

Degree programme	Type	Course
Biological and Environmental Engineering	OB	1

Contact lecturer

Name : Daniel Gonzalez Ale

Email : daniel.gonzalez.ale@uab.cat

Teaching staff

Daniel Gonzalez Ale

Xavier Garcia Ortega

Group languages

You can consult this information at the [end](#) of the document.

Prerequisites

There are no prerequisites for this subject

Objectives

The main objective of the module is that the student assimilates the importance of the biotechnological processes in the current situation and its potential in the future of our society. The student will have to understand the crucial role of the engineering of bioprocesses in the industry of the 21st century as well as to know how to value the advantages, disadvantages, weaknesses and opportunities that the biological alternative supposes both in industrial processes of bioproducts or biorefineries as in the processes of treatment of waste effluents.

Learning outcomes

- CA01 (Address and calculate the correct mass balances depending on the setup of a bioprocess.) Address and calculate the correct mass balances depending on the setup of a bioprocess.
- CA02 (Design biofilters for the treatment of contaminated gases.) Design biofilters for the treatment of contaminated gases.
- CA03 (Propose strategies for energy recovery and/or solid waste.) Propose strategies for energy recovery and/or solid waste.
- KA01 (Identify the importance of biotechnological processes in the present day and their potential in the future of our society.) Identify the importance of biotechnological processes in the present day and their potential in the future of our society.
- KA02 (Gather the right information to determine the most suitable setup of operations for a biotechnological process.) Gather the right information to determine the most suitable setup of

- operations for a biotechnological process.
- SA01 (Search, compare, critically analyse and summarise information obtained from databases and other sources to solve complex problems in one's specialist area.) Search, compare, critically analyse and summarise information obtained from databases and other sources to solve complex problems in one's specialist area.
- SA02 (Prepare technical reports in the field of environmental engineering and/or biological engineering and present the results orally in a clear, concise and unambiguous manner.) Prepare technical reports in the field of environmental engineering and/or biological engineering and present the results orally in a clear, concise and unambiguous manner.
- SA03 (Plan the different activities related to the resolution of tasks assigned as part of a work group, while appropriately managing time and resources.) Plan the different activities related to the resolution of tasks assigned as part of a work group, while appropriately managing time and resources.

Contents

- State of the art of biotechnological processes in today's society. Concepts of industrial biotechnology, bioeconomics and biorefineries. Phases of the substitution of a chemical process by a biological one.
- Applied Microbiology: Taxonomy. Microbial diversity. Engineering of microorganisms.
- Growth, biocatalyst and microbial kinetics
- Mass and Energy Balances in a biological process
- Operation of a biotechnological process. Configurations
- Biological alternatives to the treatment of urban and industrial liquid effluents. Comparison of physical-chemical and biological processes
- Material and energy recovery of solid waste
- Opportunities for reuse of current wastes
- Biofiltration: Bioreactors for the treatment of gaseous streams

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Mentoring sessions	2	0.08	
Completion of theoretical work, cases, problem-solving in teams	3	0.12	
Resolution of problems, cases of study and elaboration of work in teams	49	1.96	
Self study, reading of books, articles and case studies	49	1.96	
Seminars for solving numerical problems and case studies. Preparation and discussion of cases	12	0.48	
Theoretical lectures	24	0.96	

1) Theoretical lectures: The student acquires the scientific knowledge of the subject attending Master classes and complementing them with personal study. In addition, the learning method will be applied based on cases to reinforce the knowledge within the theory classes.

2) Workshops for solving problems and case studies: In these sessions, the resolution of problems and/or cases will be applied. Likewise, through group activities, the ability to analyze and synthesise and reasoning will be worked on student's criticism.

3) Mentoring sessions: Meetings of small groups of students with the professors to clarify doubts (to agree schedule via institutional email only). Note that no queries will be answered by email or messages sent using the Moodle messenger.

4) Self-taught and in-team study: These are autonomous activities that will serve the student to consolidate the knowledge acquired in face-to-face activities and develop the corresponding competences

Annotation: within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continuous assessment activities

Title	Weight	Hours	ECTS	Learning outcomes
Practical Exam	20%	2	0.08	CA01, CA02
Theoretical exam	30%	1	0.04	CA03, KA01, KA02
Oral presentation of case studies (in teams)	25%	1	0.04	SA03
Written report of case study (in group)	25%	7	0.28	SA01, SA02

Please refer to the catalan or spanish version of the Syllabus for details.

Bibliography

Doran, Pauline M.- Bioprocess engineering principles. Amsterdam: Elsevier, cop. 2013 2nd ed. Accès per usuari UAB: https://bibcercador.uab.cat/permalink/34CSUC_UAB/avjcib/alma991002840049706709

Liu, Shijie. Bioprocess engineering: kinetics, biosystems, sustainability, and reactor design. Boston: Elsevier, cop. 2020 Bioprocess Engineering | https://bibcercador.uab.cat/permalink/34CSUC_UAB/1c3utr0/cdi_askewsholts_vlebooks_9780444637932

Shigeo Kato et al. "Biochemical Engineering: A Textbook for Engineers, Chemists and Biologists" 2015 Wiley-VCH Verlag GmbH & Co : Biochemical Engineering | Wiley Online Books (uab.cat) https://bibcercador.uab.cat/permalink/34CSUC_UAB/1eqfv2p/alma991010703614006709

Shuler, Michael L. Bioprocess engineering: Basic concepts. Upper Saddle River, New Jersey: Prentice Hall, cop. 2002 2nd ed.

Glick BR et al. "Molecular biotechnology : principles and applications of recombinant DNA" 4th Ed. 2010. ASM Press

Lema JM, Suarez S. "Innovative Wastewater Treatment & Resource Recovery Technologies: Impacts on Energy, Economy and Environment". 2018. IWA Publishing.

Metcalf & Eddy. Wastewater Engineering: Treatment and Resource Recovery (5th Edition). McGraw Hill Inc. 2014.

Kennes C, Veiga MC. "Bioreactors for waste gas treatment". 2001. Kluwer Academic Publishers.

Materials diversos y artículos científicos disponibles a Moodle.

Software

The software used will be:

- MS Excel: for the use of spreadsheets for the design of wastewater and waste gas treatment systems

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this [link](#). To access the information, you will need to enter the course CODE

Type of teaching	Group	Language	Semester	Shift
(TEm) Theory (master)	1	Catalan/Spanish	first semester	afternoon