IM2656 Bio-Nanotechnology 7.5 credits

Bio-Nanoteknik

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

Establishment

Course syllabus for IM2656 valid from Autumn 2008

Grading scale

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

Education cycle

Second cycle

Main field of study

Engineering Physics

Specific prerequisites

Good knowledge about the physics and chemistry courses according to the study plan or corresponding background

Language of instruction

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

Intended learning outcomes

This course will provide the basic elements of the interface concepts between biology and nanotechnology. The course will focus on the living systems at the nano and micro level as well as the role of genes, proteins and other macromolecules as the building elements of nano structured devices.

After successful completion of the course, the students should be able to:

- Understand the basic concept in cell biology and cell organelles
- Capable to define biological macromolecules
- Understand the basic concept in molecular recognition
- Give an example and explain the function and potential application of protein based structures
- Give an example and explain the function and application of DNA based nanostructures
- Perform in-vitro laboratory tests on the interaction of nanoparticles with cells.
- Assess the toxic effects of nanoparticles based on in-vitro laboratory tests.
- Identify pathogenic organisms by magnetic nanoparticle-based techniques.
- Present the result of the laboratory exercise as written report
- Present and interpret the laboratory exercise as presentation

Course contents

he molecular machinery of the cell, as well as the physico-chemical interactions between the cells characterizes the living systems. Understanding the assembly of the cell opens some exciting possibilities to construct artificial structures in applied nanotechnology, which will mimic the functions of the biological systems. A major challenge is to exploit the structures and processes of biomolecules at the cellular and organ-specific levels in order to design novel functional materials, biosensors and bioelectronic components. At the same time, the functionalized nanodevices show a strong potential for applications in medicine including imaging and diagnostic techniques, improved biomimetic materials, drug design and drug delivery.LabBasic sterilization techniques; delivery of molecules/nanoparticles by endocytosis; identification of pathogenic organisms by magnetic nanoparticles-based techniques.

Course literature

Lecture notes and reference literature Essential cell biology, Alberts et al. Garland Science, New York 2004 Bio-nanotechnology, Goodsell Wiley-Liss, New Jersey, 2004Nanobiotechnology, CM Niemeyer and CA Mirkin, Wiley-VCH, 2004

Examination

- INL1 - Assignment, 1.0 credits, grading scale: P, F
- TEN1 - Examination, 5.0 credits, grading scale: A, B, C, D, E, FX, F
- LAB1 - Laboratory Work, 1.5 credits, grading scale: P, 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.

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

Other requirements for final grade

TEN1: 5 hpTUT1: 1 hp LAB1: 1,5 hp

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.