(*)Facultade de Química

Presentation

The studies of Chemistry have a large tradition at the University of Vigo, where it has been taught during more than 30 years. The stablisment of the Universitary System of Galicia in the 90s and the current process of implantation of the European Space of Higher Education (EEES) modified the offer of degrees, but no the pioneering spirit of the chemists in research of in the quest for a better service to the society.

Degrees given in the Faculty

Degree in Chemistry

- Masters And Doctorates:
  - Industry and Chemical Research and Industrial Chemistry
  - Theoretical chemistry and Computational Modelling
- Master:
  - Science and Technology of Conservation of Fishing Products

Web page

Information about the Faculty of Chemistry:

http://quimica.uvigo.es

Máster Universitario en Ciencia y Tecnología de Conservación de Productos de la Pesca

Subjects

Year 1st

Code	Name	Quadmester	Total Cr.
V11M085V02104	Marine species of commercial interest. Biology, parasitology and microbiology. Species identification	1st	3
V11M085V02105	Food safety and quality. Hygiene, toxicology and food legislation. Risks prevention	1st	3

V11M085V02106	Chemical analysis of fishery products. Biotic and abiotic contaminants. Quality control in the laboratory.	1st	3
V11M085V02107	Environmental aspects	1st	3
V11M085V02108	Business and social aspects	1st	3
V11M085V02205	Cold Storage: Freezing and Refrigeration Procedures and Technologies	2nd	5
V11M085V02206	Conservation by heat: Canned opening and pasteurized	2nd	5
V11M085V02301	Physical and Chemical Treatments	2nd	3
V11M085V02402	Product Innovation and Process	2nd	3

IDENTIFYING DATA				
Marine species of commercial interest. Biology, parasitology and microbiology. Species identification				
Subject	Marine species of commercial interest. Biology, parasitology and microbiology. Species identification			
Code	V11M085V02104			
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	http://http://webs.uvigo.es/pesca_master/			
General description	The objective of this course is to know and differentiate the main fishing and aquaculture species of interest in our country, as well as describing the nutritional values of fishery products. The aim is to know and understand the fundamental aspects of the biology of fish and cephalopods and the basic aspects of bivalve and crustacean biology, as well as acquiring basic knowledge about parasitology of fishery products. Also, the alteration of the fishing products and the factors that influence their quality will be evaluated, studying the microbiology of fishery products and the basic aspects of the techniques of species identification by DNA analysis.			

Training and Learning Results	
Code	
A1	Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.
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.
B4	That the students develop the problem-solving abilities of application of the theoretical knowledge in practice.
C1	Know and differentiate the main fishing and aquaculture species of commercial interest in our country, with its main biological characteristics.
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
That students know how to identify marine species of commercial interest.	A1 A3 B1 C1 D4
That the students know the biology of the different fish, cephalopods, molluscs, bivalves and crustaceans.	A3 A5 B4 C1 D4

That students know how to differentiate marine parasites of economic and sanitary importance.	A1 A5 B1 C1 D5
That the students know the pathogenic microorganisms and the norms that guarantee consumer health.	A1 A3 B1 C1 D4 D5

Contents
Topic
Lesson 1. Marine species of commercial interest. Introduction.
Lesson 2. Biology of fish and cephalopods.
Lesson 3. Biology of bivalve molluscs and crustaceans.
Lesson 4. Basic parasitology. Parasitology of fish, bivalves and cephalopods.
Lesson 5. Marine parasites of economic and health importance (zoonoses). Anisakis and Pseudoterranova. Parasites as biological markers.
Lesson 6. Microorganisms present in fishery products. Origin and factors influencing the fish microbiota.
Lesson 7. Pathogenic microorganisms: standards to guarantee consumer health.
Lesson 8. Species identification.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	16	40	56
Case studies	4	7	11
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.
Case studies	Resolution of cases, doubts and queries both individually or in a small group regarding the follow-up and study of the course contents.
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.
Case studies	The student will be guided in the acquisition of basic skills and problem solving related to the subject matter of study. The progress of the student will be monitored.
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	A1	B1 B4	C1	D4
Case studies	Problem solving and practical cases will be evaluated, as well as the student's autonomous work.	20		B1 B4	C1	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	A1 A3 A5	B1 B4	C1	D4 D5
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	A1 A3 A5	B1 B4	C1	D4 D5

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

Michael J. Leboffe and Burton E. Pierce.Morton, **A photographic Atlas for Microbiology Laboratory**, Pub. Co.,

