



Course	CHEM 2401-001
Course Title	Introductory Quantitative Methods in Chemistry
Professor	Dr. Dushanthi Dissanayake
Term	Spring 2025 (January 21 – May 9, 2025)
Meetings	Mondays & Wednesdays / 11:30 a.m. – 3:15 p.m.
Locations	Science Learning Center (SLC) 2.202 and Berkner Hall (BE) 2.506

Instructor's and Teaching Assistants (TA's) Contact Information

Office Location	Science Learning Center (SLC) 3.310
Email Address	dushanthi.dissanayake@utdallas.edu
Office Hours	Monday and Wednesday 10:00 am – 11:00 am or by appointment.
Teaching Assistant (TA)	TA/ Email : Cary Darwin / cary.darwin@utdallas.edu Office Hours: TBD
Technical Support	If you experience any problems with your UTD account you may send an email to: assist@utdallas.edu or call the UTD Computer Helpdesk at 972-883-2911. Additional information can be found on the Office of Information Technology's webpage at https://oit.utdallas.edu/ and e-learning help desk page at https://ets.utdallas.edu/elearning/helpdesk .

CHEM 2401 General Information

Pre-Requisites	General Chemistry II Lecture & Lab / CHEM 1312 & 1112 (or 1316 & 1116).
Course Description	A study of theories, applications, and calculations involved in methods of analysis, and the practice of volumetric, gravimetric, and spectrophotometric methods.
Learning Outcomes	<p><u>Objectives:</u> This course emphasizes the theory, applications, calculations, and practice involved in volumetric, gravimetric, and spectrophotometric methods of analysis (in other words: "What Analytical Chemists Do").</p> <p><u>Expected Learning Outcomes</u> Students should be able to:</p> <ol style="list-style-type: none">1. Solve stoichiometric and other analytical calculations2. Demonstrate their ability to carry out quantitative volumetric, photometric, and potentiometric determinations3. Explain the necessity for and use of error estimates and statistical methods4. Master the use of spreadsheets like Excel5. Operate at a level of good laboratory practice including safety and cleanliness6. Implement a professional-level lab notebook7. Construct professional-level lab reports
Required Materials	<ul style="list-style-type: none">• Quantitative Chemical Analysis, 7th, 8th, 9th, or 10th ed." by Daniel C. Harris• Experiments for Quantitative Chemical Analysis, by D.C. Harris (Posted in e-learning)• One combination lock & a folder/binder for handouts• A Notebook (NB) for recording all data.
Supplemental Material & Info	<ul style="list-style-type: none">• Student Success and Office of Undergraduate Education Resources https://www.utdallas.edu/studentsuccess/ https://oue.utdallas.edu/• <u>Chemistry Clinic</u> offers in-person student hours Monday through Friday, and it is located in the Berkner building. Students can walk in and attend student hours offered by undergraduate tutors, graduate TAs and faculty. <p>General Chemistry and Biochemistry: M-F 10:00 am to 6:00 pm in BE 2.410 Organic chemistry: M-F 9:00 am to 6:00 pm in BE 3.502 For more information: https://chemistry.utdallas.edu/chemclinic/</p>

