

**1. General information****Course:** FOOD TECHNOLOGY II**Type:** CORE COURSE**Degree:** 383 - UNDERGRADUATE DEGREE PROGRAMME IN FOOD SCIENCE AND TECHNOLOGY**Center:** 1 - FACULTY OF SCIENCE AND CHEMICAL TECHNOLOGY**Year:** 3**Main language:** Spanish**Use of additional languages:****Web site:****Code:** 58319**ECTS credits:** 6**Academic year:** 2022-23**Group(s):** 22**Duration:** First semester**Second language:** English**English Friendly:** Y**Bilingual:** N**Lecturer:** MIGUEL ANGEL GONZALEZ VIÑAS - Group(s): 22

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**2. Pre-Requisites**

The basic knowledge that students should have, in general, and that will be of great use to them when taking the subject, can be summarized in the following points:

- Basic knowledge of biochemistry and the structure and properties of food components.
- In addition, they must have previously studied the subjects of raw material production, basic operations and food technology I.
- Pupils who take the subject will already have completed their training in the basic sciences module taught between the first and second year of the grade.

**3. Justification in the curriculum, relation to other subjects and to the profession**

This course deals with the study of one of the priority objectives of Food Science and Technology, namely the supply of healthy and nutritious food for human beings. The fulfillment of this objective includes diverse aspects such as the conservation of food avoiding its chemical and/or microbial alteration, applying traditional conservation techniques and researching other more appropriate techniques according to current needs, and on the other hand trying to increase or at least maintain the nutritional value of food. For this reason, this course studies in detail all the food preservation methods available for industry (cold, heat, high pressure, chemical methods, etc.) and the latest advances being developed (emerging techniques).

The student will acquire sufficient knowledge to know how to apply the most appropriate conservation method to each food and to know the effect it will have on its characteristics. They will know the basis of the different processes, the equipment to be used and its most important applications.

In order to achieve these objectives, the student must know other subjects related to the study of food composition, manufacturing methods and food analysis techniques, as well as aspects of hygiene in the food industry.

**4. Degree competences achieved in this course****Course competences**

Code	Description
CB02	Apply their knowledge to their job or vocation in a professional manner and show that they have the competences to construct and justify arguments and solve problems within their subject area.
CB04	Transmit information, ideas, problems and solutions for both specialist and non-specialist audiences.
E08	To be able to apply the technological advances and the innovation in foods and food processing processes in the food industry and to evaluate their acceptability by consumers
E09	To know, optimize and control the production and conservation food processes
E10	To acquire knowledge on equipments and systems for the automatization and control of food processing
E11	To qualify to be able to evaluate the effects of processing on the components and properties of foods
E16	To know and manage behaviour guidelines on personal hygiene, food handling and hygienic control of food processing
E22	To perform formation of staff in the food sector
G01	To develop the aptitude to gather and interpret information and data to issue critical judgments that include a reflection on relevant topics of social, scientific or ethical nature.
G03	To develop habits of excellence and quality in the professional exercise applying the fundamental human rights, the principles of equality of opportunities and the values of a culture of peace and democratic. Acquiring an ethical commitment and acting according to the professional business ethics and the respect to the environment.
G04	To develop the necessary skills of learning to undertake later studies with a high degree of autonomy. To understand and to use the English language, both written and spoken, applied to the area of the Food Science and Technology. (To

G05	be able to acquire this ability, a series of actions that will be specified in every module will be performed).
G07	To possess ability of organization and planning, initiative, entrepreneurship and aptitude to be employed in teamworks. To possess capacity of resolution of specific problems of the professional area and to develop the critical reasoning and decision making.
G09	To develop the motivation for quality, the capacity to adapt to new situations and the creativity.

## 5. Objectives or Learning Outcomes

### Course learning outcomes

#### Description

To achieve that the student is capable of seeking and selecting the ideal conditions of every operation and to obtain the products of better quality with the minimal cost.

To develop his aptitude to be a member of a teamwork.

To achieve that the student acquires a complete formation that allows him to choose the packing most adequate for any food and to be able to interpret the functionality and the effect that that packing is going to cause in the final characteristics of the food.

