Instrumental Analysis
Chemistry 4330
Spring 2008

Lectures: MWF, 10:0 – 10:50
Instructor: John Hansen, Office: Room 2126
Office Hours:
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Text: Principles of Instrumental Analysis, Fifth Edition by Skoog, Holler and Nieman, Saunders Publishing

Course Objectives

CHM 4330 is a semester-long course designed for chemistry majors that covers the use of instrumentation for chemical analysis. In this class, we will discuss the theory behind the analysis (with a strong emphasis on quantum mechanics and spectroscopy), instrumental operation (that covers the electronics and optical components of instruments), and data analysis and interpretation (which includes signal processing, Fourier transformation, and statistical analysis). It is assumed that you have completed a course in analytical chemistry, calculus-based physics and quantum chemistry or quantum mechanics.

Learning Outcomes

In this course, students will demonstrate their understanding of the physical basis and general applications of instrumental techniques applied to the analysis of chemical systems. In particular, they will demonstrate their ability to analyze electronic circuits used in instrumentation (this includes networks, RC circuits, operational amplifiers, digital electronics and logic circuits), and their understanding in the theory and operation of a wide variety of instruments, as well as interpretation of experimental data.

Expectations

It is my desire that each of you will succeed in this course. I will try to help you in anyway I can. It is vitally important you keep up with the material. I have found, without exception, those that received a grade of A or B in this course have consistently done the homework and took it seriously. Please see me, if you should have any difficulties.

Grading

The grade in this course will be based on four in-class exams and a final exam.
Each in-class exam is worth a 100 points, and the final exam is worth 150 points.
Grades will be calculated based on a maximum of 550 points.
Grade Scale: > 90% = A; 80 - 90% = B; 70 - 80% = C; 60 - 70% = D; < 60% = F

Policies

1. You are responsible for all material covered and all announcements made in

class. Absence from class does not excuse or relieve you of this responsibility.

2. Cheating will not be tolerated. On the first occurrence it will result in a grade of zero for the exercise in question. A second occurrence will result in a grade of F for the course. All out of class assignments will be done in the absence of any collaboration from others. Any questions, clarifications, or requests for assistance should be directed only to me.
3. No make-up exams will be given. Anyone not able to take an exam on the day scheduled must contact me before the exam.

Tentative Schedule

Date	Topic	Chapters
1/09	DC & AC Circuits	1 and 2
1/11	RC Circuits	2
1/13	RC Filters	2
1/18	Operational Amplifiers	3
1/20	Op Amp Circuits	3
1/23	Op Amp Circuits	3
1/25	Digital Electronics	4
1/27	Digital Electronics	4
1/30	Signals and Noise	5
2/01	Spectrometric Methods	6
2/03	**ExamI**	
2/06	Optical Instruments	7
2/08	Optical Instruments	7
2/10	Atomic Spectrometry	8
2/13	Atomic Fluorescence	9
2/15	Atomic Absorption	9
2/17	Molecular Absorption	14
2/20	Molecular Absorption	14
2/22	Molecular Luminescence	15
2/24	Infrared Spectrometry	16
2/27	Infrared Spectrometry	17
3/01	**Exam II**	
3/03	Raman Spectroscopy	18

3/06	Raman Spectroscopy	18
3/08	NMR	19
3/10	NMR	19
3/13	NMR	19
3/15	NMR	19
3/17	NMR	19
3/27	Atomic Mass Spectrometry	11
3/29	Atomic Mass Spectrometry	11
3/31	Molecular Mass Spectrometry	20
4/03	Molecular Mass Spectrometry	20
4/05	**Exam III**	
4/07	Chromatography	26
4/10	Chromatography	26
4/12	Chromatography	26
4/14	Chromatography	27
4/17	Potentiometry	22 & 23
4/19	Potentiometry	23
4/21	Voltammetry	25
4/24	Voltammetry	25
4/27	Voltammetry	25
4/28	**Exam IV**	
5/01	Review	
5/03	**Final** (8:00 to 10:00 am)	

Some Supplementary Texts
(recommended, not required)

1. The Art of Electronics, Horowitz and Hill
2. Building Scientific Apparatus, Moore, Davis and Coplan
3. Discrete Systems and Digital Signal Processing, Strum and Kirk
4. Physical Methods in Chemistry, Drago
5. Data Reduction and Error Analysis for the Physical Sciences, Bevington
6. The Fourier Transform and its Applications, Bracewell
7. The Fast Fourier Transform, Brigham