Chemistry 306 Spring, 2014 Course Guidelines

Flight Crew: Daniel Graham, Agnes Orlof, Jon Derouin

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JD Info: Flanner Hall Room 019, phone: 1-773-508-3122; jderouin1@luc.edu

Lab Times: T 0830 – 1220, 1300 – 1650; F 1025 – 1415.

Places: Flanner Hall Basement Biochemistry Lab, NMR Lab, and Quantitative Analysis Lab

DG Office Hours: M, W 1230 – 1330 or by arrangement.
AO Office Hours: M 1000 – 1100 or by arrangement
JD Office Hours: TBA

This course will introduce techniques and analysis central to experimental biophysical chemistry. We will pursue the following activities:

(1) The quantification of information in experimental data. Mass spectra, IR spectra, and nature's proteins will be the objects of interest.

(2) The statistical analysis of experimental data: strategies for dealing with uncertainty. Measurements will focus on solution densities, crystallization velocities, electrochemical potentials, and evaporation rates.

(3) The application of mathematical models to experimental data. The measurements will re-visit the crystallization velocities of supercooled liquids. Temperature and time variables will also be taken into account.

(4) Techniques and practice of numerical integration and differentiation. The measurements and analyses will involve thermodynamic isotherms and infrared spectra.

(5) Techniques and applications of Fourier spectral analysis. Two lab meetings will be devoted to spectral analysis, infrared and laser light diffraction experiments.

(6) Experimental measurements of π. Let us measure π four or five different ways and celebrate π-Day in the process.

(7) Techniques and applications of magnetic resonance.

(8) Techniques and applications of circular dichroism measurements: globular proteins will be the systems of interest.

(9) Experimental study of *either* periodic precipitation in electrolyte solutions or Brownian motion.

Course Structure:

Chem 306 will consist of experiments and lessons in data analysis, presentation, and reporting. Consultations with DG, AO, and JD will be a feature of every lab meeting. Lab quizzes will transpire at the start of four lab meetings early in the semester. A mid-term exam will occupy one of the lab meetings. Yet another meeting will focus on the experimental measurement of π, *aka* celebration of π–Day. The last few meetings will concentrate on magnetic resonance, circular dichroism, and periodic precipitation experiments and *possibly* Brownian motion. A research-style paper will be written by each student on the experiment of his or her choice.

Students will work both individually and in two- to three-member teams. Teams can remain fluid throughout the semester. Work with people you like!

If you have a labtop computer, by all means bring it to lab meetings and fire it up. It will help in multiple data analysis activities.

Grading:

Grades will be determined on the basis of four areas with equal weight factors:

Lab Consultation Points: 25%
Lab Quizzes: 25%
Mid-term exam: 25%
Completion of magnetic resonance, circular dichroism, and periodic precipitation (or Brownian motion) experiments plus research-format paper: 25%

The following scale will be used: 90% - 100% A ; 80% - 89% B; 70% - 79% C; 60% - 69% D; < 60% F

Team work is integral to Chem 306. Points and grades, however, will be grounded upon individual effort and achievement. As with Chem 305—and pchem, ochem, etc. in general—the subject is neither easy nor quick to learn, but the process is rewarding if good-faith effort is made. Students are urged to consult with the flight crew to discuss problems before they become serious.

First Meeting: Logistics and handouts. See Sakai for pdf versions.

Second Meeting: The quantification of information in experimental data.

Third Meeting: Quiz on second meeting material followed by the statistical analysis of experimental data.

Fourth Meeting: Quiz on third meting material followed by the application of mathematical models to experimental data.

Fifth Meeting: Quiz on fourth meeting material followed by techniques and practice of numerical integration and differentiation.

Sixth Meeting: Quiz on fifth meeting material followed by techniques and applications of Fourier

analysis

Seventh Meeting: No quiz! But more Fourier Analysis!

Eighth Meeting: No quiz here either! But let us celebrate π-Day most dutifully!

Ninth Meeting: Mid-Term Exam. The exam will address essential material of previous lab meetings.

Tenth Meeting: Techniques and applications of magnetic resonance.

Eleventh Meeting: Techniques and applications of circular dichroism measurements.

Last Meeting: Experimental study of either periodic precipitation or Brownian motion.

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The Ten Commandments of Physical Chemistry (adapted from SU handout)

I. Thou Shalt maintain an open mind.

II. Thou shalt never take anything for granted; thou shalt check up early and often and make sure of absolutely everything.

III. Thou shalt have a pretty good time and thy work shall be interesting.

IV. Thou shalt respect the intelligence of all parties.

V. Thou shalt not gather in small and divisive groups, nor do violence upon one another.

VI. Thou shalt fear no problem, theoretical or experimental. Yet shall ye fear and despise sloth, dullness, and gutlessness, for these will bring bad Karma and Mother Nature's wrath.

VII. Thou shalt hack away at problems with dignity and help thy associates to do likewise.

VIII. Thou shalt bend over backwards to record data, observations, and questions that come to mind.

IX. Thou shalt admit thy mistakes, for they shall be forgiven.

X. Thou shalt roll and bounce over the inevitable potholes. When everything around thee wirleth and falleth apart, thou shalt adjust and say to thyself, "This too shall pass".

The PChem Motto: No lies, no hate, no fear.