J.G. Capuccino and N. Sherman., **Microbiology. A laboratory Manual**, 6ª edición. Benjamin/Cummings Company Inc,

Doyle, M.P., F. Diez-Gonzalez, C. Hill, **Food Microbiology: Fundamentals and Frontiers**, 5ª ed, ASM Press, 2019

Leboffe, M.J., B.E. Pierce, **Microbiology Laboratory Theory & Application**, 4ª ed, Morton Publishing Company, 2015

Leboffe, M.J., B.E. Pierce, **A Photographic Atlas for the Microbiology Laboratory**, Morton Publishing Company, 2021

Rigel, N., **Laboratory Exercices in Microbiology**, 12ª ed, McGraw-Hill Higher Education, 2022

Waite-Cusic, J.G., A. E. Yousef, J. J. Perry, **Food Microbiology**, 2ª ed, Willey, 2022

Complementary Bibliography

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http://www.ufrgs.br/para-site/taxono.htm, **Atlas Electrónico de Parasitología**,

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http://www.biosci.ohio-state.edu, **Directorio de Parasitología**,

http://www.ent.iastate.edu/imagegallery, **Galería Entomológica de la Iowa state University**,

http://www.med-chem.com/Para/index.htm, **Paras-site Online**,

http://bumc.bu.edu/medicine, **Web Page de Zoonosis**,

http://cvm.msu.edu/courses/mic569/docs/parasite/index.html, **Identificación de parásitos por internet**,

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 Macho G, Molares J. & Vázquez E., **Timing of larval release by three barnacles from NW Iberian Peninsula**, Marine Ecology Progress Series 298, 251-260.,

 Primo C. & Vázquez E., **Zoogeography of the Southern Africa Ascidian Fauna.**, Journal of Biogeography 31, 1987-2009,

 Bellas J., Beiras R. & Vázquez E., **A standardisation of Ciona intestinalis (Chordata, Ascidiacea) embryo-larval bioassay for ecotoxicological studies**, Water Research 37, 4613-4622,

 Vázquez E. & Young C.M., **Responses of compound ascidian larvae to haloclines.**, Marine Ecology Progress Series 113, 179-190.,

 Young C.M., Vázquez E., Metaxas A. & Tyler P.A, **Embryology of Vestimentiferan Tube Worms from Deep-sea Methane/Sulfide Seeps**, Nature 381, 514-516.,

Capuccino, J.G., N. Sherman, **Microbiology. A laboratory Manual**, 12ª ed, Benjamin/Cummings Company Inc., 2019

Johnson, T.R., C.L. Case, **Laboratory Experiments in Microbiology**, 12ª ed, Pearson, 2019

Recommendations

Other comments

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

IDENTIFYING DATA				
Food safety and quality. Hygiene, toxicology and food legislation. Risks prevention				
Subject	Food safety and quality. Hygiene, toxicology and food legislation. Risks prevention			
Code	V11M085V02105			
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	http://http://webs.uvigo.es/pesca_master/			
General description	Through the study of this subject, the student is expected to be able to analyze the evaluation of toxic risk through the identification of dangers and the evaluation of exposure to toxic substances through the intake of foods of marine origin, as well as manage a food crisis. To this end, the agenda of this subject will address various issues on: physical-chemical-biological parameters of the characterization of the quality of foods of marine origin, the basic principles of General Toxicology, and Food Safety, and the application of the same to fishery products (studying the toxicology of marine toxins, metals, emerging toxic agents, etc.), and the current regulations on these issues and on occupational risk prevention in the fishing and canning industries.			

Training and Learning Results	
Code	
A1	Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.
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.
A4	That students know how to communicate their conclusions, and the knowledge and ultimate reasons that sustain them, to specialized and non-specialized audiences in a clear and unambiguous way.
B1	That the students acquire the comprehension, analysis and synthesis capacities.
B4	That the students develop the problem-solving abilities of application of the theoretical knowledge in practice.
C2	Know the parameters of safety and characterization of the quality of fishery products, as well as their possible toxicological risks, and the legislation applicable to such products.
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.
D2	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.
D5	Commitment to ethics in the profession and in society.

