

University of Arkansas – Fort Smith
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General Syllabus

CHEM 4614 Instrumental Analysis

Credit Hours: 4

Lecture Hours: 3

Laboratory Hours: 3

Prerequisite: CHEM 3604 Analytical Chemistry

Effective: 2018~2019

I. Course Information

A. Catalog Description

Explores instrumental methods of chemical analysis including basic design and theory of operation for modern instrumentation. Emphasizes the practical applications and limitations of each technique. Course is offered every other year; consult with faculty advisor.

B. Additional Information - None

II. Student Learning Outcomes

A. Subject Matter

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

1. Prepare a sample, run the instrument, and interpret the data to determine molecular structure using NMR.
2. Prepare a sample, run the instrument, and interpret the data to determine electronic transitions using UV-Vis spectroscopy.
3. Prepare a sample, run the instrument, and interpret the data to determine functional groups, structure, and vibrational modes using IR spectroscopy.
4. Prepare a sample, run the instrument, and interpret the data from a gas chromatograph and a high performance liquid chromatograph.
5. Describe the principles and operation of and interpret data from a mass spectrometer. Describe the principles and operation and advantages of GC-MS.
6. Prepare a sample, run the instrument, and interpret the data from an atomic absorption and atomic emission instrumentation.
7. Use electrochemical techniques in the analysis of chemical reagents.

8. Describe the principles and operation x-ray diffraction.

B. University Learning Outcomes

Instrumental Analysis enhances student abilities in the following areas:

Analytical Skills

Critical Thinking Skills: Students will identify a problem or issue and will research, evaluate, and compare information from varying sources in order to evaluate authority, accuracy, recency, and bias relevant to the problems/issues. Students will generate solutions/analysis of problems/issues evaluated and will assess and justify the solutions and/or analysis.

Communication Skills (written and oral)

Students will communicate proficiently. Students will compose coherent documents appropriate to the intended audience and effectively communicate orally in a public setting.

Ethical Decision Making

Students will model ethical decision-making processes. Students will identify ethical dilemmas and affected parties and will apply ethical frameworks to resolve a variety of ethical dilemmas.

Global & Cultural Perspectives

Students will reflect upon cultural differences and their implications for interacting with people from cultures other than their own. Students will demonstrate understanding or application of their discipline in a global environment and will demonstrate how their discipline impacts or is impacted by different cultures.

III. Major Course Topics

- A. Nuclear Magnetic Resonance Spectroscopy
- B. Ultraviolet-Visible Spectroscopy
- C. Infrared Spectroscopy
- D. Gas Chromatography
- E. Mass Spectrometry
- F. High Performance Liquid Chromatography