SK2534 Molecular Biophysics 7.5 credits

Molekylär biofysik

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

Establishment

The course syllabus is valid from Spring 2022 according to the school principal's decision: S-2022-0529 Decision date: 2022-02-24

Grading scale

A, B, C, D, E, FX, F

Education cycle

Second cycle

Main field of study

Engineering Physics

Specific prerequisites

Completed degree project at the undergraduate level in engineering physics or medical technology.

English B / English 6

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

Molecular biophysics is a general course in biophysics where the student learns the fundamental physical, quantitative and structural aspects of living systems. An important course goal for the student is to gain experience in using physical models, statistical mechanics and mathematical statistics to understand and critically analyze biological experimental results and observations.

After completing the course, the student should be able to:

- Describe RNA, DNA and proteins with respect to structure, stability and function.
- Describe how and why water molecules affect biological structures and reactions.
- Describe and compare biological systems at the following structural levels: cell, aggregate and individual molecules.
- Visualize and analyze protein structure with a computer as an aid.
- Demonstrate how classical and statistical mechanics explain structure and function in biological systems.
- Explain and exemplify how light interacts with biological material and thus controls functions and energy processes, as well as how this interaction can be used to study biological molecules and their functions.
- Analyze biological processes using thermodynamic principles to quantify associated enthalpy, entropy and kinetics.
- Formulate physical models to describe biological and biochemical systems.

Course contents

Models and equations for:

- Structure of biological macromolecules
- Forces and interactions in biological molecules
- Water, hydrophobicity and solubility, and its role in protein folding
- The Boltzmann distribution and free energy
- Membrane proteins, ion channels, and transporters
- Computer methods for simulating biological molecules
- Energy turnover
- Methods for calculation-based drug development

Examination

- INL1 - Hand in assignment, 3.0 credits, grading scale: P, F
- LAB1 - Laboratory work, 2.0 credits, grading scale: P, F
- TEN1 - Written exam, 2.5 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.