

Fall 2023

CHEM 222-001: Analytical Chemistry

Gregory Edens

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Edens, Gregory, "CHEM 222-001: Analytical Chemistry" (2023). *Chemistry, Environmental and Forensic Science Syllabi*. 509.

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Chemistry: *Fall 2023 Course Syllabus*

NJIT Academic Integrity Code: All Students should be aware that the Department of Chemistry & Environmental Science (CES) takes the University Code on Academic Integrity at NJIT very seriously and enforces it strictly. This means that there must not be any forms of plagiarism, i.e., copying of homework, class projects, or lab assignments, or any form of cheating in quizzes and exams. Under the University Code on Academic Integrity, students are obligated to report any such activities to the Instructor.

COURSE INFORMATION

Course Description: This course is designed to introduce students to the fundamentals of Analytical Chemistry, a sub-discipline of chemistry. Analytical Chemistry deals with identifying and assaying materials and their components. Quantitative Analysis deals with the latter of these processes, i.e., how much of a specific substance is in the material to be analyzed. CHEM 222 introduces the theory and applications of quantitative chemical analysis developed from various phenomena such as the law of mass action, the Nernst equation, conservation of mass, and charge, to mention just a few. Topics to be covered include data analysis, chemical equilibria, acid-base chemistry, titrimetric methods, electrochemistry, spectroscopy, and mass spectrometry and separation techniques. Classical techniques will be complemented with discussions on databases and statistical methods.

Number of Credits: 3

Prerequisites: 2

Course-Section and Instructors

Course-Section	Instructor
CHM 222-001	Gregory Edens, Ph.D. email: gregory.edens@njit.edu tel: 973-642-7938 Office Hours: Friday 11:00 AM - 1:00 PM

Class time: Tue & Thur 10:00 - 11:20 am at CULM Lec-3

E-Mail: All E-mail to me should start with CHEM 222 in the subject so that it can be filtered appropriately. Any e-mail pertaining to your academic standing (i.e., grades) must be sent from your NJIT account. Anonymous e-mail will not be read.

Required Textbook:

Title	Quantitative Chemical Analysis (Achieve 1-Term Access Card)
Author	DC Harris & CA Lucy
Edition	10 th
Publisher	MPS (Macmillan Publishers)
ISBN #	9781319384807

University-wide Withdrawal Date: The last day to withdraw with a **W** is Thursday, November 13, 2023. It will be strictly enforced.

Learning Outcomes:

1. Develop a sound physical understanding of the principles of analytical chemistry
2. Show how these principles are applied through exercises and problem-solving assignments
3. Develop an understanding of the limitations and uncertainties of results using statistics and
4. spreadsheets exercises.

POLICIES

All CES students must familiarize themselves with, and adhere to, all official university-wide student policies. CES takes these policies very seriously and enforces them strictly.

Grading Policy: The final grade in this course will be determined as follows:

Homework, Quizzes, Clicker	15
Active learning teamwork	15
Midterm Exam I	20
Midterm Exam II	25
Final Exam	25

Your final letter grade in this course will be based on the following tentative curve:

A	90 - 100	C	70 - 75.5
B+	86 - 89.5	D	60 - 69.5
B	80 - 85.5	F	< 60
C+	76 - 79.5		

Attendance Policy: Attendance at classes will be recorded and is **mandatory**. Each class is a learning experience that cannot be replicated through simply “getting the notes.”

Homework Policy: Homework is an expectation of the course. The homework problems set by the instructor are to be handed in for grading and will be used in the determination of the final letter grade as described above.

Exams: There will be two midterm exams held in class during the semester and one comprehensive final exam. The following exam periods are tentative and therefore possibly subject to change:

Midterm Exam I	Thursday October 5
Midterm Exam II	Thursday November 16

The final exam will test your knowledge of all the course material taught in the entire course.

Makeup Exam Policy: There will normally be **NO MAKE-UP QUIZZES OR EXAMS** during the semester. In the event that a student has a legitimate reason for missing a quiz or exam, the student should contact the Dean of Students office and present written verifiable proof of the reason for missing the exam, e.g., a doctor's note, police report, court notice, etc. clearly stating the date AND time of the mitigating problem. The student must also notify the CES Department Office/Instructor that the exam will be missed so that appropriate steps can be taken to make up the grade.

Cellular Phones: All cellular phones and other electronic devices must be switched off during all class times. Such devices must be stowed in bags during exams or quizzes.

ADDITIONAL RESOURCES

Chemistry Tutoring Center: Located in the Central King Building, Lower Level, Rm. G12. Hours of operation are Monday - Friday 10:00 am - 6:00 pm. For further information please click [here](#).

