

Instrumental Analysis –CHEM 382
Fall Semester 2008

MWF 10:45–11:40 – RNS 435

Instructor: Dr. Douglas Beussman

Office: RNS 436 - Phone: 786-3429

Email: beussmad@stolaf.edu

Office hours: Monday 9-10, Tuesday 10-11, Thursday 1-3 – RNS 436

Objectives: This course will focus on how modern chemical instrumentation functions. Lectures will investigate the mechanical, mathematical, optical and electronic basis of several classes of instruments. Topics covered will include basic electronics and computer interfacing, spectrophotometric instruments, mass spectrometers, and various separation methods.

Prerequisites: Chem 255, 256 - Concurrent registration in Chem 378

Course web page: The URL for the CHEM 382 web page is:

<http://www.stolaf.edu/people/beussmad/Chem382/>

The web page will contain information about the course, a copy of the syllabus, class handouts, and announcements.

Grading: Grades will be assigned based on a straight scale from the results of problem sets, simulation problems, class participation, three take-home exams, and one comprehensive final exam.

Exam 1	130 points
Exam 2	130 points
Exam 3	130 points
12 Problem Sets	120 points total
14 Simulation Problems	140 points total
Final Exam	225 points
Class Participation	<u>25 points</u>
TOTAL	900 points

Grades

>90%	A
>80%	B
>70%	C
>60%	D

Problem Sets: Twelve problem sets will be given throughout the semester. Homework should be turned in during class, but will be accepted until 5:00 PM in SC 328. ***Problem Sets turned in after 5:00 PM the day it is due will not be graded, unless previous arrangements have been made with the instructor.*** Students are encouraged to work on the problems as a group, but each student must turn in their own work. Handing in photocopied or hand-copied answers constitutes academic dishonesty.

Simulation Problems: Fourteen simulation problems will be given throughout the semester. Simulation problems should be turned in electronically via email by midnight the day they are due. ***Simulation Problems turned in after midnight the day they are due will not be graded, unless previous arrangements have been made with the instructor.*** While students are encouraged to work together, the first three simulation problems are to be completed and turned in individually. The remaining simulation problems will be completed and turned in as a group. The group simulation problems will use the “role-playing” format.

Exams: All regular exams will be individual, closed book, closed note self-scheduling take-home exams. These self-scheduling exams will be handed out in sealed envelopes. Students will be allowed to decide when and where they wish to take the exam, but the exam must be completed in a single block of time. After the time limit is up, students will sign the pledge (or not) and return the exam to the envelope. No make-up exams will be given unless prior arrangements have been made with the instructor. Unless otherwise announced, calculators will be allowed, however, the use of programmable calculators to store information of any sort (definitions, equations, etc.) will constitute academic dishonesty. After graded exams are returned, students will have one week to turn exams in to be regraded. The reason for the regrade must be given in writing.

Textbooks: *Principles of Instrumental Analysis, Sixth Edition*
Skoog, Holler, Crouch

LabVIEW 7.0 Express Student Edition with 7.1 Update

Lecture Number	Date	Topic	Reading	HW Due	Lab
1	9/3	Introduction	1-32		
2	9/5	Voltage Dividers	32-49		
3	9/8	Voltage Dividers	49-54	Sim1	Digital I/O
4	9/10	Operational Amplifiers	59-65	PS1	
5	9/12	Current and Voltage Follower Op-Amps	65-74	Sim2	
6	9/15	A-to-D, D-to-A Converters	80-95, 102-103, 110-123	Sim3	Op Amps
7	9/17	Intro to Electrochemistry	628-653	PS2	
8	9/19	Potentiometry	659-671		
9	9/22	Potentiometry	671-683, 686-691		A/D Conversion
10	9/24	Voltammetry	716-741	Sim4	
11	9/26	Voltammetry	742-750		
12	9/29	Vacuum systems and detectors	281-287	PS3	Mock GC Oven
13	10/1	Mass Analyzers (Sectors and Quadrupole based)	287-290, 563-568	Sim5	
14	10/3	Mass Analyzers (TOF and FTMS)	569-573		
		Exam #1 (handed out 10/3, due 10/6)			
15	10/6	EI/CI Ionization	550-558		Cyclic Voltammetry
16	10/8	MALDI/ESI Ionization	558-563	PS4	
17	10/10	ESI Ionization	handouts	Sim6	
	10/13	<i>FALL BREAK</i>			None
	10/15	<i>FALL BREAK</i>			
18	10/17	Tandem Instruments	573-584		
19	10/20	Radiation Sources	132-159, 164-168	PS5	MALDI-TOF/Robot Tutorial
20	10/22	Lasers	168-175	Sim7	
21	10/24	Filters and Gratings	175-191		
22	10/27	Monochrometers		PS6	AA
23	10/29	Transducers	191-203	Sim8	
24	10/31	Single-Beam/Double Beam Instruments	348-362	PS7	
		Exam #2 (handed out 10/31, due 11/3)			
25	11/3	Intro to Atomic Absorption/Flame Cell	215-228, 230-241		ICP
26	11/5	Graphite Furnace/ICP/Atomic Emission	241-250, 254-269	Sim9	
27	11/7	Deviations from Beer's Law	336-348	PS8	

28	11/10	Michelson Interferometer	430-452, 204-211	Sim10	FT/IR
29	11/12	FT-IR	455-477	PS9	
30	11/14	Luminescence	399-422	Sim11	
31	11/17	XPS	303-317, 589-602		Robot Hydrolysis
32	11/19	Intro to Separations	762-771	Sim12	
33	11/21	Van Deemter Equation	771-784		
34	11/24	GC Instrumentation	788-792	PS10	“Robot”
	11/26	<i>BREAK</i>			
	11/28	<i>BREAK</i>			
35	12/1	GC Detectors	792-809		HPLC
36	12/3	HPLC Instrumentation	816-828	Sim13	
37	12/5	Other types of Chromatography	828-851	PS11	
		Exam #3 (handed out 12/5, due 12/8)			
38	12/8	Electrophoresis Principles	867-871	Sim14	
39	12/10	Capillary Electrophoresis Instrumentation	871-888	PS12	
		<i>FINAL EXAM</i>			

Instructor reserves the right to make schedule changes throughout the semester as needed.