UAB
Universitat Autònoma de Barcelona

Basic Operations

Code: 103253
ECTS Credits: 6

2024/2025

Degree	Type	Year
2501925 Food Science and Technology	OB	2

Contact

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Teaching groups languages

You can view this information at the end of this document.

Prerequisites

Although there are no official prerequisites, it is essential that the student is able to apply the knowledge taught in the subject Fundamentals of Processes of the second year, first semester, to be highlighted:

1) To be able to apply the mathematical tools that will be the starting point for the analysis of processes.

2) To know the fundamental properties and variables, and the transport coefficients.

3) To identify, analyze and solve balances of matter and energy in stationary and non-stationary state, without chemical reaction and with one or several phases in simple processes of the food industry.

Objectives and Contextualisation

The subject Basic Operations in the degree:

This is a compulsory second course subject, which introduces students to the basic operations based on transport of momentum (movement and transportation of fluids, filtration), heat transfer operations (heat exchangers) and mass transfer operations (extraction, drying, etc.). Therefore, the subject will be based on the concepts taught in the subject Fundamentals of Processes, regarding balances of mass and energy and the properties, variables and non-dimensional numbers that characterize the transport phenomena, which are the basic fundamentals that characterize an industrial process. To achieve the objectives of this subject will prepare the student for the subject Physical Methods of Conservation and / or Transformation (third year, first semester), which focuses on the industrial aspects of the processes and requires the basic knowledge related to them.

Objective of the subject:

To apply the principles of chemical engineering to describe and analyze the basic operations related with the processes of transformation and conservation of food.

Competences

- Analyse, summarise, resolve problems and make professional decisions.
- Apply the principles of biology and chemical engineering to describe, analyse, control and optimise the processes of food transformation and conservation.
- Apply the scientific method to resolving problems.
- Develop individual learning strategies and planning and organisation skills.

Learning Outcomes

1. Analyse, calculate and describe fluid circulation in different systems.
2. Analyse, calculate and describe matter transfer in different systems.
3. Analyse, calculate and describe the process of heat transmission in different systems.
4. Analyse, summarise, resolve problems and make professional decisions.
5. Apply the scientific method to resolving problems.
6. Develop individual learning strategies and planning and organisation skills.

Content

1. Transport of momentum.

1.1. Circulation of fluids inside the pipes.

1.2. Transport of fluids using pipes. Pumps.

1.3. Circulation of fluids through porous beds.

1.4. Filtration

1.5. Membrane separation processes: ultrafiltration and reverse osmosis.

2. Heat transmission.

2.1. Mechanisms: conduction, convection and radiation.

2.2. Heat exchangers.

2.3. Evaporation.

3. Mass transfer.

3.1. Solid-liquid extraction.

3.2. Simultaneous transfer of heat and mass (air-water system, drying)

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Master classes (theory and problem solving)	23	0.92	3, 1, 2, 4, 5

Seminars	6	0.24	3, 1, 2, 4, 5, 6
Workshops of problems	15	0.6	3, 1, 2, 4, 5, 6
Type: Supervised			
Tutorials	7	0.28	3, 1, 2, 4, 5, 6
Type: Autonomous			
Autonomous collaborative study	48	1.92	3, 1, 2, 4, 5, 6
Self-learning	35	1.4	3, 1, 2, 4, 5, 6

The development of the course is eminently practical and is based on the following activities:

1) Theoretical classes.

The student acquires the scientific knowledge of the subject attending the master classes and complementing them with the personal study of the explained subjects. In addition, the case study method or problem-based learning will be applied to reinforce knowledge within the theory classes.

2) Workshops of problems

The scientific knowledge acquired in the theory classes is worked through the resolution of problems and / or practical cases. In these classes there must be a strong interaction between students and teachers in order to complete and deepen the understanding of the knowledge worked in the theoretical classes. They can work individually or in groups according to the teacher's criteria.

3) Seminars

The scientific knowledge acquired in theory and problem classes is worked out, in group, to promote the capacity for analysis and synthesis and critical reasoning. This work is channeled through cooperative activities. In these
classes the student is the center of the learning process, while the teacher has the mission of providing the information or the sources to achieve it while directing the steps of the learning process. These sessions should also
serve to resolve doubts and deepen certain key concepts.