Accommodation of Disabilities: Office of Accessibility Resources and Services (*formerly known as Disability Support Services*) offers long term and temporary accommodations for undergraduate, graduate and visiting students at NJIT.

If you are in need of accommodations due to a disability please contact Marsha Williams-Nicholas, Accessibility and Resources and Services Manager at 973-596-2994 or via email at marsha.williamsnicholas@njit.edu. The office is located in Fenster Hall Room 260. A Letter of Accommodation Eligibility from the Office of Accessibility Resources Services office authorizing your accommodations will be required.

For further information regarding self-identification, the submission of medical documentation and additional support services provided please visit the Accessibility Resources and Services (OARS) website at:

- <http://www.njit.edu/accessibility/>

Important Dates See: Fall 2023 Academic Calendar, Registrar
<https://www.njit.edu/registrar/fall-2023-academic-calendar>

Date	Day	Event
September 4	M	Labor Day
September 5	T	First Day of Classes
September 11	M	Last Day to Add/Drop a Class Last Day for 100% Refund, Full or Partial Withdrawal
September 12	T	W Grades Posted for Course Withdrawals
September 18	M	Last Day for 90% Refund, Full or Partial Withdrawal No Refund for Partial Withdrawal after this date
October 2	M	Last Day for 50% Refund, Full Withdrawal
October 23	M	Last Day for 25% Refund, Full Withdrawal
November 13	R	Last Day to Withdraw
November 21	T	Thursday Classes Meet
November 22	W	Friday Classes Meet

November 23	R	Thanksgiving Recess Begins
November 26	Su	Thanksgiving Recess Ends
December 13	W	Last Day of Classes
December 14	R	Reading Day 1
December 15	F	Reading Day 2
December 16	Sa	Saturday Classes Meet
December 17	Su	Final Exams Begin
December 23	Sa	Final Exams End
December 25	M	Final Grades Due

Tentative Course Outline

Mtg #	Date	Topic	Assignment
1 (wk1)	Sept 5	Lecture 1: Introduction to Analytical Chemistry	
2 (wk1)	Sept 7	<i>Lecture 2: Chemical Measurements</i>	
3 (wk2)	Sept 12	Lecture 3: Experimental Errors & Statistics	
4 (wk2)	Sept 14	<i>Lecture 4: Statistics (cont)</i>	
5 (wk3)	Sept 19	<i>Lecture 5: Spreadsheets & Calibration</i>	
6 (wk3)	Sept 21	<i>Lecture 6: Volumetric Titration</i>	
7 (wk4)	Sept 26	Lecture 7: Gravimetry	
8 (wk4)	Sept 28	<i>Lecture 8: Equilibrium</i>	
9 (wk5)	Oct 3	Lecture 9: QA/QC	
10 (wk5)	Oct 5	Exam 1	
11 (wk6)	Oct 10	Lecture 10: Activity & Systematic Treatment of Equilibrium	
12 (wk6)	Oct 12	Lecture 11: Acid-Base Titration	
13 (wk7)	Oct 17	Lecture 12: Buffers & Alphas	
14 (wk7)	Oct 19	Lecture 13: Metal complex equilibria	
15 (wk8)	Oct 24	Lecture 14: Metal complex equilibria (cont)	
16 (wk8)	Oct 26	Lecture 15: Problem solving polyprotic acid	
17 (wk9)	Oct 31	Lecture 16: Electrochemical Equilibria (cont)	
18 (wk9)	Nov 2	Lecture 17: Redox Titrations	
19 (wk10)	Nov 7	Lecture 18: Redox Titrations (cont)	

20 (wk10)	Nov 9	Lecture 19: Electrodes & Potentiometry	
21 (wk11)	Nov 14	Lecture 20: Fundamentals of Spectroscopy	
22 (wk11)	Nov 16	Exam 2	
23 (wk12)	Nov 21 ("R")	Lecture 21: Applications of Spectroscopy; Fluorescence	
24 (wk12)	Nov 23	Thanksgiving - no class	
25 (wk13)	Nov 28	Lecture 22: Atomic Spectroscopy part 1	
26 (wk13)	Nov 30	Lecture 23: Atomic Spectroscopy part 2	
27 (wk14)	Dec 5	Lecture 24: Chromatography Theory	
28 (wk14)	Dec 7	Lecture 25: GC & HPLC	
29 (wk15)	Dec 12	Lecture 26: Comprehensive Final Review	

*Updated by Gregory Edens, Ph.D. August, 2023
Department of Chemistry & Environmental Sciences (CES)
Course Syllabus, Fall 2023*
