

## Introduction to Biological Physics

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**Professor:** Dr. John Portman, Room 106 Science Research Building  
Tel: 672-9518, email: [jportman@kent.edu](mailto:jportman@kent.edu)

**Office Hours:** 11:00 am - 12:30 pm, Tuesdays and Thursdays. Also by appointment, or stop by and try your luck! The best way to get in touch with me is email

**Class Time:** Mondays, Wednesdays, and Fridays from 12:05 – 12:55 in 204 Smith Hall.

**Final:** Wednesday, Dec. 14: 10:15–12:30.

**Pre-requisites:** PHY 23102

**Important Dates:** Last day to add/drop: 09/11/11 Last day to withdraw: 11/06/11

The official registration deadline for this course is 09/11/11. University policy requires all students to be officially registered in each class they are attending. Students who are not officially registered for a course by published deadlines should not be attending classes and will not receive credit or a grade for the course. Each student must confirm enrollment by checking his/her class schedule (using Student Tools in FlashLine) prior to the deadline indicated. Registration errors must be corrected prior to the deadline.

**Text:** *Physical Biology of the Cell* (2009), Rob Phillips, Jane Kondev, Julie Theriot.

Physical Biology of the Cell (PBoC) is an excellent new textbook on Biological Physics. The excitement and intrigue of the subject come across clearly in this book. Better yet, the physics and biology and physics in the book are integrated thoroughly — Biological Physics is treated as a single coherent subject. Still, PBoC covers lot of material, some of which in more depth than we will be concerned with in this class. We will discuss selected topics in many chapters of parts 1–4, though perhaps not covering any one of them in its entirety. Our treatment of selected topics may deviate from the text freely if its treatment is too advanced or detailed for our purposes.

**Other Texts:** Supplemental reading as well as additional background information may be assigned from the following (and will be made available to the class):

Philip Nelson, *Biological Physics: Energy, Entropy, and Life*.

Rodney Cotterill, *Biophysics: An Introduction*.

Alberts, et al, *Essential Cell Biology*.

Howard Berg, *Random Walks in Biology*

David S. Goodsell, *The Machinery of Life*

**Homework:** You are expected to be prepared for each class. Keep up with assigned reading and try to have it completed *before* we cover it in lecture.

Homework will be assigned approximately every week and will be due in class one week later. Some weeks, the homework will consist of problems from the end of the chapter of PBoC. Other times you will be given a recent article to read relevant to that week's topic and asked a few questions about the article. When reading an article, you should not be too concerned if you don't understand everything in the article, but rather read closely enough to get the general idea of the results and their interpretation.

No late homework will be accepted unless arranged with me before the day it is due.

**Exams:** No make-up exams will be given except in the case of documented illness or serious family crisis. There will be two exams based on assigned reading, lectures, and homework. Each exam will cover previously untested material. There will not be a cumulative exam.

**Target dates for the exams:**

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Exam 1	8 <sup>th</sup> week (Oct. 17–21)
Exam 2	last week or time of the final, Wed. Dec. 14, 10:15–12:30

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**Presentations:** A short presentation of a project of your choosing will be given to the class near the end of the semester. The assignment is to find a topic that you find interesting and tell the class what you learned about it in a 15–25 min presentation. A good start is to start looking in your textbook, Scientific American, and Physics today at the library. I will also pass out a list of potential projects including some projects people have found interesting previously. Once you find something that interests you, come see me and I can make suggestions to help focus the topic and other references. For full credit, you must decide on a title and short abstract on or before the due date.

**Target dates for the projects:**

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Title	Oct. 24
Abstract	At least a week before your presentation or Nov. 28 at the latest

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**Grading:** Grades will be based on scores from assignments with the following weights:

Exams	50 % (25% each)
Homework	30 %
Project	10 %
Participation	10 %

There are no “extra-credit” assignments to improve your grade.

**University Policies:** University policy 3-01.8 deals with the problem of academic dishonesty, cheating, and plagiarism. None of these will be tolerated in this class. The sanctions provided in this policy will be used to deal with any violations. If you have any questions, please ask.

University policy 3342-3-18 requires that students with disabilities be provided reasonable accommodations to ensure their equal access to course content. If you have a documented disability and require accommodations, please contact the instructor at the beginning of the semester to make arrangements for necessary classroom adjustments. Please note, you must first verify your eligibility for these through Student Disability Services (contact 330-672-3391 or visit [www.kent.edu/sds](http://www.kent.edu/sds) for more information on registration procedures).

**Tentative list of topics and chapters. ( These may be adjusted through semester)**

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Week	PBoC	Topics
1-2	Chapter 1 Chapter 1 and 2 ECB Chapter 2.1 -2.2	Models and Biology by the numbers Cells and their contents
3	Chapter 5.1, 5.2, 5.5	Mechanical and Chemical Equilibrium Energy in Cells Protein structure Hydrophobicity
4-5	Chapter 6.1-6.4	Entropy Rules! Ligand Receptor Binding RNA Polymerase Binding
6-7	Chapter 7.1-7.2	Two state Systems Ion Channels Cooperative Binding: Hemoglobin
8-9	Chapter 8.1-8.3	Random Walks and Structure of Macromolecules DNA as a random chain Single Molecule Mechanics
10-11	Chapter 12.1, 12.4	The Mathematics of Water Navier-Stokes Equation Life at Low Reynold's Number
11-12	Chapter 13.1-13.3	A Statistical View of Biological Dynamics Diffusion in the Cell Diffusion Equation Diffusion Limited Reactions
12 - 13	Chapter 16.1-1.2	Molecular Motors Translational Motors: Myosin Biased Random Walk
14		Presentations

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