Expected results from this subject	
Expected results from this subject	Training and Learning Results
That the students acquire the knowledge of quality control of fishing and aquaculture products.	A1 A2 B1 B4 C2 D1 D2
That students know the principles of toxicology: marine toxins, metals, toxic agents, etc.	A1 A4 B1 B4 C2 D1 D2

That students know the aspects of chemical and biological safety in foods of marine origin.	A1 A2 A4 B1 B4 C2 D1 D2
For students to develop hazard identification and food safety limits skills.	A1 A4 B1 B4 C2 D2 D5
That the students know the legislation related to the quality of the products of the fishing and the aquaculture, as well as risk prevention.	A1 A2 B1 C2 D2 D5

Contents	
Topic	
1.-Quality control parameters of fishery and aquaculture products according to EU regulations.	(*)
2.-Principles of General Toxicology	(*)
3.-Chemical and biological safety in foods of marine origin: marine toxins, metals, emerging toxic agents, etc.	(*)
4.-Characterization of food risk through the identification of hazards and the evaluation of exposure to toxins through food intake. Security limits. Parameters used in food safety.	(*)
5.-Crises related to food security. Rapid alert system, crisis management and emergency situations. Food toxicological surveillance. European, national and regional organizations related to food safety.	(*)
6.-Legislation relating to the quality of fishery and aquaculture products.	(*)
7.-Prevention of occupational hazards in industries related to fishing and aquaculture products.	(*)

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	16	40	56
Case studies	4	7	11
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.
Case studies	Resolution of cases, doubts and queries both individually or in a small group regarding the follow-up and study of the course contents.
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.
Case studies	The student will be guided in the acquisition of basic skills and problem solving related to the subject matter of study. The progress of the student will be monitored.
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	A1 B4	B1	C2	D1 D2
Case studies	Problem solving and practical cases will be evaluated, as well as the student's autonomous work.	20	A2 A4	B1 B4	C2	D1 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	A1 A4	B1 B4	C2	D1 D5
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	A1 A4	B1 B4	C2	D1 D5

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

Stine, K.E.Ç Brown, T.M., **Principles of Toxicology**, 3ª,

Shibamoto, Takayuki, **Introduction to food toxicology**, 2ª,

Cabaleiro Portela, Víctor Manuel, **Prevención de riesgos laborales: normativa de seguridad e higiene en el puesto de trabajo**,

Complementary Bibliography

Botana, L. M.; Alfonso, A., **Phycotoxins. Chemisyry and Biochemistry**, 2ª,

Recommendations

Other comments

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

IDENTIFYING DATA				
Chemical analysis of fishery products. Biotic and abiotic contaminants. Quality control in the laboratory.				
Subject	Chemical analysis of fishery products. Biotic and abiotic contaminants. Quality control in the laboratory.			
Code	V11M085V02106			
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	http://http://webs.uvigo.es/pesca_master/			
General description	This course is intended for students to acquire the necessary knowledge about the chemical composition and nutritional aspects of fishery and aquaculture products. Likewise, aspects related to the analysis of biotic and abiotic contaminants (heavy metals, marine biotoxins, biogenic amines, etc.) in them will be delved into, indicating the most appropriate analytical methodology in each case and the basic tools that allow data to be obtained. quality in the laboratory.			

Training and Learning Results	
Code	
A1	Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.
A4	That students know how to communicate their conclusions, and the knowledge and ultimate reasons that sustain them, to specialized and non-specialized audiences in a clear and unambiguous way.
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.
B5	That the students develop the abilities of teamwork, enriched by the pluridisciplinarity.
C3	Acquire basic knowledge about laboratory analytical control of fishery products, including the biotic and abiotic contaminants potentially present in them.
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.
D2	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.
D5	Commitment to ethics in the profession and in society.

Expected results from this subject	
Expected results from this subject	Training and Learning Results
That students know the chemical composition and nutritional aspects of fishery products and aquaculture.	A1 B1 C3 D1 D2
That the students know the techniques of atomic and chromatographic spectroscopy in the analysis of fishing products	A4 B1 B5 C3 D2

That the students know the biotic and abiotic contaminants and their analysis.	A4 A5 B1 C3 D1 D5
That the students know the metallic toxins, amines and marine biotoxins and their analysis.	A1 A4 B5 C3 D1 D2
That the students know the quality control in an analytical laboratory, reference materials and validation.	A4 A5 B5 C3 D2 D5

Contents	
Topic	
1. Chemical composition and nutritional aspects of fishery and aquaculture products.	(*)
2. The analytical process of decision making and experimentation to consider. Analytical methodology.	(*)
3. Biotic and abiotic contaminants and their analysis.	(*)
4. Metallic toxins: speciation and analysis.	(*)
5. Biogenic amines and their analysis.	(*)
6. Marine biotoxins and their analysis.	(*)
7. Quality control in the analytical laboratory. Reference materials. Validation.	(*)
(*)TEMA 8. Técnicas cromatográficas acopladas a espectrometría de masas.	(*)*

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	16	40	56
Case studies	4	7	11
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.
Case studies	Resolution of cases, doubts and queries both individually or in a small group regarding the follow-up and study of the course contents.
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.
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.
Case studies	The student will be guided in the acquisition of basic skills and problem solving related to the subject matter of study. The progress of the student will be monitored.

