

COURSE SYLLABUS

Academic Year: 2021/2022

Identification and characteristics of the course			
Code	501250	ECTS Credits	6
Course title (English)	Food Technology		
Course title (Spanish)	Tecnología de Alimentos		
Degree programs	Degree in AgriFood Industries Engineering		
Faculty/School	Agricultural Engineering School		
Semester	(2º)	Course type (compulsory/optional)	Compulsory
Module	Food Technology		
Subject matter	Food Technology		
Lecturer/s			
Name	Room	E-mail	Web page
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Subject Area	Food Technology		
Department	Animal Production and Food Science		
Coordinator (Only if there is more than one lecturer)	Ana Isabel Andrés Nieto		

Competencies*

Basic and general competencies:

CG6 – Capability to manage agrifood industries, with knowledge in new technologies, quality processes, traceability and certification, as well as marketing techniques of food products.

CG7 – Knowledge in basic, scientific and technological subjects, allowing a continuous learning, as well as an adaptative capability to new situations and changing environments.

CB3 – Students should have the capability of gathering and understand relevant data in order to infer judges or opinions about relevant social, scientific and ethical issues.

* The sections concerning competencies, course outline, teaching activities, teaching methodology, learning outcomes and assessment methods must conform to those included in the ANECA verified document of the degree program.

CB4 – Students should learn to communicate information, ideas, problems and solutions to all kind of audience.

CB5 – Students should develop learning skills necessary to begin latter studies with a high level of autonomy.

Specific competencies:

CETE1: Food engineering and technology.

Capability to know, understand and use premises of Food engineering and technology. Food Engineering and basic operations. Food Technology. Processes in food industries. Modelizations and optimization. Quality management and food safety. Food Analysis. Traceability.

Transversal competencies:

CT1: TIC proficiency.

Contents

Course outline*

The content included in this subject is related to the technology of processes of preparation of food raw matter to be elaborated and transformed. These processes include cleaning operations, size reduction, selection and classification, bleaching and peeling. Food preserving technologies are also studied: pasteurization, sterilization, refrigeration, freezing, dehydration, freeze drying, solute adding and smoking. Finally, packaging, storing, transportation and distribution processes are also studied in this subject.

Course contents

SECTION I.- INTRODUCTION

Lesson 1. Food Science and Technology: definition, history, objectives.

Historical development. Definition of Food Science and Technology. Objectives. Relationships with other sciences. The Spanish food industry nowadays.

Developed skills: CECTA2

Learning results: RA74

SECTION II.- TECHNOLOGICAL PROCESSES FOR PREPARING AND MANUFACTURING RAW MATERIAL.

Lesson 2.- Operations for preparing raw material (I)

Raw material reception in the food industry. Preparation of raw material. Cleaning: dry and humid methods.

Developed skills: CECTA2, CECTA3, CECTA4, CECTA5 y CECTA6

Learning results: RA71, RA72, RA73, RA74, RA75, RA76 y RA81

Lesson 3.- Operations for preparing raw material (II)

Selection and classification. Peeling. Peeling methods. Peeling equipment.

Developed skills: CECTA2, CECTA3, CECTA4, CECTA5 y CECTA6

Learning results: RA71, RA72, RA73, RA74, RA75, RA76 y RA81

Description of the practical activities of lesson n 3 :Practical lesson #1: **Preparation of vegetable raw materials.**

Practical lesson content: cleaning, peeling, size reduction of vegetables. Blanching using hot water. Peroxidase test. Analysis and discussion of results.

Type and place: Pilot plant (Vegetable PP)

Developed skills: CECTA2

Learning results: RA71, RA72, RA73, RA74, RA75, RA76 y RA81

Material and instrumental equipment to be used: Materias primas vegetales (calabacín, patatas). Cuba de lavado-escaldado. Reactivos para determinación de la peroxidasa. Equipos de cortado de materias primas.

Lesson 4.- Size reduction and increase (I)

Size reduction and increase (I). Aims. Size reduction of dry particulate foods. Equipment and application. Size reduction of fibrous foods. Equipment and application. Effect on foods

Developed skills: CECTA2, CECTA3, CECTA4, CECTA5 y CECTA6

Learning results: RA71, RA72, RA73, RA74, RA75, RA76 y RA81

Description of the practical activities of lesson N 4: Practical lesson #4:
Manufacturing of a meat product

Practical lesson content: mixing, chopping, casing, salting, thermal treatment of a meat product. Analysis and discussion of results.

