VNIVERSITAT DE VALÈNCIA

Course Guide
33186 Basic operations in biotechnological processes

COURSE DATA

Data Subject	
Code	33186
Name	Basic operations in biotechnological processes
Cycle	Grade
ECTS Credits	6.0
Academic year	2023 - 2024

Study (s)

Degree	Center	Acad. year	Period
1102 - Degree in Biotechnology	Faculty of Biological Sciences	3	Second term

Subject-matter

Degree	Subject-matter	Character
1102 - Degree in Biotechnology	90 - Biochemical engineering	Obligatory

Coordination

Name	Department
CHAFER ORTEGA, AMPARO	245 - Chemical Engineering
PEÑARROCHA OLTRA, JOSEP MANUEL	245 - Chemical Engineering

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.

OUTCOMES

1102 - Degree in Biotechnology

- Saber aplicar los conocimientos en Biotecnología al mundo profesional.
- Capacidad de interpretar datos relevantes.
- Capacidad para transmitir ideas, problemas y soluciones dentro de la Biotecnología.
- Develop skills to undertake further study.
- Capacidad para trabajar en el laboratorio incluyendo seguridad, manipulación, eliminación de residuos y registro anotado de actividades.
- Conocer los fundamentos de los fenómenos de transporte y saber plantear y utilizar los balances de materia y energía en los procesos bioindustriales.
- Saber diseñar y ejecutar un protocolo completo de obtención y purificación de un producto biotecnológico.
- Saber utilizar la lengua inglesa en la redacción de informes y para interpretar información a partir de protocolos, manuales y bases de datos.

LEARNING OUTCOMES

The main aim of the subject consist on train the students on the analysis and approach of the processing of materials in order to conditioning the raw materials or obtain the final product at industrial scale. Wirt this objective it will be introduced the basic principles of which basic operation (understood as the physic steps on the processes industry) more commonly used on the biochemistry industry.

When the subject is finished, the student must have acquired the following skills:

- Be able to describe the processing steps of materials anterior and posterior to the bioreaction step at industrial scale, and interpret and propose flux diagrams.
- Be able to enunciate the basic principles of the main basic operations used on the biotechnological industry, building equipment designs as the separation apparatus, fluids flux or heat transfer.
- Be able to propose plausible alternatives of the downstream processing of the product at industrial scale.
- Know how to interpret and use the necessary information to solve practice cases.

- Use equipment and apparatus of industrial application.
- Know the specialized bibliographic sources in order to find, select and understand the information.
- Know as analyze critically the results obtained to solving problems as when to performing the laboratory cases.
- Write reports clarify and organize.

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 momentum transfer.

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

ACTIVITY	Hours	% To be attended
Theory classes	27,00	100
Classroom practices	19,50	100
Laboratory practices	10,00	100
Tutorials	3,50	100
Attendance at events and external activities	3,50	0
Development of group work	25,00	0
Study and independent work	10,00	0
Readings supplementary material	1,00	0
Preparation of evaluation activities	15,00	0
Preparing lectures	19,00	0
Preparation of practical classes and problem	12,50	0
Resolution of case studies	3,00	0
Resolution of online questionnaires	1,00	0
TOTAL	**150,00**	

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

Basic

- 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)

Additional

- 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)