To learn how to work in an autonomous way at a pilot plant, and using the laboratory results to be able to interpret the experimental obtained results.

The student will acquire the knowledge of each one of the operations that are involved in a technological process in the food industry: the equipment necessary to develop them and the principal applications at industrial scale, as well as the effect that it exerts on every food.

It is aimed that the students know the facts, concepts and fundamentals of the Food technology, so that the indispensable foundations are established in order that they could successfully address the study of the different processes that are employed for each of the food groups: vegetable, dairy, meat, drinks, etc.

To establish conclusions and to elaborate reports that allow him to expose his results adequately both in oral and written forms. Developing his capacity of synthesis, being critical and objective.

To develop in the student the capacity of initiative to propose and solve concrete problems of the food industry, as well as of interpreting the obtained results.

To provoke and to promote in the student all those values and attitudes inherent to the scientific activity.

### Additional outcomes

In this course the learning outcomes are based on the study of all the FOOD PRESERVATION TECHNIQUES.

## 6. Units / Contents

### Unit 1: Fresh food. Possible alterations. General principles of food preservation.

Unit 1.1 Classification of preservation methods. Industrial methods of food preservation.

### Unit 2: Preservation of Foods at Low Temperatures

Unit 2.1 Effect of cold on microorganisms and enzymes.

Unit 2.2 Cold production by mechanical compression. Cryogenic systems

Unit 2.3 Design and calculation of a refrigeration system.

### Unit 3: Refrigeration. Definition and objectives. General principles.

Unit 3.1 Equipment and applications. Effect on food

Unit 3.2 Storage and transport of refrigerated food.

### Unit 4: Freezing. Definition and objectives. General Principles

Unit 4.1 Equipment and applications. Effect on food.

Unit 4.2 Storage and transport of frozen food. Thawing of food.

### Unit 5: Preservation of food by heat. Heat transfer: conduction, convection and radiation.

Unit 5.1 Heat action on microorganisms and enzymes: survival and thermoresistance curves

Unit 5.2 Heat penetration into containers. Calculation of heat treatments

### Unit 6: Pasteurization. Definition and objectives. Low pasteurization. High pasteurization.

Unit 6.1 Equipment and applications. Effect on food

### Unit 7: Sterilization. Definition and objectives. Sterilization of packaged foods. Sterilization of Unpackaged Foods

Unit 7.1 Equipment and applications. Effect on food. UHT treatment.

### Unit 8: Concentration of food by evaporation. Fundamentals of evaporation.

Unit 8.1 Factors influencing the evaporation process. Equipment and applications. Effects on food.

### Unit 9: Food conservation based on reduced water activity I. Dehydration. Fundamentals of Dehydration

Unit 9.1 Osmotic dehydration, microwave drying, solar drying, drum dryers, fluidised-bed dryers. Equipment and applications.

### Unit 10: Food conservation based on reduced water activity II.

Unit 10.1 Freeze-drying. Fundamentals. Types of freeze-dryers and applications.

Unit 10.2 Spraying. Definition and objectives. Effect on food.

Unit 10.3 Rehydration.

### Unit 11: Preservation of food by electromagnetic radiation. Food Irradiation. Definition and objectives. Fundamental aspects.

Unit 11.1 Types of radiation used. Effect of ionizing radiation on food. Equipment and applications

### Unit 12: Conservation of food by chemical and biological methods. Mechanisms of action of chemical preservatives.

Unit 12.1 Most important preservatives in Food Technology: properties and applications. Allowed doses.

### Unit 13: Other preservation methods. Salting. Fundamentals of the process.

Unit 13.1 Physical-chemical changes produced during the process. Methods and applications.

### Unit 14: Other preservation methods. Smoking: basic principles of preservation by smoke.

Unit 14.1 Origin and composition of smoke. Smoke production. Equipment and applications. Effect on food.

### Unit 15: Preservation of food in modified atmospheres. Gases as preservatives.

Unit 15.1 Types of atmospheres and effect on microorganisms and food characteristics.

