

Syllabus of Introduction to Biophysics

Author: Z.Leonenko

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I . Course Information

1. Course Code: PHY 280/BIOL280
2. Course Category: Undergraduate
3. Hours / Credits: 0.5
4. Prerequisites: 2 out of three: first year physics, chemistry or biology
5. Specialty: Nanomaterials and Technology

II . Course Description and Objectives

An introduction to the physical principles that underlie the dynamics of life from the macro to molecular scale. The course is intended for 2nd year science and engineering students and will cover a broad spectrum of topics including aspects of biotechnology, bioengineering, nanotechnology, and biomedical physics.

III. Contents and Basic Requirements

Part A:

Systemic Biophysics

- Biomechanics
- Biophysics and Fluid Flow
- Biophysics and Gas Transport
- Physics of Audition
- Physics of Vision

Part B:

Cellular-Molecular Biophysics

- Cells: structure and content
- Physics of Biomolecules
- Molecular Forces
- Physics of Bio-membranes
- Thermodynamics in Bio-systems
- Bioenergetics
- Neurobiophysics

Part C: Physical Methods in Biology and Medicine

1. X-Ray diffraction;
2. Isotope labelling;
3. Photodynamic therapy;

4. Dynamic light scattering;
5. Circular Dichroism (CD);
6. Quantum Dot imaging
7. Raman Scattering
10. Electrophoresis
11. Magnetic Resonance Imaging
12. Tomography
13. Mass spectrometry;
14. Transmission electron microscopy
15. Langmuir-Blodgett monolayer technique,
16. Surface plasmon resonance (SPR)
17. Nuclear Magnetic Resonance
18. Fluorescence and UV-vis light spectroscopy
19. Scanning probe microscopy
20. Quartz Crystal Microbalances,

IV. Teaching Arrangement

Lectures

V. Examination and Grading

Midterm (30%), assignments (20%) and final exam (50%)

VI. Texts and Reference

Lectures,

books: Elementary Biophysics: An Introduction, by P. K. Srivastava

Physics For the Biological Sciences, by Hallett et al.

“Plagiarism detection software (Turnitin) will be used to screen assignments in this course. This is being done to verify that use of all materials and sources in assignments is documented. Students will be given an option if they do not want to have their assignment screened by Turnitin. In the first week of the term, details will be provided about arrangements and alternatives for the use of Turnitin in this course.”