COURSE DATA

DATA SUBJECT

Code: 33186
Name: Basic operations in biotechnological processes
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1111 - Grado en Biotecnología	Facultat de Ciències Biològiques	3	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1111 - Grado en Biotecnología	Biochemical engineering	COMPULSORY

COORDINATION

PEÑARROCHA OLTRA JOSEP MANUEL

CHAFER ORTEGA AMPARO

SUMMARY

The subject "**Basic operations on biotechnological processes"** is a matter of compulsory nature which is cursed on the third course of the Degree on Biotechnology of the University of Valencia, during the second quarter. It consists on 6,0 credits.

On biotechnological applications at industrial scale, the raw materials were modified by reactions which take place on the bioreactors. In this sense, the physical changes first and/or posterior the reactions are of great importance for prepare the raw materials or the extraction and purification of the final product. At industrial level, the term "basic operation" is referred to the physical steps on biotechnological processes. In this context, the subject "Basic operations on biotechnological process" has the aim to introduce the basic principles of the main physical steps or basic operations which the biotechnology uses at industrial scale. Which this propose, the subject will be build on the concepts previously introduced on the matter "Introduction to biochemistry engineering", cursed on the second course of the degree, as well as on the subjects of basic nature as physic, chemistry, biology and mathematics.

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 suggested to pass previously the next subjects in order to affront with guaranties the matter:
- Mathematics I and II on the first course.
- Introduction to Biochemistry Engineering on the second course.

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

Apply analytical, synthetic and critical thinking skills in the application of the scientific method.

Capacidad de interpretar datos relevantes.

Capacidad para trabajar en el laboratorio incluyendo seguridad, manipulación, eliminación de residuos y registro anotado de actividades.

Capacidad para transmitir ideas, problemas y soluciones dentro de la Biotecnología.

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

Conocer las etapas de procesado de materiales anterior y posterior a una etapa de biorreacción a escala industrial

Conocer los fundamentos de los fenómenos de transporte y saber plantear y utilizar los balances de materia y energía en los procesos bioindustriales.

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Conocer los principios básicos de las principales operaciones utilizadas en la industria biotecnológica.

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

Develop skills to undertake further study.

Participate in multidisciplinary teams, engaging in teamwork and collaboration.

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 aplicar los conocimientos en Biotecnología al mundo profesional.

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

Saber diseñar y ejecutar un protocolo completo de obtención y purificación de un producto biotecnológico.

Saber interpretar un diagrama de flujo de materiales

Saber utilizar la lengua inglesa en la redacción de informes y para interpretar información a partir de protocolos, manuales y bases de datos.

Ser capaz de llevar a cabo el dimensionado y análisis de los biorreactores más comunes, de la esterilización térmica del medio de reacción a escala industrial y del aire, así como de los procesos de agitación y aireación en un biorreactor a nivel industrial

Ser capaz de plantear alternativas plausibles en el proceso de recuperación de producto a escala industrial

Understand the principles of the design and functioning of bioreactors.

Use English to write reports and to interpret information from protocols, manuals and databases.

Work in laboratories, including safety procedures, waste management and accurate activity logging.

DESCRIPTION OF CONTENTS

1. Introduction.

Processing of materials on the biotechnological industries. Classification of basic operations. Introduction to the separation strategies and flux diagrams.

2. Basic operations of movement quantity transport.

Fluids flux. Bombes. Filtration. Centrifugation.

3. Basic operations on heat transfer.

Equipment for heat transfer. Design of industrial heat exchangers. Evaporators.

4. Basic operations of mass transfer.

Separation operations by membranes. Adsorption. Liquid ¿ liquid extraction. Crystallization. Drying.

5. Purification sequences on biotechnological industry.

Analysis of processing materials schemes. Approach of sequences separation and purification of products.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	3,50
Theory	27,00
Laboratory	10,00
Classroom practices	19,50
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	3,50
Individual or group project	25,00
Independent study and work	11,00
Preparation of lessons	31,50
Preparation for assessment activities	16,00
Resolution of case studies	3,00
Total hours	**90,00**

TEACHING METHODOLOGY

The methodology used on the subject is focused on the following points:

Theory sessions: its offers to the student a global vision of the topic to be treated and it will be focused on the key concepts which will be developed, as well as the skills used to prepare a posteriori the subject in depth.

Practice sessions: in these sessions the teacher will explain a series of type problems focused on each of the contents developed. On the other hand, the students will work similar problems conducted by the professor. Finally, it will be proposed practical applications for the autonomy student work. These sessions will be developed on the class room with groups of 40 students.

Laboratory practices: the students will work with several experimental apparatus and use informatics tools in order to analysis and treatment of data. It will work concepts developed on theory sessions, in order to enhance their assimilation. The practices to do are:

- Study of fluids flux and bombes.

- Heat exchangers.

- Centrifugal bombe.

- Experimental study of filtration.

- Air flux through static particle beds.

Group tutorials: it will be 3 group tutorials sessions in the course. In these sessions the professor will explain concepts or solve doubts which can be proposed during the problems sessions of the course.

EVALUATION

The evaluation of learning will be do independent for the laboratory work and the theory – practice section, and it will be pass self-independent each one of them. The global evaluation of the subject is quantified by a weighted average of both parts, with a relative weight of the 85% by the theory –practice part and a 15% by the laboratory. If one of the parts is passed on the first call, the ratings will be saving for the second call.

Evaluation of laboratory practices: it will be due by the reports of each practice performed and an exam completed on the last laboratory session. The attendance to the laboratory sessions is mandatory and necessary to pass the subject. The students which fail the laboratory practices on the first call by the not attendance to the laboratory session, don't will have another opportunity to do the laboratory practices.

The students which fail the laboratory sessions for don't give the laboratory reports on the first call, or for don't give the laboratory reports at time, or for obtain a final mark down to 5 (referred to 10), can have the

opportunity to pass on the second call if they give the results report and/or complete a new exam on the date fixed.

Evaluation of theory – practice part: it is focused on the following aspects:

1. Continuously evaluation and practice activity (30% of qualification): it is focused on the attendance to classes and presence activities. Lesser extent, it will be considered the participation and implication on the teaching –learning process. The practice activities will be evaluated by the documentation given (works, reports and/or problems solved).
2. Exam (70% of quantification). It will be complete a writing exam which theory –practice questions and problems.

The part b (Theory and practice) of 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 4.5 (out of 10)

REFERENCES

- Bioseparations: downstream processing for biotechnology Belter, P.A., Cussler, E.L., Wei-Shou Hu. (John Wiley and Sons)
- Bioseparations Science and Engineering, R.G. Harrison, P. Hodd, S.R. Rudge, D.P. Petrides, Oxford University Press.
- Principios de ingeniería de los bioprocesos P.M. Doran (Ed. Acribia)
- Biochemical engineering and biotechnology handbook Atkinson, B. and Navituna F. (Stockton Press)
- Separations for Biotechnology Verrall, M.S., Hudson, M.J. (Eds.) (Ellis Horwood Limited)
- Biochemical Engineering Fundamentals J.E. Bayley y D.F.G. Ollis (McGraw-Hill)
- Flujo de fluidos. Intercambio de calor. Levenspiel, O. (Ed. Reverté)
- Mecànica de Fluids Orchillés, V.A., Sanchotello, M (PUV)
- Transmissió de calor Sanchotello, M., Orchillés, V.A. (PUV)

- Operaciones básicas de ingeniería química McCabe, W.L., Smith, J.C. (Ed. Reverté)