Universitat Autònoma de Barcelona

2019/2020

Integrated Process Design

Code: 43327
ECTS Credits: 6

Degree	Type	Year	Semester
4314579 Biological and Environmental Engineering	OB	1	2

Contact

Name: Pau Ferrer Alegre

Email: Pau.Ferrer@uab.cat

Use of Languages

Principal working language: spanish (spa)

Prerequisites

None

Objectives and Contextualisation

It is intended to analyze and design separation operations of specific application in chemical, biotechnological and environmental processes. The module also proposes to use the concepts of matter transfer for the design of continuous contact processes. The objectives of the module include the definition of sequences of operations in biotechnological processes, integrating the different stages and analyzing their relevance, quantifying the global and specific yields in separation operations and selecting between different process alternatives by means of the case study. Finally, it is intended to apply criteria for energy optimization of integrated processes.

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.
- Define and design the characteristic separation sequences in chemical, biotechnological and environmental processes in order to increase separation yields, applying criteria of energy optimisation.
- 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.
- Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.
- Use IT tools to acquire further knowledge in the field of biological and environmental engineering.

- Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.
- Work in a multidisciplinary team

Learning Outcomes

1. Analyse separation operations in biotechnological and environmental processes, solving design and operation problems.
2. Apply specific methodologies, techniques and resources to conduct research and produce innovative results in the area of biological and environmental engineering.
3. Continue the learning process, to a large extent autonomously.
4. Identify the advantages and disadvantages of the different separation sequences in sustainable waste treatment and in industrial biotechnological processes.
5. Integrate knowledge and use it to make judgements in complex situations, with incomplete information, while keeping in mind social and ethical responsibilities.
6. Integrate the different stages of a process, choosing the appropriate alternative sequencing.
7. Optimise processes in terms of energy-use on the basis of an integrated analysis.
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. Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.
11. Use IT tools to acquire further knowledge in the field of biological and environmental engineering.
12. Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.
13. Use material transfer criteria in the design of continuous-contact separation operations.
14. Work in a multidisciplinary team

Content

- UNIT 1. Separation operations by continuous contact: Absorption. Matter transfer Method of transfer units.
- UNIT 2. Separation operations in biochemical and environmental engineering. Classification, equipment and use. Calculation methods for the design. Flocculation, sedimentation, flotation, centrifugation, chromatography and membranes.
- UNIT 3. Integration of operations: separation sequences. Case study example in biotechnological processes. Case study example in environmental processes.
- UNIT 4. Energy optimization of processes. Use of energy.

Methodology

Theoretical classes: Master classes with ICT support.
Problem Classes: Resolution of problems in class and proposal of problems to be solved by the student. The problem collection will be available to the student in the Moodle Classroom.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Problem-based classes	12	0.48	1, 2, 9, 4, 6, 8, 10, 14, 13, 11
Theoretical lectures	27	1.08	4, 6, 7, 5, 3, 12, 13
Type: Autonomous			
Problem solving and review	32	1.28	1, 2, 9, 4, 6, 8, 5, 3, 12, 14, 13, 11

Study	62	2.48	5, 3

Assessment

Please refer to the Catalan or Spanish version of this document

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Deliverables in classroom	30%	8	0.32	1, 2, 9, 4, 6, 7, 8, 14, 13, 11
Final exam (individual)	30%	3	0.12	1, 4, 6, 7, 5, 10, 3, 12, 13
Partial exams	40%	6	0.24	1, 4, 6, 7, 5, 10, 3, 12, 13

Bibliography

- Introducción a las operaciones de separación de contacto continuo. A. Marcilla Gomis. Publicaciones de la Universidad de Alicante, 1999.

- Procesos de separación de biotecnologia industrial. F. Recasens Baxarias. Pubicacions Universitat Politècnica de Catalunya, 2015.