

Introduction to Food Technology

Code: 101017
ECTS Credits: 6

Degree	Type	Year	Semester
2500502 Microbiology	OT	4	0

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

Contact

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Use of Languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: No
Some groups entirely in Spanish: No

Teachers

Marta Capellas Puig
Montserrat Mor-Mur Francesch
Reyes Pla Soler
Bibiana Juan Godoy
Jordi Saldo Periago

Prerequisites

There are no official prerequisites, but it is essential that the student review the knowledge of Physics, Chemistry, Microbiology and Biochemistry.

Objectives and Contextualisation

What we eat every day and how we do it depends on our health. And also our economy, since the agri-food sector is one of the most money that moves in our country. In Catalonia, there are many food industries which must ensure healthy and safe products.

The administration, on the other hand, must carry out official controls to ensure specific legislation.

In the first part (Unit 1), food science is studied, in which the student must acquire the basic, theoretical and practical knowledge about the characteristics, composition and alteration of foodstuffs for human consumption. In the second part (Units 2 and 3), food technology is studied, in which the knowledge of the technologies principles used to obtain safe and healthy foods is acquired.

Training objectives:

At the end of the course students will be able to:

- Recognize the components and ingredients of foods, and their functions and properties
- Recognize the additives and their main functions
- Identify specific food quality indicators
- Relate components, properties and quality indicators
- Identify the food deterioration mechanisms

- Evaluate the possibility and probability of deterioration of a food for a specific cause
- Describe the main processes of transformation and / or conservation of foods, the consequences that they have on the food compounds and the raw materials and the parameters of control.
- Identify the main characteristics of food industries derived from raw materials of animal and plant origin.

Competences

- Apply knowledge of theory to practice
- Apply microorganisms or their components to the development of products of interest in health, industry and technology.
- Communicate orally and in writing.
- Design and use disinfection and sterilisation treatments and also methods for assessing their effectiveness.
- Identify and solve problems.
- Obtain, select and manage information.
- Use bibliography or internet tools, specific to microbiology or other related disciplines, both in English and in the first language.

Learning Outcomes

1. Apply knowledge of theory to practice
2. Communicate orally and in writing.
3. Identify and solve problems.
4. Know and apply the different procedures for sterilising and reducing microbial load in industrial, clinical and experimental environments.
5. Know the role of microorganisms in different production processes in order to improve these processes and ensure their success.
6. Obtain, select and manage information.
7. Understand the required operations and processes for obtaining products in which microorganisms intervene.
8. Use bibliography or internet tools, specific to microbiology or other related disciplines, both in English and in the first language.

Content

UNIT 1. Food properties and modifications

Theory:

Topic 1. The water of food. Structure and properties. State of water for food. Water activity Sorption isotherms (2 hr)

Topic 2.- Biotic modifications. Food as an ecosystem. Factors that affect the growth and survival of microorganisms in food. The theory of obstacles. (2 hr)

Topic 3. Components and ingredients of foods: functions and properties. General characteristics and functional properties of the main components of foods: glucons, proteins and lipids. Technological additives and coadjuvants. (3 h)

Topic 4.- Abiotic modifications: chemical and enzymatic reactions. Non-enzymatic darkening reactions. Lipolysis and lipid self-oxidation. Pigment reactions. Enzymatic oxidation of the lipids, proteins and carbohydrates. Reactions of enzymatic shading. (3 h)

Laboratory practice:

PL1- General knowledge of the pilot plant (1h); Enzymatic Enfosquiment (laboratory, 2h) PL2-Food Stability (2 h)

Seminar:

S1- Presentation and evaluation of the work self-learning (2 h)

UNIT 2. Fundamentals of food industries

Theory:

Topic 5. Processing in food technology. Flow diagrams. Continuous and no continuous processing.

