

**ANALYTICAL CHEM METHODS**  
**CHEM 221 - 002, Spring 2018**  
**Syllabus**

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**Class time:** Thursday 9:15 am – 12:55 pm  
**Office hours:** Thursday 2 – 4 pm or by appointment.

**Laboratory Manual:** Analytical Chemical Methods, by S. Mitra, B. Kebbekus, R. Tomkins

**Reference Book:** Fundamentals of Analytical Chemistry, ninth edition, by Douglas A. Skoog, Donald M. West, F. James Holler, and Stanley R. Crouch, Brooks/Cole 2013, ISBN-10 0495558281.

**Description:**

*“Analytical chemistry involves separating, identifying, and determining the relative amounts of the components in a sample of matter.”*

Chem221 is to teach the students the science of chemical measurements and provide them with hands-on experience in analytical chemistry. This course has been designed for students taking their first laboratory course in quantitative methods of chemical analysis. The experiments selected for this course include data evaluation, gravimetric, complexometric/volumetric/potentiometric titration, gas chromatography, UV-Vis molecular spectrophotometry, and atomic absorption spectrometry.

**Grading Policy:**

80% Lab Reports and Accuracy  
20% Exam

**Required Materials:**

- Lab manual.
- Safety goggles (available at NJIT Bookstore or Homedepot).
- Disposable nitrile gloves (available at amazon.com or Homedepot).
- Disposable lab coat (color in white, available at amazon.com).

**Lab Schedule for Spring 2018:**

Week 1: Check –in & Exp. 1 Techniques in Preparing Solutions.

Week 2, 3: Exp. 2 Determination of sulfate as barium sulfate.

Week 4, 5: Exp. 3 Percentage of  $\text{Na}_2\text{CO}_3$  in a sample.

Week 6: Exp. 4 Determination of hardness of water.

Week 7, 8: Exp. 5 Potentiometric titration of an acid mixture.

Week 9: Spring Recess.

Week 10: Exp. 6 Determination of trace iron using UV-Visible spectrophotometry.

Week 11: Exp. 7 Spectrophotometry of a two component mixture.

Week 12: Exp. 8 Determination of Na in a snack by Flame AA.

Week 13: Exp. 9 Identification and quantitation of an unknown mixture by GC.

Week 14: Makeup (one lab only)

Final Exam: TBD

### **Learning outcomes:**

By the end of the course, you should be able to do the following:

1. Prepare solutions of assigned concentrations accurately.
2. Determine percentage of precipitate using quantitative gravimetric analysis.
3. Titrate using indicator, and pH electrode. Develop a titration curve and perform a graphical analysis of a titration curve to determine the equivalence point of titration.
4. Use a spectrophotometer to analyze a single analyte and a mixture containing several species without prior separation.
5. Prepare a sample for metal analysis using acid digestion. Have hands on experience with flame atomic absorption spectrometer.
6. Have hands on experience with gas chromatograph. Identify analytes in chromatogram and determine their concentrations quantitatively.

### **NJIT Honor Code:**

The NJIT Honor Code will be upheld, and any violations will be brought to the immediate attention of the Dean of Students. Please carefully read the honor code at <http://www.njit.edu/academics/honorcode.php>.