Type and place: Pilot plant (Meat PP)

Developed skills: CECTA2, CECTA3, CECTA5

Learning results: RA71, RA72, RA73, RA77, RA78 y RA81

Material and instrumental equipment to be used: Cutter, mixer and chopping equipment. Raw meat.

Lesson 5.- Size reduction and increase (II)

Size reduction in liquid foods: emulsification, homogenisation and atomization. Equipments and applications. Size increase: agglomeration

Developed skills: CECTA2, CECTA3, CECTA4, CECTA5 y CECTA6

Learning results: RA71, RA72, RA73, RA74, RA75, RA76 y RA81

SECTION III.- FUNDAMENTALS IN FOOD PRESERVATION.

Lesson 6.- Factors and reasons for food alteration.

Factors involved in food alteration. Actions against physical and chemical alteration. Potential actions in preventing or delaying microbial activity

Developed skills: CECTA2 y CECTA3

Learning results: RA77 y RA78

SECTION IV.- TECHNOLOGICAL PROCESSES OF PRESERVATION (HEAT AND

COLD)

Lesson 7.- Blanching.

General objectives. Blanching methods: hot water, vapour. Other blanching methods. Evaluation of blanching in fruit and vegetables. Equipment and applications. Effects on nutritive and sensory characteristics of food.

Developed skills: CECTA2, CECTA3, CECTA4, CECTA5 y CECTA6

Learning results: RA71, RA72, RA73, RA77, RA78 y RA81

Description of the practical activities of lesson N 7: Practical lesson #1: **Preparation of vegetable raw materials.**

Practical lesson content: cleaning, peeling, size reduction of vegetables. Blanching using hot water. Peroxidase test. Analysis and discussion of results.

Type and place: Pilot plant (Vegetable PP)

Developed skills: CECTA2

Learning results: RA71, RA72, RA73, RA74, RA75, RA76 y RA81

Material and instrumental equipment to be used: Materias primas vegetales (calabacín, patatas). Cuba de lavado-escaldado. Reactivos para determinación de la peroxidasa. Equipos de cortado de materias primas.

Lesson 8. Fundamentals in thermobacteriology.

Basic fundamentals. Kinetics for microbial death by heat. Survival graphic. D value. Thermodestruction graphics. Z value. Commercial sterility. F and F₀ value. Practical examples of calculation of thermal treatments in canning industry

Developed skills: CECTA2

Learning results: RA71, RA72, RA73, RA77 y RA78

Practical lesson #3: **Use of thermobacteriology in canning**

Practical lesson content: can sealing. Manufacture of a vegetable can. Thermal monitorization at the critic point. F₀ calculation. Analysis and discussion of results.

Type and place: Pilot plant (Vegetable PP)

Developed skills: CECTA2, CECTA3

Learning results: RA71, RA72, RA73, RA77 y RA78

Material and instrumental equipment to be used: Semiautomatic sealer of metal cans. Temperature probes. Heating equipment. Letality calculation.

Lesson 9. Pasteurization.

Concept and objectives. Types of pasteurization. Applications in food industry. Effect on food.

Developed skills: CECTA2, CECTA3, CECTA4, CECTA5 y CECTA6

Learning results: RA71, RA72, RA73, RA77, RA78 y RA81

Description of the practical activities of lesson N 9: Practical lesson #2: **Milk pasterization.**

Practical lesson content: application and control of a pasteurization operation of raw milk. Knowledge and handling of the equipment. Lactoperoxidase test. Analysis and discussion of results.

Type and place: Pilot plant (Milk PP)

Developed skills: CECTA2, CECTA3

Learning results: RA71, RA72, RA73, RA77, RA78 y RA81

Material and instrumental equipment to be used: raw milk. Plate pasteurization equipment. Heating batch.

Lesson 10. Sterilization

Objectives. Sterilization of packaged food: Filling, exhausting and sealing of cans. Types of sterilization: continuous and discontinuous. UHT treatment. Effect on food.

