Universitat Autònoma de Barcelona

2020/2021

Bioprocess Engineering

Code: 43322
ECTS Credits: 6

Degree	Type	Year	Semester
4314579 Biological and Environmental Engineering	OB	1	1

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

Contact

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Use of Languages

Principal working language: spanish (spa)

Teachers

Pau Ferrer Alegre

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Teresa Gea Leiva

Prerequisites

There are no prerequisites for this subject

Objectives and Contextualisation

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.

Competences

- Apply methods, tools and strategies to develop biotechnological processes and products with energy-saving and sustainability criteria.
- Apply specific methodologies, techniques and resources to conduct research and produce innovative results in the area of biological and environmental engineering.
- Continue the learning process, to a large extent autonomously.
- Integrate and use biotechnology and bioprocess engineering tools to solve problems in emerging biotechnological areas for the industrial production of bioproducts.
- Integrate and use chemical, environmental and biological engineering tools to design biological systems for the sustainable processing of waste and for industrial biotechnological processes.
- Integrate knowledge and use it to make judgements in complex situations, with incomplete information, while keeping in mind social and ethical responsibilities.
- Organise, plan and manage projects

- Seek out information in the scientific literature using the appropriate channels and integrate this information, showing a capacity for synthesis, analysis of alternatives and critical debate.
- Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.

Learning Outcomes

1. Apply specific methodologies, techniques and resources to conduct research and produce innovative results in the area of biological and environmental engineering.
2. Contextualise the biological processes in the current industrial situation.
3. Continue the learning process, to a large extent autonomously.
4. Identify the advantages and disadvantages of biological processes for industrial production of bioproducts.
5. Identify the advantages and disadvantages of biological processes in treating effluents and solid wastes
6. Identify the most suitable industrial process from among the different alternatives, from an environmental perspective.
7. Integrate knowledge and use it to make judgements in complex situations, with incomplete information, while keeping in mind social and ethical responsibilities.
8. Organise, plan and manage projects
9. Seek out information in the scientific literature using the appropriate channels and integrate this information, showing a capacity for synthesis, analysis of alternatives and critical debate.
10. Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.
11. Use the basic concepts of applied microbiology to design a biological process.

Content

- 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 of contaminated gases. Design of possible configurations

Unless the requirements enforced by the health authorities demand a prioritization or reduction of these contents

Methodology

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-taugh 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
The proposed teaching methodology may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Mentoring sessions	2	0.08	7
Seminars for solving numerical problems and case studies. Preparation and discussion of cases	12	0.48	1, 9, 2, 6, 5, 4, 8, 7, 3, 10, 11
Theoretical lectures	24	0.96	2, 6, 5, 4, 7, 3, 10, 11
Type: Supervised			
Completion of theoretical work, cases, problem-solving in teams	3	0.12	1, 9, 2, 6, 5, 4, 8
Type: Autonomous			
Resolution of problems, cases of study and elaboration of work in teams	49	1.96	1, 9, 2, 6, 5, 4, 8, 7, 3, 10, 11
Self study, reading of books, articles and case studies	49	1.96	1, 9, 2, 6, 5, 4, 8, 7, 3, 10, 11

Assessment

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

Student's assessment may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Oral presentation of case studies (in teams)	25%	1	0.04	1, 9, 2, 6, 5, 4, 8, 7, 10
Practical Exam	20%	2	0.08	6, 5, 4, 11
Theoretical exam	30%	1	0.04	2, 6, 5, 4, 7, 3, 10, 11
Written report of case study (in group)	25%	7	0.28	1, 9, 2, 6, 5, 4, 8, 7, 3, 10, 11

Bibliography

A) Doran, Pauline M.- Bioprocess engineering principles. Amsterdam: Elsevier, cop. 2013 2nd ed. Accés per usuaris UAB: http://www.sciencedirect.com/science/book/9780122208515
B) Shuler, Michael L. Bioprocess engineering: Basic concepts. Upper Saddle River, New Jersey: Prentice Hall, cop. 2002 2nd ed.
C) Liu, Shijie. Bioprocess engineering: kinetics, biosystems, sustainability, and reactor design. Boston: Elsevier, cop. 2013
D) Lema JM, Suarez S. "Innovative Wastewater Treatment & Resource Recovery Technologies: Impacts on Energy, Economy and Environment". 2018. IWA Publishing.

E) Devinny JS, Deshusses MA, Webster TS. "Biofiltration for air pollution control". 1999. Lewis Publishers.
F) Kennes C, Veiga MC. "Bioreactors for waste gas treatment". 2001. Kluwer Academic Publishers.
G) Materials diversos y artícles científics disponibles a Moodle.