

CHM 263
ANALYTICAL CHEMISTRY

COURSE DESCRIPTION:

Prerequisites: CHM 132 or CHM 152

Corequisites: None

This course covers the knowledge and laboratory skills needed to perform chemical analysis. Emphasis is placed on developing laboratory techniques used in the separation, identification, and quantification of selected substances. Upon completion, students should be able to perform laboratory techniques employed in substance identification and volumetric analysis and interpret the results. *This course has been approved to satisfy the Comprehensive Articulation Agreement for transferability as a premajor and/or elective course requirement.* Course Hours Per Week: Class, 3. Lab, 4, Semester Hours Credit, 5

COURSE OBJECTIVES:

Upon completion of this course, the student will be able to:

- a. Understand basic analytical processes
- b. Perform statistical analysis of data
- c. Use a spreadsheet to perform statistical analysis of data
- d. Understand and employ commonly used titration methods
- e. Understand and employ electroanalytical techniques
- f. Understand and employ commonly used chromatography methods
- g. Understand and employ gravimetric and combustion analysis.

OUTLINE OF INSTRUCTION:

- I. Measurements
 - A. SI units
 - B. Chemical concentrations
 - C. Solution preparation
 - D. Stoichiometry
- II. Statistical Analysis
 - A. Experimental error and uncertainty
 - B. Gaussian distribution of data
 - C. Confidence intervals
 - D. Statistical testing (t, F, and Q tests)

- III. Calibration Methods
 - A. Calibration Curves
 - B. Best fit of data
 - C. Standard addition
 - D. Internal standards

- IV. Chemical Equilibrium
 - A. Equilibrium constant
 - B. Equilibrium and thermodynamics
 - C. Common ion effect

- V. Acid-base equilibrium
 - A. Strength of acids and bases
 - B. pH
 - C. Monoprotic acid-base equilibria
 - D. Polyprotic acid-base equilibria

- VI. Activity
 - A. Ionic strength and solubility
 - B. Activity coefficients

- VII. Analysis by titration
 - A. Acid-base titrations
 - B. EDTA titrations
 - C. Redox titrations

- VIII. Electrochemistry
 - A. Basic concepts
 - B. Galvanic cells
 - C. Standard Potentials

- IX. Potentiometry
 - A. Reference electrodes
 - B. Indicator electrodes
 - C. Ion-selective electrodes
 - D. Junction potentials

- X. Electroanalysis
 - A. Electrogravimetric analysis
 - B. Coulometry
 - C. Amperometry
 - D. Voltammetry

- XI. Chromatography
 - A. Introduction to analytical separations
 - B. Gas chromatography
 - C. High-performance liquid chromatography

- XII. Other analytical methods
 - A. Spectrophotometry
 - B. Mass spectrometry
 - C. Gravimetric analysis
 - D. Combustion analysis

REQUIRED TEXT AND MATERIALS:

Texts to be selected by the instructor and made available through the bookstore.

SUGGESTED REFERENCES, PERIODICALS, AND VISUAL AIDS:

Numerous supplementary texts, programmed materials, and audiovisual packages are available in the Educational Resources Center. The student may utilize these materials to reinforce the lecture and lab material or to provide material for independent study.

STATEMENT FOR STUDENTS WITH DISABILITIES:

Students who require academic accommodations due to any physical, psychological, or learning disability are encouraged to request assistance from a disability services counselor within the first two weeks of class. Likewise, students who potentially require emergency medical attention due to any chronic health condition are encouraged to disclose this information to a disability services counselor within the first two weeks of class. Counselors can be contacted by calling 686-3652 or by visiting the Student Development Office in the Phail Wynn Jr. Student Services Center, room 1309.