



## IDENTIFYING DATA

### Environmental aspects

Subject	Environmental aspects			
Code	V11M085V02107			
Study programme	Máster Universitario en Ciencia y Tecnología de Conservación de Productos de la Pesca			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Mandatory	1st	1st
Teaching language	Spanish Galician			
Department				
Coordinator	Longo González, María Asunción			
Lecturers				
E-mail				
Web	<a href="http://http://webs.uvigo.es/pesca_master/">http://http://webs.uvigo.es/pesca_master/</a>			
General description	This subject deals with the study of the environmental aspects of the treatment of gaseous, liquid and solid effluents, of industrial processes in general and of the fishery product processing sector in particular. To this end, the different techniques (unit operations) involved in these treatment processes are presented from an engineering point of view: their basics and physical, chemical and/or biological characteristics, unit design parameters and their application in environmental engineering. Practices on the studied concepts are carried out, and the legislative aspects of waste management are also considered.			

### Training and Learning Results

Code	
A2	That students know how to apply the knowledge acquired and their ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study.
A3	That students are able to integrate knowledge and face the complexity of making judgments based on information that, being incomplete or limited, includes reflections on social and ethical responsibilities linked to the application of their knowledge and judgments.
A5	That students have the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
B1	That the students acquire the comprehension, analysis and synthesis capacities.
B2	That students develop oral and written communication skills in the two co-official languages of autonomy (Spanish and Galician).
B5	That the students develop the abilities of teamwork, enriched by the pluridisciplinarity.
C4	Know the main environmental aspects that affect the processing and conservation of seafood products: control and treatment of liquid effluents, sludge, soil and atmospheric emissions. Applicable legislation.
D1	Ability to understand the meaning and application of the gender perspective in the different fields of knowledge and professional practice with the aim of achieving a more just and egalitarian society.
D3	Autonomous work capacity and decision making.
D4	Creativity, initiative and entrepreneurial spirit.
D5	Commitment to ethics in the profession and in society.

### Expected results from this subject

Expected results from this subject	Training and Learning Results
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That the students know the environmental situation of the transforming sector of fishery products.	A2 A5 B2 B5 C4 D1 D3
That students know the microbial kinetics and the different types of bioreactors	A3 A5 B2 B5 C4 D1 D4
That students know the different physical-chemical methods of industrial wastewater treatment	A2 B2 B5 C4 D4 D5
That students know the different biological methods of industrial wastewater treatment	A2 A3 B2 C4 D3 D4
That students know the techniques and treatments of industrial solid waste.	A2 A5 B1 B5 C4 D1 D3
That the students know the basic concepts of the treatment of contaminated soils and atmospheric contamination	A2 A5 B2 B5 C4 D1 D3
That students are able to handle the regulations on Environmental Management	A3 A5 B1 B5 C4 D1 D3 D5

## Contents

Topic	
1. ENVIRONMENTAL SITUATION OF THE PROCESSING SECTOR OF FISHERY PRODUCTS	1.1 Resource consumption, waste generation. 1.2 Liquid and solid effluents and emissions. 1.3 Generation of odors and noise
2. BIOREACTORS	2.1. Introduction to the biological treatment of wastewater. Microbial metabolism. Microorganisms in water treatment. 2.2. Bacterial growth. Biological growth kinetics. 2.3. Introduction to reactor design. Complete mixing reactor. Plug flow reactor. 2.4. Design of bioreactors for wastewater. Complete mixing biological reactor. Complete mixing reactor with sludge recirculation. plug flow reactor. Operation and control of bioreactors. Treatment efficiency and performance.

3. CHARACTERIZATION AND TREATMENT OF LIQUID EFFLUENTS	3.1. Wastewater: origin, classification, estimation of flows, physical, chemical and biological properties, main polluting agents 3.2. Analytical techniques for the characterization of wastewater 3.3. General scheme of a wastewater treatment plant: water treatment and sludge treatment 3.4. Treatment strategies, selection of alternatives
4. PRETREATMENT AND PHYSICO-CHEMICAL TREATMENT OF WASTEWATER	4.1. Pretreatment: dilaceration, homogenization, mixing. 4.2. Physical operations: sedimentation, flotation, filtration in granular media, gas transfer 4.3. Chemical operations: precipitation, coagulation, adsorption. 4.4. Disinfection. 4.5. Elimination of phosphorus and nitrogen by physical-chemical route. 4.6. Elimination of toxic and recalcitrant organic compounds, and dissolved inorganic substances
5. AEROBIC BIOLOGICAL TECHNOLOGIES	5.1. Basics and objectives, types of process 5.2. Aerobic processes with biomass in suspension: activated sludge process, aerated lagoons, sequential batch reactor 5.3. Aerobic processes with fixed biomass: bacterial beds, biodiscs and biocylinders, packed bed reactors 5.4. Biological nitrogen removal: nitrification/denitrification 5.5. Biological removal of phosphorus and joint nitrogen and phosphorus removal
6. ANAEROBIC BIOLOGICAL TECHNOLOGIES	6.1. Biochemistry and microbiology of methanogenesis. Stoichiometry. Energy balance. kinetic aspects. Physical-chemical parameters and nutrients. Design of equipment for anaerobic treatment: hydrodynamics, homogenization, retention time, substrate. 6.2. Anaerobic treatment technology, classification. Systems with unattached biomass. Systems with fixed biomass. multiple systems. 6.3. Lagoon treatment
7. SOLID WASTES: CHARACTERIZATION AND TREATMENT	7.1 Origin, classification and composition of MSW 7.2 Characteristics and physical-chemical properties of solid waste 7.3 Main industrial solid waste. 7.4. Reuse and recycling of fractions of solid waste. 7.5. Storage and transport of solid waste. 7.6. Definition and characteristics of hazardous solid waste
8. ATMOSPHERIC CONTAMINATION	8.1 Chemistry of the troposphere 8.2. Atmospheric pollutants. Reference contaminants. 8.3. Air pollution meteorology. 8.4 Main effects of air pollution. 8.5. Atmospheric dispersion. 8.6 Emission standards of industrial origin 8.7. Treatment of gaseous effluents. Equipment selection. Treatment design. 8.8 Air pollution control
9. TREATMENT OF CONTAMINATED SOILS	9.1. Legal framework 9.2 Technology for soil remediation 9.3 Physical-chemical technology 9.4. Thermal technologies 9.5. Biological treatment.
10. ISO STANDARDS	10.1. ISO 14,000 standards 10.2 Community Eco-management and Eco-audit Regulation: EMAS

### Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	14	35	49
Laboratory practical	6	12	18
Seminars	2	2	4
Objective questions exam	1	1	2
Self-assessment	1	1	2

\*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

### Methodologies

	Description
Lecturing	Explanation by the lecturer of the contents of the course, theoretical bases and exercises to be developed by the student. Blackboard and audiovisual means will be used.

Laboratory practical	Activities of application of knowledge to specific situations and acquisition of basic and procedural skills related to the subject matter of study. They take place in special spaces with specialized equipment (chemical laboratories).
Seminars	Personalized and/or group tutorials: student interviews with the course's teaching staff for advice / development of activities of the learning process.

### Personalized assistance

Methodologies	Description
Lecturing	The lecturers will answer the questions posed by the students, in face-to-face or online tutorials, or by email.
Laboratory practical	The student receives, in a small group, advice from the teacher on the theoretical and practical concepts of the subject, for the development of the activities to be carried out in the chemistry laboratory.
Seminars	The student receives, in group and/or individually, advice from the teacher on the theoretical and practical concepts of the subject, for the development of the objectives of the course.

### Assessment

	Description	Qualification	Training and Learning Results			
Lecturing	The attendance and participation of the students in the classes, in the discussion of contents and exercises, will be evaluated.	20	A2 A3	B1 B2	C4	D1 D3
Laboratory practical	The performance and results of the practices and the preparation of the lab report or questionnaire will be evaluated.	20	A3	B2 B5	C4	D3 D4 D5
Objective questions exam	There will be an exam with multiple choice questions that will evaluate the theoretical and practical knowledge acquired in the course.	40	A2 A3 A5	B1 B2 B5	C4	D1 D3 D4
Self-assessment	Test-type questionnaires will be carried out through the teaching platform, so that students can evaluate their degree of acquisition of the subject's competences.	20	A2 A3 A5	B1 B2 B5	C4	D1 D3 D4

### Other comments on the Evaluation

To pass the course, the student must obtain a grade equal to or greater than 4.5 points out of 10 in the final exam. In case of not reaching this grade, a "Fail" grade will be assigned, with the numerical value of the grade obtained in the final exam.

### Sources of information

#### Basic Bibliography

American Public Health Association, American Water Works Association, Water Pollution Control Federa, **Métodos normalizados para el análisis de aguas potables y residuales**, Díaz de Santos, Madrid,  
 Davis, M. L. Y Mastern, S.J., **Ingeniería y ciencias ambientales**, Ed. McGraw Hill,  
 Hernández Muñoz, A., **Depuración de aguas residuales.**, Colección Senior, Madrid,  
 Metcalf & Eddy (revisado por G. Tchobanoglous)., **Ingeniería de aguas residuales: tratamiento, vertido y reutilización (3ª ed.)**, McGraw-Hill, Madrid,  
 Tchobanoglous, G.T.; Theisen, H. y Vigil, S., **Gestión integral de residuos sólidos**, Ed. McGraw-Hill,

#### Complementary Bibliography

De Lora, F. y Miro, J., **Técnicas de Defensa del Medio Ambiente. Vol I y II**, Ed. Labor, Barcelona,  
 Degrémont, ed., **Water treatment handbook**, Ed. Degrémont, Paris.,  
 J. Glynn Henry, Gary W., **Environmental Science and Engineering**, Ed. Prentice Hall Inc,  
 Spiro, T.G. y Stigliani, W.M, **Química medioambiental**, Ed.. Prentice Hall Inc,  
 Wark, k. y Warner, C.F., **Contaminación del aire. Origen y control.**, Ed. Limusa,

### Recommendations

#### Other comments

In case of discrepancies, the Spanish version of this guide will prevail.