

J. Sargeant Reynolds Community College
Course Content Summary

Course Prefix and Number: CHM 263 **Credits:** 5

Course Title: Chemistry Instrumentation for Industry and Life Sciences

Course Description

Provides students with the knowledge and appropriate use of industrial and life science instrumentation skills needed for employment as a chemical laboratory technician in the life science or pharmaceutical industry. Focuses on use of basic and specialized lab equipment and techniques with an emphasis on sample prep, standard operating procedures (SOP), International organization for standardization (ISO) and safety for Fourier Transform Infrared Spectroscopy (FTIR), Gas Chromatography Mass Spectrometry (GCMS), High Performance Liquid Chromatography (HPLC), Nuclear Magnetic Resonance (NMR) and UV-Spectrophotometer (UV-VIS). Lecture 3 hours. Laboratory 4 hours. Total 7 hours per week.

General Course Purpose

This course covers appropriate use of various instruments and analytical methods in pharmaceutical and industrial settings. Emphasis is placed on sample preparation, statistical parameters, titrations, potentiometric methods and various forms of spectroscopy and chromatography, including Fourier Transform Infrared Spectroscopy (FTIR), Gas Chromatography Mass Spectrometry (GCMS), High Performance Liquid Chromatography (HPLC), Nuclear Magnetic Resonance (NMR), and UV-Visible Spectrophotometry. Upon completion, students should be able to carry out all analytical schemes presented.

Course Prerequisites/Corequisites

Prerequisites BIO 147 with a C or better, CHM 111 with a C or better and MTH 161
Co requisite CHM 112

Course Objectives

Upon completing the course, the student will be able to:

- Operate instrumentation commonly used in chemical and life sciences laboratories, including Fourier Transform Infrared Spectroscopy (FTIR), Gas Chromatography Mass Spectrometry (GCMS), High Performance Liquid Chromatography (HPLC), Nuclear Magnetic Resonance (NMR), and UV-Visible Spectrophotometry.
- Interpret instrumentation output from Fourier Transform Infrared Spectroscopy (FTIR), Gas Chromatography Mass Spectrometry (GCMS), High Performance Liquid Chromatography (HPLC), Nuclear Magnetic Resonance (NMR), and UV-Visible Spectrophotometry.
- Implement standard operating procedures (SOPs) for chemical analyses, including calibration, reagent preparation, recordkeeping, and quality control checks.
- Communicate professionally through written laboratory reports and technical documentation that clearly explains experimental methods, data analysis, and conclusions.
- Demonstrate workplace competencies valued in laboratory environments, including technical writing proficiency, teamwork, ethical decision-making, adaptability, and effective problem solving.

Major Topics to be Included

- Introduction to Instrumental Analysis
 - Basic instruments and components
 - The relationship between analyze concentration and instrumental response
 - Methods of calibration
 - Construction and use of calibration graphs
 - Sensitivity and detection limits
- Molecular Techniques:
 - Ultraviolet - Visible (UV-Vis)
 - Molecular Fluorescence
 - Nuclear Magnetic Resonance (NMR)
 - Mass spectrometry (MS)
- Chromatographic Techniques
 - Gas chromatography (GC)
 - Liquid chromatography (LC or HPLC)
- Electroanalytical Techniques
 - Potentiometry
 - pH meters

Effective Date/Updated: October 2025