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	A1 A4	B1	C3	D1 D2
Case studies	Problem solving and practical cases will be evaluated, as well as the student's autonomous work.	20	A4 A5	B5	C3	D2 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	A4 A5	B1 B5	C3	D1 D5
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	A4 A5	B1 B5	C3	D1 D5

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

Ruiter A., **El pescado y los productos derivados de la pesca: composición, propiedades nutritivas y estabilidad**, Ed. Acribia,

Valcarcel M, **Principios de Química Analítica**, Springer-Verlag Ibérica, Barcelona.,

Ashurst P.R., Dennis M.J., **Analytical Methods of Food Authentication**, Black Academic and Professional, London.,

Watson, D.H., **Natural Toxicants in Food**, Academic Press,

Complementary Bibliography

Sorensen H., Sorensen S. (, **Chromatography and capillary electrophoresis in food analysis,**, Royal Society of Chemistry, London,

Ebdon L., Pitts L., Cornelis R., Crews H., Donard O.F.X., Quevauviller Ph., **Trace Element Speciation for Environment Food and Health**, Royal Society of Chemistry, UK,

D'Mello J.P.F., **Food Safety: Contaminants and Toxins**, CABI Publishing, USA.,

Campañó Beltrán R., Ríos A, **Garantía de la calidad en los laboratorios analíticos,**, Ed. Síntesis, Madrid,

Recommendations

Other comments

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

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	http://http://webs.uvigo.es/pesca_master/			
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	Training and Learning Results
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 EFLUENTS	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

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Complementary Bibliography

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Spiro, T.G. y Stigliani, W.M, **Química medioambiental**, Ed.. Prentice Hall Inc,

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Recommendations

Other comments

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

IDENTIFYING DATA				
Business and social aspects				
Subject	Business and social aspects			
Code	V11M085V02108			
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	http://http://webs.uvigo.es/pesca_master/			
General description	The aim is for the student to have basic knowledge of aspects related to business strategies, marketing, internationalization, R+D+i projects, technological innovation, etc., all linked to the fishing sector. Concepts of sustainability are also introduced in the exploitation of fishery products and the legislation that pertains to them.			

Training and Learning Results	
Code	
A1	Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.
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.
A4	That students know how to communicate their conclusions, and the knowledge and ultimate reasons that sustain them, to specialized and non-specialized audiences in a clear and unambiguous way.
B1	That the students acquire the comprehension, analysis and synthesis capacities.
B4	That the students develop the problem-solving abilities of application of the theoretical knowledge in practice.
C6	Acquire knowledge about marketing and marketing for fishery and aquaculture products.
C7	Know the operations and basic technologies used in the conservation and transformation of sea products by cold, heat or other physical-chemical methods: refrigeration, freezing, sterilization, pasteurization, semi-preservation.
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.
D2	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.
D5	Commitment to ethics in the profession and in society.

Expected results from this subject	Training and Learning Results
That students know the situation of the fishing industry in Spain	A1 A2 B4 C6 D1 D2
Acquire knowledge about business management in industries of the sector, market analysis and diagnosis	A1 A2 B1 B4 C6 D1 D2
Commercialization and marketing for fishery and aquaculture products	A2 A4 B4 C7 D1 D5

Learn about overexploited or endangered species and assess the importance of sustainability in the exploitation of fishery products.	A2 A4 B4 C6 C7 D1 D5
That students know the bases and training for R&D&i projects.	A2 A4 B1 C6 C7 D1 D2
That students develop the skills to carry out practical cases of internationalization.	A2 A4 B1 C6 C7 D2 D5

Contents	
Topic	
1. The market: analysis and diagnosis. Commercialization and Marketing. New business management strategies.	(*)
2. Internationalization: factors, strategy design and international agreements.	(*)
3. Bases and training for R+D+i projects. Technological Innovation in the Food Industry. Situation of this industry in Spain.	(*)
4. Practical cases of internationalization.	(*)
5. Exploitation of fishery products: sustainability and identification of overexploited or endangered species. Applicable legislation.	(*)

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	16	40	56
Case studies	4	7	11
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.
Case studies	Resolution of cases, doubts and queries both individually or in a small group regarding the follow-up and study of the course contents.
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.
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.
Case studies	The student will be guided in the acquisition of basic skills and problem solving related to the subject matter of study. The progress of the student will be monitored.

