

COURSE PREFIX / NO.:	CHM 220
COURSE TITLE:	Analytical Chemistry I
LECTURE HRS./ WEEK:	3.0
LAB HRS./ WEEK:	3.0
CREDIT HRS/ SEMESTER	4.0

[Distance Learning Attendance/VA Statement](#)
[Textbook Information](#)

COURSE DESCRIPTION

This is the first course in a sequence that describes quantitative chemistry. Topics include gravimetric, volumetric, spectrophotometric and electrochemical analyses. Emphasis is on laboratory techniques.

COURSE COMPETENCIES

Upon successful completion of each the Modules in this course, the student should be competent to perform the indicated tasks. The student will also attain competencies as a result of applying his prerequisite knowledge to quantitative analysis.

Module 1: Introduction

1. Define the terms Technique, Method, Procedure, Protocol and Analysis as they are used in Analytical Chemistry and provide examples to differentiate one from another.
2. Relate the activities of analytical chemistry to those of synthetic and applications chemistry.
3. Provide definitions of basic terms relating to concentration and mass content of substances and use terms relating to percentage content, parts per million, and mass content appropriately.
4. Understand general course of the techniques of gravimetric, volumetric and spectroscopic techniques of analysis and several instrumental methods.
5. Maintain a laboratory notebook according to a fixed “good laboratory practices” standard.

Module 2: Measurement and Gravimetric Analysis

1. Demonstrate an understanding of measurement and chemical equilibrium as they apply to analytical chemistry and perform a simple search for sources of error in a procedure.
2. Apply simple statistics and error analysis to determine the reliability of analytical chemical procedures.
3. Perform gravimetric chemical analyses involving filtration, precipitation, separation, weighing and drying.
4. Define standards, calibration and sensitivity of a procedure and give examples.

Module 3: Volumetric Analysis and Separations

1. Perform volumetric chemical analyses using indicators, pH meters and ion-selective electrodes.
2. Prepare a primary standard, calibrate a burette and determine sensitivity of a volumetric procedure.
3. Apply advanced error analysis techniques and determine the number of replicates to achieve a given level of precision in volumetric analysis.
4. Prepare a plan for a simple separation to eliminate a known interference.

Module 4: Spectroscopy and Method Development

1. Perform a simple analysis using absorption light spectroscopy including standardization curves.
2. Describe the chemical principles and equipment used in common chromatographic, spectroscopic and irradiation methods of analysis.
3. Understand and use procedures of standardization, calibration, and blank measurements.
4. Describe the normal course of method development and the requirements of a finished protocol..

Upon successful completion of the course, the student should have achieved the following overall competencies from her or his application of chemical theory to quantitative analysis:

1. Apply appropriately the concepts of chemical equilibrium, irreversibility, hydrolysis, ion-product, reductionoxidation, chemical activity and solubility to all quantitative analysis techniques and apply the concepts of sensitivity, interference, separation and reproducibility to analytical procedures.
2. Demonstrate an understanding of chemical principles related to matter, measurement and energy as they apply specifically to analytical chemistry.

PERFORMANCE OBJECTIVES / MINIMAL STANDARDS

1. Given a term or concept, the student will be able to give a concise definition, a brief description, and an example illustrating the application of the term or concept.
2. Given an analytical procedure and equipment, the student will perform the experiment as directed, record the proper data, calculations, and observations, and evaluate his results against expected values.
3. Given an analytical procedure and nature of the sample, the student will be able to tell what chemical principles are involved and what analytical concepts are critical to completion of the procedure.
4. Given a water-soluble acid, the student will be able to determine its molar concentration.
5. Given a solution, the student will be able to determine the concentration of constituents by precipitation and gravimetric methods.
6. Given a suitable metal ore sample, the student will be able to determine the percentage of metal by digestion, solubilization, separation and redox titration.
7. The student will be able to prepare accurate standards for use in titrations and spectroscopy.
8. Given a procedure and availability of equipment, the student will be able to determine what accuracy would be expected.
9. Given a familiar mixture, the student will be able to propose a separation scheme, isolate the analyte and determine its concentration.

COURSE REQUIREMENTS

Students are responsible for compliance with the attendance policy and the conduct policy published in the York Technical College Handbook. Laboratory attendance is mandatory for all sessions. One missed laboratory session may be made up during the last week of the term. Additional missed laboratory sessions will result in a grade reduction of 7 points per session for the total laboratory grade.

EVALUATION STRATEGIES/GRADING

The final grade for the course will consist of 60% of the Lecture Test Average, and 40% of the Laboratory Grade. Lecture tests will consist of written quizzes and examinations as deemed necessary by the instructor. Specifics will be announced at the start of the course. Laboratory grade will be based on accuracy of analyses, safe and efficient laboratory technique and maintenance of a laboratory notebook with approximately equal emphasis on each.

Letter Grades will be awarded based on the standard scale:

A 90 - 100

B 80 - 89

C 70 - 79

D 60 - 69

F 59 and Below

ENTRY LEVEL SKILLS

A student should be able to use mathematical equations with ease and be proficient with the following: scientific notation, quadratic equations, ratio and proportion, significant figures, English - Metric (SI) conversions, word problems, and logarithms.

PREREQUISITES: Chemistry 111

COREQUISITES: MAT 110

Disabilities Statement: Any student who feels s/he may need an accommodation based on the impact of a disability should contact the Special Resources Offices (SR) at 803-327-8007 in the 300 area of Student Services. The SRO coordinates reasonable accommodations for students with documented disabilities.

TOPIC/ CONTENT OUTLINE

Module 1

What is Analytical Chemistry?

Techniques, Methods, Procedures, Protocols Basic Techniques: Introduction

Module 2

Measurement: Significant figures, error, statistics (normal and non-parametric) Standards and Calibration,

Sensitivity Chemical Equilibria Gravimetric Analysis

Module 3

Sample Preparation, Separations Advanced Error Analysis Volumetric Analysis

Module 4

Spectroscopy Instrumental Methods Method Development