

**Instructor:** Zhi-Feng Huang, 356 Physics Building  
 Tel: (313) 577 2791; Email: huang@wayne.edu  
 Office hours: Mon & Wed 1:30pm – 2:30pm, or by appointment

**Lecture time and location:** M W 2:30pm – 4:10pm, 185 Physics Building

**Prerequisites:** 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 the textbook of follow-up course PHY 5750);  
 2) “Biomedical Applications of Introductory Physics”, by J. A. Tuszynski and J. M. Dixon, Wiley.

**Supplementary text/References:**

“Introduction to Physics in Modern Medicine”, by S. A. Kane, Taylor & Francis;  
 “Modern Physics”, by K. S. Krane, Wiley;  
 “Modern Physics”, by P. A. Tipler and R. A. Llewellyn, W. H. Freeman;  
 Any general physics textbook of PHY 2130/2140 or PHY 2170/2180.

**Homework:** Posted in Blackboard course website; Collected in class at due date.  
 Late solutions will NOT be accepted; The lowest homework score will be dropped.  
 You must show your own work and solution steps to receive credits, although group discussions are allowed. Any copy from other sources (e.g., from other students, internet, or elsewhere) is prohibited and will be given 0 credit.

**Exams:** Two midterm exams: to be announced at least 1 week in advance (NO make-up exams);  
 Final exam (Cumulative): April 25 (Wednesday), 2:45pm – 4:45pm.

**Grading:** 1st exam: 20%  
 2nd exam: 20%  
 Final exam: 30%  
 Quiz (in class): 10%  
 Homework: 20%

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%

**Learning outcomes**

This course covers basic and applied physics concepts used in biology and modern medicine. Students are expected to learn and understand the following topics:

- Thermodynamics: Temperature and heat, thermodynamic laws, ideal gas, entropy, 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 and introduction to quantum mechanics: Photoelectric effect, blackbody radiation, atoms, molecules, energy levels and spectra, the Schrödinger equation (1D).
- Medical applications: Radioactivity, radiation therapy, medical diagnostics (X-ray, CT/CAT, emission tomography, PET).
- Nuclear magnetic resonance (NMR) and magnetic resonance imaging (MRI).

## **Additional resources and help**

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.