CHEM 3451 Quantitative Analysis

Spring 2022

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. F. D’Souza
Voice (940) 369-8832 , Chemistry Building, Room 307C
E-mail: francis.dsouza@unt.edu


Class Schedule: Tuesday/Thursday, 4:00-5:20 PM
Env 125

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

Exams: Three-term exams will be held on Tuesdays of Feb. 10, March 31, May 5 (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.

The final exam (100 points) will be comprehensive (Finals: Tuesday, May 10 – 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 discuss the needed accommodations. Permission (with proper documentation) must be obtained in advance. Medical absence requires a proper doctor’s statement.
**Homework:** 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 or typed but not photocopied pages, show details of your work) is due a week from completing a chapter. Late submission is highly discouraged and will result in only partial credit.

E-mail your completed homework as a pdf file to Anuradha Liyanage at AnuradhaLiyanage@my.unt.edu

**Homework problems:**
- Chapter 2: 1, 2, 3, 8, 11, 17, 23, 25, 27, 31, 33, 37, 39- 13 problems
- Chapter 3: 1, 2, 3, 6, 7, 9, 11, 13 – 8 problems
- Chapter 4: 1, 2, 3, 4, 5, 7, 15, 23 - 8 problems
- Chapter 5: 1, 2, 3, 4, 5, 7, 9, 11, 15, 19, 21, 23 - 12 problems
- Chapter 6: 1, 2, 3, 4, 5, 9, 11, 15 - 8 problems
- Chapter 7: 1, 2, 3, 5, 7, 13, 15, 17, 21, 23, 25, 27, 29, 31 - 14 problems
- Chapter 8: 1, 2, 3, 4, 5, 6, 7, 9, 13, 15- 10 problems
- Chapter 9: 2, 3, 5, 7, 9 - 5 problems
- Chapter 10: 1, 2, 3, 5, 9, 11, 13, 15 - 8 problems
- Chapter 11: 1, 3, 5, 7, 9, 13, 15, 17, 23, 27- 10 problems
- Chapter 12: 1, 2, 3, 4, 7, 11, 13, 15, 17- 9 problems
- Chapter 14: 1, 2, 3, 5, 9, 11, 13, 15, 19, 23, 29 - 11 problems
- Chapter 15: 1, 2, 5, 7, 9, 15, 17, 19, 21, 23, 29, - 11 problems
- Chapter 16: 1, 2, 3, 4, 6, 7, 8, 11, 13, 17 – 10 problems
- Chapter 17: 1, 2, 3, 4, 5, 7, 9, 11, 13, - 9 problems
- Chapter 18: 1, 15, 17, 19, 21- 5 problems
- Chapter 22: 1, 2, 3, 4, 6, 9, 13, 15, 19, 21, 23 - 11 problems
- Chapter 24: 1, 2, 3, 5, 7, 9, 10, 15 - 8 problems

**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:**

<table>
<thead>
<tr>
<th>Final percent Average</th>
<th>Letter Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 - 100 %</td>
<td>A</td>
</tr>
<tr>
<td>80 - 89 %</td>
<td>B</td>
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<tr>
<td>70 - 79 %</td>
<td>C</td>
</tr>
<tr>
<td>60 - 69 %</td>
<td>D</td>
</tr>
<tr>
<td>Below 60 %</td>
<td>F</td>
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</tbody>
</table>
Chapters to be covered

Chapter
The Nature of Analytical Chemistry 1
Calculations Used in Analytical Chemistry 2
Precision and Accuracy of Chemical Analyses 3
Random Errors in Chemical Analysis 4
Statistical Data Treatment and Evaluation 5
Sampling, Standardization, and Calibration 6
Aqueous Solutions and Chemical Equilibria 7
Effects of Electrolytes on Chemical Equilibria 8
Solving Equilibrium Problems for Complex Systems 9
Gravimetric Methods of Analysis 10
Titrations in Analytical Chemistry 11
Principles of Neutralization Titrations 12
Applications of Neutralization Titrations 14
Complexation and Precipitation Reactions and Titrations 15
Introduction to Electrochemistry 16
Applications of Standard Electrode Potentials 17
Introduction to Spectrochemical Methods 22
Molecular Absorption Spectrometry 24

Distribution of Points:

Tests 300 points
Finals (comprehensive) 100 points
Homework 100 points
Total 400 points

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 24
(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

SUPER TA HOURS

ANDREW DAWSON: ANDREWDAWSON2@MY.UNT.EDU

SUPER TA OFFICE HOURS ON WEDNESDAYS 10:30 AM-12:30 PM
COVID-19 Impact on Attendance
While attendance is expected as outlined above, it is important for all of us to be mindful of the health and safety of everyone in our community, especially given concerns about COVID-19. Please contact me if you are unable to attend class because you are ill, or unable to attend class due to a related issue regarding COVID-19. It is important that you communicate with me prior to being absent so I may make a decision about accommodating your request to be excused from class.
If you are experiencing any symptoms of COVID-19 (https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html) please seek medical attention from the Student Health and Wellness Center (940-565-2333 or askSHWC@unt.edu) or your health care provider PRIOR to coming to campus.
UNT also requires you to contact the UNT COVID Hotline at 844-366-5892 or COVID@unt.edu for guidance on actions to take due to symptoms, pending or positive test results, or potential exposure. While attendance is an important part of succeeding in this class, your own health, and those of others in the community, is more important.

Class Materials for Remote Instruction
Remote instruction may be necessary if community health conditions change or you need to self-isolate or quarantine due to COVID-19. Students will need access to a [webcam and microphone – faculty member to include what other basic equipment is needed] to participate in fully remote portions of the class. Additional required classroom materials for remote learning include: [list specific software, supplies, equipment, or system requirements needed for the course]. Information on how to be successful in a remote learning environment can be found at https://online.unt.edu/learn.

Statement on Face Covering
Face coverings are required in all UNT facilities. Students are expected to wear face coverings during this class (applies for chem 3452). If you are unable to wear a face-covering due to a disability, please contact the Office of Disability Access to request an accommodation. UNT face cover requirements are subject to change due to community health guidelines. Any changes will be communicated via the instructor.