Unit 15.2 Packaging in controlled, modified and vacuum atmospheres. Equipment and applications

### Unit 16: New preservation technologies. High pressures. Ultrasounds. Electric pulses. Magnetic fields. Effect on microorganisms and enzymes and food characteristics

### Unit 17: Packaging, bottling and packaging of food. Packaging materials

Unit 17.1 Dosing systems. Package-food interactions. Handling of packaged products. Internal transport. External transport.

## 7. Activities, Units/Modules and Methodology

		Related Competences					
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Training Activity	Methodology	(only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Class Attendance (theory) [ON-SITE]	Lectures	CB02 CB04 E08 E09 E10 E11 E16 E22 G01 G03 G04 G05 G07 G09	0.85	21.25	Y	N	
Laboratory practice or sessions [ON-SITE]	Practical or hands-on activities	CB02 CB04 E08 E09 E10 E11 E16 E22 G01 G03 G04 G05 G07 G09	0.8	20	Y	Y	
Practicum and practical activities report writing or preparation [OFF-SITE]	Group Work	CB02 CB04 E08 E09 E10 E11 E16 E22 G01 G03 G04 G05 G07 G09	0.5	12.5	Y	Y	
Workshops or seminars [ON-SITE]	Problem solving and exercises	CB02 CB04 E08 E09 E10 E11 E16 E22 G01 G03 G04 G05 G07 G09	0.5	12.5	Y	N	In addition to exercises, there will be virtual technical visits to industries (videos).
Group tutoring sessions [ON-SITE]	Group tutoring sessions	CB02 CB04 E08 E09 E10 E11 E16 E22 G01 G03 G04 G05 G07 G09	0.1	2.5	Y	N	
Writing of reports or projects [OFF-SITE]	Guided or supervised work	CB02 CB04 E08 E09 E10 E11 E16 E22 G01 G03 G04 G05 G07 G09	0.5	12.5	Y	N	
Final test [ON-SITE]	Assessment tests	CB02 CB04 E08 E09 E10 E11 E16 E22 G01 G03 G04 G05 G07 G09	0.15	3.75	Y	N	
Study and Exam Preparation [OFF-SITE]	Self-study	CB02 CB04 E08 E09 E10 E11 E16 E22 G01 G03 G04 G05 G07 G09	1	25	Y	N	
Self-study [OFF-SITE]	Self-study	CB02 CB04 E08 E09 E10 E11 E16 E22 G01 G03 G04 G05 G07 G09	1.6	40	Y	N	
<b>Total:</b>			<b>6</b>	<b>150</b>			
<b>Total credits of in-class work: 2.4</b>			<b>Total class time hours: 60</b>				
<b>Total credits of out of class work: 3.6</b>			<b>Total hours of out of class work: 90</b>				

As: Assessable training activity

Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

8. Evaluation criteria and Grading System			
Evaluation System	Continuous assessment	Non-continuous evaluation*	Description
Test	70.00%	85.00%	Theoretical instruction will be evaluated through a written test that will be carried out at the end of the quarter. In this way it will be possible to carry out an analysis of the competences acquired by the student.
Laboratory sessions	15.00%	15.00%	Practice in the laboratory. The laboratory practices will be valued having the student's attitude in the laboratory, the skills he or she has acquired during the laboratory, and your internship and your internship notebook
Assessment of problem solving and/or case studies	15.00%	0.00%	Problem solving, cases, jobs. In the seminars the participation will be evaluated. of the student and the resolution of the problem or case presented when applicable
<b>Total:</b>	<b>100.00%</b>	<b>100.00%</b>	

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject, an ordinary and an extraordinary one (evaluating 100% of the competences).

#### Evaluation criteria for the final exam:

##### Continuous assessment:

Both in the different tests (practical - case studies - assignments) and in the final exam a minimum of 4/10 in each of the parts and an average grade equal to or higher than 5/10 will be required to pass the course.

