Fall 2021

CHEM 222-001: Analytical Chemistry

Hao Chen

NJIT New Jersey Institute of Technology

THE COLLEGE OF SCIENCE AND LIBERAL ARTS

THE DEPARTMENT OF CHEMISTRY AND ENVIRONMENTAL SCIENCE

Chemistry:
Fall 2021 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

CHEM 222 Course Description: Analytical chemistry deals with chemical separation, identification and quantification. Chemistry 222 is an introduction to the principles and applications of classical and modern analytical techniques. Many topics will be covered in this course, including data analysis, chemical equilibria, acid-base chemistry, titration methods, electrochemistry, spectroscopy, mass spectrometry and chromatography. It is important for students to understand the advantages and disadvantages of each analytical method, besides the underlying principles. Students are encouraged to join discussion how to solve the shortcomings of these methods for improved performance. Students are also expected to develop capability for carrying out necessary calculations for various analytical questions.

Number of Credits: 3

Prerequisites: CHEM 124, 125, and 126

Course-Section and Instructors

Course-Section	Instructor
CHEM 222-001	Dr. Hao Chen **Email**: hao.chen.2@njit.edu **Telephone**: 973-596-8571

Class time: Tue & Thur 10:00 – 11:20 am at FMH 106

Office hours: Thursday 11 am – 1 pm or by appointment.

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: *Quantitative Chemical Analysis*, 10th Ed., D.C. Harris, MPS, 2020, ISBN: 9781319384807

Secondary reference: Fundamentals of Analytical Chemistry, ninth edition, by Douglas A. Skoog, Donald M. West, F. James Holler, and Stanley R. Crouch, Brooks/Cole 2014, ISBN-10 0-495-55832-X.

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.

COVID-19 Safety: Please wear facial mask in our classroom at all time

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

Homework	25%
Midterm Exam I	20%
Midterm Exam II	20%
Final Exam	30%
Attendance	5%

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

A	90-100	**C**	70-75
B+	86-89	**D**	60-69
B	80-85	**F**	<60
C+	76-79		

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 in class and will be used in the determination of the final letter grade as described above. There will be no points for late homework.

Exams: There will be two midterm exams held in class during the semester and one comprehensive final exam. 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 Chantonette Lyles, Associate Director at the Office of Accessibility Resources and Services at 973-596-5417 or via email at lyles@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://www5.njit.edu/studentsuccess/disability-support-services/

Important Dates:

Date	Day	Event
September 1, 2021	W	First Day of Classes
September 8, 2021	W	Last Day to Add/Drop Classes
November 10, 2021	W	Last Day to Withdraw
November 25 - 28, 2021	R - Su	Thanksgiving Break - University Closed
December 10, 2021	F	Last Day of Classes
December 15 - 21, 2021	W - T	Final Exam Period

Tentative
Course Outline

Lecture	Section	Topic	Assignment
1	Sep. 2	Lecture 1. Welcome and introduction	
2	Sep. 7	Lecture 2. Chemical Measurements	
3	Sep. 9	Lecture 3. Tools of the Trade	
4	Sep.14	Lecture 4. Experimental Error	
5	Sep.16	Lecture 4. Experimental Error (Continued)	
6	Sep.21	Lecture 5. Statistics	
7	Sep.22	Lecture 5. Statistics (Continued)	
8	Sep. 28	Lecture 6. Quality Assurance and Calibration Methods	
9	Sep. 30	**Exam I**	
10	Oct. 5	Lecture 7. Chemical Equilibrium	
11	Oct. 7	Lecture 8. Activity and the Systematic Treatment of Equilibrium	
12	Oct. 12	Lecture 9. Acids and Bases	
13	Oct. 14	Lecture 9. Acids and Bases (Continued)	
14	Oct. 19	Lecture 10. Acid-Base Titrations	
15	Oct. 21	Lecture 11. Fundamentals of Electrochemistry	
16	Oct. 26	Lecture 12. Potentiometry	
17	Oct. 28	Lecture 13. Voltammetry	
18	Nov. 2	Lecture 14. Fundamentals of Spectrophotometry	
19	Nov. 4	Lecture 15. Applications of Spectrophotometry	
20	Nov. 9	Lecture 16. Spectrophotometers	
21	Nov. 11	Lecture 17. Atomic Spectroscopy	
22	Nov. 16	**Exam II**	
23	Nov. 18	Lecture 18. Mass Spectrometry	
24	Nov. 23	Lecture 18. Mass Spectrometry (Continued)	
25	Nov. 25	**Thanksgiving holiday**	
26	Nov. 30	Lecture 19. Introduction to Analytical Separation	
27	Dec. 2	Lecture 20. Gas Chromatography (GC)	
28	Dec. 7	Lecture 21. Liquid Chromatography (GC)	
29	Dec. 9	Review	
30	Final Exam	**TBA**	