BIPH 3010 Advanced Biological Physics

Lecture Mon 3:00 – 4:20 PM & Fri 10:30 – 11:50 AM Room 1032 LSK

Instructor: Professor Hyokeun Park (Room 5473, Email: hkpark@ust.hk, T-2358-7322)
Instructor: Professor Pingbo Huang (Room 5463, Email: bohuangp@ust.hk, T-2358-7305)
Instructor: Professor Guang Zhu (Room 5519, Email: gzhu@ust.hk, T-2358-8705)

Course description

Credit Points: 3
Biological physics involves the application of physics to achieve an understanding of life processes. This is the second of two primarily lecture courses that will prepare advanced undergraduates for research and technical work in Biological physics. It covers advanced biological physics such as molecular and cellular biological physics, photophysics, single-molecule biophysics, Ion channel biological physics, Neurophysiology, Protein folding and engineering and Bioinformatics. At the conclusion of this course, students will be able to critically assess primary research literature written for a general scientific audience. They will also be prepared for mentored practical research investigations or professional job related to biological physics.

Prerequisite courses

Introductory biological physics
Cell biology

Grading

Midterm: 45%
Final: 55%
The grading is assigned based on students' performance in assessment tasks/activities.
Midterm examination duration: 1 hour 20 mins
Final examination duration: 3 hrs

Course Objective

Apply the biological physics concepts to biological systems, including macromolecules, molecular motor, membranes, neurons, protein engineering and bioinformatics.

Learning Outcomes

1. Understand the advanced concepts of biological physics.
2. Apply the advanced concepts of biological physics to complex biology and human diseases.
3. Explain issues and importance of biological physics to general public.

Topics in Biological Physics

1. The scale law in biology
2. Force in Life
3. Light and Life
4. Single-molecule biophysics

----------Midterm Exam----------

5. Ion channel biological physics:
6. Neurophysiology
7. Biophysical bases of separation and characterization of biomolecules
8. Biophysical approaches for structural biology

----------Final Exam----------

No textbook but **lecture notes** will be provided in the canvas.

Main References

Physical Biology of the Cell by Rob Phillips, Jane Kondev, Julie Theriot and Hernan Garcia Biophysics: Tools and Techniques, Mark C. Leake 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

Teaching and Learning Activities

Scheduled activities: 3 hrs (lecture)