##### Non-continuous evaluation:

Students who do not opt for the continuous evaluation system, valuations indicated above, will take a final test, corresponding to 85% of the grade. The remaining 15% corresponds to the qualification of the practices. To pass the course a minimum of 4/10 in each of the parts and an average grade equal to or higher than 5/10 will be required.

#### Specifications for the resit/retake exam:

The same criteria will be maintained as in the ordinary call.

#### Specifications for the second resit / retake exam:

It will consist of a final test, corresponding to 85% of the grade, which will be weighted with the grade of the practical, 15%.

In both the final exam and the laboratory, a minimum of 4/10 will be required in each of the parts and an average grade equal to or higher than 5/10.

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours

Class Attendance (theory) [PRESENCIAL][Lectures]	21.25
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	20
Practicum and practical activities report writing or preparation [AUTÓNOMA][Group Work]	12.5
Workshops or seminars [PRESENCIAL][Problem solving and exercises]	12.5
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	2.5
Writing of reports or projects [AUTÓNOMA][Guided or supervised work]	12.5
Final test [PRESENCIAL][Assessment tests]	3.75
Study and Exam Preparation [AUTÓNOMA][Self-study]	25
Self-study [AUTÓNOMA][Self-study]	40
<b>Global activity</b>	
<b>Activities</b>	<b>hours</b>
Workshops or seminars [PRESENCIAL][Problem solving and exercises]	12.5
Writing of reports or projects [AUTÓNOMA][Guided or supervised work]	12.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	25
Class Attendance (theory) [PRESENCIAL][Lectures]	21.25
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	20
Practicum and practical activities report writing or preparation [AUTÓNOMA][Group Work]	12.5
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	2.5
Final test [PRESENCIAL][Assessment tests]	3.75
Self-study [AUTÓNOMA][Self-study]	40
<b>Total horas: 150</b>	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Ana Casp	Tecnología de los Alimentos de Origen Vegetal. Vol. 1	Sintesis	España	978-84-9958-832-2	2014	
Barbosa-Cánovas, Gustavo V.	Conservación no térmica de alimentos	Acribia			1999	
Brody, Aaron L.	Envasado de alimentos en atmósferas controladas, modificadas y a vacío	Acribia			1996	
Bureau, G. y Multon, J.L.	Embalaje de los alimentos de gran consumo.	Acribia			1995	
Casp, A y Abril, J.	Procesos de conservación de alimentos	A. Madrid-Vicente. Ediciones MundiPrensa.			1999	
Côme, D. y Ulrich, R.	Le chaine du froid	Hermann editeur Blackie Academic			1995	
Gould, G.W.	New methods of food Preservation & Professional., Londres				1995	
Hersom, A.C. y Hulland, E.D.	Conservas Alimenticias: Procesado Térmico y Microbiología	Acribia, Zaragoza			1995	
Instituto Internacional del frio	Alimentos Congelados. Procesado y Distribución	Acribia			1990	
MAZZA, G	Alimentos funcionales	Acribia			2000	
Mallet, C.P.	Tecnología de los alimentos congelados	AMV			1994	
Ordoñez, J.A.	Tecnología de los Alimentos. Alimentos de origen animal.	Sintesis			1998	
Ordoñez, J:A.	Tecnología de los alimentos. Componentes de los Alimentos y Procesos	Sintesis			1998	
Rahman, M. Shafiur y López Lorenzo, Pascual,	Manual de conservación de los alimentos	Acribia			2003	
Rees, J:A.G. y Bettison, J.	Procesado Térmico y Envasado de los Alimentos.	Acribia, Zaragoza.			1994	
Rodríguez, F.	Ingeniería de la industria alimentaria. Vol.II. Operaciones	Sintesis			2002	
SELAFF, H	Tecnología de la fabricación de conservas	Acribia			2000	
SOUTHGATE, D	Conservación de frutas y hortalizas	Acribia			1992	
SÁNCHEZ PINEDA DE LAS INFANTAS, M.T.	Procesos de conservación poscosecha de productos vegetales	AMV			2004	
A. MORATA	Nuevas Tecnologías de Conservación de Alimentos.	Antonio Madrid Vicente.			2010	