


	PROCESO PARA EL DESARROLLO DE LAS ENSEÑANZAS DE LA ESCUELA DE INGENIERÍAS AGRARIAS		
	EDICIÓN: 1ª	CÓDIGO: P/CL009_D002	

COURSE SYLLABUS
Applied Food Technology
Academic Year: 2022/2023

Identification and characteristics of the course				
Code	502225-1		Créditos ECTS	6
Course title (English)	Applied Food Technology			
Course title (Spanish)	Tecnología Alimentaria Aplicada			
Degree programs	Food Science and Technology Degree			
Faculty/School	Agricultural Engineering School			
Semester	Sixth (6º)	Course type (compulsory/optional)	Compulsory	
Module	Food Technology			
Subject matter	Food Technology			
Lecturer/s				
Name	Room	E-mail	Web page	
Juan Florencio Tejada Sereno	D702 Edificio Valle del Jerte	jftejeda@unex.es	www.unex.es	
Ana Isabel Andrés Nieto	D701 Edificio Valle del Jerte	aiandres@unex.es	www.unex.es	
Subject Area	Food TEchnology			
Department	Animal Production and Food Science			
Coordinator (Only if there is more than one lecturer)	Juan Florencio Tejada Sereno			
Competencies ¹				
<p>Basics: CB1, CB2, CB3, CB4, CB5.</p> <p>Generals: CG3, CG4.</p> <p>Transversals: CT1.</p> <p>Specifics: CECTA2, CECTA3, CECTA4, CECTA5, CECTA6.</p>				

¹ The sections concerning competencies, course outline, educational activities, teaching methodologies, learning outcomes and assessment systems must conform to that included in the ANECA verified document of the degree program.

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Contents

Course outline

The content included in this subject is related to practical applications of food preparation and transformation processes, as well as the theoretical and practical applications of heat, cold and dehydration food preservation processes. New packaging systems. Culinary technology.

Course syllabus

Section 1.- Introduction to applied food technology

Name of lesson 1: Food technology applied in pilot plant and laboratory.
 Contents of lesson 1: Pilot plant and laboratory experimentation. Application of processes. Reporting and evaluation of results.
 Competencies: CECTA6

Section 2.- Food technology applied to food processing and preservation.

Name of lesson 2: Thermal processing of food: Determination of lethality.
 Contents of lesson 2: Heat penetration in canned food. Thermometric sensors. Survival curves and TDT curves. Calculation of the F_0 and C_0
 Competencies: CECTA2, CECTA3, CECTA4, CECTA5 y CECTA6.

Name of lesson 3: Design and application of freezing curves.
 Contents of lesson 3: Obtaining freezing curves for different food products. Theoretical freezing point. Calculation of the freezing time for a product.
 Competencies: CECTA2, CECTA5 y CECTA6.



Name of lesson 3: Design and application of freezing curves.
 Contents of lesson 3: Obtaining freezing curves for different food products. Theoretical freezing point. Calculation of the freezing time for a product.
 Competencies: CECTA2, CECTA5 y CECTA6.

Name of lesson 4: Food drying.
 Contents of lesson 4: Application of the psychrometric diagram for the control of food drying. Tray drying: theory and calculations. Drying curves.
 Competencies: CECTA2, CECTA3, CECTA4, CECTA5 y CECTA6.

Name of lesson 5: Extrusion.
 Contents of lesson 5: Principles and objectives. Process. Applications in the food industry. Equipment and technology.
 Competencies: CECTA2 y CECTA3.

Section 3.- Emerging technologies in food processing and preservation.

Name of lesson 6: Traditional preservation methods versus new technologies.
 Contents of lesson 6: Mechanisms of action against different food altering agents. Effect of traditional methods. New demands of food technology. Classification of new food preservation technologies.

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Competencies: CECTA2-CECTA6.

Name of lesson 7: New technologies based on non-thermal treatments I: High hydrostatic pressure (HHP).

Contents of lesson 7: Definition and fundamentals of HHP. HHP equipment. Effects HHP on foods. Applications in the food industry. Effects on food safety.

Competencies: CECTA2, CECTA3 y CECTA4.

