1. OVERVIEW

Subject Area	Protein Chemistry and Engineering
Degree	Bachelor's Degree in Biotechnology
School/Faculty	School of Biomedical and Health Sciences
Year	3º
ECTS	6
Type	Compulsory
Language(s)	Spanish
Delivery Mode	On campus
Semester	Second semester
Academic Year	24-25
Coordinating professor	Sara Gómez Quevedo
Teacher	

2. INTRODUCTION

Protein Chemistry and Engineering is a compulsory subject (worth 6 ECTS) taught each semester during the third year in the Degree in Biotechnology. This subject belongs to the INSTRUMENTAL METHODS AND BIOCHEMICAL ENGINEERING module worth a total of 36 ECTS.

The main aim of this subject area is for students to acquire a solid base on the structure and function of proteins, as well as experimental and computational methods available for the manipulation and design of proteins which are of potential biotechnological interest.

Knowledge and skills acquired in this subject will provide students with basic knowledge of chemistry and engineering of proteins required for studying on this degree course. The basic content will allow students to gain integral understanding of the effect of the protein structure on its particular functions, as well as learn about the different experimental technology in current use for obtaining, designing and manipulating proteins of biotechnological interest.

3. LEARNING OUTCOMES (RA, by the acronym in Spanish)

Knowledge (CON, by the acronym in Spanish)

CON04. Identify the techniques and principal methods of cell cultures, protein analysis from a biotechnology standpoint and genetic bases and their application in industry.

• Know the general fundamentals of molecular structure, folding, and interactions.

• Know be applications of biotechnological interest (biomedicine, agriculture, industry) and apply them to practical cases.

Abilities (HAB, by the acronym in Spanish)

HAB04. Design experimental procedures and protocols choosing the most suitable technique in the field of biotechnological research, all the while meeting quality and legislative standards.

• Predict the structures. Modelling. Optimisation.

• Demonstrate knowledge on protein engineering, heterologous expression and rational modification of proteins.

Skills

COMP04. Identify and analyse the physical and chemical properties of matter and how its structure determines its reactivity and function.

COMP07. Manage databases and IT programs which could be used in the field of biotechnology and interpret the information extracted.

4. CONTENTS

· Identify the general fundamentals of molecular structure, folding, and interactions
· Determination of structure. Databases.
· Prediction of structures. Modelling. Optimisation.
· Protein engineering. Heterologous expression. Rational modification of proteins.
· Applications of biotechnological interest (biomedicine, agriculture, industry). Practical cases.

This subject area is divided into five learning units, which are then divided into various topics:

1. **Unit 1: General fundamentals of molecular structure, folding, and interactions**
   Topic 1. Context and introduction
   Topic 2. Primary structure
   Topic 3. From DNA to proteins: life cycle
   Topic 4. Three-dimensional conformation
2. **Unit 2: Determination of structure. Databases.**
   Topic 5. Techniques to determine the structure of proteins
   Topic 6. Structure databases
   Topic 7. Catalytic activity
   Topic 8. Other molecular activity
   Topic 9. Dynamic aspects of the structure
   Topic 11. Interactions
   Topic 12. Regulation mechanisms
3. **Unit 3: Prediction of structures. Modelling. Optimisation.**
   Topic 10. Prediction of structures using computational methods
4. **Unit 4: Protein engineering. Heterologous expression. Rational modification of proteins.**
   Topic 13. Protein production
   Topic 14. Protein engineering and design
5. **Unit 5: Applications of biotechnological interest (biomedicine, agriculture, industry). Practical cases.**
   Topic 15. Applications of biotechnological interest (biomedicine, agriculture, industry)
   Topic 16. Practical cases

5. TEACHING/LEARNING METHODS

The types of teaching/learning methods are as follows:

- Lectures
- Collaborative learning.
- Project-based learning
- Learning based on workshop teaching

6. LEARNING ACTIVITIES

The types of learning activities, plus the amount of time spent on each activity, are as follows:

On campus:

Learning activity	Number of hours
Lectures	34
Asynchronous master lectures	14
Debates and discussions	2
Problem-solving	10
Spoken presentations	2
Written reports and essays	3
Tutorials	15
Independent working	49
Workshops and/or lab work	12
Research (scientific/case studies) and projects	3
On-campus knowledge tests	6
TOTAL	**150**

7. ASSESSMENT

The assessment methods, together with how much they each count towards the final grade for the subject area, are as follows:

On campus:

Assessment system	Weight
On-campus knowledge tests	60
Spoken presentations	10
Reports and written work	10
Case study/problem scenario	10
Laboratory practice	10

On the Virtual Campus, when you open the subject area, you can see all the details of your assessment activities and the deadlines and assessment procedures for each activity.

