PHY 4700 Introduction to Biomedical Physics Winter 2015

Instructor: Ashis Mukhopadhyay, Associate Professor
258 Physics Building
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Office hours: T : 1:00pm – 3:00 pm, or by appointment

Lecture time and location: M W 11:45pm – 1:35pm, 245 Physics Building

Prerequisite: PHY 2130/2140 or PHY 2170/2180; MAT 2020; PHY 3700

Textbook: 1) "Biological Physics: Energy, Information, Life", by Philip Nelson, updated 1st edition, W. H. Freeman (also being the textbook of the follow-up course "PHY 6700: Biological Physics");
2) "Biomedical Applications of Introductory Physics", by J. A. Tuszynski and J. M. Dixon, Wiley.
3) "Physics", by Giambattista, Richardson, and Richardson, McGraw-Hill or similar.

Additional text/References:
"Introduction to Physics in Modern Medicine", by S. A. Kane, Taylor & Francis;
"Modern Physics", 2nd edition, by K. S. Krane, Wiley;
"Modern Physics", 5th edition, by P. A. Tipler and R. A. Llewellyn, W. H. Freeman;

Homework: Posted in Blackboard course website; Due 1 week after assigned;
Late solutions will NOT be accepted; the lowest homework score will be dropped.

Exams: Three midterm exams: to be announced one week in advance;
Final exam (Cumulative): April 30 (Thursday), 10:40 am – 1:10 pm.

Grading:

1st exam:	15%
2nd exam:	20% (special)
3rd exam:	15%
Final exam:	25%
Quiz (in class):	15%
Homework:	10%

A: 90 – 100%; A-: 85 – 89%
B+: 80 – 84%; B: 75 – 79%; B-: 70 – 74%
C+: 65 – 69%; C: 60 – 64%; C-: 55 – 59%
D+: 50 – 54%; D: 45 – 49%; D-: 40 – 44%
F: 0 – 39%

Bonus: In class activities and participation up to 5% (This is my discretion).

Learning objectives

This course covers basic and applied physics concepts used in biology and modern medicine. At the completion of the course you should be able to:

- Apply 1st law of thermodynamics to simple biological processes
- Explain how living things generate order and debate whether it is consistent with the 2nd law of thermodynamics
- Calculate the change of entropy for different thermodynamic processes
- Recognize the advantages of probabilistic description for a system consisting of large

number of molecules

- Obtain a molecular understanding of concepts, such as pressure, temperature, etc.
- Use the Boltzmann factor to explain biological phenomena and realize the importance of thermal energy, k_BT at the nanoscale
- Explain diffusion and random walk as well as their roles in molecular transport within cells, membranes, and biological organisms.
- Apply concepts of modern physics for medical applications, such as MRI, radiation therapy, etc.

STUDENT DISABILITY SERVICES: If you have a documented disability that requires accommodations, you will need to register with Student Disability Services (SDS) for coordination of your academic accommodations. The Student Disability Services (SDS) office is located at 1600 David Adamany Undergraduate Library in the Student Academic Success Services department. SDS telephone number is 313-577-1851 or 313-577-3365 (TDD only). Once you have your accommodations in place, I will be glad to meet with you privately during my office hours to discuss your special needs. Student Disability Services' mission is to assist the university in creating an accessible community where students with disabilities have an equal opportunity to fully participate in their educational experience at Wayne State University.

Please be aware that a delay in getting SDS accommodation letters for the current semester may hinder the availability or facilitation of those accommodations in a timely manner. Therefore, it is in your best interest to get your accommodation letters as early in the semester as possible.