Developed skills: CECTA2, CECTA3, CECTA4, CECTA5 y CECTA6

Learning results: RA71, RA72, RA73, RA77, RA78 y RA81

Description of the practical activities of lesson N 10: Practical lesson #3: **Use of thermobacteriology in canning**

Practical lesson content: can sealing. Manufacture of a vegetable can. Thermal monitorization at the critical point. F_0 calculation. Analysis and discussion of results.

Type and place: Pilot plant (Vegetable PP)

Developed skills: CECTA2, CECTA3

Learning results: RA71, RA72, RA73, RA77 y RA78

Material and instrumental equipment to be used: Semiautomatic sealer of metal cans. Temperature probes. Heating equipment. Letality calculation.

Lesson 11. Microwave heating

General aspects of electromagnetic radiations. Characteristics of microwaves. Dielectric properties of materials. Transformation of microwave energy into heat. Equipments. Applications. Effect on food.

Developed skills: CECTA2, CECTA3, CECTA4, CECTA5 y CECTA6

Learning results: RA71, RA72, RA73, RA77, RA78 y RA81

Lesson 12. Infrared radiations

Theoretical aspects. Equipments and facilities. Applications.

Developed skills: CECTA2, CECTA3, CECTA4, CECTA5 y CECTA6

Learning results: RA71, RA72, RA73, RA77 y RA78

Lesson 13. Chilling

Fundamentals of preservations using chilling. Effect on the velocity of chemical reactions and microbial development. Factors to control during chilling. Refrigerators and refrigeration storage. Effect on food.

Developed skills: CECTA2, CECTA3, CECTA4, CECTA5 y CECTA6

Learning results: RA71, RA72, RA73, RA77, RA78 y RA81

Lesson 14. Freezing

Process and freezing stages: crystalization theory. Freezing curves. Changes in food during freezing. Effect on chemical and biochemical reactions. Effect on microorganisms. Freezers and freezing storage. Thawing.

Developed skills: CECTA2, CECTA3, CECTA4, CECTA5 y CECTA6

Learning results: RA71, RA72, RA73, RA77, RA78 y RA81

Lesson 15.- Mechanical refrigeration

Calculation of the necessities for chilling and freezing. Calculation of freezing time. Cold production. Mechanical refrigerator and cryogenic systems.

Developed skills: CECTA2, CECTA3, CECTA4, CECTA5 y CECTA6

Learning results: RA71, RA72, RA73, RA77, RA78 y RA81

SECTION V.-FOOD PRESERVATION THROUGH WATER ACTIVITY REDUCTION

Lesson 16. Dehydration

Concept, objectives and fundamental. Psychrometry. Applications of the psychrometric diagram. Drying velocity, drying curves and stages. Effect on food. Equipment.

Developed skills: CECTA2, CECTA3, CECTA4, CECTA5 y CECTA6

Learning results: RA71, RA72, RA73, RA77, RA78 y RA81

Description of the practical activities of lesson N 16: Practical lesson #5: **Dehydration**

Practical lesson content: Simultation and control of a dehydration process. Use of a dry and humid bulb termometer. Use and application of a psicrometric diagram. Calculation of water loss. Analysis and discussion of results.

Type and place: Pilot plant (Meat PP)

Developed skills: CECTA2, CECTA3

Learning results: RA71, RA72, RA73, RA77, RA78 y RA81

Material and instrumental equipment to be used: Drying chamber. Dry and humid bulb termometer. Psicrometric diagram

Lesson 17. Freeze drying and freeze concentration

Freeze drying. Theory. Equipment. Effect on food. Freezing concentration Theory. Equipment.

Developed skills: CECTA2, CECTA3, CECTA4, CECTA5 y CECTA6

Learning results: RA71, RA72, RA73, RA77, RA78 y RA81

Lesson 18. Reduction of water activity of food.

Salt as agent depressor of water activity. Curing salts. Salting methods.

Developed skills: CECTA2, CECTA3, CECTA4, CECTA5 y CECTA6

Learning results: RA71, RA72, RA73, RA77, RA78 y RA81

Lesson 19. Smoking.

Definition. Smoked food. Applications on food industry.

Developed skills: CECTA2, CECTA3, CECTA4, CECTA5 y CECTA6

Learning results: RA71, RA72, RA73, RA77, RA78 y RA81

SECTION VI.- FINAL OPERATIONS

Lesson 20.- Food packaging

Function of packaging. Requirements of containers. Types of packaging materials. Packaging systems.

