



## DEGREE CURRICULUM

# PLANT FOOD PROCESSING TECHNOLOGY I

Coordination: GARZA GARZA, SALVADOR

Academic year 2022-23

# PLANT FOOD PROCESSING TECHNOLOGY I 2022-23

## Subject's general information

Subject name	PLANT FOOD PROCESSING TECHNOLOGY I			
Code	102239			
Semester	1st Q(SEMESTER) CONTINUED EVALUATION			
Typology	Degree	Course	Character	Modality
	Bachelor's Degree in Food Science and Technology	3	COMPULSORY	Attendance-based
Course number of credits (ECTS)	6			
Type of activity, credits, and groups	Activity type	PRALAB	PRAULA	TEORIA
	Number of credits	1	0.4	4.6
	Number of groups	3	2	1
Coordination	GARZA GARZA, SALVADOR			
Department	FOOD TECHNOLOGY, ENGINEERING AND SCIENCE			
Teaching load distribution between lectures and independent student work	On-site hours: 60 Off-site hours: 90			
Important information on data processing	Consult <a href="#">this link</a> for more information.			
Language	Spanish 60 % Catalan 40 %			

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
GARZA GARZA, SALVADOR	salvador.garza@udl.cat	5	
MAGRI TERSA, XAVIER	xavier.magri@udl.cat	1,8	
MARTIN BELLOSO, OLGA	olga.martin@udl.cat	1,6	

## Subject's extra information

### Observations:

It is mandatory to attend all the laboratory practice sessions, as well as to hand in the corresponding practice reports and other evaluable activities.

### In order to pass the course, the following conditions must be fulfilled:

- 1.- To obtain a minimum grade of 4 out of 10 in each of the written tests (exams).
- 2.- To obtain an average grade in each of the modules equal or higher than 4.

The average grade of each module will be calculated from the grade of the written exam(s) and the different evaluable activities developed in each one of the modules: practicals, seminars, visits...

- 3.- To obtain a final average grade of the course, obtained from the average grade of each module, equal or higher than 5.

It is mandatory for the students to wear the individual protection equipment (PPE) in the practical sessions:

- UdL unisex white lab coat
- Protection glasses
- Chemical / biological protection gloves

**Note:** If, for health reasons, or other unforeseen circumstances, teaching activities cannot be carried out in the classroom, they will take place remotely.

## Learning objectives

The student, after passing the subject, must be able to:

- Differentiate the specific characteristics of the sector and the vegetable processing industries.
- Strengthen the fundamentals of pasteurization and heat sterilization as well as freezing as food preservation techniques.
- Handle the legislation related to this type of industries.
- Specify the characteristics of the raw materials necessary to obtain the required final product.
- Estimate the utilization needs of the different types of packaging, additives and technological aids.
- Select and plan the stages necessary to obtain the different types of canned, juices or frozen vegetables.
- Choose the most suitable equipment for each stage of the corresponding process.
- Apply the appropriate techniques for the manufacture of canned, juices and frozen of the most important vegetables, as well as the Hazard Analysis and Critical Control Points (HACCP) system.
- Make the necessary determinations for the quality control of raw materials, packaging, additives and final product.
- Interpret the results of analytical determinations to improve processes and products.
- Acquire the ability to determine, advise and act on technical problems and product alterations.

## Competences

### Specific competences:

- SC1. To select and apply the physical and mathematical foundations necessary for the development of other disciplines and the activities of the profession.  
 SC2. Identify and apply the necessary chemical foundations for the development of other disciplines and the activities of the profession.  
 SC4. Select and apply the basic concepts of the statistical method, being able to statistically analyze the results of studies and interpret them critically.  
 SC5. Apply the basic processes of a laboratory and use equipment, handle reagents, meet safety conditions and prepare reports.  
 SC6. Raise and solve problems by correctly applying the concepts acquired to specific situations.

- SC23. Schematic, based on flow diagrams, the food processing and preservation processes.  
 SC24. Identify and evaluate raw materials, ingredients, additives and technological aids for use in the agro-food industry.  
 SC25. Explain the role of ingredients and food additives.  
 SC26. Apply basic knowledge about raw materials, ingredients and additives to the formulation of food.  
 SC27. Interpret the physical and chemical changes that occur during different food processing processes.  
 SC28. Modify the processes of food production on the basis of objectives.  
 SE29. Select equipment and organize food processing and packaging lines.  
 SE30. Develop new processes and products.

- SC31. Identify and assess the various parts of an agro-food industry project.  
 SE32. Dimensioning production lines.  
 SE33. Estimate equipment capacities for production lines and requirements for auxiliary systems.

### Basic competences

- CB2. That students know how to apply their knowledge to their work or vocation in a professional way and possess the skills that are usually demonstrated through the development and defense of arguments and the resolution of problems within their area of study  
 CB3. That students have the ability to gather and interpret relevant data (usually within their area of study) to make judgements that include a reflection on relevant social, scientific or ethical issues.  
 CB4. That students can transmit information, ideas, problems and solutions to both specialized and non-specialized audiences  
 CB5. That students have developed those learning skills necessary to undertake further studies with a high degree of autonomy.

## Generic competences

CG1. Analyze concrete situations, define problems, make decisions and implement action plans in the search for solutions.  
CG2. Interpret studies, reports, data and analyze them numerically.  
CG3. Select and manage the available written and computerized information sources related to the professional activity.  
CG4. Working alone and in a multidisciplinary team.  
CG5. Understand and express yourself with the appropriate terminology.  
CG6. Discuss and argue in diverse forums.  
CG7. Retraining in new technological advances through continuous learning.

CG8. Value comprehensive training, personal motivation and mobility.  
CG9. Analyze and assess the social and ethical implications of professional activity.  
CG10. Have a critical and innovative spirit.  
CG11. To analyze and assess the environmental implications in the professional activity.

## Transversal competences

CT1. Correctly present oral and written information  
CT3. Use existing computer and communication tools as support for the development of your professional activity  
CT4. To respect the fundamental rights of equality between men and women, the promotion of human rights and the values of a culture of peace and democratic values

## Subject contents

### Set of topics

#### **Chapter I. INTRODUCTION TO THE TRANSFORMATION OF VEGETABLES**

Unit 1. Food preservation systems. Foundations and relative importance of pasteurization and heat sterilization and freezing.  
Unit 2. Current situation and prospects of the fruit and vegetable processing sector. Installation and organization of vegetable processing industries.

#### **Chapter II. LEGISLATION**

Unit 3. European and Spanish legislation that affects the installation and operation of canned, juices and frozen vegetable industries, as well as the obtained products.

#### **Chapter III. AUXILIARY MATERIALS IN THE CANNING INDUSTRY**

Unit 4. Packaging of canned vegetables. Packaging characteristics and handling metal and glass containers. Corrosion of metal containers. Frozen vegetable packaging.  
Unit 5. Additives and technological aids. Function and need for use.  
Unit 6. Labeling of canned and frozen vegetables.

#### **Chapter IV. TRANSFORMATION OF CANNED VEGETABLES**

Unit 7. Sterilization process parameters. Factors that influence vegetables canning sterilization. Microbial thermo-resistance and heat penetration into the containers.  
Unit 8. Quality, alterations and shelf life of canned vegetables.  
Unit 9. General process for preparing canned vegetables. HACCP system application.  
Unit 10. Technology for manufacturing low-acid vegetables.  
Unit 11. Manufacturing technology for medium acid vegetables.  
Unit 12. Manufacturing technology for high acid vegetables.

#### **Chapter V. FROZEN VEGETABLES**

Unit 13. Quality and shelf life of frozen vegetables.  
Unit 14. Elaboration of frozen vegetables. General manufacturing process. Application of HACCP system.  
Unit 15. Processing technology for frozen vegetables. Freezing vegetables. Freezing fruit.

#### **CHAPTER VI. FRUIT JUICES, FRUITS AND DERIVATIVES**

Unit 16.- Composition, properties and nutritional value of citrus juices. Morphology of citrus fruits. Components and technological and nutritional importance. Chemical composition: Sugars. Acids. Suspended solids. Vitamins. Lipids. Minerals. Pigments. Aromas.  
Unit 17.- Composition, properties and nutritional value of sweet fruit and grape juices. Sweet fruit morphology. Components and technological and nutritional importance. Chemical composition: Sugars. Acids. Suspended solids. Vitamins. Lipids. Minerals. Pigments. Aromas. Components and technological and nutritional importance of the grape.  
Unit 18.- Preliminary and complementary operations. Influence of raw material. Preliminary operations. Complementary operations: Sieving, Deaeration, Centrifugation, Decantation.  
Unit 19.- Juice extraction technology. Extraction of citrus juices. FMC extractor. Sweet fruit extraction systems. Types press. Hydraulic presses.  
Unit 20.- Enzymatic applications in the juice industry. Enzymes in the juice industry. Enzymatic clarification. Enzymatic maceration of the pulp. Enzymatic liquefaction. Enzymatic applications in citrus processing.  
Unit 21.- Juice clarification. Non-enzymatic clarification. Turbidity formation mechanisms. Process controls clarification. Clarifying agents. Filtration. Ultrafiltration.  
Unit 22.- Juice concentration by evaporation. Concentration by evaporation. Multiple effect evaporators. Plate evaporators. Design of evaporation plants.

### Practical activities

#### **Classroom practices**

1. Interpretation of technical information obtained from commercial catalogs

2. Interpretation of the information collected in regulations and scientific articles
3. Calculation of ingredients and proportions to be used in the manufacture of canned vegetables specific.
4. Evaluation of the information offered on the labels of canned, juices and frozen vegetables and their compliance with legislation.

## Laboratory practices

1. Quality control of fruit juices
2. Quality control of frozen vegetables.
3. Elaboration of a fruit nectar.
4. Determination of essential oils in citrus juices.
5. Sensory analysis of fruit juices.

It is MANDATORY that students wear the following personal protective equipment (PPE) during the laboratory practices.

- UdL unisex white lab coat
- Safety glasses
- