



King Saud University
Department of Chemistry
CHEM 350



Instrumental Methods of Analysis
First Semester **1447 (2025/2026)**

Credit Hours: 4 hours (2+2)

Time: Lecture: Sun & Tue 08:00–08:50 am, Mon & Wed 11:00–11:50 am

Lab: Tue 02:00–05:50 pm & Wed 02:00–05:50 pm

Lecture Theater: Building No. 5 (A 057 1 05 0140)

Instructor: Dr. Ahmad Aqel

Web Site: faculty.ksu.edu.sa/en/aifseisi/home

Office No.: 2A/149, AA/53, & 2A127

Office Hours: Sun & Tue: 11:00–12:00, Mon & Wed: 10:00–12:00 and by appointment

E-mail: aifseisi@ksu.edu.sa

Teaching Assistant: Dr. Turki Alkhulaiwi

Prerequisites: CHEM 101

Course Objectives ...

The main purpose of this course is to help the students to learn and understand several concepts in spectroscopic and electro-analytical methods. By the end of this course, students expected to:

- Define the basic principles of electromagnetic radiation.
- Be familiar with some of the spectroscopic techniques such as fluorometry, phosphorometry, and chemiluminescence.
- Describe the basics of molecular and atomic spectrometry.
- Know the proper analysis tool for specific metals or compounds.
- Define the basic principles of electro-analytical techniques.
- Recognize the theory of the three main categories electro-analytical methods; potentiometry, coulometry, and voltammetry.
- To learn the students with the knowledge and skills of separation methods, especially GC and HPLC techniques.
- Interpret the spectroscopic, electrochemical, and chromatographic experimental data.

This course also designed to give students the opportunity to perform and evaluate different spectroscopic, chromatographic, and electro-analytical experiments, to identify various standard compounds, and to deal with some traditional and modern analytical instruments.

Course Description ...

This course is designed to provide principles and practical experience in spectroscopic, chromatographic, and electro-analytical methods for BSc students. The course consists of two-contact hours lecture and four-contact hours lab per week. Lectures and experiments provide the fundamentals needed to understand the techniques and instrumentations involved in these powerful analytical tools.

Textbook & References ...

- 1- Principles of Instrumental Analysis, 7th ed., Douglas Skoog, James Holler, Stanley Crouch, Cengage Learning, 2018.
- 2- Chemical Analysis: Modern Instrumentation Methods and Techniques, 3rd ed., Francis Rouessac, Annick Rouessac, John Towey, Wiley, 2022.
- 3- Analytical Chemistry, Instrumental Analysis, 5th ed., Ibrahim Al-Zamil, Al-Khrigi Publisher, 2015 (in Arabic).

Course Contents (Lecture) ...

The course includes series of lectures and experiments covers the following subjects:

- Interaction of electromagnetic radiation with matter.
- Basic principles of molecular and atomic spectrometry.
- Spectrometric instrumentation.
- Atomic absorption, emission and fluorescence spectrometry.
- Basic principles of electro-analytical techniques.
- Potentiometry and potentiometric titrations.
- Coulometry and conductimetry.
- Voltammetry and related techniques.
- Introduction for separation methods.
- Basics of chromatography; definition, principle, types, and applications.
- Principles of gas and high-performance liquid chromatography (GC and HPLC).

Course Contents (Laboratory) ...

During this practical course, students will be exposed to some traditional and modern techniques for analysis of several chemicals. Various spectroscopic, chromatographic, and electro-chemical techniques such as AAS, AES, ICP, HPLC, GC, and other instruments for measuring cell potential and voltage will be included. Each experiment consists of general principles, components of the system and applications.

Evaluation & Assessment

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| - Midterm exam | 20% |
| - Activities (assignment, discussion, homework's, presentation, project) | 10% |
| - Laboratory (reports, quizzes, and practical exams) | 30% |
| - Final exam (comprehensive) | 40% |

Good Luck !