

## Chemistry 306 Spring 2018 Course Guidelines

Flight Crew: Daniel Graham and Agnes Pecak

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Lab Times: M 1340 – 1730; T 0830 – 1220; F 0830 – 1220; F 1340 – 1730. Four Sections!

Places: Flanner Hall Basement Biochemistry Lab. Some experiments will transpire in Flanner 315, the NMR Lab, and the Quantitative Analysis Lab.

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

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

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

- (1) Information and Experimental Data. Basic principles will be illustrated via logic gates, radiometric functions, spectroscopy, genomic and protein sequence analysis.
- (2) Information and Uncertainty: strategies for making the most of imperfect situations. Basic principles will be illustrated via phase transition kinetics, electrochemical potentials, and reverse mitosis.
- (3) Information and Models. Thermometric devices, Brownian motion and processing will be at center stage.
- (4) Analogue Information and Accumulation: Techniques of numerical integration and differentiation. Applications will include thermodynamic isotherms, electronic-vibrational spectroscopy, and electron paramagnetic resonance (EPR).
- (5) Techniques and applications of Fourier spectral analysis. Two lab meetings will be devoted to principles, noise color analysis, infrared and laser light diffraction.
- (6) Experimental measurements of  $\pi$ . The transcendental number  $\pi$  will be measured five or more ways. We will celebrate  $\pi$ -Day in the process!
- (7) Principles and applications of magnetic resonance: nuclear and electron: proteins and steroids will be the systems of interest.
- (8) Principles and applications of circular dichroism spectroscopy: globular proteins will be the systems of interest.
- (9) Principles and applications of phase transition order and kinetics: model membrane systems will be studied.

## Course Structure:

Chemistry 306 will consist of experiments, analysis, and oral and written presentations. 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  $\pi$  and celebration of  $\pi$ -Day. The last few meetings will concentrate on magnetic resonance, the circular dichroism of globular proteins, and phase transitions of model membrane systems. To close the semester, 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 data analysis.

## 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 membrane phase transition 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 Chemistry 306 curriculum 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  $\pi$ -Day.

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

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

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### **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.