Pre-treatment of raw materials. (1 h)

Topic 6. Low temperature effects. Industrial refrigeration, reactions rate and food stability. Changes in cell structure. Freezing nucleation. Restructuring for low temperatures. (4 h)

Topic 7.- Use of high temperatures in food preservation. Blanching, pasteurization and sterilization. Equipment and processes used at food industry. Heat treatments in fluid foods. Equipment. Effect on microorganisms: TDT curves, D and F0 coefficients. Food modifications. Control of heat treatments. (4 h)

Topic 8.- Other applications of high temperature treatments: baked, fried, toasted, baking, dielectric cooking, baking by induction. Ohmization. High isostatic pressure. Radiation. Characteristics of ionizing and non-ionizing radiation. Effect on microorganisms and food. (3 h)

Seminars:

S2- Bioconservation (2h)

S3- Heat treatments: TDT curves (2h), self-learning activity of the associated unit 2

UNIT 3. Fundamentals of the industries from raw materials of animal and vegetable origin

Theory:

Topic 9.- Dairy Technology . Composition and structure of milk. Microbiology of milk. Preservation treatments. Concentrated milk and milk powder. Cream and butter. Coagulation Other products. (3 h)

Topic 10.- Technology of meat and derivatives. Normal and abnormal post-mortem metabolism in meat channels. Microbiology. Cooling and freezing. Systems of classification and prediction of quality. (2 hr)

Topic 11.- Technology of fishery products. Composition and post-mortem changes. Conservation methods. Refrigeration and Freezing. Preserves and Semiconserves. (4 h)

Seminars:

S4- Description of meat derivatives (2 h)

S5- Fermented cereals and legumes (2 h)

Laboratory practice:

PL3- Elaboration of dairy products (2 hours), self-learning activity of Associated Unit 3

Unless the requirements enforced by the health authorities demand a prioritization or reduction of these contents

Methodology

The methodology used in this course combines the following activities:

- Lectures where the student acquires the basic concepts of the subject.
- Work seminar to complete and deepen the concepts exposed in the master classes, analyzing information and solving questions.
- Seminars on the presentation and evaluation of the work of self-learning.
- Laboratory practices: complete and reinforce the knowledge acquired in the lectures. They allow the acquisition of work skills in the laboratory and the experimental understanding of concepts. At the beginning of the course, the student will have a guide available with all the practices to be performed at laboratory. The student must make a comprehensive reading of the guide. Each practice will include: objective / s, foundation, methodology and a section for the results that are obtained, as well as a file to prepare the report of each

session. The student will have to prepare the report during the practice.

In the first session, the student must submit the proof of passing the Basic Safety test signed with the commitment of knowledge and compliance with the work and safety regulations in the practice laboratory. The practical sessions are of compulsory. The absence of a session can be justified.

• Self-learning work of the student:

- Individual, for the presentation and preparation of cases, and for the study and preparation of the exam.

- In group of 4 people, for the preparation and presentation of cases. In some cases, the work involves the search and selection of information in various sources and the answer to the questions raised in the case, and its presentation and discussion in front of the professors and other class groups. In others, students must respond to the Virtual Campus.

The teaching material used in the course will be available on the Virtual Campus. The student will find, before each session, the presentations in pdf format that teachers will use in class, to use it as a support when taking notes. They will also include the necessary scripts for the practices, which the student will have to print on the first day of the course.

In the Virtual Campus will also be left self-assessment material of the units of the subject, which the student can use to reinforce their knowledge.

The proposed teaching methodology may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Laboratory practices	8	0.32	1, 7, 5, 3
Lectures	32	1.28	7, 5, 4
Seminars	10	0.4	1, 7, 5, 4, 3, 2
Type: Autonomous			
Autonomous study and bibliographic consultation	60	2.4	1, 7, 5, 4, 3, 6
Case resolution and presentation, autoevaluation exercises	36	1.44	1, 7, 5, 4, 3, 6, 2

Assessment

Maximum score that can be obtained is 100 points. The course will be passed with a minimum overall score of 50. The assessment will be individual and will be carried out continuously during the different training activities that have been programmed.

The final grade of the subject will be as follow:

Unit 1. Exam: 65%; Self-study: 35%

33% of the final grade of the subject. Minimum for average in the global mark: 4/10

Unit 2. Exam: 65%; Self-study: 35%.

34% of the final grade of the subject. Minimum for average in the global mark: 4/10

Unit 3. Exam: 65%; Self-study: 35%

33% of the final grade of the subject. Minimum to average: 4/10

Students will have to do an individual self-study job (in unit 2) or in groups of 4 people (units 1 and 3). The work of unit 1 will be presented in public presentation, together with the rest of the groups, in a session scheduled in class hours. The works of units 2 and 3 will be sent to the professors via Virtual Campus. The

minimum score to average on the unit's mark is 5/10.