Schedule & Academic Calendar

Meeting	Date	Lecture Topic and/or Activity	Lab Topic or Exp.#	Due Dates
01 W	1/22	Welcome to Quant / Grading/ Lab Safety	-----	
02 M	1/27	Linear Regression / Excel & Word	Drawer check-in	Safety Quiz
03 W	1/29	Pipette Calibrations / Lab Notebooks	Calibrate Pipets	
04 M	2/03	Buret Calibrations / Lab Reports	Calibrate Pipets	
05 W	2/05	Statistics Lectures I	Calibrate Burets	Pipet calibration data
06 M	2/10	Statistics Lectures II / Exp. 6B	Calibrate Burets	
07 W	2/12	Acids, Bases, Buffers, Titrations	Boiling water for Exp. 6B	Buret graph submission I
08 M	2/17	Acids, Bases, Buffers, Titrations	Exp. 6B	Exp. 6B NB check Stat. assignment
09 W	2/19	Acids, Bases, Buffers, Titrations	Exp. 6B	
10 M	2/24	Acids, Bases, Buffers, Titrations	-----	Buret graph submission II
11 W	2/26	The pH of High-Purity water / Exp. 7	pH meters / Prep for Exp. 7	Exp. 6B Report
12 M	3/03	Acids, Bases, Buffers, Titrations	Exp. 7 – Group 1	Exp. 7 NB check
13 W	3/05	Acids, Bases, Buffers, Titrations	Exp. 7 – Group 2	Exp. 7 NB check
14 M	3/10	Midterm Review	-----	
15 W	3/12	Midterm Exam (11:30 am – 12:45 pm)	-----	
	3/17 – 3/23	Spring Break (No class meetings)	-----	
16 M	3/24	Exam Follow-Up / Electrochemistry	-----	Exp. 7 Report
17 W	3/26	Potentiometric Titrations / Exp. 16	Prep for Exp. 16	EChem. Quiz
18 M	3/31	Potentiometric Titrations	Exp. 16 – Group 2	Exp. 16 NB check
19 W	4/02	Potentiometric Titrations	Exp. 16 – Group 1	Exp. 16 NB check
20 M	4/07	Exp. 16 report discussion	-----	
21 W	4/09	Analytical Sampling / Exp. 12	Exp. 12	
22 M	4/14	EDTA Titrations	Exp. 12	Exp. 12 NB check Exp. 16 Report
23 W	4/16	EDTA Titrations / Exp. 23	Exp. 12	EDTA Quiz
24 M	4/21	Spectrophotometry and Calibrations	Exp. 23	Exp. 23 NB check
25 W	4/23	Spectrophotometry and Calibrations	Exp. 23	Spectroscopy Quiz
26 M	4/28	Analytical Separations / Exp. 27	-----	Exp. 12 Report
27 W	4/30	Analytical Separations	Exp. 27	Sep. Sci. Quiz Exp. 27 Report
28 M	5/05	Final Exam Reviews	Drawer check-out	Exp. 23 Report
29 W	5/07	-----	-----	
Final Exam Day and Time = TBA				

CHEM 2401 Policies

	Harris Exp #	Title	8th Edition PDF Page #
Experiments	1.	Calibration of Volumetric Glassware	12
	6B.	Preparing Standard Bases	34
	7.	Using a pH Electrode for an Acid-Base Titration	37
	16.	Potentiometric Halide Titration with Ag ⁺	71
	12.	EDTA Titration of Ca ²⁺ and Mg ²⁺ in Natural Waters	58
	23.	Spectrophotometric Analysis of a Mixture: Caffeine & Benzoic Acid	90
	27.	Properties of an Ion-Exchange Resin	102
Safety	<p>IMPORTANT: In accordance with University and Chemistry Department safety rules, any time anyone (student, TA, instructor, or visitor) is in a lab, only the chemical splash goggles are allowed in the teaching labs. <u>They must have indirect ventilation, be ANSI Z87.1-2020 compliant AND rated D3 for chemical splash.</u> Safety glasses are no longer permitted. In addition, arms, legs, and feet should be <u>covered</u> in the lab. Closed-toed shoes and socks that <u>fully</u> cover your foot and ankle are also required. Hair longer than shoulder length must be put up in an appropriate manner to keep it out of harm's way. The first violation in the semester will result in a warning and removal from the lab until the safety eyewear is in-place. The second violation in the semester will result in dismissal from that lab period with no extra time being allowed for make-up of the work scheduled for that lab period. Similar penalties will apply if any other safety rules are violated. In summary, all students are responsible for all information inside the undergraduate safety manual; it is located at:</p> <p>https://research.utdallas.edu/researchers/research-and-academic-safety</p>		
Lab Reports	<p>Each student will prepare their own Lab Report for experiments based on the guidelines described in the Quant Handout "Writing a Laboratory Report". Please refer to the CHEM 2401 Schedule (column 5) for all Lab Report Due Dates. Lab Reports are due at midnight (11:59 pm) on the date stated in the syllabus. Late Reports will be penalized at a deduction rate of 21% per week (3 % per day). If a student does not perform an Experiment, the student will receive zero (0) points for the corresponding Lab Report. Make-up of lab periods/experiments missed (for valid medical or emergency reasons) will be attempted based on the availability of the apparatus, BE 2.506, and the professor & TAs.</p>		
Lab NoteBooks	<p>Each student must keep his or her own neat and orderly Lab Notebook using ink. Please put your name and a date on every Notebook page you use. In addition, be sure to include data labels and units on all tables and graphs. Drawing chemical structures and balanced chemical reactions in your Notebook is highly encouraged. Additional tips for keeping a professional Notebook can be found on page 25 of your textbook. Your Notebook must be signed and dated by your TA (or instructor) at the end of any day you spend working in the lab. Lab notebooks will be checked prior to each experiment.</p>		
Lab Technique	<p>Each student will be evaluated with respect to their adherence to good safety practices, laboratory technical skills, and laboratory etiquette/professionalism. The evaluations will be made by your TA (with the instructor) at the end of each Experiment. If one does not attend, one cannot earn Technique Points.</p>		
Quizzes	<p>The majority of Quizzes will be administered after the Midterm Exam and before the Cumulative Final Exam There will not be make-up quizzes; a missed quiz equates to zero (0) points.</p>		
Midterm Exam	<p>The Midterm Exam (Wednesday, March 12, 2025) will focus on Equilibrium, Acids and Bases, pH and pKa Calculations, Buffers, and Titration Curves. There will not be a make-up Midterm Exam; a missed Midterm Exam equates to zero (0) points. Students must take the Midterm corresponding to the Section they are enrolled in.</p>		