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	A1	B1	C6 C7	D1 D2
Case studies	Problem solving and practical cases will be evaluated, as well as the student's autonomous work.	20	A1 A2	B1 B4	C6 C7	D1 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 A4	B4	C6 C7	D1 D5
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 A4	B4	C6 C7	D1 D5

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

Strategor, **Estrategia, estructura, dicisión e identidad**,

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Etxezarreta, M. (coord.), **La Agricultura española en la era de la globalización.**, Madrid: Servicio de Publicaciones del Ministerio de Agricultura, Pesca y Alimentación,

Complementary Bibliography

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informes elaborados, además del ICEX, ANFACO-CECOPESCA,

Recommendations

Other comments

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

IDENTIFYING DATA

Cold Storage: Freezing and Refrigeration Procedures and Technologies

Subject	Cold Storage: Freezing and Refrigeration Procedures and Technologies			
Code	V11M085V02205			
Study programme	Máster Universitario en Ciencia y Tecnología de Conservación de Productos de la Pesca			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	5	Mandatory	1st	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Longo González, María Asunción			
Lecturers				
E-mail				
Web	http://http://webs.uvigo.es/pesca_master/			
General description	This course studies the effect of refrigeration and freezing on fishery and aquaculture products, as well as the various application technologies for these processes and their influence on the extension of the useful life of said products. For this, the theoretical basis of the cooling processes are analyzed, the alterations that their application produces in the characteristics of the fishery products, and the theoretical and practical aspects of their quality control in the laboratory during their conservation period. The various methods and equipment used and the logistical aspects of the cooling, conservation and storage of these products, both on board and on land, including traceability, as well as the thawing processes and the production lines from the frozen product, are also studied.			

Training and Learning Results

Code	
A1	Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.
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.
A4	That students know how to communicate their conclusions, and the knowledge and ultimate reasons that sustain them, to specialized and non-specialized audiences in a clear and unambiguous way.
B1	That the students acquire the comprehension, analysis and synthesis capacities.
B4	That the students develop the problem-solving abilities of application of the theoretical knowledge in practice.
C8	Study the different forms of preparation and packaging systems for sea products treated by cold, heat or other methods, both traditionally and new technological orientations: restructured products, prepared dishes, modified atmospheres, high pressures, etc.
C9	Understand the organization of production in the industry of fishery and aquaculture products treated by cold, heat and other processes. Production methods and their logistics.
C10	Determine the criteria and procedures for the control of the quality of the products of the fishing and of the containers and packaging used in its commercial circuit. Know the procedures for its analytical control and defect detection.
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.
D2	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.
D5	Commitment to ethics in the profession and in society.

Expected results from this subject

Expected results from this subject	Training and Learning Results

That the students know the various forms of elaboration in packaging systems for cold-treated sea products: refrigeration and freezing. Understand the nature, properties and types of ice.	A1 A4 B1 B4 C8 C9 D1 D2
That the students know other refrigeration systems (temperature below zero; mixture of water and ice; liquid ice)	A1 A4 B1 B4 C8 D1 D2
That students know the characteristics of frozen seafood products (in the factory and on board)	A1 A3 B1 B4 C8 C9 D1 D2
That the students know the logistics of the product and its traceability	A1 A4 B1 B4 C9 C10 D1 D2 D5
That students know the extension of the shelf life of refrigerated fishery products. Chemical preservatives.	A1 A3 B4 C8 C9 C10 D1 D5
That the students know the lines of elaboration and packaging of products from the frozen and refrigerated product.	A3 A4 B1 C9 C10 D2 D5
That students know the logistics of storage, production and placing on the market and use of by-products	A1 A4 B1 B4 C8 C9 C10 D2 D5

Contents	
Topic	
1. Theoretical foundations of the refrigeration and freezing process	(*)
2. Cooling of fish on board and on land.	(*)
3. Nature, properties and types of ice. Use and necessary quantity in the preservation of fish. Manufacture of ice with seawater and refrigerated seawater.	(*)
4. Other refrigeration systems (temperature below zero; mixture of water and ice; liquid ice).	(*)

