

Milk and Dairy Products

Code: 102648
ECTS Credits: 6

Degree	Type	Year	Semester
2501925 Food Science and Technology	OT	4	2
2502445 Veterinary Medicine	OT	5	0

Contact

Name: Antonio José Trujillo Mesa
Email: Toni.Trujillo@uab.cat

Use of Languages

Principal working language: spanish (spa)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

Teachers

Marta Capellas Puig
Victoria Ferragut Pérez
Manuel Castillo Zambudio
Bibiana Juan Godoy

Prerequisites

This course is an optional multi-purpose subject since it can be taken by the students of the CTA degree (4th year) and the Veterinary degree (5th year). Although there are no official prerequisites, it is advisable that the student has taken the following subjects in CTA degree (Food processing methods I and II, Pilot plant practices) and Veterinary degree (Food Science, Food Technology and Food Safety and Inspection).

Objectives and Contextualisation

The course of Science and Technology of Milk is an optional subject and belongs to the subject Food Technology. This course has the purpose of orientating towards the specialization in future professional activities, and it complements the courses of Food Processing Methods I and II, and Pilot Plant Practices. The general objective of the course is that the student achieves a profound training in the dairy industry, able to respond to the qualification demanded by the job market, strongly marked by the need to make profitable the technological productive processes.

Objectives of the course:

- Identify the main structures and components of milk, relating their functions, characteristics and possible interactions
- Apply and understand the different treatments to which the milk can be subjected from the moment it is extracted from the animal producer until it reaches the consumer

- Apply knowledge of the milk science to the processes of obtaining milk and milk products to determine and analyze the possible causes of deterioration and how to avoid it, as well as the alterations produced to the main components of milk by the technological treatments applied and storage, to prevent and control deterioration reactions

- Establish and understand the production processes of different types of milk and milk products, and know their characteristics, composition and technology

Competences

Food Science and Technology

- Analyse, summarise, resolve problems and make professional decisions.
- Apply the principles of processing techniques and evaluate their effects on the quality and safety of the product.
- Apply the scientific method to resolving problems.
- Communicate effectively with both professional and non-professional audiences, orally and in writing, in the first language and/or in English.
- Develop individual learning strategies and planning and organisation skills.
- Search for, manage and interpret information from different sources.
- Show understanding of the mechanisms by which raw materials deteriorate and the reactions and changes that take place during storage and processing, and apply the methods for controlling this.
- Use IT resources for communication, the search for information within the field of study, data processing and calculations.

Veterinary Medicine

- Apply food technology to the preparation of food for human consumption.
- Comunicar la informació obtinguda durant l'exercici professional de manera fluïda, oralment i per escrit, amb altres col·legues, autoritats i la societat en general.
- Demonstrate knowledge of the rights and duties of the veterinarian, with a special focus on ethical principles
- Perform risk analyses, including those of environmental and biosafety, and evaluate and manage them.
- Work effectively in single or multidisciplinary teams and show respect, appreciation and sensitivity for the work of others.

Learning Outcomes

1. Analyse, summarise, resolve problems and make professional decisions.
2. Apply specific technological processes to the preparation of milk and dairy products, meat and derived products, and fishing, egg and plant products, and understand the modifications derived from the application of these processes to the finished product.
3. Apply suitable methodologies and tests to evaluate the salubrity of milk, meat, fishing products, eggs, plants and derived products, as well as products made in collective catering establishments.
4. Apply the scientific method to resolving problems.
5. Apply the technological processes that are specific to milk and dairy products, meat and meat derivatives, fish products, egg products and vegetable products, and understand the modifications to the final product that these processes make.
6. Communicate effectively with both professional and non-professional audiences, orally and in writing, in the first language and/or in English.
7. Communicate information obtained during professional exercise in a fluid manner, orally and in writing, with other colleagues, authorities and society in general.
8. Develop individual learning strategies and planning and organisation skills.
9. Distinguish the main environmental risks related with the companies in the dairy, meat, fishing and aquaculture, eggs and egg product and fruit and vegetable sectors, as well as collective catering establishments and apply the most suitable measures for their control.
10. Foresee and resolve specific problems in these industries.