Name of lesson 8: New technologies based on non-thermal treatments II: Food irradiation.

Contents of lesson 8: Theoretical aspects. Effects of radiation on micro-organisms. Effect of radiation on food (authorised doses). Application of irradiation in the food industry.

Competencies: CECTA2, CECTA3 y CECTA4.

Name of lesson 9: Emerging technologies based on non-thermal treatments III: Ultrasound. Light pulses. Magnetic fields.

Contents of lesson 9: Description of the processes of action of these technologies. Applications in and effects on foods.

Competencies: CECTA2, CECTA3 y CECTA4.

Name of lesson 10: Emerging technologies based on heat treatments I: Vacuum cooking.

Contents of lesson 10: Concept and fundamentals. Advantages of vacuum cooking. Process: processing steps (flow chart). Equipment. Food applications.

Competencies: CECTA2, CECTA3 y CECTA4.

Name of lesson 11: Emerging technologies based on heat treatments II: Ohmic heating.

Contents of lesson 11: Fundamentals. Effects on micro-organisms and food. Equipment and installations. Applications. Advantages and disadvantages.

Competencies: CECTA2, CECTA3 y CECTA4.

Section 4.- Innovation in food packaging

Name of lesson 12: Active and intelligent packaging.

Contents of lesson 12: Concept. Types of active and intelligent packaging. Applications in the food industry.

Competencies: CECTA2, CECTA4 y CECTA5.

Name of lesson 13: Biobased Packaging Material.

Contents of lesson 13: Concept. Types of polymers and origin. Applications.



Competencies: CECTA2 y CECTA4.

Name of lesson 14: Edible films and coatings.

Contents of lesson 14: Concept. Polymers used. Applications.

Competencies: CECTA2 y CECTA4.

Section 5.- Culinary technology

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Name of lesson 15: Introduction to culinary technology.
 Contents of lesson 15: Concept and objectives of culinary technology. Food sources. The professional culinary space.
 Competencies: CECTA2, CECTA3 y CECTA4.

Name of lesson 16: Culinary techniques.
 Contents of lesson 16: Cooking. Types of cooking. In a non-liquid medium. In a fatty medium. In aqueous medium. In mixed media. In special media.
 Competencies: CECTA2, CECTA3 y CECTA4.

Contents of practical sessions in laboratory or plant pilot (LAB)

Practical activities of section 2 (14 hours).

Sesion 1- Determination of lethality in a canned food.

Place: Plant pilot.

Equipment and instruments to be used: autoclave, thermocouple probe, laptop computer and software (Thermolog), metal and glass containers, raw materials.

Competencies: CECTA2, CECTA5, CECTA6.

Session 2- Pilot plant simulation of a tray drying process.

Place: Plant pilot.

Materials and instruments to be used: portable dehydration equipment, thermohygrometers, raw materials.

Competencies: CECTA2, CECTA3, CECTA5, CECTA6.

Session 3- Design and elaboration of freezing curves for different foodstuffs.

Place: Plant pilot.

Materials and instruments to be used: freezer, thermocouple probe, laptop computer and software (Thermolog), raw materials.

Competencies: CECTA2, CECTA5, CECTA6.

Learning outcomes in this section: RA72, RA73, RA78 y RA81.

Practical activities of section 3 (9 hours).



Session 4- Lyophilisation of foods. The student will carry out the procedure, knowing the function of the equipment and analysing the humidity of the product before and after the process.

Place: Laboratories of the *Instituto de Investigación en Recursos Agroalimentarios (INURA)* located in the University Research Institutes Building (University Campus of Badajoz).

Materials and instruments to be used: lyophiliser, raw materials, drying oven, glass and porcelain laboratory equipment.

Competencies: CECTA2, CECTA3, CECTA5, CECTA6.

Session 5- Vacuum cooking treatment.

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Place: Laboratory.

Materials and instruments to be used: Gastrovac equipment, thermostatised bath, raw materials, plastic bags.

Competencies: CECTA2, CECTA3, CECTA5, CECTA6.

Session 6- Visit to CICYTEX/INTAEX.

Competencies: CECTA5.

Session 7- Control of the sealing of metal cans.

Place: Plant pilot.

