Course Syllabus  
Chem 2821: Thermodynamics and Kinetics Lab  
Spring 2012

Lecture: Fri. 2-2:50 Chem 304  
Labs:  
  Sec. 001 Wed. 2-6 pm, Chem 319  
  Sec. 002 Thurs. 2-6 pm, Chem 319  
Final Exam: Fri. April 20, 2-3 pm, Chem 304 (during lecture hour)

Instructor: Dr. B. Jill Venton  
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office hours: Fridays after class (3 pm) or by appointment

T.A.s:  
  Vijay Ramdeen (responsible for rotation experiments 1-3 in class, grading expts 1,2)  
    Email: vmr5f@virginia.edu
  
  Jenny Lounsbury (responsible for rotation experiments 4-6 in class, grading expts. 4,5)  
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  Amanda Prior (responsible for course development and preparation, grading expts. 3,6)  
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How do we make sure our food is pure, our drugs contain the proper ingredients, and that our water and air are safe? The answer to these questions is modern chemical analysis! The purpose of this course is to introduce the student to thermodynamics and kinetics by introducing them to modern analytical chemistry. The emphasis will be on modern chemical instrumentation and understanding the theory and principles that underlie it. Students will be studying electrochemistry, including potentiometry and cyclic voltammetry, UV-Vis spectroscopy, separations, including high performance liquid chromatography, and mass spectrometry. Through these experiments, they will learn about how thermodynamics and kinetics are applied by modern chemists to do chemical analyses. Students will also gain writing skills and graphing skills. At the end of the course, the student will have a good knowledge of modern chemical instrumentation and it’s application in society.

Lab Overview: All experiments and the final project will be done in groups of 3-4 students. However, lab reports are to be done on your own and turned in individually. Because we are using chemical instruments that are expensive, we only have 1 of each instrument in the lab. Thus, you will be rotating through experiments, and each group will be doing a different experiment each week. For the last portion of the class, each group will be assigned a directed research project and an instrument to use. Your group will have to come up with a procedure, do the experiment (including any troubleshooting!), and then write a journal article style report on the results.

Lab Reports: Lab reports are due at 2 pm the day of your lab. You are expected to turn in the final report from your previous week’s lab as well as the prelab for that week’s experiment. To help with unforeseen conflicts, illnesses, etc, you are allowed a total of 4 late days for the rotation post-lab reports. The report must be turned in by 2 pm to your T.A. to count as one day late. Late reports may be emailed, but you should follow up with a paper copy to the person responsible for grading the report (see TA listing above). After your 4 late days are up, each day a report is late, the grade will be reduced by 10%.

Prelabs cannot be turned in late and will count as a 0 if not turned in the day of the lab!
The final project will be assessed a 10% late penalty for each day it is late. Late days cannot be used!

Rotation lab reports will not be turned back to the students until after all the rotations are completed. However, grades will be posted weekly and reports will be available for inspection from the TAs during office hours.

**Honor System:** I trust every student in this course to fully comply with all of the provisions of the UVA honor system. All alleged honor violations brought to my attention will be forwarded to the Honor Committee. If, in my judgment, it is beyond a reasonable doubt that a student has committed an honor violation with regard to a given exam, that student will receive an immediate grade of ‘F’ for that assignment, irrespective of any subsequent action taken by the Honor Committee. Students must especially pay attention to proper reference citations and avoiding plagiarism in their lab reports, final projects, and presentation. Violations of these guidelines will result in a failing grade.

**Attendance:** Attendance at all class sessions is expected. The final exam will cover the material from the course lectures. If you must miss a lab session, you must contact the instructor as soon as possible and turn in a valid excuse. There is one make-up week for rotation labs, but an alternate solution will need to be worked out if a student misses time during the project phase of the lab.

**Course materials:** Course website is on collab. All lab experiments will be posted on collab. Students need to print out these experiments and bring them to class. Additional reading is occasionally included. To answer the prelab questions, students may need to do additional reading of text-books or the literature. They are expected to cite all references used for these assignments.

**Grading:** The class will be graded on a normal grading scale (i.e. 90=A, 80=B etc). Some curving may be done if necessary at the end of the class. Grades will be weighted as follows:
- Preliminary Lab, Volumetric glassware: 5 %
- Each Rotation lab: 10 % (total 6 labs *10%=60%)
- Final Project lab: 20 %
- Final Exam: 15 %

**Lab Schedule**
- Jan. 25/26: Check-in, Safety, Preliminary lab: Calibrating Volumetric Glassware
- Feb 1/2: 1st Rotation Expt. *
- Feb 8/9: 2nd Rotation Expt. *
- Feb 15/16: 3rd Rotation Expt. *
- Feb 22/23: 4th Rotation Expt. *
- Feb 29/Mar 1: 5th Rotation Expt. *
- Mar 7/8: Spring Break
- March 14/15: 6th Rotation Expt. *
- Mar 21/22: Make-Up Week
- Mar. 28/29: Project: Week 1, Planning
- Apr. 4/5: Project: Week 2, Experiments
Apr 11/12  Project: Week 3, Experiments
April 18/19  Project week 4, Experiments and Data Analysis
April 25/26  **Final Project due**, Project Presentations during lab period

* Rotation Experiments:
  1. Potentiometric Determination of Fluoride
  2. Cyclic Voltammetry for Determination of Acetaminophen
  3. Kinetic Analysis with Visible Spectroscopy
  4. Shrinky-Dink Microfluidics
  5. HPLC-UV for analysis of analgesics
  6. HPLC-MS for organic synthesis analysis

  The order your group does the experiments will be determined on the first lab day.

**Tentative Lecture Schedule**

Jan. 20  Introduction to the class
Jan. 27  Introduction to rotation experiments
Feb. 3  Introduction to electrochemistry
Feb. 10  Potentiometry
Feb. 17  UV-Vis
Feb. 25  Cyclic voltammetry
Mar. 2  Introduction to separations
Mar. 9  Spring Break
Mar. 16  HPLC
Mar. 23  Mass Spectrometry
Mar. 30  Microfluidics
April 6  Statistics, Good Laboratory Practices
April 13  Writing Research Paper, Review
**April 20**  **Final Exam during lecture hour (2-3 pm)**