Final Exam	The Final Exam is <u>Cumulative</u> . There will not be a make-up Final Exam; a missed Final Exam equates to zero (0) points. Students must take the Final Exam corresponding to the Section they are enrolled in.
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Grading (credit) Criteria	<p>Quizzes (100 points)</p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>Safety quiz</td><td style="text-align: right;">20</td></tr> <tr><td>Exp. 16 – EChem Quiz</td><td style="text-align: right;">20</td></tr> <tr><td>Exp. 12 – EDTA Quiz</td><td style="text-align: right;">20</td></tr> <tr><td>Exp. 23 – Spectroscopy Quiz</td><td style="text-align: right;">20</td></tr> <tr><td>Exp. 27 – Sep. Sci. Quiz</td><td style="text-align: right;">20</td></tr> </table> <p>Lab Techniques (70 points)</p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>Exp. 1 - Calibration of Volumetric Glassware</td><td style="text-align: right;">10</td></tr> <tr><td>Exp. 6B - Preparing a Standard Base</td><td style="text-align: right;">10</td></tr> <tr><td>Exp. 7 - Using a pH Electrode for an Acid-Base Titration</td><td style="text-align: right;">10</td></tr> <tr><td>Exp. 16 - Potentiometric Halide Titration with Ag⁺</td><td style="text-align: right;">10</td></tr> <tr><td>Exp. 12 - EDTA Titration of Ca²⁺ and Mg²⁺ in Natural Waters</td><td style="text-align: right;">10</td></tr> <tr><td>Exp. 23 - Spectrophotometric Analysis of Caffeine</td><td style="text-align: right;">10</td></tr> <tr><td>Exp. 27 - Properties of an Ion-Exchange Resin</td><td style="text-align: right;">10</td></tr> </table> <p>Lab Reports and Notebooks (440 points)</p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>Exp. 6B - Preparing a Standard Base</td><td style="text-align: right;">40</td></tr> <tr><td>Exp. 7 - Using a pH Electrode for an Acid-Base Titration</td><td style="text-align: right;">80</td></tr> <tr><td>Exp. 16 - Potentiometric Halide Titration with Ag⁺</td><td style="text-align: right;">80</td></tr> <tr><td>Exp. 12 - EDTA Titration of Ca²⁺ and Mg²⁺ in Natural Waters</td><td style="text-align: right;">80</td></tr> <tr><td>Exp. 23 - Spectrophotometric Analysis of Caffeine</td><td style="text-align: right;">80</td></tr> <tr><td>Exp. 27 - Properties of an Ion-Exchange Resin</td><td style="text-align: right;">80</td></tr> </table> <p>Special Assignments (90 points)</p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>Exp. 1 - Pipet calibration data</td><td style="text-align: right;">20</td></tr> <tr><td>Exp. 1 - Buret Graph</td><td style="text-align: right;">30</td></tr> <tr><td>Statistics Assignment</td><td style="text-align: right;">40</td></tr> </table> <p>Exams (300 points)</p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>Midterm</td><td style="text-align: right;">100</td></tr> <tr><td>Final Exam</td><td style="text-align: right;">200</td></tr> </table> <hr/> <p>Total 1000</p>	Safety quiz	20	Exp. 16 – EChem Quiz	20	Exp. 12 – EDTA Quiz	20	Exp. 23 – Spectroscopy Quiz	20	Exp. 27 – Sep. Sci. Quiz	20	Exp. 1 - Calibration of Volumetric Glassware	10	Exp. 6B - Preparing a Standard Base	10	Exp. 7 - Using a pH Electrode for an Acid-Base Titration	10	Exp. 16 - Potentiometric Halide Titration with Ag ⁺	10	Exp. 12 - EDTA Titration of Ca ²⁺ and Mg ²⁺ in Natural Waters	10	Exp. 23 - Spectrophotometric Analysis of Caffeine	10	Exp. 27 - Properties of an Ion-Exchange Resin	10	Exp. 6B - Preparing a Standard Base	40	Exp. 7 - Using a pH Electrode for an Acid-Base Titration	80	Exp. 16 - Potentiometric Halide Titration with Ag ⁺	80	Exp. 12 - EDTA Titration of Ca ²⁺ and Mg ²⁺ in Natural Waters	80	Exp. 23 - Spectrophotometric Analysis of Caffeine	80	Exp. 27 - Properties of an Ion-Exchange Resin	80	Exp. 1 - Pipet calibration data	20	Exp. 1 - Buret Graph	30	Statistics Assignment	40	Midterm	100	Final Exam	200
