


	<b>PROCESO PARA EL DESARROLLO DE LAS ENSEÑANZAS DE LA ESCUELA DE INGENIERÍAS AGRARIAS</b>		
		<b>CÓDIGO: P/CL009_D002</b>	



## SUBJECT PROGRAMME IN FOOD TECHNOLOGY

**Academic course: 2017-2018**

Identification and characteristics of the subject					
Code	501250			Credits ECTS	6
Denomination (Spanish)	<b>Tecnología de Alimentos</b>				
Denomination (English)	Food Technology				
Degree	2 <sup>nd</sup> Food Science and Technology and 3 <sup>rd</sup> Food Industry Engineering				
Center	Agricultural Engineering School				
Semester	Fourth (4 <sup>o</sup> )	Character	Compulsory		
Module	Food Technology				
Materia	Food Technology				
Professor/s					
Name	Room	e-mail	Web link		
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Field of knowledge	Food Technology				
Department	Animal Production and Food Science				
Coordinator (in case the is more than one professor )	<b>Ana Isabel Andrés Nieto</b>				
Specific skills of the subject					
<p>CECTA2.- Capacity to know, understand and implement the principles of basic fundamentals and technological processes for production, packaging and preserving of food.</p> <p>CECTA3.- To evaluate the impact of processing on food properties.</p> <p>CECTA4.- To establish the suitability of the technological advances for food innovation and food industry processing.</p> <p>CECTA5.- Capacity to know, understand and use the agrofood facilities, equipment and auxiliary machinery .</p> <p>CECTA6.- Capacity to know, understand and control the processes in agrofood industry. Modelization and optimization of food processes.</p>					

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Lessons and contents
<b>Short description of the content</b>
<p>The content included in this subject are 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, liophilization, solute adding and smoking. Finally, packaging, storing, transportation and distribution processes are also studied in this subject.</p>
<b>Syllabus (Big Group activities)</b>
<p><b>SECTION I.- INTRODUCTION</b></p> <p><b><u>Lesson 1. Food Science and Technology: definition, history, objectives.</u></b></p> <p>Historical development. Definition of Food Science and Technology. Objectives. Relationships with other sciences. The Spanish food industry nowadays.</p> <p>Developed skills: CECTA2 Learning results: RA74</p> <p><b>SECTION II.- TECHNOLOGICAL PROCESSES FOR PREPARING AND MANUFACTURING RAW MATERIAL.</b></p> <p><b><u>Lesson 2.- Operations for preparing raw material (I)</u></b></p> <p>Raw material reception in the food industry. Preparation of raw material. Cleaning: dry and humid methods.</p> <p>Developed skills: CECTA2, CECTA3, CECTA4, CECTA5, CECTA6 Learning results: RA71, RA72, RA73, RA74, RA75, RA76, RA81</p> <p><b><u>Lesson 3.- Operations for preparing raw material (II)</u></b></p> <p>Selection and classification. Peeling. Peeling methods. Peeling equipment.</p> <p>Developed skills: CECTA2, CECTA3, CECTA4, CECTA5, CECTA6 Learning results: RA71, RA72, RA73, RA74, RA75, RA76, RA81</p> <p><b><u>Lesson 4.- Size reduction and increase (I)</u></b></p> <p>Objetives. Size reduction in dry food. Equipment and applications. Size reduction of fibrous food. Equipment and applications. Effect on food.</p> <p>Developed skills: CECTA2, CECTA3, CECTA4, CECTA5, CECTA6 Learning results: RA71, RA72, RA73, RA74, RA75, RA76, RA81</p> <p><b><u>Lesson 5.- Size reduction and increase (II)</u></b></p> <p>Size reduction of liquid food or any of its components: homogenization and atomization.</p>

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Equipment and applications. Size increase: agglomeration.

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

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

### **SECTION III.- FUNDAMENTALS IN FOOD PRESERVATION.**

#### **Lesson 6.- Factors and reasons for food alteration.**

Nature of the 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, CECTA3

Learning results: RA77, 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, CECTA6

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

#### **Lesson 8. Fundamentals in thermobacteriology.**

Basic fundamentals. Kinetic of microbial destruction by heat. Survival graphic. D value. Thermodestruction graphics. Z value. Commercial sterility. F and F<sub>0</sub> value. Practical examples of calculation of thermal treatments in canning industry.

Developed skills: CECTA2

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

#### **Lesson 9. Pasterization.**

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

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

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



#### **Lesson 10. Esterilization**

Objectives. Esterilization of packed food. Filling, evacuation and sealing of packs. Types of sterilization: continuous and discontinuous. UHT treatment. Effect of food.