5. Auxiliary material, machinery and refrigeration facilities.	(*)
6. Characteristics of frozen sea products (in the factory and on board).	(*)
7. Product logistics. Traceability.	(*)
8. Extension of the shelf life of refrigerated fishery products.	(*)
9. Chemical preservatives.	(*)
10. Methods of freezing and convenience of application.	(*)
11. Thawing and methods	(*)
12. Production lines and products from the frozen and refrigerated product.	(*)
13. Packaging and labeling systems for fresh, refrigerated and frozen products.	(*)
14. Storage logistics, production and placing on the market	(*)
15 Use of by-products: restructured products, prepared dishes.	(*)

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	28	70	98
Case studies	5	10	15
Studies excursion	3	1	4
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.
Case studies	Resolution of cases, doubts and queries both individually or in a small group regarding the follow-up and study of the course contents.
Studies excursion	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 non-academic outdoor spaces. These include field practices, visits to events, research centers, companies, institutions, etc.
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.
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.
Studies excursion	Guidance and advice in a small group by the teacher on the concepts of field practices, company visits, etc.
Case studies	The student will be guided in the acquisition of basic skills and problem solving related to the subject matter of study. The progress of the student will be monitored.

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	A1 A3	B1	C8 C9 C10	D1 D5
Case studies	Problem solving and practical cases will be evaluated, as well as the student's autonomous work.	20	A1 A4	B1 B4	C8 C9 C10	D1 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	A1	B1	C8 C9 C10	D2 D5
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	A1	B1	C8 C9 C10	D2 D5

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

- Madrid, A., Gómez Pastrana, J., Santiago, F. y Madrid, J.M., **Refrigeración, congelación y envasado de los alimentos.**, Ed.: AMV y Mundi-Prensa Libros, Madrid,
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Complementary Bibliography

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- W.A. Johnston, F.J. Nicholson, A. Roger and G.D. Stroud., **Freezing and Refrigerated Storage in Fisheries**, FAO Fisheries Technical Paper 340,
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Recommendations

Other comments

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

IDENTIFYING DATA				
Conservation by heat: Canned opening and pasteurized				
Subject	Conservation by heat: Canned opening and pasteurized			
Code	V11M085V02206			
Study programme	Máster Universitario en Ciencia y Tecnología de Conservación de Productos de la Pesca			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	5	Mandatory	1st	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Longo González, María Asunción			
Lecturers				
E-mail				
Web	http://http://webs.uvigo.es/pesca_master/			
General description	In this course, the methodologies for applying heat treatments as a means of preserving fishery and aquaculture products are studied, as well as their effect on said products and their influence on the extension of their useful life. For this, the theoretical foundations of these processes are analyzed, mainly pasteurization and sterilization, and the various techniques and equipment used during the processing of fishery products are studied, both theoretically and through practical work on the elaboration of various products in a pilot plant. . Laboratory quality control of the different raw materials used (fish, sauces, packaging...) and the final products obtained are addressed.			

Training and Learning Results	
Code	
A1	Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.
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.
A4	That students know how to communicate their conclusions, and the knowledge and ultimate reasons that sustain them, to specialized and non-specialized audiences in a clear and unambiguous way.
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).
B3	That the students develop the skills to perform experimental work, handling of material and biological elements and related programs.
B5	That the students develop the abilities of teamwork, enriched by the pluridisciplinarity.
C8	Study the different forms of preparation and packaging systems for sea products treated by cold, heat or other methods, both traditionally and new technological orientations: restructured products, prepared dishes, modified atmospheres, high pressures, etc.
C9	Understand the organization of production in the industry of fishery and aquaculture products treated by cold, heat and other processes. Production methods and their logistics.
C10	Determine the criteria and procedures for the control of the quality of the products of the fishing and of the containers and packaging used in its commercial circuit. Know the procedures for its analytical control and defect detection.
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.

