COURSE LAYOUT

1. GENERAL

SCHOOL	APPLIED BIOLOGY & BIOTECHNOLOGY		
DEPARTMENT	BIOTECHNOLOGY		
STUDY LEVEL	*Undergraduate*		
COURSE CODE	**3300**	**SEMESTER**	2nd
COURSE TITLE	Biomolecular Biochemistry		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS**
Lectures	3	1.56
Laboratory exercises	2	0.56
Group and/or individual assignments		0.56
Independent study		2.32
TOTAL		5

COURSE TYPE	Background
PREREQUISITES	No
LANGUAGE	Greek with English support in terminology
IS THE COURSE OFFERED for ERASMUS STUDENTS?	YES (in Greek)
COURSE WEB PAGE	

2. LEARNING OUTCOMES

Learning Outcomes

Upon successful completion of the course, the student will:
- He has knowledge of the basic concepts and definitions of Biochemistry.
- Has knowledge of the components and structures of proteins, nucleic acids, carbohydrates and lipids.
- Has knowledge of basic concepts of enzyme function and inhibition.
- Has knowledge of basic mechanisms of function of various proteins.
- Has knowledge of basic ways of cellular communication.
- Has knowledge of molecular scale processes for chemical signal transduction.

General Competences

1. Search, analysis and synthesis of data and information, also using the necessary technologies.
2. Adaptation to new situations.
3. Decision making.
4. Autonomous work.
5. Group work.
6. Promotion of free, creative and inductive thinking

3. COURSE CONTENT

THEORY

1. Introduction to Biochemistry (concepts, basic definitions, correlation with known chemical terms).

2. Teaching the module "Structure and function of proteins". Specifically explained: The amino acids that structure proteins in terms of their structure and their properties – The primary structure of proteins – The peptide bonds – The elements of secondary structure – The concept of tertiary (examples) – The quaternary structure – The association of primary sequence and tertiary structure.
3. Teaching the section "Basic principles of enzyme action", in the context of which the catalytic action of enzymes, the thermodynamic parameters that govern catalysis and the formation of the transition state are explained.
4. Teaching the section "Kinetics and regulation of enzymes", in which the kinetics of biochemical reactions, the Michaelis-Menten model (Km, Vmax, Kcat concepts), allosteric enzymes and R and T states are explained.
5. Teaching the section "Enzyme mechanisms and inhibitors", in which the ways in which enzyme activity is affected by changes in operating conditions and by the presence of different categories of inhibitors are explained.
6. Teaching the "Hemoglobin" section, in which the structure and function of a well-studied protein is explained. In more detail it is taught: The way oxygen binds to myoglobin and hemoglobin – The synergistic binding – The allosteric modification – The Bohr effect (promotion of oxygen release) – The way droplets encoding the hemoglobin subunits are involved in disease mutations.
7. Teaching the section "Carbohydrates", in the context of which the structures of monosaccharides, the various types of polysaccharides and the covalent connection of carbohydrates with proteins are explained.
8. Teaching the unit "Lipids and cell membranes". The following are taught in more detail: The fatty acids that are components of lipids – The types of membrane lipids – The spontaneous self-organization of lipids in an aqueous environment – Proteins as tools of membranes – Diffusion in membrane membranes – Internal membranes of eukaryotic cell compartments.
9. Teaching of the unit "Membrane channels and pumps", in the context of which the following are taught: The ways of transporting molecules through the membrane (active-passive transport) - The families of membrane proteins that pump molecules/ions through membranes with ATP consumption - The function of secondary transporters – Channels that transport ions rapidly across membranes – The function of gap junctions to move ions/molecules between cells – Channels that increase the permeability of membranes to water.
10. Teaching the module "Signal Transduction Processes", which teaches the transmission of signals through molecular circuits. In particular, the following are explained: The structure of heptahelical receptors – The composition of trimeric G proteins, the changes that the quaternary complex undergoes and their role in signaling – The example of insulin – The role of phosphorylation – Epidermal growth factor signaling – Some malfunctions that can lead to diseases.

LABORATORY

1. Rules of behavior in biochemical laboratories.
2. Use of micropipettes and other laboratory equipment.
3. Preparation of solutions.
4. Buffers.
5. Methods for determining protein concentration.
6. Protein chromatography.
7. Protein electrophoresis.
8. Centrifugation.

4. TEACHING and LEARNING METHODS - Evaluation

TEACHING METHOD	In suitably equipped teaching rooms
USE OF INFORMATICS and COMMUNICATION TECHNOLOGIES	Use of powerpoint presentations in lectures, use of e-class website and videos to inform, distribution of educational material, grading of laboratory exercises
TEACHING ORGANISATION	*Activity* / *Work Load* Lectures: 39 Laboratory exercises: 14 Group and/or individual assignments: 14 Independent study: 58 *Course total (25 hours of student work loadper ECTS)*: ***125***
STUDENTS EVALUATION	I. Written final exam, which includes: • Multiple choice questions. • Questions of short and/or detailed development. • Problems/exercises based on theoretical knowledge developed in the lectures. II. Laboratory Exercises III. Individual/Group Assignments The overall grade is obtained by the average of the written exam in theory and in laboratory.

5. BIBILIOGRAPHY

1. Biochemistry (Stryer) (2015) Broken Hill Publishers.
2. Principles of Biochemistry (LEHNINGER) NELSON L. DAVID, COX M. MICHAEL