

## Course Unit: 935025 - Separation processes

Year 2 Semester 4 ISCED Code: 721 ECTS: 5

Type of Course Unit: Compulsory Delivery Mode: Face-to-face

Language of Instruction: Portuguese

COURSE COORDINATOR: Antónia Teresa Zorro Nobre Macedo

### HOURS OF WORK

TOTAL HOURS	Contact Hours								Hours in autonomous work
	Theory	Theory and practice	Practical and laboratory work	Field work	Seminar	Internship	Tutorial guidance	Other	
125	15		45						65

Prerequisites (if applicable): Not applicable

### LEARNING OUTCOMES (knowledge, skills and competence)

- Differentiate between the different studied operations in respect to the grounds of separation, driving forces involved, operating modes and kinds of equipment available.
- Know how to select the operation or sequence of operations suited to a given desired application, in new situations.
- Solve problems on the operations studied.
- Encourage the student autonomy in search of relevant information about the subjects studied, by online searches, participation in conferences, etc.

### CONTENTS

1. Separation processes and separation mechanisms.
2. Extraction solid-liquid; extraction, liquid-liquid and supercritical extraction. Applications and equipment used in the food industry.
3. Absorption of gases; applications.
4. Classical filtration: fundamental principles, operational methods, equipment and applications.
5. Membrane separation processes: membrane structures and types of materials used in their manufacture; separation operations (microfiltration, ultrafiltration, nanofiltration, reverse osmosis, electrodialysis, pervaporation); modules used in the various operations. Applications in the food industry.
6. Distillation: continuous distillation; batch distillation, steam distillation and vacuum distillation. Applications.

### DEMONSTRATION OF THE CONTENTS COHERENCE WITH THE COURSE UNIT'S LEARNING OUTCOMES

In the syllabus, the different ways of separating food mixtures are presented, with reference to their driving forces and phases involved. This information will allow the student to distinguish the different operations. The detailed study of each of the operations, throughout the program, provides students with a deeper understanding of them. Thus, it is intended that he learns in such a way that he is able to select, among several possible processes, which is the most efficient way to achieve a certain goal.

### TEACHING METHODOLOGIES

- Lectures.

-Solving problems and presentation of case studies.

- Practical applications in the technological pavilion.

### **DEMONSTRATION OF THE COHERENCE BETWEEN THE TEACHING METHODOLOGIES AND THE LEARNING OUTCOMES**

An expositive approach of the several key concepts, during which several practical examples are presented and explained, will allow students with a deeper understanding of them. In the same way, problem solving is a fundamental tool since it can make an important contribution to a better interiorization, preservation and extrapolation of acquired knowledge.

### **EVALUATION METHODS**

-The evaluation involves the realization of two partial tests or an exam in normal time and an exam on appeal, to students who have not obtained approval in the discipline at the normal time. This component contributes with 70% to the overall score, while the reports of practical classes contribute with 30%.

- Admission to the exam necessitates the presence in 3/4 of the practical classes, according to the Internal Rules

### **MAIN BIBLIOGRAPHY**

Foust, A S., Wenzel, L. A., Clump, C. W., Maus, L., Andersen, L. Bryce (1980). Principles of Unit Operations, 2nd Ed. John Wiley & Sons, Inc.

Mulder M. (2003). Basic Principles of Membrane Technology, 2nd Ed. Kluwer Academic Publishers.

Seader, J. D., Henley, E. J. (1998). Separation Process Principles.

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