When finalizing the formative activities of each unit and the date specified in the general programming, the student will perform a written exam (test type with answers of multiple choice combined with questions of development in some of the units) on the knowledge acquired during the classes, the practices and the self-learning. The minimum score to average on the unit's mark is 4/10

- The student who has not completed the practices cannot attend the examinations. The content of practices may be evaluated in the exams.
- To be eligible for the retake process, the student should have been previously evaluated in a set of activities equaling at least two thirds of the final score of the course or module. Thus, the student will be graded as "Not Evaluable" if the weighting of all conducted evaluation activities is less than 67% of the final score

Student's assesment may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Presentation and discussion of self-learning work	35%	1	0.04	1, 7, 5, 4, 3, 6, 2, 8
Written exams	65%	3	0.12	1, 7, 5, 4, 3, 2

Bibliography

Unit 1

- Fennema O.R. (2010). 3ª ed. Química de los alimentos. Ed. Acribia, Zaragoza .
- Ibarz, A. (2005). Operaciones unitarias en la ingeniería de alimentos. Mundi Prensa, Madrid.
- Multon J.L.. (1999) Aditivos y auxiliares de fabricación en las industrias agroalimentarias. Ed. Acribia, Zaragoza.
- ICMSF (1980). Ecología microbiana de los alimentos 1. Factores que afectan a la supervivencia de los microorganismos. Acribia, Zaragoza.
- ICMSF (2000). Microorganismos de los alimentos.Vol. 6, Ecología microbiana de los alimentos. Acribia, Zaragoza.
- Ordóñez J. A. (ed.) (1999) Tecnología de los alimentos. Vol I. Componentes de los alimentos y procesos. Ed. Síntesis, Madrid.
- Ordóñez J. A. (ed.) (1999) Tecnología de los alimentos. Vol II. Alimentos de origen animal. Ed. Síntesis, Madrid.
- Ray, B. (2001, 2004, 2008). Fundamental food microbiology. CRC Press, Boca Raton, Florida.
- Sperber W. H. and Doyle M.P. (2009). Compendium of the microbiological spoilage of foods and beverages. Springer, New York.

Wong D.W.S. (1994) Química de los Alimentos: mecanismos y teoría. Acribia, Zaragoza.

Units 2 and 3

- Brennan J.G., J.R. Butters, N.D. Cowell i A.E.V. Lilley (1990) Food engineering operations. Ed. Elsevier Applied Science, Barking. Las operaciones en la ingeniería de alimentos. Ed. Acribia, 1998

- Fellows P. (2007) Food processing technology. Woodhead Publising, Cambridge.- Tecnología del procesado de alimentos. Ed. Acribia (1993).
- Lawrie R. (1998) Meat Science. Ed. Woodhead Publishing, Cambridge. (Existeix la traducció castellana -Ed. Acribia, 1977- d'una edició anterior).
- Mafart P. (1993) Ingeniería industrial alimentaria. Vol. 1: Procesos físicos de conservación. Ed. Acribia, Saragossa.
- Mafart P. i Béliard E. (1994) Ingeniería industrial alimentaria. Vol. 2: Técnicas de separación. Ed. Acribia, Saragossa.
- Regenstein J.M. y C.E. Regenstein (1991) Introduction to fish technology. Ed. Van Nostrand Reinhold, Nova York, Nova York.
- Richardson, T. i J.W. Finley (eds.) (1985) Chemical changes in food during processing. Ed. AVI Publishing Company, Westport, Connecticut.
- Stadelman W.J. i O.J. Cotterill (1986) Egg science and technology. Ed. AVI Publishing Company, Westport, Connecticut.
- Thapon J.-L. i C.-M. Bourgeois (1995) L'oeuf et les ovoproduits. Ed, Tech & Doc, París.
- Walstra, P., Geurts, T.J., Noomen, A., Jellema, A (2001). Ciencia de la leche y tecnología de los productos lácteos. Editorial Acribia S.A. Zaragoza.

Books online Network UAB:

http://app.knovel.com/web/browse-a-subject-area.v/catid:216/cat_slug:food-science/

<http://www.sciencedirect.com/> (les Enciclopèdies "of dairy sciences", "of meat sciences" "of food sciences and nutrition")

<http://pubs.rsc.org/en/ebooks#!key=subject&value=food>