Expected results from this subject	
Expected results from this subject	Training and Learning Results

That the students acquire knowledge about the phases in the elaboration of canned fish and other canned products.	A1 A3 B1 B3 C8 C9 C10 D1 D3
That students know the properties and packaging materials: heat sealing and closure control.	A3 A4 B1 B2 B5 C8 C9 C10 D1 D3
That the students know the equipment, management and control of autoclaves and the sterilization and pasteurization systems of packaged products.	A3 A4 B2 B5 C8 C9 C10 D1 D4
That the students know experimental methods for the determination of sterilization and pasteurization tables.	A1 A4 B1 B2 C8 C9 C10 D3 D4
That students know the efficient management of production, production times and energy savings of the plant.	A1 A3 B1 B3 B5 C8 C9 C10 D3 D4

Contents	
Topic	
1. Phases in the preparation of canned fish and other canned products (prepared dishes).	(*)*
2. Properties and packaging materials.	(*)*
3. Definition and formation of the seam and heat sealing. Control of closings.	(*)*
4. Equipment, management and control of autoclaves and pasteurisers.	(*)
5. Sterilization and pasteurization systems for packaged products.	(*)
6. Experimental methods for the determination of sterilization and pasteurization tables.	(*)
7. Theoretical foundations of the sterilization and pasteurization process.	(*)
8. Production and time management and correct design of the Factory Layout.	(*)
9. Principles of economy of movements. Bimanual diagrams.	(*)

10. Efficient management, energy and input savings. (*)

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	26	65	91
Laboratory practical	10	16	26
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 are developed in special spaces with specialized equipment (laboratories, pilot plant, etc.
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	Advice, in a small group, by the teacher on the theoretical and practical concepts of the laboratory practices of the subject.
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	A1 A3	B1 B2	C8 C9 C10	D1 D4
Laboratory practical	The performance and results of the practices and the completion of the practice report or questionnaire.	20	A3 A4	B2 B3 B5	C8 C9 C10	D3 D4
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	A3 A4	B1 B3 B5	C8 C9 C10	D1 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	A3 A4	B1 B3 B5	C8 C9 C10	D1 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

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 FAO/WHO, CAC/RCP 23-1979, **Recommended International Code of Hygienic Practice for Low-Acid and Acidified Low-Acid Canned Foods, in CODEX ALIMENTARIUS**, FAO Information Division - Food And Agriculture Organization of the United Nations & World H,

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 Richardson P, **Thermal Technologies in Food Processing.**, Woodhead Publishing Limited and CRC Press LLC, Cambridge, England,

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Complementary Bibliography

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Recommendations

Other comments

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

IDENTIFYING DATA				
Physical and Chemical Treatments				
Subject	Physical and Chemical Treatments			
Code	V11M085V02301			
Study programme	Máster Universitario en Ciencia y Tecnología de Conservación de Productos de la Pesca			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Mandatory	1st	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Longo González, María Asunción			
Lecturers				
E-mail				
Web	http://webs.uvigo.es/pesca_master/			
General description	In this course, the different physical and chemical procedures used to prolong the useful life of fishery and aquaculture products are addressed, starting with the more traditional methods, to the more innovative ones. It will focus on the use of traditional methods that have been superseded from a technological point of view but which are organoleptically important and offer diversification for the consumer and, at the other extreme, the use of advanced technologies to supply products and lengthen the useful life and considerations necessary to choose the appropriate packaging depending on the type of food, technological process and storage conditions.			

Training and Learning Results	
Code	
A1	Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.
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.
B4	That the students develop the problem-solving abilities of application of the theoretical knowledge in practice.
C8	Study the different forms of preparation and packaging systems for sea products treated by cold, heat or other methods, both traditionally and new technological orientations: restructured products, prepared dishes, modified atmospheres, high pressures, etc.
C9	Understand the organization of production in the industry of fishery and aquaculture products treated by cold, heat and other processes. Production methods and their logistics.
C10	Determine the criteria and procedures for the control of the quality of the products of the fishing and of the containers and packaging used in its commercial circuit. Know the procedures for its analytical control and defect detection.
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.
D2	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.
D5	Commitment to ethics in the profession and in society.

