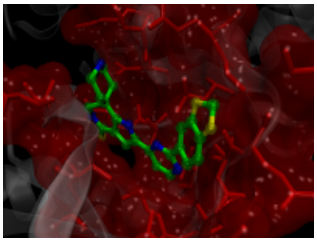
Biophysics of Macromolecules
BIOL 4596

Spring Semester 2015



Term:	January 14 – May 2
Class Times:	MWF 9:30am – 10:20am
Location:	201 Williams Hall
Instructor:	Michal Brylinski
E-mail:	mbrylinski@lsu.edu
Website:	http://brylinski.cct.lsu.edu
Office 1:	407 Choppin Hall
Office 2:	2054 Digital Media Center
Office hours:	Mon 3pm – 5pm (Office 1) Thu 3pm – 5pm (Office 1) or by appointment

Recommended Text: "Molecular Biophysics: Structures in motion" by Michael Daune, Oxford University Press

Course Objectives: Understand the biophysical principles of structure, dynamics and function of various biological molecules and their assemblies at the molecular level. Students are expected to be able to apply key principles to their research and to everyday life. Emphasis will be placed on theory and methods commonly used in structure-based drug design. Using advanced visualization software, students will learn how to effectively communicate biophysics concepts to a broad audience. Furthermore, well-known tools, such as Microsoft Excel, Apache OpenOffice Calc, or LibreOffice Calc, will be used at an advanced level to tackle common problems and perform calculations in molecular biophysics. Progress will be assessed through in-class presentations and discussions, individual project assignments, and exams. This 3 credit hour course requires a minimum of 6 hours (on average)/week outside class work/study.

Projects: Each student will be assigned an individual project related to molecular biophysics of modern drug design. You can either select the assignment from a list provided by the instructor or propose a new project that is within the scope of this course. In order to accomplish these assignments, you will need to learn how to 1) use open source molecular visualization software, 2) use common spreadsheet software at an advanced level to perform molecular calculations/simulations, 3) create domain-specific presentations that include 3D molecular visuals to effectively communicate biophysical concepts and results. You may discuss project assignments with your classmates or use online resources for help, but you must present your own work throughout the semester.

Grading Policy: Projects 20% (C-I)
Presentations 20% (C-I)
Midterm 25%
Final 35%

This is a certified **Communication-Intensive (C-I)** course which meets all of the requirements set forth by LSU's Communication across the Curriculum program, including

- instruction and assignments emphasizing informal and formal visual and technological modes;
- teaching of discipline-specific communication techniques;
- use of draft-feedback-revision process for learning;
- practice of ethical and professional work standards;
- 40% of the course grade rooted in communication-based work; and
- a student/faculty ratio no greater than 35:1.

Students interested in pursuing the LSU Distinguished Communicators certification may use this C-I course for credit. For more information about this student recognition program, visit www.cxc.lsu.edu.

Tentative Schedule:

Conformation of biopolymers

- Geometry of a polymer chain, intramolecular forces I
- Intramolecular forces II, calculation of conformations

Conformation of nucleic acids

- Primary structure, structure of the nucleotide chain, the double-helix structure
- Polymorphism and flexibility of DNA, structure of ribonucleic acid

Conformation of proteins

- Sequence, conformational parameters of the peptide bond, analysis of secondary structures
- Prediction of secondary structure, tertiary structure

Dynamics of biopolymers

- Brownian motion, conformational changes
- Experimental methods, modeling of intramolecular dynamics

Hydration of biopolymers

- Properties of water, hydrophobic and hydrophilic molecules, hydration of proteins and nucleic acids

Biopolymers as polyelectrolytes

- Charge distributions, electrolytic solutions, polyelectrolyte solutions

Associations between molecules

- Binding energy, mechanisms and specificity of recognition, formation of subcellular structures

Students with disabilities: If any student feels that he/she has a disability and needs special accommodations of any nature whatsoever, the instructor will work with you to provide reasonable accommodations to ensure that you have a fair opportunity to perform in this class. Please advise the instructor of such disability and the desired accommodations at some point before, during or immediately after the first scheduled class period.