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

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

#### **Lesson 11. Microwave heating**

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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, CECTA6

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

### **Lesson 12. Infrared radiations**

Theoretical aspects. Equipments and facilities. Applications. Other non-ionizing radiations.

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

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

### **Lesson 13. Chilling**

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

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

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

### **Lesson 14. Freezing**

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

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

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

### **Lesson 15.- Mechanical refrigeration**

Calculation of the necessities for chilling and freezing. Calculation of freezing time. Cold production. Refrigerators and refrigeration storage. Freezers and freezing storage Vapour Compression and cryogenics systems.

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

Learning results: RA71, RA72, RA73, RA77, RA78, 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 and facilities. Applications.

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

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

### **Lesson 17. Lyophilization and freezing through concentration**

Theoretical fundamentals. Applications. Effect on food. Freezing through concentrations: fundamentals and objectives.

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

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

**Lesson 18. Reduction of water activity of food through solute addition.**

Agents depressors of water activity and mechanism of action. Salting technology: methods, effect on food. Sugar and other chemical compounds addition. Effect on food.

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

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

**Lesson 19. Smoking.**

Definition and smoke composition. Smoke production systems. Characteristics of the smoking equipment. Effect on food. Applications on food industry.

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

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

**SECTION VI.- FINAL OPERATIONS**

**Lesson 20.- Food packaging**

Aims of packaging. Design and material of containers. Interactions between container and food. Packaging procedures. Pack sealing and Sealing control. Packaging for distribution. Labelling.

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

Learning results: RA79, RA80, RA81

**Lesson 21.- Food transport**

Transport systems. Transportation equipments. Neumatic equipments. Cranes and vehicles. Food transport under controlled temperature.

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

Learning results: RA79, RA80 y RA81

**PRACTICAL SYLLABUS**

**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, 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.

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**Practical lesson #2: Milk pasteurization.**

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, RA81

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

**Practical lesson #3: Use of thermobacteriology for manufacturing of preserve food. Sealing control of metal cans.**

Practical lesson content: can sealing. Manufacturing 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, RA78

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

**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, RA81

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

**Practical lesson #5: Dehydration**

Practical lesson content: Simulataion and control of a dehydration process. Use of a dry and humid bulb thermometer. 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, RA81

Material and instrumental equipment to be used: Drying chamber. Cámara de secado-maduración. Dry and humid bulb thermometer. Psicrometric diagram

**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: 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, 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...)

**Practical lesson #7: Modified atmosphere packaging**

Practical lesson content: Use of gas mixtures for prolonging shelf 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, RA81

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

**Memorandum (Seminario)**

Writing of a memorándum, mainly practical, in relation to the practical lesson #6. The students must describe the characteristics of the product previously manufactured in lesson #6, manufacturing process, flow diagram, troubles during manufacturing and troubleshooting plan in relation to a potential commercialization of the food product.

Developed skills: CB2, CG3, CG4, CT1, CECTA2, CECTA3, CECTA4, CECTA5, CECTA6

Learning results: RA71 a RA81, RA83, RA87, RA89

**Education Activities**

Student working hours		Attendance		Tutorial activities	Non attendance
Lesson	Total	GG	SL	TP	EP
1		1			2
2		1			2
3		2			4
4		2			3

5		1			2	
6		1			2	
7		2			3	
8		4			6	
9		1,5			3	
10		1,5			3	
11		2			4	
12		1			2	
13		1,5			3	
14		2			4	
15		2			4	
16		2			4	
17		2			4	
18		3			6	
19		2			4	
20		2			4	
21		1			1	
LABORATORY						
1			3		2	
2			3		2	
3			3		2	
4			2		1	
5			3		2	
6			3		2	
7			3		2,5	
MEMORANDUM						
			2,5			
<b>Total evaluation</b>		<b>150</b>	<b>37.5</b>	<b>22,5</b>	<b>7.5</b>	<b>82.5</b>

GG: big group (100 students).

SL: laboratory

TP: Tutorial class

EP: non attendance

### Teaching methods

- *Lectio magistralis*
- Practical lessons in laboratory and pilot plants.
- Memorándum preparation
- Tutorial lesson

### Evaluation procedure



#### A ) Continuos evaluation

- Final exam (60%)
- Attendance (5%)
- Pratical lesson attendance and exam (20%)
- Memorandum (15%)

#### B) Alternative sytem with a global exam

Final exam: test (65%) and short and long questions (35%)



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### Bibliography and web sites

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- <http://www.agronort.com/informacion/abcbiotec/abcbio1.html>
- <http://www.consumaseguridad.com>

### Tutorial timetable

See published timetable at <https://www.unex.es/conoce-la-uex/centros/eia>