COURSE DATA

DATA SUBJECT

Code: 33191
Name: Industrial bioprocesses
Cycle: Undergraduate Studies
ECTS Credits: 4.5
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1111 - Grado en Biotecnología	Facultat de Ciències Biològiques	4	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1111 - Grado en Biotecnología	Optability	ELECTIVES

COORDINATION

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SUMMARY

For the implementation of full-scale biotechnological applications it is necessary the ability of proposing and studying several feasible alternatives and be able to carry out the selection of the optimal configuration from analysis of economical criteria. Besides, in order to develop or operate a bioprocess at full-scale, the biotechnologist needs a series of conceptual tools and skills that enable him to deal with facilities, instrumentation and process control systems. Thus, from a global and integral approach, this course deals with conceptual tools and skills necessary for the conception or operation of an industrial-scale bioprocess.

This is an elective course to be developed in the fourth year of the degree in biotechnology with a workload of 4.5 ECTS. The topics of the course are grouped into three sections:

- Process strategy and economical evaluations

- Control and instrumentation of bioprocesses

- General services and facilities for industrial bioprocesses (water, energy, steam, compressed air)

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

It is recommended to have passed the subjects included in the module of Biochemical Engineering to successfully work this subject.

COMPETENCES / LEARNING OUTCOMES

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Actuar con autonomía en el aprendizaje, tomando decisiones fundamentadas en diferentes contextos, emitiendo juicios en base a la experimentación y el análisis y transfiriendo el conocimiento a nuevas situaciones

Capacidad de interpretar datos relevantes.

Colaborar eficazmente en equipos de trabajo, asumiendo responsabilidades y funciones de liderazgo y contribuyendo a la mejora y desarrollo colectivo

Conocer los diferentes tipos de procesos biotecnológicos asociados a la producción industrial.

Contribuir en el diseño, desarrollo y ejecución de soluciones que den respuesta a demandas sociales, teniendo en cuenta como referente los Objetivos de Desarrollo Sostenible

Demostrar razonamiento crítico y autocrítico en el ámbito de la titulación, considerando aspectos tales como la ética profesional, los valores morales y las implicaciones sociales de las diferentes actividades realizadas

Diseñar procesos de manipulación y obtención de productos biotecnológicos.

Propose creative and innovative solutions to complex situations or problems, typical of the area of ¿¿¿¿connection, to donate responses to the various professional and social needs

Saber comunicarse de manera efectiva, tanto de forma oral como escrita, adaptándose a las características de la situación y de la audiencia

DESCRIPTION OF CONTENTS

1. Introduction to process strategy

Bioprocesses technology for obtention of biotechnology products:

- Characteristic case studies.

- Identification of alternatives.

2. Economic aspects of process strategy

Investment, costs, net cash flow.

Evaluating and selecting alternatives.

Optimization.

3. Control and instrumentation of industrial bioprocesses

Control system elements: physical or chemical sensors, controller; final control element.

- Feedback control: on/off and proportional-integral-derivative (PID) controller.

- Advanced control systems.

Industrial control systems.

Digital control.

4. Facilities for biotech processes

Sources of energy supply for biotechnology industries.

Calculating and estimating energy requirements.

Electrical facilities.

Steam production and use: equipment and facilities.

Compressed air: equipment and facilities.

Supply and conditioning of water process.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	2,00
Theory	28,00
Laboratory	15,00
Total hours	**45,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	6,00
Independent study and work	23,00
Preparation of lessons	17,00
Preparation for assessment activities	11,50
Resolution of case studies	10,00
Total hours	**67,50**

TEACHING METHODOLOGY

The methodology used in the course will consider the following aspects:

Theory sessions: Students will be given an overview of the subject to be covered and will be introduced to the key concepts to be developed, as well as the resources to be used for the subsequent preparation of the subject in depth. As this is an applied subject, in these sessions some practical applications may be presented, as an example, in order to enhance the assimilation of the concepts introduced. The theory classes will be taught in a single group.

Sessions of practical classes-laboratory: In these sessions students will work on practical problems and cases supervised by the professor. Also, practical applications will be proposed for the students' autonomous work. Students will work with different instrumentation equipment and control and will become familiar with the use of computer tools for the treatment and analysis of data. They will also be shown the auxiliary services of the ETSE building (boiler, compressed air, etc...), as well as their operation. Concepts developed in the theoretical sessions will be worked on at in order to enhance their assimilation. These sessions will take place in classrooms in small groups of 16 students.

Tutorials: students will be divided into small groups and will participate in 2 sessions distributed throughout the course. In these sessions, the teacher will try to clarify concepts and resolve any doubts that may arise during the course.
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EVALUATION

The evaluation of the course will take place as follows:

1. Continuous assessment and practical activities (50% of grade): Based on written work given to the professors (reports, solved problems, etc) and/or individual specific tests.

2. Objective test (50% of grade): Based on a written test with theoretical and practical questions.

The course will be over passed when the weighted average grade is equal to or greater than 5 (out of 10), being mandatory to obtain in the objective test a grade equal or greater than 4.0 (out of 10). In the case of lower grade in the objective test, this will be the 100 % of the final grade.

REFERENCES

- Biochemical engineering and biotechnology handbook. B Atkinson y F. Mavituna. Ed. Stockton Press.
- Ingeniería Bioquímica. F. Gòdia Casablancas y J. López Santín (editores). Editorial Síntesis.
- Analysis synthesis and design of chemical processes. R. Turton et al. Ed. Prentice-Hall.
- El pronóstico económico en química industrial. A. Vian. Quimica e Industria.
- Evaluación de inversiones industriales. R. Jordá. Ed Alhambra.
- Control e instrumentación de procesos químicos. P. Ollero de Castro y E. Fernández Camacho. Editorial Síntesis.
- Manual de instalaciones hidráulicas, sanitarias, gas, aire comprimido y vapor (2ª ed). S. Zepeda. Editorial Limusa.

- Instalaciones eléctricas de baja tensión comerciales e industriales: cálculos eléctricos y esquemas unifilares. A. Lagunas Marqués. Thomson. Paraninfo.
- Principios de ingeniería de los bioprocesos. P.M. Doran. Editorial Acribia.
- Bioseparations science and engineering. R.G. Harrison et al. Ed. Oxford.
- Analysis synthesis and design of chemical processes. R. Turton et al. Ed. Prentice-Hall.
- Plant design and economics for chemical engineers. M.S. Peters y K.D. Timmerhouse. Ed. McGraw-Hill.
- Chemical process control: an introduction to theory and practice. G. Stephanopoulos. Ed Prentice-Hall.
- Tecnología Energética. V. Bermudez. Editorial UPV.
- Instalaciones eléctricas. A. J. Conejo, J.M. Arroyo y F. Milano, F. McGraw-Hill España, 2007.