

**SYLLABUS****CHEM 425-Quantitative Instrumental Analysis****Spring 2016**

LECTURES: MW 15:10 in Fulmer 225.

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

GRADING: There are one midterm exam covering week 1 through week 7 materials and one final exam covering week 8 through week 15 materials. The Final Grade will be the average of the two exams.

CREDITS: 2

**Textbook: Required**

Title : Undergraduate Instrumental Analysis

Author : Robinson, Skelly-Frame, Frame

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," 8<sup>th</sup> 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 a few general 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 to 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 better. The lectures will supplement, enhance, and clarify the information from the textbook rather than simply reiterate it.

**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 two exams: one midterm 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 Topic

Week of	Topic	Remarks
Jan 11-15	Introduction-Instrument Design	
Jan 18-22	Signal and Noise, Figures of Merit	Martin Luther King Monday
Jan 25-29	Methods of Quantification	
Feb 1- 5	Light and interactions with matter	
Feb 8-12	Light and interactions with matter	
Feb 15-19	Spectroscopy Instrumentation	Monday, President Day, Class Holiday
Feb 22-26	Molecular Absorption	
Feb. 29-Mar 4	Molecular Luminescence	Midterm Exam
Mar 7-11	NMR	
Mar 14-18	No Lectures	Spring Break
Mar 21-25	FTIR/Raman	
Mar 28-Apr 1	Atomic Spectroscopy	
April 4-8	Fundamentals of Chromatography	
April 11-15	GC/HPLC/Capillary Electrophoresis	
April 18-22	Mass Spec	
April 25-29	Make up and Prepare for Final	
May 2-6		Final Exam