PHY 4700 Introduction to Biomedical Physics Winter 2013

Instructor: Ashis Mukhopadhyay, Associate Professor
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Office hours: W 4:00 pm – 6:00 pm, or by appointment

Lecture time and location: M W 1:55pm – 3:45pm, 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: Two midterm exams: to be announced two weeks in advance;
Final exam (Cumulative): April 24 (Wednesday), 1:20 pm – 3:50 pm.

Grading: 1st exam: 20%
2nd exam: 20%
Final exam: 30%
Quiz (in class) & attendance: 20%
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%

Course content (for guidance only)

This course covers basic and applied physics concepts used in biology and modern medicine, including:

- Brief review of General Physics I & II (selected topics)
- Thermodynamics: Temperature and heat, ideal gas, entropy, free energy, microscopic systems, and Boltzmann distribution.
- Diffusion, random walks, osmosis, and the related biological applications including cell membranes and biological organisms.
- Fluid mechanics in biological systems.
- Modern physics: Photoelectric effect, blackbody radiation, atoms, molecules, energy levels and spectra.
- Medical applications: Radioactivity, radiation therapy, medical diagnostics (X-ray, CT/CAT, emission tomography, PET), magnetic resonance imaging (MRI).