Materials and instruments to be used: semi-automatic seamer; gauges; metal scissors; markers.

Competencies: CECTA5, CECTA6.

Learning outcomes in this section: RA72, RA73, RA74, RA76, RA78, RA81 y RA94.

Practical activities of section 4 (6 hours)

Session 8- Packaging (I). Protective atmospheres. The student will carry out the packaging of various products (e.g. fresh meat, fruit, vegetables, cured meat products...) under different conditions (vacuum, MAP packaging with different atmospheres).

Place: Plant pilot.

Competencies: CECTA2, CECTA4, CECTA5, CECTA6.

Session 9 – Packaging II. Study of the shelf life of a packaged product.

Place: Plant pilot.

Materials and instruments to be used: Thermosealing machine (Ulma Smart 500), plastic packaging, plastic film, gases, raw materials.

Competencies: CECTA2, CECTA4, CECTA5, CECTA6.

Session 10- Edible films and coatings.

Place: IT classroom

Competencies: CECTA2, CECTA4.

Learning outcomes in this section: RA78 y RA79.

Practical activities of section 5 (3 hours)

Session 11- Cooking chemistry.

Place: Laboratory

Competencies: CECTA2, CECTA3, CECTA5, CECTA6.

Learning outcomes in this section: RA93.

Educational activities *

Student workload in hours by lesson		Lectures	Practical activities				Monitoring activity	Homework
Lesson	Total	L	HI	LAB	COM	SEM	SGT	PS

1	5	1					4
2	5	1					4
3	5	1					4
4	5	1					4
5	9,5	2				1,5	6
6	5	1					4
7	8	2					4
8	8	2					6
9	5	1					4
10	8	1,5				1,5	5
11	5	1					4
12	5	1					4
13	5	1					4
14	5	1					4
15	5	1					4
16	6,5	2				1,5	4
Laboratory or plant pilot							
1	6			3			3
2	5			3			2
3	5			3			2
4	5			3			2
5	5			3			2
6	5			3			2
7	5			3			2
8	5			3			2
9	5			3			2
10	6			3			3
11	2			2			
Assessment		2					
TOTAL		20,5		32,0		4,5	93

L: Lectures (100 students)

HI: Hospital internships (7 students)

LAB: Laboratory or field practices (15 students)

COM: Computer room or language laboratory practices (30 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 Methodologies

1. Lectures and discussion of theoretical contents
2. Laboratory practices, pilot plants and field
3. Development and presentation of seminars
3. Use of the virtual classroom (<https://campusvirtual.unex.es/portal/>)

Learning outcomes

RA72, RA73, RA74, RA76, RA78, RA79, RA81, RA83, RA84, RA93, RA94.

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Assessment systems

A) CONTINUOUS EVALUATION

1. Final evaluation of theoretical knowledge: **Final exam (60%)**. Written final exam consisting on quiz questions and/or short questions and/or problems.
2. **Continuos evaluation (35%)**: Reports and questionnaires about practical sessions to evaluate practical skills. They will be based on the presentation of reports according to the established model and/or short questions, which will be started to be filled in during seminar/laboratory activities (when attended) or in a final exam (when not attended).
3. Attendance with academic achievement: **Other activities (5%)** (attendance at ECTS tutorials, preparation of work, class attendance, participation in class, correct spelling in exams...).

To pass the course it is necessary to obtain a grade of 5 points or higher in this exam. The activities in points 2 and 3 are "non-recoverable", unless the student repeats that part of the work plan the following year. A "non-recoverable" activity is understood to be one that, once carried out, retains the mark obtained, which will be applied, with the appropriate weighting, for the calculation of the student's final mark in the corresponding year of the course.

B) ALTERNATIVE SYTEM WITH A GLOBAL EXAM

The choice of the global exam modality corresponds to the students, who will be able to carry it out, during the first quarter of the period of teaching the subject. Applications will be made through a specific space created for this in the Virtual Campus. In the absence of an express request by the student, the assigned modality will be that of continuous evaluation.

The alternative global exam consists of two parts:

Part 1: written final exam (50%): this exam consists on quiz questions and short questions. Test-type questions will only have a true answer; Those questions answered incorrectly will subtract 1/3 from the value of the question, that is, three wrong answers cancel a successful one.

