Chemistry 412  
Analytical Chemistry II  
Course Syllabus  
Spring Semester 2007

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Office Hours: Whenever I’m not busy – just stop by. Feel free to contact me by phone or e-mail. I check my e-mail regularly.

Course Overview: Chemistry 412 is an advanced undergraduate level course in instrumental methods of analytical chemistry, covering spectroscopic, electrochemical, surface analytical and separation methods. Classical methods of analysis were covered in CHM 212.

Required Text: Principles of Instrumental Analysis by Skoog, Holler and Crouch 6\textsuperscript{th}/ed. This text covers the range of topics in both spectroscopy and separations. For those of you taking CHM 414, the lab experiment will be distributed to you in lecture.

Course Grade: Your final grade in CHM 412 will be determined by your performance on 3 in term exams, one final exam and several homework assignments. The distribution is as follows.

\begin{align*}
3 \text{ hour exams} & \quad @ \ 20\% \ \text{each} = 60\% \ \text{Course grade} \\
1 \text{ final exam} & \quad @ \ 30\% \ = 30\% \ \text{Friday, May 11}^{\text{th}}, 11:30 – 2:30 \\
\text{Homework sets} & \quad = 10\%
\end{align*}

Exams will be about equally spaced. I’ll announce exams approximately two weeks ahead.

Topics:

1. Introduction and fundamentals (Chapters 1 – 5)
2. Introduction to Spectrometric Methods (Chapter 6)
3. Components of Optical Instruments (Chapter 7)
4. Introduction to Electroanalytical Chemistry
   a. Potentiometry
   b. Voltammetry
5. Atomic spectroscopy
   a. Atomic Absorption
   b. Atomic Fluorescence
   c. Atomic Emission

6. Molecular spectroscopy
   a. UV-Visible
   b. Fluorescence spectroscopy (steady-state, lifetime, FRET, anisotropy)
   c. Infrared spectroscopy (specular/diffuse reflection, grazing angle, ATR)
   d. Raman spectroscopy (resonance raman, SERS)
   e. Mass Spec (EI, CI, ESI, MALDI, TOF)

7. Introduction to surface spectroscopy/microscopy (as time permits, these topics are meant to familiarize you with the methods employed in the fast growing field of nano/surface science)
   a. XPS/ESCA (X-ray photoelectron spectroscopy)
   b. AFM, STM, SEM (atomic force, scanning tunneling, scanning electron microscopy)
   c. SIMS (secondary ion mass spec)
   d. Ellipsometry/SPR (surface plasmon resonance)

8. Separation Methods
   a. Fundamentals of separation science (resolution, retention time, capacity factor, columns, support, etc.)
   b. HPLC (normal-phase vs. reversed-phase)
   c. GC
   d. CE/CEC