CHEMISTRY 320
Syllabus for Instrumental Methods of Analysis
Lecture Portion

Fall, 2013
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Course goals: This course explores the theory, principles of operation, and hands-on use of the basic instrumentation used in the chemical industry. Whether or not you become an analytical chemist, you will find some form of chemical instrumentation being used in your field (including geology, biology, chemistry, and the medical industry). As the formal textbook by Skoog, et al. points out in the preface, there is no way all of the material in the text can be covered in one semester (possibly not even in two semesters). My goal is that you come away from this course with a working knowledge of the theory and function of the commonly used instruments, and with the ability to figure out how to use other instruments that you may come across in your career.

In the last four years the course material has radically changed radically. You have two new eTextbooks that will be given out in class.

Specific Goals:
-Apply statistics learned in Quant (Chem240) to data analysis collected in this class
-Apply concepts learned in physics and physical chemistry to how instruments work
-Gain a theoretical and applied understanding of how instruments work and what analyte's each instrument can and cannot measure
-Understand the theory behind FAAS, FAES, AES, ICP-AES, ICP-MS, GC-FID, GC-ECD, GC-MS, LC-UV-Vis, LC-MS, CE-UV-Vis, and CE-MS
-Gain hands on experience in FAAS, LC, GC, and MS
-Gain hands on experience in analyzing samples containing a complex matrix
-Learn to write in a scientific manner

Materials:

-Suggested Reference/Formal Text: Skoog, Holler, & Nieman, Principals of Instrumental Analysis, Fifth Edition, Saunders College Publishing, 1998. (ONE COPY IS ON RESERVE IN PENROSE LIBRARY). In the past I have required that you purchase a copy of this book; now it is optional but I still highly recommend purchasing a used, older edition from eBay or Amazon. Fifth or sixth editions will be fine since publishers today do not change very much in new editions.

-A Primer by Agilent Technologies. Good laboratory practice and current good manufacturing practice, Chapters 1, 2, 3 and 6.

-A Short Guide to Writing about Chemistry by Holly Davis, Julian Tyson, and Jan Pechenik, published by Longman (Pearson Education, Inc.), 2010. Purchase in the bookstore.

-A FREE eTextbook by Dunnivant and Ginsbach. Flame Atomic Absorbance and Emission Spectroscopy and Inductively Coupled Spectrometry - Mass Spectrometry. Available at http://marcus.whitman.edu/~dunnivfm/ (off my home page) and I will be handing out printed copies per your request.

-A FREE eTextbook by Dunnivant and Ginsbach. LIQUID CHROMATOGRAPHY-, GAS CHROMATOGRAPHY-, AND CAPILLARY ELECTROPHORESIS- MASS SPECTROMETRY. Another eTextbook available on my home page.

-PowerPoint-Based Class notes

-The Internet

-A scientific calculator (with statistical capabilities such as linear regression)

Class meeting times: Lecture: Monday, Tuesday and Thursday at 11:00-11:50
320 Lab: Mon. & Wed. from 1:00 – 4:00, 1 day maybe longer

Lecture Schedule:

Tu, 3 Sept.	Intro: Syllabus, etc.
Th, 5 Sept.	Intro, pre-lab, GLP (Agilent Blue Book Reading, Ch 1, 2, 3, and 6)
M, 9 Sept.	Ch 6, Noise, Calib
Tu, 10 Sept.	Optical Physics, Ch 1, slides 1-10
Th, 12 Sept.	Optical Physics, Ch 1, slides 10-18 and pre-lab
M, 16 Sept.	Optical Physics, Ch 1, slides 18-31
Tu, 17 Sept.	FAAS, Ch 2, slides 1-7
Th, 19 Sept.	FAAS, Ch 2, slides 8-10 and pre-lab
M, 23 Sept.	FAAS, Ch 2, slides 10-18
Tu, 24 Sept.	ICP, Ch 3, slides 1-9
Th, 26 Sept.	ICP, Ch 3, slides 10-16 and pre-lab
M, 30 Sept.	ICP, Ch 3, slides 16-25
Tu, 1 Oct.	ICP, Ch 3, slides 25-end, Ch 4 (ICP-MS), slides 1-2

