

## SUBJECT TEACHING GUIDE

G1947 - Structural Biology and Protein Engineering

Degree in Biomedical Sciences

Academic year 2024-2025

1. IDENTIFYING DATA					
Degree	Degree in Biomedical Sciences			Type and Year	Optional. Year 4
Faculty	Faculty of Medicine				
Discipline					
Course unit title and code	G1947 - Structural Biology and Protein Engineering				
Number of ECTS credits allocated	6	Term	Semester based (1)		
Web					
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. BIOLOGIA MOLECULAR
Name of lecturer	IGNACIO MARIA ARECHAGA ITURREGUI
E-mail	ignacio.arechaga@unican.es
Office	Facultad de Medicina. Planta: + 1. DESPACHO DE JOSE PEDRO VAQUE DIEZ (1095)
Other lecturers	JORGE RIPOLL ROZADA IVÁN MÉNDEZ GUZMÁN

### 3.1 LEARNING OUTCOMES

- Identification of structural motives and understanding of the different structural levels of the three dimensional organization of proteins and nucleic acids
- Structure -function relationships of proteins and nucleic acids
- Understanding of different methodologies to solve the structures of proteins and nucleic acids . This involves knowledge of the physical principles and the computational methods. Applications on biomedicine
- Learning of software to visualize and manipulate macromolecular structures
- Use of structural data bases
- In silico knowledge of software to predict macromolecular structures and ligand-protein docking
- Identification of basic principles in the structure-function relationship of nucleic acids and proteins.
- Identification of methods used in protein engineering

### 4. OBJECTIVES

- 1-Knowledge of the principles that determine macromolecular structures
- 2.-Understanding and use of experimental techniques for macromolecular structure determination

### 6. SUBJECT PROGRAM

#### CONTENTS

- |   |   |
|---|---|
| 1 | <ul style="list-style-type: none"> <li>1. Primary structure of proteins</li> <li>2.-Secondary structure of proteins</li> <li>3.-Tertiary and quaternary structure of proteins</li> <li>4.- Globular proteins</li> <li>5.- Fibrose proteins</li> <li>6.- Membrane proteins</li> <li>7.- Macromolecular interactions</li> <li>8.- Thermodynamic stability of proteins</li> <li>9.- Protein folding</li> <li>10.- Primary structure of nucleic acids</li> <li>11.- Structure, translation and replication of DNA</li> <li>12.- Structure, translation and replication of RNA</li> <li>13.- Methods for the determination of secondary structural of proteins</li> <li>14.- Protein crystallization and X-ray diffraction</li> <li>15.- Electron microscopy and image processing</li> <li>16.- Nuclear Magnetic Resonance</li> <li>17.- Analytical ultracentrifugation and light scattering</li> <li>18.- Data bases and structural prediction of proteins</li> <li>19.- Molecular evolution</li> <li>20.- Protein engineering</li> </ul> |
|---|---|

**7. ASSESSMENT METHODS AND CRITERIA**

Description	Type	Final Eval.	Reassessn	%
Written exam 40 % of final mark	Written exam	No	Yes	40,00
Written exam 40% of total mark	Written exam	No	Yes	40,00
Written exam 10% of total mark	Laboratory evaluation	No	No	10,00
Oral exposition 10% of final mark	Oral Exam	No	No	10,00
<b>TOTAL</b>				<b>100,00</b>
<b>Observations</b>				
<p>-Two partial exams, each of them will be 40 % of the final mark. To pass each of these exams 50 % of the mark is needed . In special criscumstances (i.e. taking into account the practical and the oral presentation) 40% will be sufficient.</p> <p>-One practical exam (10% of final mark) and a Oral Presentation (10% of final mark).</p> <p>-To pass the course the addition of all these exams has to be at least 50 % of the final mark.</p>				
Observations for part-time students				

**8. BIBLIOGRAPHY AND TEACHING MATERIALS**

BASIC
<ul style="list-style-type: none"> <li>- Estructura de Proteínas. Autores; Carlos Gómez-Moreno, Javier Sancho. Editorial: Ariel. Año de Edición: 2003</li> <li>-Fundamentals of Protein Structure and Function. Autores: Engelbert Bauxbaum. Editorial: Springer. Año de Edición: 2015 (2nd Edition)</li> <li>- Exploring Protein Structure: Principles and Practice. Autores: Tim Skern. Editorial: Springer. Año de Edición: 2018</li> <li>-A Practical Guide to Protein Engineering. Autores: Tuck Seng Wong, Kang Lan Tee. Editorial: Springer. Año de Edición: 2020</li> </ul>