11. Recognise the changes, alterations and adulterations suffered by milk, meat, fishing products, eggs, plants and derived products, as well as products made in collective catering establishments.
12. Recognise the changes, spoilage and adulterations that can affect milk, meat, fish products, eggs, vegetables and products deriving from these, and also products made in group catering businesses.
13. Recognise the dangers to milk, meat, fishing products, eggs, plants and derived products, as well as products made in collective catering establishments, and evaluate the risk involved for different consumers.
14. Search for, manage and interpret information from different sources.
15. Select processes of conservation, transformation, transport and storage that are suited to foods of animal and plant origin.
16. Use IT resources for communication, the search for information within the field of study, data processing and calculations.
17. Work effectively in single or multidisciplinary teams and show respect, appreciation and sensitivity for the work of others.

Content

Block I. Milk science

History and current situation of the dairy industry. General characteristics of milk. Milk microbiology. Major and minor components (proteins, lipids, lactose and other carbohydrates, minerals, vitamins, enzymes, ...). Goat and sheep milks

Block II. Milk technology

Milk treatments at the farm. Initial treatments of milk at the industry. Pasteurization and sterilization. Concentrated and dehydrated milks. Modifications related to the initial treatments, produced by thermal treatments and by concentration and dehydration technologies.

Block III. Technology of dairy products

Cream, butter, ice cream, smoothies and desserts. Milk coagulation. Yogurt and other fermented milks. Cheese. Dairy industry by-products (whey cheese, buttermilk, ...). Caseins, caseinates, whey proteins and coprecipitates.

Block IV. Current trends in the dairy products market

Milk and special dairy products (lactose-free, with vitamins, with functional products, probiotics, prebiotics, symbiotic, milk formula, ...).

PRACTICE PROGRAM

P1 Milk standardization. Cream and butter (4 h)

P2 Ice cream elaboration (4 h)

P3. Elaboration of ripened cheese (4 h)

P4 Yogurt preparation and analysis (3 h)

SEMINARS PROGRAM

CASES (ABP: problem-based learning)

S1 Resolution and discussion of cases (3 h)

S2. Resolution and discussion of cases (3 h)

The distribution and presentation of the cases will be done in class and the follow-up of the cases by tutorials.

Methodology

1. Theoretical classes

The student acquires the scientific knowledge of the subject by attending the lectures (master classes) and complementing them with the personal study of the topics explained. These classes are the activities in which less interaction is required of the student since they are conceived as a fundamentally unidirectional method of transmitting the knowledge of the teacher to the student.

2. Seminars and Self-Learning Work (ABP: problem-based learning)

The seminars are designed to discuss and resolve doubts and learn more about the subject. Throughout the course, cases related to milk and dairy products will be considered. These cases will be developed through the following work scheme: presentation and assignment of the cases to be solved, follow-up of the cases by tutoring, and resolution of the case by oral presentation. These cases will be developed through 2 seminars.

3. Pilot plant practices

The part of practical development of this subject will be done in small groups at the pilot plant of Food Technology. The objective of the practical classes is to complete, apply and reinforce the knowledge acquired to the theoretical classes. The students will realize the practical sessions based on a script that previously they will have to read. Based on the knowledge acquired from the pilot plant, the results obtained and the bibliography provided by the professors, the student will have to answer and deliver questionnaires about the practices of the pilot plant in order to determine the practical contents.

4. Visits to dairies

The visits to the companies are of great educational importance in that they rely on techniques and materials for learning, influencing very positively in the improvement of learning, as well as in the motivation of the students. Throughout the academic year, one or two visits to dairies will be planned.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Pilot Plant Practices	15	0.6	
Seminars	6	0.24	1, 4, 5, 2, 3, 14, 7, 6, 8, 9, 10, 12, 11, 13, 15, 17, 16
Theoretical classes	30	1.2	1, 4, 5, 2, 3, 14, 8, 10, 12, 11, 13, 15
Visit to dairies	2	0.08	5, 2, 3, 9, 10, 12, 11, 13, 15
Type: Supervised			
Tutorials	6	0.24	1, 4, 5, 2, 3, 14, 7, 6, 8, 9, 10, 12, 11, 13, 15, 17, 16
Type: Autonomous			
Evaluation	3	0.12	1, 4, 5, 2, 3, 9, 10, 12, 11, 13, 15
Self-learning	40	1.6	1, 4, 5, 2, 3, 14, 8, 9, 10, 12, 11, 13, 15, 17, 16
Study	44	1.76	1, 4, 5, 2, 3, 14, 8, 9, 10, 11, 13, 15, 16

