

PHYS 2010 Introductory Biological Physics

Spring semester 2025

Lectures: Mon 4:30PM - 5:50PM LTH

Fri 12:00PM - 1:20PM LTH

Tutorial: Wed 9:30-10:20 AM G009A, CYT Bldg

Lecturer: Professor Hyokeun Park (Department of Physics and Division of Life science)

TA: Chun Pui Wu

Course description

This course introduces the physical concepts in the study of biological systems, including macromolecules, membranes, molecular motor and nerves. Biological phenomena will be discussed based on physical principles with appropriate mathematics when necessary. The emphasis will be on the applications of physics in biology.

Prerequisite courses

LIFS 1901 or level 3 or above in HKDSE 1x Biology and

PHYS1111 or PHYS1112 or PHYS1312

Grading

Homework: 30%

Midterm: 30%

Final: 40%

Grading Scale

A: Exceptional, outstanding and excellent performance in exam and homework.

B: Very good and solid performance in exam and homework.

C: Satisfactory, in exam and homework.

D: Marginal Performance in in exam and homework.

F: Unsatisfactory performance in in exam and homework.

Reference

Physical Biology of the Cell by Rob Phillips, Jane Kondev, Julie Theriot and Hernan Garcia

The Physics of Living Processes A Mesoscopic Approach, Tomas Andrew Waigh

Biological Physics: Energy, Information, Life by Philip Nelson

Physical Models of Living Systems by Philip Nelson

Course Intended Learning Outcomes

On successful completion of this course, students are expected to be able to:

1. Understand the basic concepts of biological physics and how these are related to our daily life.

2. Recognize how biological physics can solve fundamental questions related to biology and human diseases.
3. Examine information relevant to biological physics issues.
4. Explain issues and importance of biological physics to general public.

Topics in Biological Physics

1. Life from the Perspective of Physics
2. What's Inside Cells
3. The Structure of Biological Molecules
4. Molecular Driving Forces: Statistical Thermodynamics
5. Statistical Thermodynamics of Life
6. Biological Polymers.
7. Diffusion
-----Midterm---(tentatively March 24 2025)
8. Life at Low Reynolds Number
9. Rate Equations and Dynamics in the Cell
10. Molecular Motor
11. Physical Properties of Cell Membrane
12. Physics of neurons