

SYLLABUS

1. COURSE DESCRIPTION

Degree:	Biotechnology
Course:	Protein Chemistry and Engineering
Module:	Optional Training
Department:	Molecular Biology and Biochemical
Academic Year:	2017-2018
Term:	Second
ECTS credits:	6 ECTS
Year:	4th year
Type:	Optional
Language:	Spanish

Course Model:	B1	
a. Basic Learning (EB):		60 %
b. Practical Learning (EPD):		40 %

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2. LECTURERS

Coordinator	
Name:	Yolanda Aguilera García
School:	School Experimental Sciences
Department:	Molecular Biology and Biochemical
Area:	Biochemistry and Molecular Biology
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3. TOPICS

BASIC LEARNING:

1. STRUCTURE AND FOLDING

Topic 1.1. What are proteins chemically?

Topic 1.2. Stereochemistry of amino acids and peptides.

Topic 1.3. Load distributions.

Theme 1.4. The cellular medium: interactions of biological molecules with water and non-aqueous media.

Topic 1.5. Punctual and spatial symmetries of protein chains.

Topic 1.6. Folding of proteins.

2. POST-TRANSLATION MODIFICATIONS (MPT).

Topic 2.1. Proteolytic processing and conformational changes: Proteolysis and editing of proteins, chaperones.

Topic 2.2. Proteolysis dependent on MPT:

Topic 2.3. Phosphorylation.

Topic 2.4. Glycosylation

Topic 2.5. Acetylation. Methylation

Topic 2.6. Amidation and deamidation.

Topic 2.7. Biotinylation. Carbamylation.

Topic 2.8. Formulation. Miristoilation. Palmitoylation.

Topic 2.9. Sulfation. Oxidation. Hydroxylation

3. PROTEIN-LINKING INTERACTION.

Topic 3.1. Review of the fundamentals of the thermodynamics of chemical reactions in solution.

Topic 3.2. Interactions between macromolecules.

Topic 3.3. Union of small ligands to proteins: simple and multiple equilibria.

Unit 3.4. The union of oxygen to hemoglobin.

Topic 3.5 Unions of protons to proteins.

4. PROTEIN ENGINEERING

Topic 4.1. Protein engineering. Substitution, insertion and elimination of amino acids (directed mutagenesis).

Topic 4.2. Exchange of modules and domains. Chimeric proteins.

Topic 4.3. Modification of the functional specificity of proteins.

Topic 4.4. Modification of protein stability.

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Topic 4.5. Directed evolution of proteins. Combinatorial libraries of peptides and proteins.

Topic 4.6. Catalytic antibodies.

PRACTICAL LEARNING:

The EPD activities consist of two activities with several sessions each :

- 1 Laboratory sessions, in which the student will learn to study the folding kinetics of molecules and the interaction of proteins with a ligand. To do this, he will learn to manage the measurement equipment, will carry out experiments that show the interaction of a transcription factor with a promoter zone of a gene.
 - 1.1 **Practice 1.** Effect of post-translational modifications of proteins on the regulation of gene expression: Regulation of NANOG expression by the trimethylation of lysine 9 of histone H3.
 - 1.2 **Practice 2.** Thermodynamic study of the azide - myoglobin binding
- 2 Seminars sessions, in which the student will apply the knowledge acquired in the BS to deepen in aspects related to the curriculum of the basic teachings. The seminars will be held in a theory classroom and will be in a single group. The semianrios will deal with topics related to the EB of clear scientific news