CHEM686 Molecular Biophysics
Spring 2016

Spring 2016, Monday 6 - 9 pm, Brown Laboratory 116.

Instructor: Sharon Rozovsky
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Office hours: Monday 5-6 pm (directly before class) or by appointment
Location: 136 Brown Laboratory

Course content
Introduction to biophysical chemistry; Molecular forces; Conformations of macromolecules; Theory and applications of biophysical methods, emphasizing spectroscopic and imaging techniques: optical spectroscopy and microscopy, X-ray crystallography, electron microscopy and Nuclear Magnetic Resonance spectroscopy; Membrane biophysics.

Course learning objectives
The main objective of the class is to provide an overview of contemporary biophysical research and develop the students’ ability to critically assess data. In addition it aims to provide the students with tools to independently get familiar with techniques and their underlying assumptions and limitations.

After successful completion of this course, a student should be able to:
1. Describe key intermolecular forces and their magnitude in proteins.
2. Describe key biophysical techniques and their underlying assumptions.
3. Find and evaluate sources and information needed in solving problems.
4. Plan experiments to address biophysical research topics.
5. Work together with other students in discussing ideas, evaluating information and formulating solutions to problems.
6. Communicate ideas clearly and effectively in written and oral formats.

Prerequisite
CHEM641
CHEM418/419 or CHEM443/444 are helpful but not mandatory classes

Course structure and grading
Exams: There will be 1 midterm exam. The final includes a paper and class presentation (see instructions on a separate page).
The final grade is computed as follows: class presentations (15%), class participation (15%) midterm (25%), final project paper (20%), final project class presentations (20%), and rating of projects by students (5%).

**Recommended texts**

The class will relay on reading from primary research articles and reviews, online resources, and the following textbooks:

2. “*Introduction to Proteins: Structure, Function, and Motion*” by Kessel and Ben-Tal
3. “*Molecular and Cellular Biophysics*” by Meyer B. Jackson
4. “*Principles of fluorescence spectroscopy*” by Joseph R. Lakowicz

Springer e-book version (available to UD students)

SpringerLink -- http://delcat.udel.edu/cgi-bin/delprxy.cgi?http://dx.doi.org/10.1007/978-0-387-46312-4

All books were placed on reserve in the chemistry library and there is no need to purchase them. Reading will be available on the class wiki ahead of class.

**Class web site**

The CHEM686 web page (sakai.udel.edu) will have announcements, exam answer keys, and class notes. Please check routinely for announcements.

**Reading assignments**

In order to encourage discussion in class and more involvement with the material, I or the presenting student(s) will assign reading material ahead of class. Since this class is based on guided reading and discussion, you should come prepared to discuss and explain the readings. Class participation counts toward 15% of the grade.

Further reading may also be assigned following certain lectures. Material that is covered in the reading assignments but was not discussed in class may appear on the exams.

**In class presentations**

Each student will be assigned to present a specific topic. This will require the student to email the class a review(s) -chosen in consultation with me- to read ahead of class. The presentation itself will be a 40 minutes power point talk about the topic leading up to the discussion of the article content. After your presentation you will give a questionnaire (designed to take about 10 minutes to administer) to your fellow students. It should query them about the main points
that you wanted to communicate. The results of such a questionnaire are a great feedback that allows you to further improve your presentation, communication and teaching skills. The reminder of the class is dedicated to the discussion of the review article that you will lead. The presentation and questionnaire sheet will be evaluated and contribute towards your grade.

To ensure that you are sufficiently prepared for your presentation and to help you to deliver a presentations of high quality that is meaningful to your colleagues we will meet two weeks before your presentation to go over your slides and your questionnaire. The expectation is that you have a complete and finalized presentation and questionnaire ready for this meeting – not a draft or an outline. Coming ill prepared will lead to automatic point reduction. To simplify scheduling we will meet right after class in my office. If you have a scheduling conflict please email ahead of time.

All students must read the assigned review article to prepare for the presentation on the topic and for subsequent discussion. You will be expected to actively participate. If you have not read the article you cannot really contribute to class and an automatic point reduction will be invoked. However, since life is not perfect, everyone gets a one-time exception as long as you let me know in the beginning of class.

**Tentative class schedule**

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
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<tbody>
<tr>
<td>1</td>
<td>Feb 8</td>
<td>Overview &amp; Nir Ben Tal</td>
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<tr>
<td>2</td>
<td>Feb 15</td>
<td>Nir Ben Tal</td>
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<td>3</td>
<td>Feb 22</td>
<td>Nir Ben Tal</td>
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<tr>
<td>4</td>
<td>Feb 29</td>
<td>Nir Ben Tal and Fluorescent proteins</td>
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<tr>
<td>5</td>
<td>Mar 7</td>
<td>Introduction fluorescence and Fluorescence microscopy</td>
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<tr>
<td>6</td>
<td>Mar 14</td>
<td>FRET, TIRF, single molecule (guest lecture)</td>
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<td>7</td>
<td>Mar 21</td>
<td>Stimulated emission depletion (STED) microscopy and photoactivatable localization (PALM) microscopy and midterm in class</td>
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<tr>
<td>8</td>
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<td>Spring break</td>
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<tr>
<td>9</td>
<td>Apr 4</td>
<td>Fluorescence microscopy/ Biomembranes/Selected topics</td>
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<tr>
<td>10</td>
<td>Apr 11</td>
<td>Fluorescence microscopy/ Biomembranes/Selected topics</td>
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<tr>
<td>11</td>
<td>Apr 18</td>
<td>Fluorescence microscopy/</td>
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<td>12</td>
<td>Apr 25</td>
<td>Biomembranes/Selected topics</td>
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<tr>
<td>13</td>
<td>May 2</td>
<td>Students presentations of final project</td>
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<tr>
<td>14</td>
<td>May 9</td>
<td>Students presentations of final project</td>
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<tr>
<td>15</td>
<td>May 16</td>
<td>Students presentations of final project</td>
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