

SYLLABUS

Quantitative Instrumental Analysis

CHEM 425
Spring 2018

LECTURES: MW 15:10 in Fulmer 225.

INSTRUCTORS: Prof. Alex Li, OFFICE: Fulmer 171; PHONE: 335-7196; Email: dequan@wsu.edu; Office Hours: by appointment.

GRADING: There are two midterm exams covering materials up to the exam and one final exam covering materials after the second midterm. The Final Grade will be the average of the three exams.

CREDITS: 2

Textbook: Required

Title : Undergraduate Instrumental Analysis
Author : Robinson, Skelly-Frame, Frame II
Publisher : CRC Press, Taylor & Francis Group
Edition/Year : 7th Ed./2014
ISBN : 978-1-4200-6135-2

Students will find the reference textbook “**Quantitative Chemical Analysis**,” 8th ed by **Harris** an extremely useful resource though it is not a required text.

COURSE DESCRIPTION, OBJECTIVES, and LEARNING GOALS: This course will cover the introduction to modern instruments used in chemistry and other related fields. In addition, it combines instrumental analysis with spectral interpretation to enhance problem solving in chemistry, biology, medicine, food sciences, and materials. The objective of this course is to: 1. Provide an overview of instrumental methods of analysis that are currently used to make chemical measurements; 2. Provide a knowledge base that will enable the selection of appropriate instrumental methods for a desired analysis; 3. Provide a basic understanding of the response mechanisms of the various instrumental methods of analysis; 4. Provide a basic understanding of the components of analytical instruments.

Student learning outcomes are too numerous to be listed specifically. The following are only several sample outcomes after students have finished the course successfully:

- 1) Understand the modern instrument design principles.
- 2) Use key metrics such as signal to noise ratio to gauge the performance of instruments.
- 3) Mastering basic methods used to quantify analytes of interest.
- 4) Through spectroscopy, learn the interactions between light and matter.
- 5) Understand the structures of basic spectrometers and their operating principles.
- 6) Apply molecular absorption spectroscopy to quantitative analyses.
- 7) Apply photoluminescence for quantitative and ultrasensitive analyses.
- 8) Use NMR to interpret organic molecular structures.
- 9) Use FTIR techniques to determine and confirm structures.
- 10) Apply atomic spectroscopy for quantitative analyses.

- 11) Familiar with various chromatography techniques such as HPLC and electrophoresis
- 12) Interpret mass spectroscopy data and apply them in analyses.

LECTURES: Lectures must be attended regularly and students are responsible for making up the missed materials if they missed the classes for reasons beyond their control. Exam questions are based primarily on lecture materials and homework. Students must read the textbook or other reference materials before and after class in order to digest the materials covered in the lecture. The lectures will supplement, enhance, and clarify the information from the textbook rather than simply reiterate it. Thus it is highly recommended that students should attend classes and take notes for future reviews and studies for exams.

HOMEWORK: Homework will be assigned weekly associated with the materials presented in the previous week. Homework will be due one week from the date of assignment except specified otherwise. Late homework will not be accepted. We strongly encourage that you complete your homework because it will help you in the exams.

EXAMS: There will be three exams: two midterms and one final. The student will be responsible for bringing a calculator and a pencil to all exams. No notes or books are allowed. No make-up exams will be given. If the student is unable to take a scheduled exam for reasons beyond his/her control, he/she should contact the instructor as soon as possible. These issues will be determined case-by-case by the instructor before the exam.

Disabilities: Students with Disabilities: Reasonable accommodations are available for students with a documented disability. If you have a disability and may need accommodations to fully participate in this class, please visit the Disability Resource Center (DRC). All accommodations MUST be approved through the DRC (Washington Building, Room 217). Please stop by or call 509-335-3417 to make an appointment with a disability specialist.

Academic Integrity: We encourage you to work with classmates on assignments. However, each student must turn in original work. No copying will be accepted. That includes sharing of spreadsheets, graphs and other figures. Students who violate WSU's Policy on Academic Integrity will receive an F as a final grade in this course.

Schedule of Lecture Topics

Week of	Topic	Remarks
Jan 8-12	Introduction to Instrument Design	
Jan 15-19	Signal, Noise, Figures of Merit	Martin Luther King Monday
Jan 22-26	Methods of Quantification	
Jan 29-Feb 2	Light-matter interactions	
Feb 5-9	Spectroscopy Instrumentation	
Feb 12-16	Molecular Absorption	Midterm exam 1
Feb 19-23	Absorption/Luminescence	Monday, President Day Class Holiday
Feb. 26-Mar 2	Molecular Luminescence/NMR	
Mar 5-9	NMR	
Mar 12-16	Spring Break	
Mar 19-23	FTIR/Raman	
Mar 26-30	Atomic Spectroscopy	Midterm Exam 2
Apr 2-6	Fundamentals of Chromatography	
Apr 9-13	GC/HPLC/Capillary Electrophoresis	
Apr 16-20	Mass Spec	
Apr 23-27	Preparation for Final Exam	
Apr 30-May 4		Final Exam