Course	**CHEM 2401-001 / Quantitative Chemical Analysis (QCA)**
Instructor	Dr. Dushanthi Dissanayake
Term	Spring 2024 (January 16 – May 16, 2024)
Meetings	Mondays & Wednesdays / 11:30 a.m. – 3:15 p.m.
Locations	Science Learning Center (SLC) 3.102 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	Thursday 1:30 pm – 3:30 pm or by appointment.
Teaching Assistant (TA)	**TA/ Email :** Daniel Relix / daniel.relix@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	*Objectives:* 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"). *Expected Learning Outcomes* *Students should be able to:* 1. Solve stoichiometric and other analytical calculations 2. Demonstrate their ability to carry out quantitative volumetric, photometric, and potentiometric determinations 3. Explain the necessity for and use of error estimates and statistical methods 4. Master the use of spreadsheets like Excel 5. Operate at a level of good laboratory practice including safety and cleanliness 6. Implement a professional-level lab notebook 7. Construct professional-level lab reports
Required Materials	• 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	• Student Success and Office of Undergraduate Education Resources https://www.utdallas.edu/studentsuccess/ https://oue.utdallas.edu/ *Chemistry Clinic* offers in-person office hours Monday through Friday, students can walk in and attend office hours offered by undergraduate tutors, graduate TAs and faculty. Room: BE 2.410 Hours: Monday - Friday 8.00 am - 5.00 pm For more information: https://chemistry.utdallas.edu/chemclinic/
Academic Support Resources	The information contained in the following link lists the University's academic support resources for all students. https://oisds.utdallas.edu/syllabus-policies/#academic-support-resources

Schedule & Academic Calendar

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

CHEM 2401 Policies

Experiments	Harris Exp # Title 8th Edition PDF Page # 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	IMPORTANT: In accordance with University and Chemistry Department safety rules, any time anyone (student, TA, instructor, or visitor) is in a lab, Z87-rated safety eyewear must be worn. 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: https://research.utdallas.edu/researchers/research-and-academic-safety
Lab Reports	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.
Lab NoteBooks	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.
Lab Technique	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.
Quizzes	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.
Midterm Exam	The Midterm Exam (Wednesday, March 06, 2024) 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.
Final Exam	The Final Exam is Cumulative. 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.

Grading (credit) Criteria

Quizzes (100 points)

Safety quiz	20
Exp. 16 – EChem Quiz	20
Exp. 12 – EDTA Quiz	20
Exp. 23 – Spectroscopy Quiz	20
Exp. 27 – Sep. Sci. Quiz	20

Lab Techniques (70 points)

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

Lab Reports and Notebooks (440 points)

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

Special Assignments (90 points)

Exp. 1 - Pipet calibration data	20
Exp. 1 - Buret Graph	30
Statistics Assignment	40

Exams (300 points)

Midterm	100
Final Exam	200
Total	**1000**

*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.*

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):

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 – 720 = C-	600 – 629 = D-
			<599 = F

Sections -001 & -002 & -003 are unique courses and are not graded together.

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

The University's attendance policy requirement is that individual faculty set their course attendance requirements. Regular and punctual class attendance is expected.

Activities	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 Office of Student AccessAbility 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	*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:* *"As a Comet, I pledge honesty, integrity, and service in all that I do."*
UT Dallas Syllabus Policies and Procedures	*The information contained in the following link constitutes the University's policies and procedures segment of the course syllabus. Please review the sections regarding the credit/no credit grading option and withdrawal from class.* *Please go to http://go.utdallas.edu/syllabus-policies for these policies.*

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