

CHEM430 Analytical Chemistry I

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Fall Term 2013
Office Hours: Tu/Th 11:00 a.m.- noon
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Class Meetings: Tu/Th 9:30-10:50 a.m.

Class Room: Curtis 344

Course Objectives:

- to exercise the proper use of statistical methods to critically evaluate chemical data
- to develop a basic understanding of electronic components and circuits and their use in modern analytical instrumentation
- to understand the types of noise present in chemical measurements, and hardware and software methods to improve the measured signal-to-noise ratio
- to develop a basic understanding of the interaction of electromagnetic radiation with matter, and how these interactions can be utilized for qualitative and quantitative analysis
- to develop an understanding of the principal building blocks of optical instrumentation

Textbook:

Douglas A. Skoog, F. James Holler, Stanley R. Crouch, Principles of Instrumental Analysis, 6th ed., Belmont, CA: Thomson Brooks-Cole, Inc., 2007, ISBN-10: 0-495-01201-7.

List of Topics:

Introduction to Analytical Techniques	chapter 1
Introduction to Optical Methods	chapter 13
Experimental Measurements & Statistics	chapter 1, appendix 1
Review of Electricity	
Basic Electronics & Electronic Test Equipment	chapter 2-3
Signals & Noise	chapter 5
Properties of Electromagnetic Radiation	chapter 6
Components of Optical Instruments	chapter 7
Molecular Absorption Spectroscopy	chapter 13
Atomic Spectroscopy	chapter 8-9
Molecular UV/visible Absorption Spectroscopy	chapter 14
Molecular Luminescence Spectroscopy	chapter 15
Infrared Absorption Spectroscopy	chapter 16-17

Proposed Schedule:

Oct 29	EXAM I
Nov 28	Thanksgiving Holiday (no class)
Finals week	EXAM II

Course Grading: 2 Exams (35% each for a total of 70%)
Problem Sets (several of which will total 30%)
Extra Credit Paper (topic must be approved by 11/5/13)

Extra Credit Paper:

You may write an extra credit research paper that will be due the day of the final examination. After all of the problem sets and exams are graded and the final grades are assigned, I will read the papers and grade them on a scale of 0 to 10. An excellent paper can therefore boost you one full letter grade. Because I grade them after the final grades are assigned (from your exams and problem sets), there will be no effect on your grade in the course even if everyone in the class writes a paper and you do not. The paper may be on any **analytical chemistry** subject, but I must approve it before you begin. For example, you can choose an analytical technique and write about the technique itself *or* the instrumentation used in performing the measurements. You may choose a material and describe several different analytical techniques that can be used to measure some important property of the material. If you used an instrument on co-op and always wanted to know more about how it worked, or you are developing a process for your senior design project and know you need to use some analytical instrumentation there, this is your chance. I encourage you to use your textbook or issues of the journal *Analytical Chemistry* (in the library or electronically through the Hagerty library electronic journals page) to find a topic of interest to you. The first issue of the month of *Analytical Chemistry* contains a number of review articles (called *Feature Articles*) written by experts in their field that would be appropriate starting places for these papers. **Important note to students also taking CHEM367 Chemical Information Retrieval:** you may **NOT** use the same paper for both your CHEM367 term paper and this extra credit paper.

The papers should be 7 to 10 pages in length (single-spaced, with one-inch margins) and be written in an appropriate scientific style (i.e., using references). I expect to see good use of the scientific literature- you may use a textbook as a starting point, but you must use at least five primary references (research articles or monographs) in writing the paper. To ensure that you are making good progress on your report you must have the topic approved by November 5, 2013 and submit a list of references (bibliography) and outline **electronically** through Bb Learn by November 19, 2013. The final paper must be turned in **electronically** through Bb Learn by the day of the final.

Please remember that plagiarism has many forms and is never acceptable.

Additional Reading:

- Howard A. Strobel, William R. Heineman, Chemical Instrumentation: A Systematic Approach, New York: John Wiley & Sons, Inc., 1989.
- H.H. Willard, L.L. Merritt, Jr., J.A. Dean, F.A. Settle, Jr., Instrumental Methods of Analysis, 7th ed., New York: D. Van Nostrand & Co., 1988.
- G.D. Christian, J.E. O'Reilly, Instrumental Analysis, 2nd ed., Boston, MA: Allyn & Bacon, Inc., 1986.
- D.G. Peters, J.M. Hayes, G.M. Hieftje, Chemical Separations and Measurements, Philadelphia, PA: W.B. Saunders Co., 1974.