Developed skills: CECTA2, CECTA3, CECTA4, CECTA5 y CECTA6

Learning results: RA79, RA80 y RA81

Description of the practical activities of lesson N 20: Practical lesson #7: **Modified atmosphere packaging**

Practical lesson content: Use of gas mixtures for prolonging shel life. Use of the thermosealing equipment, gas mixer and gas analyzer. Analysis of the headspace of the packs.

Type and place: Pilot plant (Vegetable PP)

Developed skills: CECTA2

Learning results: RA79, RA80 y RA81

Material and instrumental equipment to be used: Rigid packs. Plastic material. Thermosealing equipment. Gas mixer. Gas analyzer. Gases.

Lesson 21.- Food transport

Transport systems. Transport within the industry. Transport in the distribution chain

Developed skills: CECTA2, CECTA3, CECTA4, CECTA5 y CECTA6

Learning results: RA79, RA80 y RA81

Description of the practical activities of lesson N1-21: Practical lesson #6: **Food product manufacturing**

Practical lesson content: The students, in groups, will manufacture a food product from different raw material. They will be able to use the available equipment at the pilot plants Among the potential food products to be manufactured are: smothies, tomato and olive oil gelatin, olive paté, tomato soft candy etc.

Type and place: Pilot plant (Meat PP)

Developed skills: CECTA2, CECTA6

Learning results: RA71, RA72, RA73, RA77, RA78 y RA81

Material and instrumental equipment to be used: Equipments and material in the pilot plants. A wide variety of raw material (tomato, olives, olive oil...)

Writing of a monographic report (Seminar), related with practical lesson n. 6. The students should describe the characteristics of the produced product, the flow chart, the alterations or problems observed, etc.

Competences: CB2, CG3, CG4, CT1, CECTA2, CECTA3, CECTA4, CECTA5, CECTA6

Learning outcomes: RA71 a RA81, RA83, RA87 y RA89

Educational activities *								
Student workload (hours per lesson)		Lectures	Practical sessions				Monitoring activity	Homework
Lesson	Total	L	HI	LAB	COM	SEM	SGT	PS
1	3	1						2
2	3,5	1,5						2
3	7	2					1	4
4	5	2						3
5	3	1						2
6	4	1					1	2
7	5	2						3
8	10	3					1	6
9	4	1						3
10	5	2						3
11	7	2					1	4
12	4	2						2
13	6	2					1	3
14	6	2						4
15	6	2						4
16	7	2					1	4
17	6	2						4
18	8	2						6
19	7,5	2					1,5	4
20	6	2						4
21	2	1						1
LABORATORY	0							
1	5			3				2
2	5			3				2
3	5			3				2
4	3			2				1
5	4			3				1
6	4			3				1
7	4			3				1
SEMINARIO	2,5					2,5		
<u>Assesment**</u>	2,5							
TOTAL ECTS	150	37,5	0	20	0	2,5	7,5	80

L: Lectures (100 students)

HI: Hospital internships (7 students)

LAB: Lab sessions or field practice (15 students)

COM: Computer room or language laboratory practice (30 students)

<p>SEM: Problem-solving classes, seminars or case studies (40 students) SGT: Scheduled group tutorials (educational monitoring, ECTS type tutorials) PS: Personal study, individual or group work and reading of bibliography</p>
Teaching Methodology*
<ul style="list-style-type: none"> • Lectures • Practical lessons in pilot plant • Seminar and monographic report • Tutorials
Learning outcomes *
<p>RA71. RA72. RA73. RA74. RA75. RA76. RA77. RA78. RA79. RA80. RA81. RA83. RA84.</p>
Assessment methods *
<ol style="list-style-type: none"> 1. Final evaluation: Final exam¹ in order to evaluate content and competencies related to activities of Big Group. It will consist on test-type and short answer-type questions as well as problems. It will be up to 60% of the final calification. 2. Continuous evaluation: Reports of practical lessons and questionnaires in order to evaluate contents and competencies related to seminars/laboratory activities². It will consist on delivering reports based on practical lessons and/or short questions, which will be answered by students during the practical lesson (if attending) or in a final exam (in case of not attending). This will sum up 35% of the final calification. 3. Attendance with achievement to on-site activities: other activities (attendance to tutorías ECTS, reports writing, attendance to class, participating, questionnaires, kahoot questions, correct grammar. This will sum up to 5% of the final calification. <p><u>Observations:</u> ¹ Final exam will only be valid to be considered in the final mark of the materia, from 5 points. ²LAB-SEM activities are "non-recoverable", unless the student repeat such</p>

activity the following year.

In order to pass the materia, 5 points should be obtained as the minimum mark and practical lessons should also be passed by the student.

Announcements, marks and claim dates will be announced as established by Resolución 26/10/2020, DOE nº 212, del martes, 3 de noviembre de 2020.

ALTERNATIVE EVALUATION SYSTEM WITH FINAL AND GLOBAL EXAM

The students who wish to be evaluated by a global exam, should communicate it to the professor in charge through the "Campus Virtual de la asignatura". The deadline will be the first quarter of the school time frame or until the last day of enrolling time frame in case this one finished after that time frame.

The global exam consists on:

1st Part: final written exam (65% of the final mark): test and short-type questions.

2nd Part: Theoretical-practical exam (35% of the final mark): short questions dealing on the practical contents studied along the curse

A final global mark of 5 points will be necessary to pass the materia.

Bibliography (basic and complementary)

- Aleixandre, JL y García, MJ (1999). Industrias agroalimentarias. Servicio de publicaciones de la Universidad Politécnica de Valencia, Valencia.
- Aleixandre y García (1999). *Prácticas de procesos de elaboración y conservación de alimentos*. Servicio de publicaciones de la Universidad Politécnica de Valencia. Valencia.
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- Fellows, P. (1993). *Tecnología del procesado de alimentos: Principios y prácticas*. Ed. Acribia. Zaragoza.
- Holdsworth, S. (1988). *Conservación de frutas y hortalizas*. Ed. Acribia. Zaragoza.
- Ordóñez y cols. (1998). *Tecnología de los Alimentos*. Vol. I: Componentes de los alimentos y procesos. Ed. Síntesis. Madrid.
- Paine, F. y Paine, H.(1994). *Manual De Envasado De Alimentos*. Ed. A. Madrid Vicente Ediciones. Madrid.
- Raventós, M. (2003). *Industria alimentaria. Tecnologías Emergentes*. Ed. UPC. Barcelona.
- Rodríguez, F. y cols. (2002). *Ingeniería de la Industria Alimentaria*. Vol. II y III. Ed. Síntesis. Madrid.

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Other resources and complementary materials

- Aleixandre, J.L. y García, M.J. (1999). *Industrias Agroalimentarias*. Servicio De Publicaciones De La Universidad Politécnica De Valencia, Valencia.
- Barbosa, G.V., Pothakamury, U.R., Palou, E. y Swanson, B.G. (1999). *Conservación No Térmica De Alimentos*. Acribia, Zaragoza.
- Brody A.L. (1989). *Envasado De Alimentos En Atmósferas Controladas, Modificadas Y A Vacío*. Ed. Acribia S.A. Zaragoza.
- Coles, R. y cols. (2004). *Manual de envasado de alimentos y bebidas*. AMV Ediciones y Mundiprensa. Madrid.
- Fennema, O. (2000). *Introducción A La Ciencia De Los Alimentos*. 2ª Edición. Editorial Reverté, S.A. Barcelona.
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- Lewis, M.J. (1993). *Propiedades Físicas De Los Alimentos Y De Los SisLessons De Procesado*. Acribia, Zaragoza.
- Lück, E. y Jager, M. (1995). *Conservación Química De Los Alimentos. Características, Usos, Efectos*. Editorial Acribia, S.A. Zaragoza.
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- Sielaff, H. (2000). *Tecnología de la fabricación de conservas*. Ed. Acribia. Zaragoza.
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- http://www.spec-equip.com/desalinadora_por_osmosis_inversa.html
- <http://www.diquima.upm.es/Investigacion/proyectos/chevic/catalogo/FILTROS/Func4.htm>
- <http://www.komline.com/SiteDirectory.html>
- <http://www.solidliquid-separation.com/PressureFilters/pressure.htm>

- <http://www.carbueros.com/>
- <http://www.unavarra.es/genmic/micind-0.htm>
- <http://www.agronort.com/informacion/abcbiotec/abcbio1.html>