ECE/BIOM 480A1
Introduction to Biophysics- Syllabus
Fall 2009

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Meeting time: Monday and Wednesday 9:00 – 10:15 pm, Yates 308

Course website: https://ramct.colostate.edu/webct/logon/429110511011

Office hours: contact me by email to schedule office hours.


Description: This course will introduce the field of biological physics by examining living systems quantitatively. The course is intended to train a broad student audience in mathematical and physical modeling of biological systems. All the topics covered in the syllabus will be rigorously rooted in quantitative experimental data. Emphasis will be given to understanding the techniques and instrumentation used to investigate biological systems at the nanoscale. This course will also serve as an introduction to bionanotechnology.

Topics to be covered:
- Cell components. Length, force and time scales in biophysics. AFM.
- DNA packaging in viruses. DNA elasticity. Nanomanipulation.
- Brownian motion. Diffusion.
- Electrophoresis. Nernst-Planck equation.
- Transport at low Reynolds numbers.
- Entropic forces.
- Charged surfaces and their counterion clouds. Electroosmosis.
- Molecular motors. High resolution imaging techniques.
- Membrane potentials. Ion channels.
- Nerve impulses.
We will not cover chapters 3 and 8
Chapter 3 deals with probability and statistics. If you do not have a good background in these areas it is highly recommended that you read this chapter.

**Method of evaluation:** One midterm: 20%, Final: 50%, Homeworks (8 best homeworks): 20%, Quizzes (8 best): 10%

The University is required to provide reasonable accommodations to students with disabilities, so as not to discriminate on the basis of that disability. Students with disabilities are encouraged to contact the instructors to discuss their individual needs for accommodations. Also, you may visit Resources for Disabled Students: [http://rds.colostate.edu/](http://rds.colostate.edu/) or call them at (970) 491-6385.

CSU policy on Sexual Harassment applies to all persons affiliated with the University, including its students and employees. Any student in this class who believes s/he has been the subject of discrimination or harassment is encouraged to contact the instructor or the Office of Equal Opportunity and Diversity at (970) 491-5836 or via email [oeod@colostate.edu](mailto:oeod@colostate.edu)
# ECE 480A1 - Introduction to Biophysics
## Tentative course schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Required Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cell components. Dimensions involved. AFM</td>
<td>Chapter 2 + handouts</td>
</tr>
<tr>
<td>2-3</td>
<td>DNA packaging in viruses. DNA elasticity. Nanomanipulation</td>
<td>Chapter 9 + handouts</td>
</tr>
<tr>
<td>4-5a</td>
<td>Brownian motion. Diffusion.</td>
<td>Chapter 4</td>
</tr>
<tr>
<td>5b</td>
<td>Electrophoresis. Nernst-Planck equation</td>
<td>Chapter 4</td>
</tr>
<tr>
<td>6</td>
<td>Fluctuation dissipation theorem. Low Reynolds numbers.</td>
<td>Chapter 5 + handouts</td>
</tr>
<tr>
<td>7a</td>
<td>Review of chapter 6</td>
<td>Chapter 6</td>
</tr>
<tr>
<td>7b-9</td>
<td>Entropic forces. Charged surfaces and their counterion clouds</td>
<td>Chapter 7</td>
</tr>
<tr>
<td>10-11</td>
<td>Molecular motors. High resolution imaging techniques</td>
<td>Chapter 10</td>
</tr>
<tr>
<td>12-13</td>
<td>Membrane potentials. Ion channels</td>
<td>Chapter 11</td>
</tr>
<tr>
<td>14-15a</td>
<td>Nerve impulses</td>
<td>Chapter 12</td>
</tr>
<tr>
<td>15b</td>
<td>Review</td>
<td></td>
</tr>
</tbody>
</table>

**Exams:**

Week 7: Mid-term covering weeks 1-5.
Week 16: Final