Assessment

The competences of this subject will be evaluated by:

- a) An individual control of the contents of the thematic block I by examining by short-medium development or test questions, with a weight of 15% of the final grade.
- b) Individual global control of the contents of all the blocks (I-IV) by examining medium development question, with a weight of 40% of the final grade.
- c) Self-learning work. The group of students that will present and defend the proposed cases will be evaluated. Each student will participate in the resolution of a case that will weigh 20% of the final grade. To obtain this note it is essential that the student has participated in the oral presentation of the assigned subject as well as having attended the two case resolution seminars which will be subject of examination. Also for each of the thematic blocks I, II and III will be a small individual self-learning work in class that will be corrected by pairs and will have a global weight of 5% of the final grade.
- d) The evaluation of pilot plant practices and the questionnaire of these practices will have a weight of 20% of the grade and are subject of examination. To obtain this note it is essential to have completed all the practices that are compulsory and have delivered the questionnaire included in each practice to the corresponding teacher. Two of these unrealized practices, at most, can be recovered through works assigned by the professor responsible for the practices and delivered before the individual global control.

To pass the subject an average of 5 points (1-10 score) is requested, taking into account these minimums:

- a) a minimum of 5 points (1-10 score) in each of the controls; in case of undershoot this goal, one final examination test will be given by each trainee
- b) a minimum of 5 points (1-10 score) in cooperative activities
- c) It is generally considered that a student is not evaluable if he has participated in evaluation activities that represent $\leq 15\%$ of the final grade

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Cooperative activities (PBL seminars, results of pilot plant practices, and small self-learning work)	45% (20% practices, 20% PBL and 5% small self-learning work)	1	0.04	1, 4, 5, 2, 3, 14, 7, 6, 8, 9, 10, 12, 11, 13, 15, 17, 16
Partial control of Block I and global control including all blocks, cases and practices	55% (15% partial control and 40% global control)	3	0.12	1, 4, 5, 2, 3, 6, 9, 10, 12, 11, 13, 15

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FOX, P.F. McSWEENEY, L.H. (2006). Advanced dairy chemistry:. Vol. II. Lipids Kluwer Academic/Plenum: Springer, cop., Nueva York.

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Electronic resources

A.O.A.C. Official methods of analysis <http://www.eoma.aoac.org/>

Llibres electrònics <http://www.knovel.com/web/portal/browse/subject/60/filter/0/>

Science Direct <https://www.sciencedirect.com/science/book>

Scopus <http://www.scopus.com/home.url>

Journal of Dairy Research <http://journals.cambridge.org/action/displayJournal?jid=dar>

Journal of Dairy Science <http://www.journalofdairyscience.org/>

International Dairy Journal <http://www.journals.elsevier.com/international-dairy-journal/>

Dairy Science and Technology (Le Lait) <https://www.springer.com/food+science/journal/13594>

ILE, Industrias Lácteas Españolas <http://dialnet.unirioja.es/servlet/revista?codigo=2831>

Milchwissenschaft <http://www.milkscience.de/menu-top/about-the-journal/>

Websites of interest

American Dairy Science Association <http://www.adsa.org>

Center for Dairy Research Universidad de Wisconsin <http://www.cdr.wisc.edu>

Codex Alimentarius Commission
<https://www.fsis.usda.gov/wps/portal/fsis/topics/international-affairs/us-codex-alimentarius/Codex+Alimentarius+C>

Directorate General for Health & Consumers http://ec.europa.eu/dgs/health_consumer/index_en.htm

European Dairy Association <http://eda.euromilk.org>

European Food Safety Authority (EFSA) <http://www.efsa.europa.eu/>

Food and Drug Administration (FDA) <http://www.fda.gov>

International Dairy Federation (IDF-FIL) <https://www.fil-idf.org/>