Biochemistry 801

Course format / grading:

This course consists of informal presentations by members of the instructional team (Professors Markley, Butcher, and Henzler-Wildman and NMRFAM staff members). Students are encouraged to ask questions and join in discussions about concepts or material covered in the readings or lectures.

Grading will be on the basis of attendance, class participation, and a term paper to be turned in on the last class day.

Text / readings:

The course does not use a text, although students may wish to purchase one of the recommended ones. Readings will be from the literature.

Term paper:

The term paper should be 10-20 pages and cite about 10-20 recent journal articles or reviews.

The topic of the paper can be one of those suggested or one of the student's choice (with approval from the professor in charge).

A critical analysis of the literature is what is expected.

We suggest that the term paper topic not relate to the student's research project.

Suggested term paper topics (2018):

NMR in metabolic profiling
Structural studies of G-coupled protein receptors
Hybrid methods for structure determination: NMR + other methods
Evolutionary constraints in protein NMR structure determination
Solid-state NMR of large protein complexes
Dynamic nuclear polarization and its application to structural biology
NMR methods for determining structural ensembles of flexible systems
Combination of molecular dynamics and protein NMR
Role of bioinformatics/computer science in biomolecular NMR

Typical List of Topics Covered in Biochemistry 801
Course organization and overview
Principles of NMR data collection and analysis
Chemical shifts and J-couplings
Sample preparation and isotope labeling strategies
NMR relaxation and molecular dynamics
NOE and exchange spectroscopy
Data collection strategies
Fast data collection strategies
Hydrogen bonding
Hydrogen exchange
Relaxation dispersion NMR: conformational dynamics and allostery
Protein thermodynamics from NMR
Electron-nuclear interactions (paramagnetic effects)
Calculation of NMR observables
Intrinsically disordered proteins and protein folding
Protein structure determination
Residual dipolar couplings and protein structure refinement
Automated approaches to protein assignment and structure determination
Spring break
Spring break
RNA structure determination
RNA dynamics
SAXS and WAXS and their use in conjunction with NMR data
Methods for larger proteins
Protein complexes
Protein-ligand screening
NMR spectroscopy in drug discovery
NMR structure validation
Solid-state NMR
Membrane proteins
NMR-based metabolomics
Magnetic resonance imaging and *in vivo* spectroscopy