

4:112 Analytical Chemistry II

Spring 2008

Instructor: Professor M. Lei Geng
330 IATL, Department of Chemistry
Phone: 335-3167
E-mail: Lei-Geng@uiowa.edu

Lectures: 10:30-11:20 am MWF, S307 PBB

Office Hours: 1:30-2:30 pm MWF or by appointment

Textbook: Skoog, Holler and Nieman, *Principles of Instrumental Analysis*, Brooks/Cole, Thomson Learning.

Course Objectives:

The objective of Analytical Chemistry II is to discuss instrumental methods for chemical analysis. Instrumental analysis is playing a crucial role in today's chemical and pharmaceutical industry, biomedicine, environmental and materials sciences. This course will introduce to the students technologies that utilize automated instrumentation to identify, quantify and separate chemical species. Optical spectroscopic, mass spectrometric and chemical separation methods will be covered in the course.

Grading:

Problem sets 250 points; Hour exams 300 points; Final exam 200 points.

Total points for the course: 750

Plus and minus grades will be assigned.

- (1) Problem Sets: Five problem sets will be assigned during the semester. The problem sets will be based on lecture materials and the textbook. (50 points each)
- (2) Hour exams: There will be three hour exams. (100 points each)
- (3) Final exam: The final exam will have two components. The first component covers materials since hour exam 3 and the second is cumulative. (200 points)

Course Web Site:

All course materials are available on the 004:112 Icon site. Course syllabus, schedule, lecture notes, announcements, answer keys to assignments and exams, and grades are posted on this site.

Course Topics and Schedule

| Dates | Lecture Topics / Assignments |
|---------|--|
| Jan. 23 | Introduction |
| Jan. 25 | Introduction |
| Jan. 28 | Principles of spectroscopy |
| Jan. 30 | Principles of spectroscopy |
| Feb. 1 | Principles of spectroscopy |
| Feb. 4 | No class |
| Feb. 6 | Components for chemical instrumentation: Physical and geometric optics |
| Feb. 8 | Components for chemical instrumentation: Sources and Detectors |
| Feb. 11 | Components for chemical instrumentation: Monochromators and polychromators |
| Feb. 13 | Components for chemical instrumentation: Monochromators and polychromators |
| Feb. 13 | Problem Set 1 Due |
| Feb. 15 | Measurement basics: Signal and noise |
| Feb. 18 | Exam 1 |
| Feb. 20 | Measurement basics: Electronics |
| Feb. 22 | Measurement basics: Electronics |
| Feb. 25 | Atomic spectroscopy: Introduction |
| Feb. 27 | Atomic spectroscopy: Atomic absorption spectroscopy |
| Feb. 29 | Atomic spectroscopy: Atomic absorption spectroscopy |
| Mar. 3 | Atomic spectroscopy: Atomic emission and fluorescence spectroscopy |
| Mar. 5 | Molecular spectroscopy: Introduction |
| Mar. 5 | Problem Set 2 Due |
| Mar. 7 | Molecular UV-visible spectroscopy |
| Mar. 10 | Exam 2 |
| Mar. 12 | Molecular luminescence spectroscopy |
| Mar. 14 | Molecular luminescence spectroscopy |

| Dates | Lecture Topics / Assignments |
|--------------|---|
| Mar. 17-21 | Spring break |
| Mar. 24 | Vibrational spectroscopy: Introduction |
| Mar. 26 | Vibrational spectroscopy: Infrared spectroscopy |
| Mar. 28 | Vibrational spectroscopy: Infrared spectroscopy |
| Mar. 28 | Problem Set 3 Due |
| Mar. 31 | Vibrational spectroscopy: Raman spectroscopy |
| Apr. 2 | Mass spectrometry |
| Apr. 4 | Mass spectrometry |
| Apr. 7 | Mass spectrometry |
| Apr. 9 | Mass spectrometry |
| Apr. 11 | Exam 3 |
| Apr. 14 | Introduction to chemical separations |
| Apr. 14 | Problem Set 4 Due |
| Apr. 16 | Introduction to chemical separations |
| Apr. 18 | Introduction to chemical separations |
| Apr. 21 | Gas chromatography |
| Apr. 25 | Gas chromatography |
| Apr. 23 | High performance liquid chromatography |
| Apr. 28 | High performance liquid chromatography |
| Apr. 30 | High performance liquid chromatography |
| May 2 | High performance liquid chromatography |
| May 2 | Problem Set 5 Due |
| May 5 | Capillary electrophoresis and electrochromatography |
| May 7 | Capillary electrophoresis and electrochromatography |
| May 9 | Surface characterization methods |
| May 12 | Final Exam (2:15 – 4:15 pm, S307 PBB) |