



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,
- María del Carmen Torrens Quesada, Mariano Chirivella Caballero, **Planta de manipulación, envasado y congelado de productos de la pesca.**, Ed.: Universidad Politécnica de Las Palmas, Escuela Universitaria Politécnica,
- Justo Nombela Maqueda, Aurora de Blas Carbonero., **Guía técnica de manipulación a bordo de productos pesqueros. Vol. I: Productos congelados**, Ed.: Ministerio de Agricultura, Pesca y Alimentación, Centro de Publicaciones,
- Justo Nombela Maqueda, **Guía técnica de manipulación a bordo de productos pesqueros. Vol. II: Productos frescos**, Ed.: Ministerio de Agricultura, Pesca y Alimentación, Centro de Publicaciones, Madrid,,
- Zdzislaw E. Sikorski., **Tecnología de los productos del mar: Recursos, composición nutritiva y conservación**, Editorial Acribia S.A., Zaragoza, España,

Complementary Bibliography

- J. Graham, W.A. Johnston y F.J. Nicholson, **El hielo en las pesquerías**, FAO. Documento técnico de pesca nº 331,
- Huss, H.H., **Aseguramiento de la calidad de los productos pesqueros. Laboratorio Tecnológico. Ministerio de Pesca. Dinamarca**, FAO. Documento técnico de pesca nº 334,
- W.A. Johnston, F.J. Nicholson, A. Roger and G.D. Stroud., **Freezing and Refrigerated Storage in Fisheries**, FAO Fisheries Technical Paper 340,
- Huss, H.H. (1998)., **El pescado fresco: su calidad y cambios de su calidad. Laboratorio Tecnológico. Ministerio de Pesca. Dinamarca.**, FAO. Documento técnico de pesca nº 348,
- FAO/WHO, CAC/RCP 52-2003, **Code of Practice for Fish and Fishery Products, in CODEX ALIMENTARIUS.**, FAO Information Division - Food And Agriculture Organization of the United Nations & World H,
- FAO/WHO, CAC/GL 31-1999, **Directrices del Codex para la Evaluación Sensorial del Pescado y los Mariscos en Laboratorio. CODEX ALIMENTARIUS.**, FAO Information Division - Food And Agriculture Organization of the United Nations & World H,

Recommendations

Other comments

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