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	<p><i>Quizzes, the Midterm, and The Final Exam will be different for each Section. If you suspect that an assignment has been graded incorrectly, you have one week, after the graded assignment is returned to you, to contact the TA/instructor for a review.</i></p> <p>Your final letter grade for the course will be determined using the scale shown below where the class average is set at the “B-/C+” border (e.g., 795 points):</p> <table border="1"> <tr> <td>970 – 1000 = A+</td> <td>870 – 899 = B+</td> <td>770 – 799 = C+</td> <td>670 – 699 = D+</td> </tr> <tr> <td>930 – 969 = A</td> <td>830 – 869 = B</td> <td>730 – 769 = C</td> <td>630 – 669 = D</td> </tr> <tr> <td>900 – 929 = A-</td> <td>800 – 829 = B-</td> <td>700 – 729 = C-</td> <td>600 – 629 = D-</td> </tr> <tr> <td></td> <td></td> <td></td> <td><599 = F</td> </tr> </table> <p><i>Sections -001, 002 & 003 are unique courses and are not graded together.</i></p>	970 – 1000 = A+	870 – 899 = B+	770 – 799 = C+	670 – 699 = D+	930 – 969 = A	830 – 869 = B	730 – 769 = C	630 – 669 = D	900 – 929 = A-	800 – 829 = B-	700 – 729 = C-	600 – 629 = D-				<599 = F
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Class Citizenship	If a student is enrolled in Section-001, that student cannot attend Section-002 or Section-003 meetings (and vice versa). In addition, it is typical for CHEM-2401 activities to utilize the entire 225 minutes of class time such that students cannot simultaneously enroll in other classes whose meeting days and times conflict with those of the CHEM 2401 section they are enrolled in.																
Class Attendance and Off-Campus Activities	The University’s attendance policy requirement is that individual faculty set their course attendance requirements. Regular and punctual class attendance is expected. Students who fail to attend class regularly are inviting scholastic difficulty. There are no off-campus activities in this course.																
Class Materials	The instructor may provide class materials that will be made available to all students registered for this class as they are intended to supplement the classroom experience. These materials may be downloaded during the course; however, these materials are for registered students' use only. Classroom materials may not be reproduced or shared with those not in class or uploaded to other online environments except to implement an approved AccessAbility Resource Center accommodation. Failure to comply with these University requirements is a violation of the Student Code of Conduct .																
Restrictions	Auditing this course is not allowed.																
Late Work	No assignments will be accepted after the conclusion of “Final Exams Week”.																
Extra Credit	None																
Comet Creed	<i>This creed was voted on by the UT Dallas student body in 2014. It is a standard that Comets choose to live by and encourage others to do the same:</i> <i>“As a Comet, I pledge honesty, integrity, and service in all that I do.”</i>																
Accommodations for Students with Disabilities	Please review the section within the UT Dallas Syllabus Policies and Procedures webpage.																
Academic Support Resources	Please visit the https://oisds.utdallas.edu/syllabus-policies/#academic-support-resources page to view the University’s academic support resources for all students.																
UT Dallas Syllabus Policies and Procedures	Please visit the https://go.utdallas.edu/syllabus-policies page to view the University’s policies and procedures segment of the course syllabus. Please review the catalog sections regarding the credit/no credit or pass/fail grading option and withdrawal from class.																

The descriptions and timelines contained in this syllabus are subject to change at the discretion of the Professor.