Expected results from this subject	
Expected results from this subject	Training and Learning Results
To know the processes involved in the production of semi-preserved products at an industrial level.	A1 A3 B1 B4 C8 C9 D1 D2

That the students know the manufacturing techniques of smoked products and the technological variables.	A1 A5 B4 C9 C10 D1 D5
Acquire knowledge about packaging and its types, for this range of products. Know the process of closing the products.	A3 A5 B1 B4 C8 C9 C10 D1 D2
That the students know the biotechnological methods of conservation of fishery products.	A1 B1 B4 C8 C9 C10 D2 D5
To understand the different aspects and the importance of traditional treatments in this range of products. To understand production methods and logistics	A3 A5 B4 C8 C9 C10 D2 D5

Contents

Topic	
1. General considerations on manufacturing processes of semi-preserves.	- Process of production of anchovy in salting and fillets of anchovy, codfish in salting, etc.
2. Manufacture of smoked products. Technological variables.	- Production of smoked salmon, herring, etc. - Technological variables of the process and their incidence in the characteristics of the final product. - Controls applicable in industrial processing.
3. Specific packaging processes.	- Packaging in modified atmospheres and controlled atmospheres. - Additives and technological adjuvants, bacteriocins. - Novel procedures: high pressures, electrical pulses, microwave, ohmic heating. - Active and intelligent packaging.
4. Biotechnological methods of conservation of fishery products.	- Bioconservation. Protective cultures. Bacteriocins. Probiotics. - Other methods for natural conservation of fish products: essential oils, spices, other additives. - Production of additives for fishing industries. - Trends in Functional Foods.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	14	35	49
Case studies	4	8	12
Studies excursion	2	4	6
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.
Case studies	Resolution of cases, doubts and queries both individually or in a small group regarding the follow-up and study of the course contents.
Studies excursion	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 non-academic outdoor spaces. These include field practices, visits to events, research centers, companies, institutions, etc.
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.
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.
Studies excursion	Guidance and advice in a small group by the teacher on the concepts of field practices, company visits, etc.
Case studies	The student will be guided in the acquisition of basic skills and problem solving related to the subject matter of study. The progress of the student will be monitored.

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	A1 A3	B1	C8 C9 C10	D1 D2 D5
Case studies	Problem solving and practical cases will be evaluated, as well as the student's autonomous work.	20	A1 A3 A5	B1 B4	C8 C9 C10	D1 D2 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	A1 A3	B1 B4	C8 C9 C10	D2 D5
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	A1 A3	B1 B4	C8 C9 C10	D2 D5

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

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Recommendations

Other comments

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IDENTIFYING DATA				
Product Innovation and Process				
Subject	Product Innovation and Process			
Code	V11M085V02402			
Study programme	Máster Universitario en Ciencia y Tecnología de Conservación de Productos de la Pesca			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Mandatory	1st	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Longo González, María Asunción			
Lecturers				
E-mail				
Web	http://webs.uvigo.es/pesca_master/			
General description	This course will cover aspects such as the description of the process of launching a new product, approach and development of life studies, methodologies for the development of new products, innovation in process, future prospects in fishery and aquaculture products, methodologies for estimating production costs, map of R&D&I funding.			

Training and Learning Results	
Code	
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.
A4	That students know how to communicate their conclusions, and the knowledge and ultimate reasons that sustain them, to specialized and non-specialized audiences in a clear and unambiguous way.
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.
B4	That the students develop the problem-solving abilities of application of the theoretical knowledge in practice.
C15	Know the critical variables that determine the viability of a product or novel processes. Use tools to obtain critical information for feasibility.
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.
D2	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.
D5	Commitment to ethics in the profession and in society.

Expected results from this subject	
Expected results from this subject	Training and Learning Results
That students know the management and innovation to develop new processes and new products successfully	A3 A4 B1 B4 C15 D1 D2
That students know the future prospects of fishing and aquaculture products.	A3 A5 B1 B4 C15 D2

That students know innovation in new types of packaging	A3 A5 B1 B4 C15 D2 D5
That students know the necessary aspects for the processing of R&D&i grants.	A3 A4 B1 B4 C15 D2 D5

Contents	
Topic	
1. Processing and conservation of sea products.	- Managing innovation for the succesful development of new products and new processes.
2. Elaboration of new products.	- Methodologies for the development of novel products
3. Creative processes applied to the innovation.	- Future prospects for fishery and aquaculture products.
4. Innovation in packaging.	- General aspects - Use of polymers.
5. R&D&I funding	- Map of funding - The environment of public support for innovation

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	14	35	49
Case studies	4	8	12
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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
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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**
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Case studies	The student will be guided in the acquisition of basic skills and problem solving related to the subject matter of study. The progress of the student will be monitored.

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	A3 A4	B1	C15	D1 D2
Case studies	Problem solving and practical cases will be evaluated, as well as the student's autonomous work.	20	A3 A4 A5	B1 B4	C15	D1 D2 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	A3 A5	B4		D2 D5
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	A3 A5	B4		D1 D5

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

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Recommendations

Other comments

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