Course Unit Descriptor

Study Programme: Bachelor Academic Studies in Biochemistry

Course Unit Title: Structure and Function of Proteins

Course Unit Code: B-302

Name of Lecturer(s): Assistant professor Nataša Simin

Type and Level of Studies:
Bachelor of Science Degree

Course Status (compulsory/elective): Obligatory

Semester (winter/summer): Winter

Language of instruction: English

Mode of course unit delivery (face-to-face/distance learning): Face-to-face

Number of ECTS Allocated: 6

Prerequisites: None

Course Aims:
To provide students with a systematic knowledge of all levels of protein structure and mechanisms of protein synthesis and folding. To enable students to understand the relationship between the three-dimensional structure and biological function of proteins. To familiarize students with main classes of proteins involved in various biological processes. To introduce students to modern techniques used in protein structure determination. To develop students' practical skills in using software for visualization and manipulation of protein models, as well as laboratory skills to carry out Western blot and ELISA methods.

Learning Outcomes:
Upon successful completion of the course, the student is able to demonstrate systematic knowledge of all levels of protein structure and explain mechanisms of protein synthesis and folding, explain how the three-dimensional structure and reactivity of biological macromolecules determines their biological function, classify proteins according to their function and specify the functions of the main representatives of each class, demonstrate knowledge of the methods used in protein structure determination, independently use software for visualization and manipulation of protein models, and carry out Western blot and ELISA methods.

Syllabus:
Theory
The primary structure of proteins, sequencing. Non-covalent interactions that stabilize protein structure. Secondary and supersecondary structures. Domains, the tertiary structure. Quaternary structure. Methods for protein structure determination. Translation. Posttranslational modifications. Protein folding. Conformational changes of proteins. Classification of proteins by function. Fibrous proteins. Membrane proteins (ion channels, ion pumps, transporters, receptors). Protein degradation. Immunoglobulins and MHC proteins. Analytical methods based on antigen-antibody interactions.
Practice
The acid-base properties of amino acids. Calculation of the ionization state of amino acids and peptides. Calculation of peptides pI. Introduction to databases of proteins and how to use them. Computer practice to master software for visualizing three-dimensional structures of proteins and the analysis of interactions within the protein, the interaction with other proteins, nucleic acids and ligands. The application of NMR and X-ray crystallography techniques in protein

structure analysis. Denaturation / renaturation of proteins. The separation of plasma proteins by SDS-PAGE electrophoresis. Western-blot. Application of ELISA methods.

Required Reading:

Branden C, Tooze J.: Introduction to Protein Structure, 2nd Ed., Garland Publishing, New York 1999.

Petsko G, Ringe D: Protein Structure and Function, Blackwell Publishing, 2003.

Zubay GL, Parson WW, Vance DE.: Principles of Biochemistry, Wm C Brown, Iowa,1995.

Nelson DL, Cox MM.: Lehninger principles of biochemistry, 4th Ed., W.H. Freeman & Company, 2004.

Weekly Contact Hours: 5	**Lectures:** 3	**Practical work:** 2

Teaching Methods: Lectures, laboratory work, seminar(s)

Knowledge Assessment (maximum of 100 points): 100

Pre-exam obligations	40	**Final exam**	60
Active class participation	10	written exam	60
Practical work	15	oral exam	
Preliminary exam(s)			
Seminar(s)	15		