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

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Cooperative activities (workshops of problems/seminars): inside and outside the classroom	10%	6	0.24	3, 1, 2, 4, 5, 6
Exam I	45%	3	0.12	3, 1, 2, 4, 5, 6

Exam II	45%	3	0.12	3, 1, 2, 4, 5, 6
Second-chance Exam	90%	4	0.16	3, 1, 2, 4, 5, 6

The competences of this subject will be evaluated by means of:

Continuous evaluation:

- 2 partial exams (90% of the final grade, the first exam corresponding to the first part of the course material, the second corresponding to the second half, each will be worth 45% of the final grade).

- Delivery of solved problems (10% of the final grade). The problems resolved during the Seminars will constitute the whole of this note. The notes of problems are not preserved from one year to the next.

For students who do not pass the continued evaluation:

- Second-chance exam (90% of the final grade, or 45%, depending on the case).

- The remaining 10% of the note will be the mark obtained with the delivery of problems resolved during the continuous evaluation. This note can not be retrieved.

In order to pass the subject, the following must be fulfilled:

a) A minimum of 5 points (out of 10) on average of the partial exams, and at least a score of 4 on each of the two exams to make an average; If he/she does not reach this note, the student must attend the second-chance examination for the recovery of the corresponding exams. If the student does not reach the 5 on average, he/she must attend the second-chance exam to recover the exams below a mark of 5.

b) In case of attendance to the second-chance exam, to have a mark of at least 5 points. If this exam is only for a partial part, the recovery grade must be above 4, and reach an average of 5 with the previously approved partial.

c) In the case that the student did not reach an average of 5 on the second-chance exam or on partial exams, having all of them above 4, the student can pass the subject if the 90% corresponding to this mark plus 10% corresponding to the problems delivered reaches 5.

The marks ofthe seminars, partial and second-chance exams can be lowered in case of spelling and writing mistakes.

In no case there will be examinations (evaluation tests) on days and hours other than those officially published by the Coordination of the Degree.

It will be considered that a student is not evaluable if he/she has participated in assessment activities that represent $\leq$ 15% of the final grade.

This subject/module does not include the single evaluation system.

Bibliography

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• Francisco Rodríguez (2002) "Ingeniería de la industria alimentaria" Vol II: Operaciones de procesado de alimentos. Ed. Síntesis, Madrid.

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• Casal J., Clotet R. (1995) "Operacions Unitàries de la Indústria Alimentària" Societat Catalana de Tecnologia. Barcelona.

• Singh, R. P., Heldman, D. R. (1997) "Introducción a la ingeniería de los alimentos" 2nd ed. Editorial Acribia, S.A., Zaragoza.

• Coulson J.M., Richardson J.F. (2003) "Chemical Engineering" Vol. 1, 2 and 6, 6th ed. Pergamon Press, Oxford.

• Foust A.S., Wenzel L.A., Clump C.W., Mans L., Andersen L.B.(2008) "Principles of Unit Operations". 2nd ed. Wiley &Sons. New York.

• P.J. Fryer P.J., Pyle D.L., Rielly C.D. (1997) "Chemical Engineering for the Food Industry". Blackie Academic & Professional. London.

• Geankoplis, Ch.J. (1993) "Transport Processes and Unit Operations" 3rd ed. Prentice Hall. New Jersey.

• McCabe W.L., Smith J.C., Harriot P. (2001) "Unit Operations of Chemical Engineering" 6th ed. McGraw-Hill. New York.

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• Heldman D.R., Lund D.B., Sabliov C. (2019) "Handbook of food engineering". CRC Press LLC, USA.

• Perry, R.H., Green, D.W. (2008) "Perry's Chemical Engineers' Handbook". 8th ed. McGraw-Hill.

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Software

It does not apply

Language list

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	1	Spanish	second semester	afternoon
(PAUL) Classroom practices	2	Catalan/Spanish	second semester	afternoon
(TE) Theory	1	Spanish	second semester	afternoon