

Spring 2020

CHEM 221-102: Analytical Chemical Methods

Hao Chen

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Chemistry: *Spring 2020 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 221 Course Description: The objective of this course is to teach the students the science of chemical measurements. Often, scientists and engineers are faced with the question, what is in a given sample, and how much? Chemical measurement or analytical chemistry is the systematic study of methods which can be used to answer these questions.

This course has been designed for students taking their first laboratory course in quantitative methods of chemical analysis. The topics covered fall under the general category of Analytical Chemistry. By the end of the semester, the students are expected to have acquired fundamental knowledge to prepare them to embark upon a rational approach to qualitative and quantitative analysis. After reviewing the large number of topics and experiments that could have been included here, we have selected a small set of diverse experiments that we believe will provide fundamental knowledge of various popular and powerful analytical techniques. These experiments include data evaluation, gravimetric, complexometric/volumetric/potentiometric titration, and UV-Vis molecular spectrophotometry.

It will be to the student's advantage to continue to read and reread the chapters in their textbooks on laboratory techniques throughout the semester. There are also some practical aspects of chemical analysis that are best learnt during the experiments. For example, you will learn that one should not use a graduated cylinder for accurate volumetric measurements, and that solids are best dissolved in a beaker covered with a watch glass. The laboratory professor or teaching assistant (TA) will usually explain and/or demonstrate these and many more techniques which have been used successfully over the years.

Students are encouraged to ask questions before it is too late and the mistakes have already been committed.

Number of Credits: 2

Prerequisites: CHEM 222

Course-Section and Instructors

| Course-Section | Instructor |
|---|---|
| CHEM 221-102 (Tuesday, 5:45-9:50 pm, Tier 208) Office hours: Tuesday 4 pm or by appointment. | Dr. Hao Chen Email: hao.chen.2@njit.edu Telephone: 973-596-8571 Office: York office 232 |

E-Mail: All E-mail to me should start with CHEM 221 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.

Lab manual is required.

Reference Textbook: *Quantitative Chemical Analysis*, 9th Ed., D.C. Harris, WH Freeman, NY, 2016, ISBN-10: 1-4641-3538-X

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.

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

| | |
|--------------------------------|-----|
| Eight labs (each 10%) | 80% |
| Two quizzes (each 5%) | 5% |
| Exam | 10% |
| Lab behavior and lab cleanness | 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 | | |
| | | | |
| | | | |

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 lab 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/>

Course Outline

| Week | Date | Topic | Assignment |
|------|--------|--|------------|
| 1 | Jan 21 | Check in/Safety Lecture | |
| 2 | Jan 28 | Lab #1: Techniques in Preparing Solutions | |
| 3 | Feb 4 | Lab#2: Volumetric Glassware, Statistics, and Spreadsheet Exercise | |
| 4 | Feb 11 | Lab#3: Determination of sulfate as barium sulfate | |
| 5 | Feb 18 | Lab#3: Determination of sulfate as barium sulfate | |
| 6 | Feb 25 | Lab #4: Percentage of Na ₂ CO ₃ in a sample | |
| 7 | Mar 3 | Lab #4: Percentage of Na ₂ CO ₃ in a sample | |
| 8 | Mar 10 | Lab #5: Determination of hardness of water | |
| 9 | Mar 17 | Spring break | |
| 10 | Mar 24 | Lab #6: Potentiometric titration of an acid mixture | |
| 11 | Mar 31 | Lab #6: Potentiometric titration of an acid mixture | |
| 12 | Apr 7 | Lab #7: Determination of trace iron using UV-Visible spectrophotometry | |
| 13 | Apr 14 | Lab #8: Spectrophotometry of a two component mixture | |
| 14 | Apr 21 | Make up | |
| 15 | Apr 28 | Exam | |
| 16 | May 5 | Check out | |