

Chemistry 306 Spring, 2017 Course Guidelines

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Lab Times: M 0830 – 1220; T 1340 – 1730; W 0830 – 1220; F 0830 – 1220.

Places: Flanner Hall Basement Biochemistry Lab, Lab 315, NMR Lab, and Quantitative Analysis Lab

DG Office Hours: W 1230 – 1330; Th 0830 – 0930, or by arrangement.

AO Office Hours: M 1115 – 1220, or by arrangement

RF Office Hours: M 1230 – 1330, or by arrangement

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

- (1) Information and experimental data. Several venues will illustrate the principles including logic gates, radiometric functions, genomic and protein sequence analysis.
- (2) Information and uncertainty: strategies for making the most of imperfect situations. Several venues will illustrate principles via phase transition kinetics, electrochemical potentials, and reverse mitosis kinetics.
- (3) Information and models. Thermometric devices and Brownian processors will be at center stage.
- (4) Analogue Information and Accumulation: Techniques of numerical integration and differentiation. Applications will include thermodynamic isotherms, infrared spectra, and electron paramagnetic resonance (EPR).
- (5) Techniques and applications of Fourier spectral analysis. Two lab meetings will be devoted to principles, spectral analysis, infrared and laser light diffraction.
- (6) Experimental measurements of π . The transcendental number π will be measured five different ways. We will celebrate π -Day in the process.
- (7) Techniques and applications of magnetic resonance, in particular nuclear and electron.
- (8) Techniques and applications of circular dichroism measurements: globular proteins will be the systems of interest.
- (9) Experimental study of phase transition order and kinetics.

Course Structure:

Chemistry 306 will consist of experiments and lessons in data analysis, presentation, and reporting.

Consultations with the flight crew will part of every lab meeting. Lab quizzes will transpire at the start of four meetings early in the semester. A mid-term exam will occupy one lab meeting. One meeting will focus on the measurement of π and celebration of π -Day. The last few meetings will concentrate on magnetic resonance, the circular dichroism of folded and unfolded proteins, and phase transition order of model membrane systems. A research-format paper will be written by each student on the experiment of his or her choice.

Students will work individually and pairs. Teams are fluid throughout the semester. Work with people you like!

If you have a laptop computer and flash drive, please bring them to lab meetings. These will assist in experiments and analyses.

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 essential to Chemistry 306 (and life in general). Points and grades, however, will be grounded upon individual effort and achievement. As with science across disciplines, 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 the flight crew to discuss problems before they become serious.

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

Second Meeting: Information and experimental data.

Third Meeting: Quiz on second meeting material followed by a study of analogue information and uncertainty.

Fourth Meeting: Quiz on third meeting material followed by a study of information and models.

Fifth Meeting: Quiz on fourth meeting material followed by a study of analogue information and accumulation techniques.

Sixth Meeting: Quiz on fifth meeting material (last quiz!) followed by techniques and applications of Fourier analysis.

Seventh Meeting: More Fourier Analysis!

Eighth Meeting: Celebration of π -Day.

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

The tenth – twelfth meeting will follow a rotation format of three experiments: magnetic resonance, circular dichroism spectroscopy of enzymatic proteins, and phase transition order kinetics.

The Ten Commandments of Lab Work (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 others.
- V. Thou shalt not gather in small and divisive groups.
- VI. Thou shalt fear no experiment. Yet shall thee fear and despise sloth, dullness, and gutlessness, for these will bring bad Karma.
- VII. Thou shalt hack away at things with dignity and help associates to do likewise.
- VIII. Thou shalt bend over backwards to record data 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.

The Chemistry 306 Motto: No lies, no hate, no fear.