Study programme : BSc in Biology

Degree level: Bachelor degree

Course title: Methods in Structural Biology

Professor: dr Edward Petri

Elective course

Number of ECTS: 6

Prerequisites:

Course objective:

Structural biology enables an understanding of the working mechanisms of the molecular components involved in biological processes. The major goal of this course is to introduce students to methods used in macromolecular structure determination and the study of their interactions, and to develop a deeper understanding of the connection between protein structure and function.

Course outcome:

Following successful completion of preliminary and final exams, students will be able to:

- Understand the structural basis of biological processes, the connection between genes and the structure of biomolecules, and the structural basis of genetic conservation
- Distinguish between techniques and methods used in structural biology and evaluate their use under different conditions and for different biological problems
- Use online tools and databases for macromolecular modeling
- Create and analyze high resolution of macromolecular structures
- Critically read scientific literature containing structural information
- Understand the structural basis of bioinformatics
- Use proteomic databases from the internet (PDB,SWISS PROT, NCBI, BLAST, EBI....) necessary for research in modern biology.

Course content:

Theoretical part

Methods for determination of protein structure, dynamics and interactions. Heterologous expression and protein purification. Protein crystallization. Protein structure determination. Parameters of structure quality. Nuclear magnetic resonance (NMR). Electron microscopy (cryoEM). Isothermal calorymetry titration (ITC). Fluorescence spectroscopy (FRET/BRET). Circular dichroism (CD). Limited proteolysis. Protein folding, processing and degradation. Protein-protein interactions. Biology of membrane proteins. Connection between structure and funtion of proteins, nucleic acids and other macromolecules. Connection between genes and structures of biomolecules, structural basis for genetic conservation. Proteomics, structural bioinformatics and macromolecular modeling.

Practical part

The practical part of the course will be organized in computer labs, combined with lectures, which will allow students to master the use of proteomic and bioinformatics internet resources and programs for 3D macromolecular visualization and analysis.

Reading List:

1. Bourne P., Structural bioinformatics, Wiley-Liss (2003).
2. Serdyuk, I., Zaccai, N., Zaccai, J., *Methods in molecular biophysics: structure, dynamics, function*, 2010
3. Branden, C. & Tooze, J. *Introduction to Protein Structure,* 2nd Edition, Garland Publishing, New York.
4. Lucky, M. *Membrane Structural Biology*, Cambridge, 2010

Total hours:				
Lectures: 2	Practicals:	Other:2	Student research work:	

Methods of instruction:

lecutres, computer-based exercises, semester project, consultations

Assessment (maximum number of points 100)

Requirements	points	Final exam	points
Active participation in lectures		Written exam	30
Active participation in practicals		Oral exam	10
Laboratory reports	20		
Essay	20		
Preliminary exams	20		

Remark: