

COURSE SYLLABUS

Academic Year: 2024/2025

Identification and characteristics of the course			
Code	501250	ECTS Credits	6
Course title (English)	Food TEchnology		
Course title (Spanish)	Tecnología de Alimentos		
Degree programs	Food Science and Technology Degree		
Faculty/School	Agricultural Engineering School		
Semester	Fort h (4º)	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 ^{1*}
1. CECTA2 – Capability for knowing, understanding and using the basic fundamentals and technological processes for producing, packaging and preserving foods.
2. CECTA3: Capability for evaluating the effect of processing on foods.
3. CECTA4: Capability for evaluating the technological advances for innovation of food and food processes in food industry.

^{1*} 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.

5. CECTA6: Capability for knowing, understanding and controlling the processes in food industry. Modelling and optimizing food processes.

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 pasteriration 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 discontinuos. 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 critic 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 electromagnetics 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 radiatons

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 pat e, 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, CT2, 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		
Assesment**	2,5							
TOTAL ECTS	150	37,5	0	20	0	2,5	7,5	80

L: Lectures (85 students)

HI: Hospital internships (7 students)

LAB: Laboratory or field practices (15 students)

COM: Computer room or language laboratory practices (20 students)

SEM: Problem classes or 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

Teaching Methodology*

- Lectures
- Practical lessons in pilot plant
- Seminar and monographic report
- Tutorials

Learning outcomes *

RA71. Understand and be knowledgeable about the fundamentals of unit operations in the food industry and be capable of selecting possible alternatives for specific purposes.

RA72. Analyze the influence of operating variables on the performance and efficiency of the process and their potential effects on food.

RA73. Understand the need to work with engineering criteria for process control and optimization and the sustainability of the environment.

RA74. Understand the different mechanisms available in food technology for the preparation of raw materials for their subsequent transformation into processed foods.

RA75. Have knowledge of the basic principles and different technologies for food transformation throughout the entire production chain.

RA76. Apply the aforementioned knowledge to adapt the most appropriate technological processes for transforming each type of raw material into processed foods.

RA77. Understand the fundamentals of various food preservation technologies available in the food industry.

RA78. Apply the most suitable preservation method to each food based on its characteristics and the desired final product.

RA79. Understand food packaging systems and analyze the possibilities and conditions for packaging processed foods.

RA80. Plan the storage and transportation of raw materials and finished products in the food industry.

RA81. Students should be familiar with the auxiliary equipment and machinery used in the agri-food industry, process automation and control, engineering of works and facilities, agro-industrial constructions, and waste management and utilization.

RA83. Effectively use ICT (Information and Communication Technology) for information search, processing, report elaboration, and project writing.

RA84. Knowledge of different sources and search methods related to food technology information.

Regenerate response

Assessment methods *

1. Final evaluation: **Final exam**¹ 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 to **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.

Observations

¹ The final exam will only be valid for the final grade of the subject if it is passed with a minimum score of 5. Seminar-Laboratory activities are "non-recoverable" unless the student repeats that part of the work plan the following year.

²To pass the subject, it will be necessary to obtain a minimum score of 5 in the theoretical exam and pass the practicals. Additionally, the presence of spelling errors will be negatively evaluated in the final grade.

The examination schedules, grades, and periods for filing complaints will be announced in a timely manner as established by the regulations published in Resolution 26/10/2020, DOE No. 212, on Tuesday, November 3, 2020

ALTERNATIVE EVALUATION SYSTEM WITH FINAL AND GLOBAL EXAM

In compliance with Resolution 26/10/2020, DOE No. 212, dated Tuesday, November 3, 2020, this section includes the characteristics and conditions of the alternative global assessment for evaluating the competencies of this subject.

According to Article 4 of the aforementioned resolution, students who wish to avail themselves of this evaluation system must notify the professor through the specific space created for this purpose in the Virtual Campus of the subject. The deadline to

choose the global modality will be during the first quarter of the teaching period or until the last day of the registration extension period if it ends after that period.

The alternative global exam consists of two parts:

1st Part: Written final exam (65% of the final grade): It will consist of multiple-choice and short-answer questions related to the topics covered. The multiple-choice questions will only have one correct answer; incorrectly answered questions will deduct 1/3 of the question's value, meaning three wrong answers cancel out one correct answer. Short-answer questions will be scored, if answered correctly, as a multiple-choice question. This part will be evaluated on a total of ten points.

2nd Part: Theoretical-practical exam (35% of the final grade): It will consist of short-answer, descriptive, and/or practical questions based on the practical content covered during the course. This part will be evaluated on a total of ten points.

To pass the subject through this alternative evaluation system, a minimum of five points must be achieved in each of these two parts. Competencies evaluated: CECTA2, CECTA3, CECTA4, CECTA5, CECTA6.

In both evaluation systems, the grading scale in effect at the time will be applied. The results obtained by the student in each subject of the study plan will be graded according to the following numerical scale from 0 to 10, with one decimal place, to which the corresponding qualitative grade may be added: 0 - 4.9: Fail (F), 5.0 - 6.9: Pass (P), 7.0 - 8.9: Good (G), 9.0 - 10: Excellent (E). The distinction of "Honors" may be granted to students who have obtained a grade equal to or higher than 9.0. Their number cannot exceed five percent of the number of students enrolled in the subject in the corresponding academic year unless it is lower than 20, in which case only one "Honors" distinction may be awarded.

Bibliography (basic and complementary)

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Other resources and complementary materials

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

