Physics 200 Molecular Biophysics
Fall 2013

Professor Jay Newman
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Office Hours: TBA
Text: Methods in Molecular Biophysics, by Serdyuk, Zaccai and Zaccai (SZ^2)
Course Web Site: **minerva.union.edu/newmanj/Physics200**

The course will cover material on the basic structure and function of biomolecules and will include a variety of physical techniques used to study these systems. We will cover most of the topics in SZ^2, skipping a few (for example, we'll omit the chapter on thermodynamics). An outline of the course is given below.

We will run the class partly as a seminar in which you will present material from the text book in class four times, the presentations counting 10% of your final grade each. Readings and homework will be assigned, collected and graded and will count about 30% of the grade. The balance of the grade, 30%, will be based on a major term paper, which will be due the last day of classes, and a class presentation based on the paper. There will be no final exam.

The web site will have all the slides used in class in both Powerpoint and pdf formats (powerpoints used in student presentations will also be posted). Note that this course gives WAC credit. Aside from the research paper, for which you will do a draft and a final version, most homework also will involve some writing that will be graded based on your use of English, your writing style, as well as the science content.

1. **Introduction to the Study of Biomolecules: What is Biophysics?**

2. **The Basic Building Blocks** (Part A2 expanded)
Proteins, nucleic acids, lipids, etc...

3. **Molecular Interactions** (Not in text)
Basic ideas on electrical and hydrodynamic interactions of biomolecules

4. **Biological Structure and Function: Techniques used in Biophysics**
Examples of case studies using a variety of physical techniques, including:

- **Mass spectrometry (Part B)
- Hydrodynamics:
    1. Basic ideas (Part D1-2)
    2. Viscosity and Diffusion (Part D9, D3)
    3. **Sedimentation (Part D4)
    4. **Electrophoresis (Part D5)
    5. Dynamic Light Scattering (Part D10)
    6. **Fluorescence methods (Parts D8, D11)
- Chromatography (Not in text)
- **Microscopy, including new microscopies (Part F1-5)
- *Electron microscopy (Part H1-2)

- *Optical spectroscopy (Part E1)
- Nuclear magnetic resonance (Part J1-3 expanded)
- X-ray diffraction (Part G1,3 expanded)

* = student presentations

Tentative Schedule of Topics:

Week	Dates	Monday	Wednesday	Friday
1	September 9		Introduction, Structure of Biomolecules	Structure/ DNA & Proteins
2	September 16	DNA and proteins	Biomolecules con't, and interactions	Biomolecules con't, and interactions
3	September 23	TBD	Intro to Hydrodynamics	*Mass Spectrometry
4	September 30	Viscosity and Diffusion	*Sedimentation	Dynamic Light Scattering
5	October 7	*Electrophoresis	Intro to Fluorescence, and *Fluorescence Depolarization **Paper Topics Due**	*Fluorescence Correlation Spectroscopy
6	October 14	Chromatography	*Microscopy1	*Microscopy2
7	October 21	*Electron Microscopy	Intro to Spectroscopy	*Optical Spectroscopy
8	October 28	TBD	NMR **Paper Drafts Due**	NMR con't
9	November 4	NMR con't	X-ray diffraction	X-ray diffraction con't
10	November 11	X-ray diffraction con't	Finish loose ends	**Class Presentations**
	November 18	**Class Presentations Final Papers Due**		

Presentation Topics:

Mass Spectrometry	two parts
Sedimentation	two parts
Electrophoresis	two parts
Fluorescence Depolarization	one presentation
Fluorescence Correlation Spectroscopy	one presentation
Microscopy I and II	two parts
Electron Microscopy	one presentation
Optical Spectroscopy	one presentation