Th, 3 Oct.	ICP-MS, Ch 4, slides 2-5 and pre-lab
M, 7 Oct.	ICP-MS, Ch 4, slides 6-13
Tu, 8 Oct.	ICP-MS, Ch 4, slides 14-16; Ch 5 (Contrasts), slides 1-5
Th, 10 Oct.	Review
F-Tu,	Exam
M-Tu, 14-15 Oct.	Fall Break
Th, 13 Oct.	lab data
M, 21 Oct.	Chrom. Theory, Ch 1, slides 1-31
Tu, 22 Oct.	Chrom. Theory, Ch 1, slides 31-41
Th, 24 Oct.	Prep for Paper
M, 28 Oct.	GC, Ch 2, slides 1-4 and pre-lab
Tu, 29 Oct.	GC, Ch 2, slides 4-8
Th, 31 Oct.	GC, Ch 2, slides 8-20 and pre-lab (Lab Paper Tentatively Due)
M, 4 Nov.	GC, Ch 2, slides 20-34
Tu, 5 Nov.	GC, Ch 2, slides 34-39
Th, 7 Nov.	GC, Ch 2, slides 40-47 and pre-lab
M, 11 Nov.	LC, Ch 3, slides 1-12
Tu, 12 Nov.	LC, Ch 3, slides 13-27
Th., 14 Nov.	CE, Ch 4, slides 1-? and pre-lab
M, 18 Nov.	CE, Ch 4, slides mid –end
Tu, 19 Nov.	MS, Ch 5, slides 1-10
Th, 21 Nov.	MS, Ch 5, slides 10-20

Thanksgiving Break

M, 2 Dec.	MS, Ch 5, slides 20-30
Tu, 3 Dec.	MS, Ch 5, slides 30-40
Th, 5 Dec.	MS, Ch 5, slides 40-50
M, 9 Dec.	MS, Ch 5, slides 50-65 and Lab Data Swap
Tu, 10 Dec.	Fragmentation, Ch 6
Th, 12 Dec.	Review
M, 16 Dec.	Lab Paper II Tentatively Due
T, 17 Dec.	Exam II Tentatively Due
Th, 19 Dec.	Ethics in Science

Grading Break-down:	**Points**	
Exam 1 (Metals)	100	given probably 1/2 of the way through the sem.
Exam 2 (~Organics)	100	given probably at the end of the sem.
?Final (comprehensive)	100	finals week
Stats & Solutions lab	25	the first lab of the semester (Quant practical)
Lab paper #1	100	first half of semester
Lab paper #2	100	second half of semester
Lab notebook	50	graded at the end of the lab
TOTAL	**575 or 475 depending on the final**	

Exams will be taken out of class (on selected ~Fridays/weekends) so that we do not have a 1-hour time constraint. Depending on the exam, I will allow 2 to ? hours. Tentative data or given, but exact exam dates will be determined at least one week in advance as we go through the semester. ALL EXAMS ARE CLOSED BOOK, NOTES, INTERNET, AND FRIEND.

Grading:		
	92.0-100	A
	90.0-91.9	A-
	88.0-89.9	B+
	82.0-87.9	B
	80.0-81.9	B-
	78.0-79.9	C+
	72.0-77.9	C
	70.0-71.9	C-
	60-70	D
	<60	F

Our official time for the final is Wednesday, Dec. 18, 9:00-11:00. (This will be comprehensive on the fairly "Big Picture" items that we covered in lecture and lab)

Attachments:

*Labeling bottles. You will follow proper safety guidelines in labeling all containers, no matter how small, in our lab. Some "batch" labeling can be done.

*Analytical hints. Common-sense suggestions for working in lab.

*Prices. How much analytical measurements cost in a commercial lab and how much chemistry techs make.

*Virtual grade book.

*Lab notebook extra guidelines.