BB2160 Structure Biology 7.5 credits

Strukturbiologi

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 BB2160 valid from Spring 2011

Grading scale

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

Education cycle

Second cycle

Main field of study

Biotechnology

Specific prerequisites

Admission requirements for independent students:
A total of 20 university credits (hp) in biochemistry, microbiology and gene technology/molecular biology. 30 university credits (hp) chemistry, as well as 20 university credits (hp) in mathematics and computer science or corresponding. Documented proficiency in English corresponding to English B.

Admission requirements for programme students at KTH:

Language of instruction

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

Intended learning outcomes

Overall goal

The main goal is to provide the student with basic knowledge and insight about the three-dimensional (3D) structure of macromolecules (protein and nucleic acids) and the relationship between structure and function. A general introduction to the determination of 3D structure is included. The teaching is based on a knowledge-interaction concept that is used to increase and deepen the perception and understanding of 3D structure and structure-function relationships. To achieve this, lectures are intimately coupled to interactive computer exercises known as kinetic images (kinemages) where structures are studied and analyzed in 3D.

Specific aims

You should be able to describe the main characteristics of amino acids and the principle types of motifs and folds. You should know about the principle forces that fold the proteins and maintain the structures, and be able to suggest changes to a protein structure that would lead to for instance increased thermostability. You should be able to describe the function of a number of important proteins and relate their function to the structure. With the aid of kinemage exercises, you should be able to draw connections between the information from the course literature and the actual 3D structures. You should know about the functions and tools available in the structure database, and be able to use these for retrieving information and structures, as well as validating structures. You should be able to validate a 3D structure using tools available in the structure database and by analyzing electron-density maps. You should be able to outline the principles for crystallization of soluble, globular proteins. You should know the basic principles for how a 3D structure is determined, most importantly using the method of X-ray crystallography. During the seminar project, you will study, in detail, a specific protein structure and its function. Guided by information retrieved from the course and scientific articles, you should be able to analyze, validate and discuss the structure, and to present your observations and reflections as a written report as well as an oral presentation at the end of the course.

Course contents

Biomolecular structures. High resolution structure detemination techniques such as NMR-spectroscopy and X-ray crystallography. Forces that fold the proteins and maintain the structures. Structure-function relationship examples e.g. transcription factors, immunoglobulines, and signal transduction proteins. Structural databases, visualization and analysis of structures. Applications in pharmaceutical industry.

Course literature

Branden C, and Tooze J., Introduction to Protein Structure, 2nd Ed. Garland Publishing Inc., 1999, and relevant handouts

Examination

- LAB1 - Laboratory Work, 1.5 credits, grading scale: P, F
- LIT1 - Literature Task, 2.0 credits, grading scale: P, F
- TEN1 - Written exam, 4.0 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

Examination (TEN 1; 4,0 credits, grading scale A - F), Laboratory Course (LAB1; 1,5 credits, grading scale Pass/Fail)
Literature assignment (LIT1; 2,0 credits, grading scale A-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.