These texts are available on reserve in the Hagerty Library.

Recorded Lectures

The lectures for this class will be recorded; the screencasts will be made available on the *Lecture Archive* page available on the course homepage on Bb Learn. Every effort will be made to have the screencasts posted within 48 hours of the class. They will be available in both Shockwave (Flash) and zipped Ipod (*.m4v) format. In some cases additional material will be assigned as recorded lectures only. You are responsible for the material presented in those lectures as well.

Microsoft Office Availability

Unfortunately, the university decided approximately two years ago to discontinue the student license for Microsoft Office products as a cost-saving measure. This affects you if you downloaded and installed your copy of MS Office from the Drexel software server; if you purchased your own copy of Office when you purchased your computer you are *not* affected by this situation. This creates a problem in that we have extensively used Excel for problem solving and data analysis in both CHEM430 and CHEM431; in particular we use many of the tools in Excel's Data Analysis Toolpack Add-on that do not have good replacements in either Calc (as part of Open Office) or Spreadsheets (as part of Google Docs). After a good deal of hunting I have found an alternative freeware spreadsheet program named Gnumeric that in my opinion has better statistical analysis tools than those in Excel's Data Analysis Toolpack. You should download the software (the current version is 1.10.16) from <http://projects.gnome.org/gnumeric/>. The on-line User's Manual for the program can be found at <http://projects.gnome.org/gnumeric/doc/gnumeric.shtml>. I will use this software in class for the statistical analysis demonstrations.

Bb Learn

We will be using Bb Learn 9, Drexel's on-line Course Management System, extensively to enhance communication in CHEM430. The instructions below tell you how to log on and begin using Bb Learn:

- 1) Login through DrexelOne at <http://one.drexel.edu>.
- 2) Enter your Drexel domain ID and password, click on **Login**.
- 3) Click on the **Students** Tab.
- 4) Click on the **My Courses** link.

or

- 1) Enter the Drexel Bb Learn website directly at <https://learn.dcollege.net/>.
- 2) Enter your Drexel domain ID and password, click on **OK**.

If you enter these correctly you will now be on your Bb Learn dashboard. Select **Analytical Chemistry I CHEM430** from the list of courses in the center pane of the screen under the heading **My Courses**. You will now be on the course homepage. Please note that **ALL** of your homework assignments will be posted as assignments on the homepage. The calendar will be used for assignment and exam reminders, etc.

Attendance/Lateness Policy

While I do not require attendance at the lectures (as they are recorded and posted on Bb Learn), I highly encourage you to attend in order to be able to ask questions and help shape the course of the

discussion. You are, of course, responsible for the material covered or assigned in the lecture, even if you choose to watch one or more of them afterwards.

Academic Integrity

As you are working towards becoming a chemical professional, you are expected to maintain the highest degree of integrity in your work, as reflected by the Ethical & Professional Guidelines as published by the American Chemical Society (available at the ACS website under Careers, Professional Development, Ethics and Professional Guidelines). Your efforts as a student here at Drexel are covered by the academic dishonesty policy found at http://www.drexel.edu/provost/policies/academic_dishonesty.asp.

Course Drop/Withdrawal

Courses may only be dropped during the “drop period” lasting from the beginning of the enrollment period through the end of the second week of the quarter. Dropping a course results in the course being removed from the student’s academic record without a “W” appearing on the transcript; i.e., neither the course nor the grade of “W” appears on the student’s transcript. Students may withdraw from a course during the “withdrawal period” lasting from the beginning of the third week through the end of the seventh week of the quarter. Withdrawing from a course causes both the name of the course and the grade of “W” to appear on the student’s transcript. Before withdrawing from a course, students should consult with the instructor. You should consult the information found on the Provost’s office website http://www.drexel.edu/provost/policies/course_drop.asp for complete details.

Disability Services

Students with disabilities who wish to request accommodations and services at Drexel University need to present a current accommodation verification letter (“AVL”) to the instructor before accommodations can be made. AVL's are issued by the Office of Disability Resources, which is based in the Office of Equality & Diversity (<http://www.drexel.edu/oed/disabilityResources/Overview/>).

Communication

It is assumed that all students have a Drexel computer account for email and easy access to the Internet and to the Drexel University network.

Syllabus Modification

I reserve the right to modify the syllabus, including the course schedule and list of topics, at anytime during the course. I will announce any changes both in lecture and by posting on Bb Learn.