



# SK2512 Cellular Biophysics 10.0 credits

## Cellulär 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

Course syllabus for SK2512 valid from Spring 2019

## Grading scale

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

## Education cycle

Second cycle

## Main field of study

Biotechnology, Engineering Physics, Physics

## Language of instruction

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

## Intended learning outcomes

Upon completion of the course, students should be able to:

- describe the basic physical principles of cell function in transport of water, ions and nutrients
- define mathematical models for transport of water, ions and solutes in and across the cell membrane
- describe how the cell regulates water and ion balance and how it is affected by the cell environment
- calculate the cell membrane potential and how it varies in different situations
- perform measurements of different cellular physical parameters using microscope-based methods

## Course contents

Models and equations describing the transport of water, ions and nutrients within cells and through cell membranes. Active and passive transport. Channels and carriers. Cell electrical potential (graded and action potential). Methods for measuring cellular physical parameters.

Lectures (24 hours), laboratory exercises (32 hours), hand-in assignment

Laboratory exercises:

- measurement of diffusion in an aqueous solution that mimics cytoplasm (fluorescent microscopy)
- measurement of diffusion in cell membranes (living cells, confocal microscopy)
- measurement of changes in cell volume (living cells, confocal microscopy)
- measurement of changes in cell membrane potential (living cells, confocal microscopy)

## Specific prerequisites

Basic knowledge of mathematics (differential and integral calculus, linear algebra, differential equations) and physics (classical physics, electromagnetism).

## Course literature

Weiss TF. Cellular Biophysics, vol 1: Transport, MIT Press, 1996

Weiss TF. Cellular Biophysics, vol 2: Electrical properties, MIT Press, 1997

## Examination

- INL1 - Hand in assignment, 1.0 credits, grading scale: P, F
- LAB1 - Laboratory experiments, 4.0 credits, grading scale: P, F
- TEN1 - Written exam, 5.0 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.

## Other requirements for final grade

Hand-in assignment (INL1 1,0 credits, grade scale: P, F)

Laboratory exercises (LAB1 4,0 credits, grade scale: P, F)

Written exam (TEN1 5,0 credits, grade scale: A, B, C, D, E, FX, F)

## 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.