

## Course guide

# 240EQ221 - 240EQ221 - Protein Engineering

Last modified: 02/06/2022

**Unit in charge:** Barcelona East School of Engineering  
**Teaching unit:** 713 - EQ - Department of Chemical Engineering.

**Degree:** MASTER'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2012). (Optional subject).

**Academic year:** 2022    **ECTS Credits:** 6.0    **Languages:** Spanish

### LECTURER

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**Coordinating lecturer:** Juan Jesus Perez Gonzalez

**Others:** Luis del Valle Mendoza  
Pere Garriga Solé

### PRIOR SKILLS

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Basic knowledge in biochemistry

### DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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**Specific:**

1. Apply knowledge of mathematics, physics, chemistry, biology and other natural sciences, obtained through study, experience, and practice, critical reasoning to establish economically viable solutions to technical problems.

**Generical:**

2. Possess independent learning skills to maintain and enhance the competencies of chemical engineering to enable the continued development of their profession.

**Transversal:**

3. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.

4. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.

### TEACHING METHODOLOGY

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Subject in process of extinction. There is no teaching, the students that enroll it do so only with the right to an exam.

### LEARNING OBJECTIVES OF THE SUBJECT

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The aim of the subject is to provide knowledge on the biosynthesis, structure and function of proteins. Furthermore, the techniques associated with gene cloning and expression of recombinant proteins. Provide knowledge of the protein design with specific properties.



## STUDY LOAD

Type	Hours	Percentage
Self study	96,0	64.00
Hours large group	54,0	36.00

Total learning time: 150 h

## CONTENTS

### 1. SYNTHESIS OF PROTEINS

**Description:**

Knowledge about the translation and expression of proteins

**Specific objectives:**

Structure of the genes: operational and structural. Transcription and genetic code.

Structure and function of the RNA: mRNA, tRNA, rRNA and IRNA. The ribosome.

Translation. Post-translation modifications. Intracellular transit of proteins.

**Related activities:**

Use of biocomputing tools

**Full-or-part-time:** 50h

Theory classes: 16h

Practical classes: 10h

Guided activities: 4h

Self study : 20h

### 2. STRUCTURE AND FUNCTION OF PROTEINS

**Description:**

Provide knowledge about the structure of proteins

**Specific objectives:**

Secondary, tertiary and quaternary structure. Function of the proteins.

Structural flexibility of the proteins. Protein fold.

**Related activities:**

Use of the database pdb

**Full-or-part-time:** 20h

Theory classes: 6h

Guided activities: 2h

Self study : 12h

### 3. EXPRESSION OF RECOMBINANT PROTEINS

**Description:**

Provide knowledge about the expression of recombinant proteins

**Specific objectives:**

Expression of proteins in cellular culture, purification and characterisation of recombinant proteins

**Related activities:**

Expression and purification of recombinant proteins

**Full-or-part-time:** 25h

Theory classes: 6h

Laboratory classes: 4h

Guided activities: 5h

Self study : 10h

### 4. DIRECTED MUTAGENESIS

**Description:**

Provide knowledge about the directed mutagenesis

**Specific objectives:**

Directed mutagenesis. Functional tests and spectroscopies of analysis of the recombinant proteins.

**Related activities:**

Expression and purification of recombinant proteins

**Full-or-part-time:** 25h

Theory classes: 6h

Practical classes: 9h

Self study : 10h

### 5. ENZYMES

**Description:**

Description of the function of enzymes

**Specific objectives:**

Protein-ligand interactions. Enzyme mechanisms

**Full-or-part-time:** 20h

Theory classes: 4h

Practical classes: 4h

Self study : 12h



## 6. DESIGN OF PROTEINS WITH SPECIFIC FUNCTIONS

**Description:**

Analyse real cases of the novo design

**Specific objectives:**

Description of examples about modification and design of novo of proteins

**Related activities:**

Bibliographic research of examples using the directed mutagenesis for the protein design with new functions.

**Full-or-part-time:** 10h

Theory classes: 4h

Self study : 6h

## GRADING SYSTEM

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Subject in process of extinction. There is only one final test that corresponds to 100% of the final grade of the subject.