7.1. Ordinary exam period

To pass the subject area in the ordinary exam period you must obtain a mark of 5.0 or more out of 10.0 in all assessed parts of the subject. Any part you do not pass in the ordinary exam period will need to be recovered in the extraordinary exam period (resits).

Your final grade will be the average of the partial marks in each of the learning activities you have passed. The continuous assessment system for the learning activities requires attendance to at least 50% of the classes.

It is compulsory for students studying degrees on-campus to accredit attendance to at least 50% of classes. This requirement qualifies students for the right to obtain academic counselling, support and monitoring from the professor. Failure to accredit attendance to at least 50% of the classes by any of the means proposed by the University will mean that the professor awarding a fail to the student for that subject area in the ordinary exam period in accordance with the grading system outlined in these regulations. All of the above, without prejudice to the other requirements or higher attendance percentages that other faculties may stipulate in their learning guides or internal regulations. Regulations for the assessment of official degree programmes, Art. 1 point 4.

(*https://universidadeuropea.com/documents/1798/6. Reglamento evaluacion titulaciones oficiales grado UEM v2.pdf*)

7.2. Extraordinary exam period (resits)

To pass the subject area in the extraordinary exam period (resits), the students must obtain a mark equal to or above 5.0 out of 10.0 in all parts of the subject assessment they did not pass during the ordinary exam period.

The student must submit the activities not passed in the ordinary exam period taking into account the corrections or comments made by the teacher. The student must also submit any activities which were not submitted.

The final grade will be the average of the partial marks in each of the activities passed (with a mark equal to or higher than 5 out of 10). The marks for the assessable activities the student passed in the ordinary exam period will be maintained for calculating this grade.

8. TIMELINE

The timeline with delivery dates of assessable activities in the subject area is indicated in this section:

Assessable activities	Date
Topics 1-6	Week 1-7
Topics 7-16	Week 8-17

Partial objective test	Week 9-10
Spoken presentations	Week 4-17
Laboratory work	Week 3-17
Case Studies	Week 14-17
Scientific research of case studies and projects	Week 8-14
Final objective test	Week 18-21

The timeline may be subject to modifications for logistical reasons of the activities. Students will be informed of any changes in due time and course.

9. BIBLIOGRAPHY

The is no list of reference material for this subject area. However, we recommend the following bibliography which will be complemented in class.

The recommended bibliography is indicated below:

- Gregory A. Petsko, Dagmar Ringe. Protein structure and function. Oxford University Press, 2009
- Arthur M. Lesk. Introduction to protein science: architecture, function and genomics. Oxford University Press, 2010
- Gary Walsh. Proteins: biochemistry and biotechnology. John Wiley & Sons, 2004.
- Michael M. Cox, George N. Philips. Handbook of proteins: structure, function and methods (vol I and II). John Wiley & Sons, 2008
- Jenny Gu, Philip E. Bourne. Structural bioinformatics. John Wiley & Sons, 2009

10. EDUCATIONAL GUIDANCE AND DIVERSITY UNIT

The Educational Guidance and Diversity Unit (ODI in Spanish) offers support throughout your time at university to help you with your academic achievement. Other cornerstones of our educational policy are the inclusion of students with special educational needs, universal access in all our university campuses and equal opportunities.

This ODI unit offers students:

1. Support and monitoring through counselling and personalised student plans for those who need to improve their academic performance.
2. Curricular adaptations to uphold diversity, with assistance for those students who require specific educational support, leading to equal opportunities without significant changes to methodology or evaluation.
3. We offer students a range of extracurricular educational resources to reinforce skills which will enhance their personal and professional development.
4. Career guidance by offering tools and advice to students with doubts regarding their professional careers or those who believe they have chosen the wrong line of study.

Students who need educational support can contact us at:
orientacioneducativa@universidadeuropea.es

11. SATISFACTION SURVEYS

Your opinion matters!

Universidad Europea encourages you to complete our satisfaction surveys to identify strengths and areas for improvement for staff, degree courses and the learning process.

These surveys will be available in the surveys area of your virtual campus or by email.

Your opinion is essential to improve the quality of the course.

Many thanks for taking part.