1. OVERVIEW

Subject Area	Biotechnological processes and products
Degree	Bachelor's Degree in Biotechnology
School/Faculty	School of Biomedical and Health Sciences
Year	4º
ECTS	6
Type	Compulsory
Language(s)	Spanish
Delivery Mode	On campus
Semester	Yearly
Academic Year	24-25
Coordinating professor	Sara Gómez Quevedo

2. INTRODUCTION

- Biotechnological Processes and Products is a compulsory subject worth 9 ECTS and is taught yearly in the fourth year of the Bachelor's Degree in Biotechnology and the Combined Degree in Pharmaceuticals and Biotechnology. This subject belongs to the BIOTECHNOLOGICAL PROCESSES AND INDUSTRIAL APPLICATIONS module worth a total of 36 ECTS. Biotechnological Processes and Products is based on the description and study of the main processes and products used in the bioindustry.
- The main objective of this subject is to provide students with knowledge regarding the main biotechnological processes currently used in industry to obtain high added-value products and design new bioprocesses. This subject will provide a base for understanding and learning other subjects and developing a professional career.

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

Knowledge (CON, by the acronym in Spanish)

CON02. Recognise the structure, organisation and function of tissues, organs and systems, viruses and cells, as well as the processes which occur in them.

· Understand the diversity of metabolic processes in microorganisms which are currently applied in industry to obtain products of human interest.

· Know how to evaluate scientific data using mathematical and statistical procedures.

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.

· Design and execute a complete protocol for cleaning and purifying a biotechnological product in a bioreactor.

· Propose different biotechnological solutions to resolve a problem posed.

· Suitably complete laboratory notebooks and know how to use scientific language correctly, clearly and concisely so experiments can be reproduced in the laboratory.
· Associate physical, chemical and biological knowledge acquired in the subject and apply them to biological processes.
· Use different scientific sources and correctly interpret the main bibliography databases and IT programs related to literature searches.

Skills

COMP06. Develop the skills needed to use the most common equipment, instruments and basic techniques in biotechnology, following quality standards and current biosecurity regulations.
COMP08. Design and execute operation protocols for bioreactors and purification of biotechnological products.
COMP12. Identify and analyse biotechnological strategies associated with monitoring, preserving and restoring the environment.

4. CONTENTS

· Analysis of biotechnological processes.
· Modelling and simulation of processes.
· Optimisation of financial parameters and techniques in bioprocesses.
· Case studies: production of insecticides, therapeutic proteins and biodegradable products.
· Production of therapeutic proteins on an industrial scale.
· Food production through biotechnological processes.
· Detection and control of environmental pollution.

This subject is organised into 5 units, divided into 9 topics as follows:

Introduction: Analysis of biotechnological processes.

- TOPIC 1. Introduction to bioprocesses. Analysis of biotechnological processes.
- TOPIC 2. Microbial metabolism. Heterotropic, photoautotrophic and chemolithotropic metabolism pathways.

Food production through biotechnological processes. The food industry

- TOPIC 3. Food production through biotechnological processes. The production of beer, wine, sake, cheese, yoghurt and other fermented food.
- TOPIC 4. Other products destined for the food industry. Organic acids, amino acids and polysaccharides.

Biofuel and biodegradable products.

- TOPIC 5. Biofuel. Bioethanol.
- TOPIC 6. Bioplastics and other biomaterials. Detection and control of environmental pollution.

Pharmaceutical industry and production of therapeutic proteins on an industrial scale.

- TOPIC 7. Production of antibiotics.
- TOPIC 8. Production of therapeutic proteins on an industrial scale.

Modelling and simulation of bioprocesses.

- TOPIC 9. Modelling of bioprocesses. Introduction to mathematical modelling of processes and practical cases.

Throughout the subject area, we will analyse case studies, looking at the optimisation of financial and technical parameters in bioprocesses.

5. TEACHING/LEARNING METHODS

The types of teaching/learning methods are as follows:

- Lecture
- 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	56 h
Asynchronous master lectures	18 h
Debates and discussions	2 h
Case Studies	7 h
Problem-solving	8 h
Spoken presentations	2 h
Written reports and essays	10 h
Tutorials	20 h
Independent working	75 h
Workshops and/or lab work	15 h
On-campus knowledge tests	12 h
TOTAL	**225 h**

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	5%
Project	5%
Reports and written work	15%
Laboratory practice	15%

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 1-4	Week 1-7
Topics 5-7	Week 8-17
Topics 8-13	Week 18-40
Partial objective test (P1)	Week 9-10
Partial objective test (P2)	Week 19-20
Spoken presentations	Week 8-17
Laboratory work	Week 9-12
Case Studies	Week 1-40
Scientific research of case studies and projects	Week 1-40
Final objective test	Week 40-42

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:

- Aehle, W.: “Enzymes in industry: productions and applications”, 3ª ed., Wiley-VCH, Weinheim, 2007.
- Barredo, J.L. (Ed.): “Microbial enzymes and biotransformations”, Human Press Inc., Totowa, New Jersey, 2005.

- Diaz, M: “Ingeniería de bioprocesos” Ed. Paraninfo, 2012.
- Okafor N y Okeke B.C. “Modern industrial microbiology and biotechnology”. Taylor and Francis, 2017
- Parés, R. y Juárez, A.: “Bioquímica de los microorganismos”, Reverté, D.L., 1997.
- Ratledge, C. y Kristiansen, B.: “Basic biotechnology”, 3ª ed., Cambridge University Press, Oxford, 2006.
- Salminen, S.: “Lactic acid bacteria: microbiology and functional aspects”, Marcel Dekker, 2004.
- Scheper, T.; Faurie, R. y Thommel, J. (Eds): “Microbial Production of L-Amino acids”, Springer-Verlag, Berlin Heidelberg, 2003.
- Scragg, A.: “Environmental biotechnology”, Oxford University Press, 2004.
- Thieman, W.J. y Palladino, M.A.: “Introducción a la Biotecnología”, Editorial Pearson Educación S.A., 2010.
- Walker, G.M.: “Yeast physiology and biotechnology”, Ed. John Wiley & Sons, 2000.

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.