COURSE DATA

Data Subject	
Code	33184
Name	Introduction to biochemical engineering
Cycle	Grade
ECTS Credits	4.5
Academic year	2021 - 2022

Study (s)

Degree	Center	Acad. year	Period
1102 - Degree in Biotechnology	Faculty of Biological Sciences	2	Second term

Subject-matter

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

Coordination

Name	Department
MARTI ORTEGA, NURIA	245 - Chemical Engineering

SUMMARY

Introduction to Biochemical Engineering is a 4,5 credits mandatory course that is taught in the second semester of the second year of the Biotechnology degree of the University of Valencia.

Based on previous concepts introduced in basic subjects (Physics, Chemistry, Biology, and Mathematics) this course introduces the main tools to quantitatively apply Biotechnology at industrial scale. These tools are basically, the application of conservation laws by means of mass and energy balances and the use of the kinetic laws that define the velocity equations in physical processes.

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, Mathematics II and Chemistry.

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

LEARNING OUTCOMES

At the end of the course, the student must have acquired the following skills:

• Be able to interpret a flow mass diagram

• Apply energy and material balances in different processes related to the biotechnology industry

• Use the transport velocity equations for simple applications

• Know how to interpret and use the information to solve practice cases

• Use equipment of industrial application.

• Know the specialized bibliographic sources in order to find, select and understand the information

• Be able to critically analyze the results of practical applications

• Write reports with clarity and order

DESCRIPTION OF CONTENTS

1. Introduction

Definition of Biochemical Engineering. Biotechnology industry processes: continues and batch mode. Definition of Basic Operation. Calculations and data presentation in engineering processes.

2. Mass balances

Formulation of balances. Total mass balance. Total amount of substance balance. Mass balance applied to a component. Mass balances applied in systems with recirculation, derivation or purged streams. Application of material balances: nonreacting systems in steady and unsteady state. Stoichiometry of growth and elemental balances.

3. Energy balances

Total energy balance. Enthalpy balance. Application to systems without chemical reaction in steady and unsteady state. Application to fermentation processes. Mechanical energy balance.

4. Introduction to transport phenomena.

Transport mechanisms: molecular and turbulent. Rate equations in molecular transport. Turbulent transport: Definitions of transport coefficients.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	21,00	100
Classroom practices	12,00	100
Laboratory practices	10,00	100
Tutorials	2,00	100
Development of group work	10,00	0
Development of individual work	7,00	0
Study and independent work	10,00	0
Readings supplementary material	2,00	0
Preparation of evaluation activities	10,00	0
Preparing lectures	6,00	0
Preparation of practical classes and problem	10,00	0
Resolution of case studies	10,00	0
Resolution of online questionnaires	2,50	0

TOTAL	**112,50**

TEACHING METHODOLOGY

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

Lecture sessions: Single group to introduce the theoretical and practical principles of the course.

Practical lessons: Practical questions and problems will be solved in groups of 40 students (max) in a regular classroom. Also, resolution of problems will be proposed to the students who will individually solve them.

Laboratory sessions: Students will work in the lab using the concepts developed on theory sessions. Then, the students will submit a report about the work carried out at the lab. These sessions are mandatory for all the students. Practices which will be made are:

- Material balance applied to a non-steady state component.

- Energy balance in unsteady state

- Calculations corresponding to the practices in the laboratory.

Tutorials: Students will be divided into small groups to solve any question they have.

EVALUATION

The evaluation of the course will be conducted independently considering laboratory work and theoretical and practical work:

a) Lab work: 20% of grade

b) Theory and practice work: 80% of grade.

a) Laboratory (20% of grade). Students will be evaluated by the submission of a report about the work carried out in the lab sessions. Students which fail the laboratory practices by the not attendance to the laboratory session and will not have another opportunity to do the laboratory practices during the same course. This part will be over passed when the grade is equal to or greater than 5.

b) Theory and practice (80% of grade) will be graded based on:

1. Practice work (25%): Based on the resolution of on-line question lists and problems

2. Objective test (75%): Based on a written test with theoretical and practical questions. It is mandatory to obtain in the objective test a grade equal or greater than 4.0 (out of 10).

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) and to assist to the laboratory sessions.

REFERENCES

Basic

- Principios de ingeniería de los bioprocesos.
  P.M. Doran (Ed. Acribia)
- Ingeniería Bioquímica.
  F. Gòdia Casablancas, J. López Santín (editores) (Ed. Síntesis)
- Introducción a la Ingeniería Química
  J.F. Izquierdo, J. Costa, E. Martínez de la Ossa, J. Rodríguez y M. Izquierdo (Ed. Reverté)

Additional

- Material and Energy Balances
  G.V. Reklaitis (Ed. Wiley)
- Introducció a l'Enginyeria Química
  A. Aucejo, D. Benaiges, A. Berna, M. Sanchotello, C. Solà (Ed. Biblioteca Universitària)
- Biochemical Engineering Fundamentals
  J.E. Bayley y D.F.G. Ollis (Ed. McGraw-Hill)

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

The distribution of teaching between physical and non-physical presence activities may be modified during the course if health conditions require it