

Syllabus for Chemistry 250 (2 credits)
Instrument Proficiency for Scientists - HPLC
Fall 2010

Instructor

Duane Weisshaar Office: GSC 254 e-mail: duane.weisshaar@augie.edu
Phone 274-4812 Home: 339-7269 class website: <http://faculty.augie.edu/~dew>
Office hours 9-10 am MTWF and by appointment

Class schedule

Wet lab work: 2-3 hours per week, preferably including 2:00-2:50 W, specifically scheduled with the instructor.

For some of the lab activities you may need to work in larger time blocks to ensure ample time for progress on the experiment at hand.

Permissible unscheduled work (not wet lab): computer, literature, writing reports.

Principal locations of course work: GSC 240, 259, and 265.

Regular attendance is expected.

Work in groups of two is permitted and encouraged.

Course description

This course will enable students to develop proficiency in using intelligently the High Performance Liquid Chromatograph. Students will develop pertinent background through reading, computer based training, and class discussion. Students will develop proficiency in the actual operation of the HPLC instrument and a variety of detectors. Corequisite: Chemistry 242.

Instruments

Work will be centered around the Agilent LC 1100 and its photodiode array detector. If projects require other detectors or two groups wish to work at the same time, the PeakSimple system may also be used. Other detectors available include UV, fluorescence, refractive index, electrochemical, and conductivity.

Supplies

Safety goggles with full splash guards (wear them consistently in lab work)

Bound lab notebook (may be blank pages in one used in another course)

Resources (no texts to purchase)

Use these resources in place. **Do not remove them!** If you wish, photocopy key sections at your own expense. You may take materials to the main library for copying (free), but return them promptly.

Primary Resources

1. Instrument manuals for the Agilent LC 1100 HPLC. The upgraded software does not fit the manual exactly, but it's the same version as Dr. Mays HPLC.
2. *Interactive HPLC* Windows Training Software, Ver. 4.0a, Cognitive Solutions Ltd. CSL HPLC icon on Chem13 (Computer by the laser printer in 240).
3. *HPLC Simulation*, JCE Software, Ver. 3.00, 1996. JCE HPLC icon on Chem13 (Computer by the laser printer in 240). This program requires a CD available from DEW.



Additional Resources, when appropriate

1. Lindsay, S. *High Performance Liquid Chromatography*, Analytical Chemistry by Open Learning, 2nd Ed., Wiley, New York, 1992
2. ChromAcademy at <http://www.chromacademy.com/> - on-line chromatography tutorials.
3. Analytical Science Digital Library at <http://www.asdlib.org/> - a good resource for analytical information on the web, especially information for academic settings and labs.
4. course outline on liquid chromatography at <http://ull.chemistry.uakron.edu/analytical/LC/>.
5. online HPLC textbook at <http://hplc.chem.shu.edu/HPLC/index.html>.
6. <http://www.forumsci.co.il/HPLC/topics.html> - links to a variety of sites related to HPLC.
7. Perrone, P. A. *A Laboratory Manual for Liquid Chromatography*, Perkin-Elmer, USA, 1987.
8. *J. Chem. Ed.* index, search via the ACS journals search page: <http://pubs.acs.org/search/advanced>.
9. Chemistry 311 materials by the window in the Chemistry Library.

- a. Lab and Writing Resources - experimental procedures.
 - b. Articles on Instrumental Methods.
 - c. Analysis and Instrumental Methods texts and lab manuals.
10. Class website at <http://inst.augie.edu/~dew/> and associated links.

Deadline

Completion of all work and submission of reports is Friday, Dec 3. In place of a final exam, the class will meet at 2:00 pm on Wednesday, Dec 8, to share experiences and evaluate the course.

Grading

Criteria for grades of C, B, and A are outlined below. Plus/minus grades will be determined by the quality of the work submitted. **Turn things in as they are completed.**

To earn a grade of C:

1. Each person maintain a current and satisfactory laboratory notebook.
2. Be present in lab each week.
3. Study and take notes on the instrument manuals.
4. In a written report, summarize safety precautions and proper care of HPLC pumps and detector. Include hazards, handling, disposal information for the reagents used in the procedures you selected for 6 (below). Be specific for your lab situation. Get the instructor's OK on this information BEFORE you begin lab work and follow your specs.
5. Complete the JCE HPLC Simulation exercise. Obtain the CD, software manual, and an unknown number from the instructor. This must be completed before working on the instrument itself. 
6. Using the LC 1100 optimize the isocratic separation for a selected component of a commercial product - attain baseline separation of the target component while minimizing total run time. Get instructor approval of the procedure/application before beginning. (The instructor has a file of some appropriate labs, but you are not restricted to that selection).
7. Successfully demonstrate to the instructor your operation of the HPLC system.

To earn a grade of B - requirements for a C plus:

8. Complete the CSL Interactive HPLC computer based training and the 3 associated exams. Turn in notes and exam certificates. 
9. Explore the ACOL volume on HPLC, online resources and other texts (e.g. HPLC chapters in Instrumental Analysis texts). Prepare a 2-3 page paper (double spaced) comparing and contrasting EITHER a) HPLC modes of separation (normal phase, reverse phase, ion exchange, size exclusion) OR b) HPLC detectors (fixed and variable wavelength uv/vis, refractive index, conductivity, amperometric, fluorescence). Include notes from the references in your notebook. Turn in a hard copy of the paper and email the instructor an electronic copy (include partners initials in the file name).
10. Quantitate the selected component in your previous separation (from requirements for a C) using the calibration curve approach. Include at least four concentrations in the calibration curve, at least three injections for each concentration and the unknown, determine the 95% confidence interval of the component using linear regression and associated stats, plot the calibration curve (data and regression line).

To earn a grade of A - requirements for a B plus:

11. Prepare a second 2-3 page paper on the topic not chosen in 9 above. (You will have prepared papers on BOTH Comparison of Separation Modes and Comparison of Detectors). Turn in a hard copy of the paper and email the instructor an electronic copy (include partners initials in the file name).
12. Optimize the separation of components of another product or sample requiring a different column/detector. Get instructor approval of the procedure/application before beginning. (The instructor has a file of some appropriate labs, but you are not restricted to that selection).
13. Demonstrate to the instructor your proficiency with the new component(s).
14. Prepare a set of operating instructions for the new component(s).