



Universidad
de Burgos

MSc Program: Advancements in Food Sciences and Biotechnologies
MSc in Food Safety and Biotechnology
Department of Biotechnology and Food Science
Faculty of Sciences
University of Burgos

COURSE						CODE
MEMBRANE PROCESSES DESIGN AND EVALUATION						7448
Tuition Period (semester)	Duration (in months)	Type (Mand/Op)	ECTS Credits	Hours (theoretical)	Hours (practical)	Hours (other activities)
Semester 1	1	Op	4	40	30	30

LECTURER IN CHARGE OF COURSE (1)			
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LECTURER (2)			
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3.3.1. SPECIFIC EDUCATIONAL OBJECTIVES
OBJECTIVES:
<ol style="list-style-type: none">1. To understand and describe membrane separation technologies and their current state of development and implementation at industrial level.2. To analyze their interest as technological innovation compared to other conventional separation processes.3. To know the possibilities offered by membrane separation technologies in process sustainability and intensification.4. To study the calculation and optimization methods for the design and control of these processes.5. To acquire practical skills of use of these technologies at a pilot scale.
COURSE PROGRAMME SUMMARY:
THEORETICAL:
Topic 1: Importance of membranes in clean technologies and process intensification.
Topic 2: Characteristics of membrane separation processes.

Topic 3: Membrane materials and characterization.

Topic 4: Pressure-driven membrane processes: microfiltration, ultrafiltration, nanofiltration and reverse osmosis.

Topic 5: Electrodialysis.

Topic 6: Other membrane processes: Gas separation, pervaporation, membrane distillation, dialysis, liquid membranes, hybrid membrane processes, membrane reactors.

Topic 7: Case studies.

PRACTICAL OR EXPERIMENTAL:

Practical Session 1: Ultrafiltration of protein solutions using flat-sheet polymeric membranes.

Practical Session 2: Nanofiltration of aqueous sucrose and salt solutions using spiral-wound membranes at a pilot plant scale.

3.3.2. TEACHING METHOD:

Learning Activities

- Lectures and directed discussion of the provided course material.
- Laboratory practicals: ultrafiltration and nanofiltration membrane processes.
- Seminars to solve problems related to membrane separations.
- Tutorials to discuss case studies on membrane processes and their sustainability.
- Group work to solve industrial problems using membrane processes.
- Report writing and oral presentation of the performed group work.
- Independent learning using online teaching and learning material.
- Assessment tests: evaluation tests and final written exam.

ECTS credit allocations (Approximate Student workload in hours):

		Hours
Classroom setting	Lectures / Directed discussions	18
	Practical Classes (and laboratory notebook compilation)	8
	Seminars	2
	Tutorials	4
	Essays - Presentations	2
	Assessment Tests	2
On Site - Total Hours:		36
Off campus	Workload to prepare theoretical and/or practical classes	22
	Resolution of exercise, practical cases and questionnaires	10
	Critical Works on Case Study and Scientific Publications	16
	Workload to prepare presentation (group work)	8
	Workload to prepare exams and/or evaluation tests	8
Off-Campus - Total Hours:		64
WORKLOAD - TOTAL HOURS:		100

3.3.3. ASSESSMENT CRITERIA AND METHOD

Continuous assessment. The student must perform independently or in groups a series of mandatory activities, with scheduled deliveries proposed by lecturers. The student must also perform an academically directed work and present it to their classmates. The evaluation of the presented work will be carried out jointly between the students of the course and the lecturers. Active participation in all programmed activities will be valued, such as classes and seminars, tutorials, laboratory practicals, etc. There will be a final written exam that will consist of a questionnaire of short questions related to the global knowledge of the course.

3.3.4. LEARNING RESOURCES

In addition to the recommended bibliography and the databases available in the University Library (www.ubu.es/biblioteca), the student will use the materials and information included in the UBU Virtual learning platform. Laboratory equipment and pilot membrane separation plants will also be used in this course.

3.3.5. CLASSROOM LANGUAGE

Spanish