Part 2: Theoretical and practical test (50%): this part consists on short and/or long questions and/or practical processes about practical sessions carried out during the course.



To pass the course with this alternative global exam it is necessary to obtain a grade of 5 points or higher in each of the two parts.

Competencies: CECTA2, CECTA3, CECTA4, CECTA5, CECTA6.

Bibliography (basic and complementary)

Basic



- 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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- Bello, J. (1998). *Ciencia y Tecnología Culinaria*. Díaz de Santos, Madrid.
- Brenan, Butters, Cowell y Lilly (1998). *Las operaciones de la ingeniería de alimentos*. Ed. Acribia. Zaragoza.
- Brody A.L. (1989). *Envasado De Alimentos En Atmósferas Controladas, Modificadas Y A Vacío*. Ed. Acribia S.A. Zaragoza.
- Casp A. y Abril J. (1999). *Procesos de conservación de alimentos*. A. Madrid Vicente y Mundi-Prensa, Madrid.
- Fellows, P. (1993). *Tecnología del procesado de alimentos: Principios y prácticas*. Ed. Acribia. Zaragoza.
- Guy, R. (2001). *Extrusión de los alimentos*. Ed. Acribia. Zaragoza.
- Holdsworth, S. (1988). *Conservación de frutas y hortalizas*. Ed. Acribia. Zaragoza.
- Madrid, A. y cols. (1997). *Refrigeración, congelación y envasado de los alimentos*. AMV Ediciones y Mundiprensa. Madrid.
- Mallet, C.P. (1994). *Tecnología De Los Alimentos Congelados*. Ed. A. Madrid Vicente Ediciones. Madrid.
- 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.
- Satin, M. (2000). *La Irradiación De Los Alimentos*. Editorial Acribia, S.A. Zaragoza.

Complementary

- 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.
- Cheftel y Cheftel (1980-1982). *Introducción a la bioquímica y tecnología de los alimentos*. Vols. 1 y 2. Ed. Acribia. 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.
- Instituto Internacional Del Frío. (1990). *Alimentos Congelados. Procesado Y Distribución*. Editorial Acribia, S.A. Zaragoza.
- Lamúa, M. (1999). *Aplicación Del Frío A Los Alimentos*. Ed. A. Madrid Vicente Ediciones Y Ediciones Mundiprensa. Madrid.
- Lewis, M.J. (1993). *Propiedades Físicas De Los Alimentos Y De Los Sistemas De Procesado*. Acribia, Zaragoza.
- Lück, E. y Jager, M. (1995). *Conservación Química De Los Alimentos. Características, Usos, Efectos*. Editorial Acribia, S.A. Zaragoza.
- Ordóñez, J.A., Cambero, M.I., Frenández, L., García, M.L., García, G., De La Hoz, L. y Selgas, M.D. (1998). *Tecnología De Los Alimentos. Vol I Y II*. Ed. Síntesis. Madrid.
- Potter, N.N. y Hotchkiss, J.H. (1999). *Ciencia De Los Alimentos*. Acribia, Zaragoza.
- Rees, T.A. y Bettison, J. (1994). *Procesado Térmico Y Envasado De Alimentos*. Ed. Acribia S.A.

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Zaragoza.

- Sielaff, H. (2000). *Tecnología de la fabricación de conservas*. Ed. Acribia. Zaragoza.
- Walter, K. (1995). *Manual práctico de ahumado de los alimentos*. Ed. Acribia. Zaragoza.
- <http://www.casals-vinicola.com/Catalogo-Indice.htm>
- <http://www.perryvidex.com/perry/perryvidex2.nsf/pSearchFood?OpenPage>
- 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>
- <http://www.consumaseguridad.com>

Otros recursos y materiales docentes complementarios

Blackboard. Audiovisual media (computer, video projector). Technical resources (classrooms, laboratories, pilot plants). Virtual classroom of the subject in the virtual campus of the Uex. (<http://campusvirtual.unex.es/portal/>)

Webs: <http://www.unex.es/conoce-la-uex/estructura-academica/centros/eia>
<http://biblioteca.unex.es>