due Feb. 14) Chap. 6: 5, 8, 19, 24, 32, 36, 40, 46, 50, 53.
Week 5: (due Feb. 21) Chap. 7: 8, 13, 15, 25, 26 Chap. 8: 5, 14, 21, 23, 34.
Week 6: (due Feb. 28) Chap. 9: 4, 7, 11, 25, 37, 40, 43, 44.
Week 7: (due Mar. 7) Chap. 10: 3, 8, 10, 15, 20, 24, 30, 33, 40.
Week 8: (due Mar. 21) Chap. 11: 2, 6, 10, 16, 20, 31, 41, 47, 55.
Week 9: (due Mar. 28) Chap. 12: 3, 6, 10, 16, 23, 32, 36, 37.
Week 10: (due Apr. 4) Chap. 13: 1, 4, 7, 8, 13.
Week 11: (due Apr. 11) Chap. 14: 3, 4, 16, 21, 28, 36 Chap. 15: 4, 11, 18, 36
Week 12: (due Apr. 18) Chap. 16: 4, 14, 19, 29, 37 Chap. 17: 11, 18, 29, 40.
Week 13: (due Apr. 25) Chap. 18: 14, 22, 25 Chap. 19: 24, 32 Chap. 20: 19, 27 Chap 21: 24.
Week 14: (due May 2) Chap. 22: 6, 36 Chap. 23: 31 Chap. 24: 28 Chap. 25: 26.

Attendance Policy: Class attendance is required and will be monitored periodically. Students will be dropped for nonattendance after three absences. 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 Phone, headphones, or handheld devices usage (texting, web surfing etc.) during class time.**

Grading Scale:

Final percent Average	Letter Grade
90.0 - 100 %	A
80.0 - 89.9 %	B
70.0 - 79.9 %	C
60.0 - 69.9 %	D
Below 60.0 %	F

Chapters to be covered

Chapter

Analytical Process	0
Chemical Measurements	1
Tools of the Trade	2
Experimental Error	3
Statistics	4
Quality Assurance and Calibration Methods	5
Chemical Equilibrium	6
Let the Titrations Begin	7
Activity and the Systematic Treatment of Equilibrium	8
Monoprotic Acid-Base Equilibria	9
Polyprotic Acid-Base Equilibria	10
Acid-Base Titrations	11
EDTA Titrations	12
Advanced Topics in Equilibrium	13
Fundamentals of Electrochemistry	14
Electrodes and Potentiometry	15
Redox Titrations	16
Electroanalytical Techniques	17
Selections in Spectroscopy	18-21
Selections in Separations and Mass Spectrometry	22-26

Distribution of Points :

Tests	300 points (-100 drop)
Finals (comprehensive)	100 points
Homework	100 points
Total	500 points (400 with drop)

To access UNT-Canvas:

Visit: <https://unt.instructure.com/login/ldap>

Login using your EUID and Password

Click on Chem 3451 Quantitative Analysis

Copies of syllabi, lecture presentations, and other relevant materials including any announcements will be posted in Canvas to download and study.

NOTICE FOR CHEM 3452 (QUANT LAB, - MEETS IN CHEM 283)

Lab starts on the week of **Jan 23**
(1st lab: *Check-in/Lab Safety*)

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

Note: The instructor reserves the right to make changes/modifications of the syllabus if needed.

The Chemistry Department believes in reasonably accommodating individuals with disabilities and complies with university policy established under Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act (1990) to provide equal access and opportunity. Please communicate with your professor as to your specific needs and/or the office of Disability Accommodation (ODA) (Room 321, Union, 565-4323).

Academic Ethics: A high level of ethical conduct will be maintained in this course. Any evidence of an act of academic dishonesty during the exams will result in an automatic F and expulsion from this course. Please adhere to university policies and the UNT Code of Conduct and Discipline with respect to academic ethics and honesty.

<http://vpaa.unt.edu/academic-integrity.htm>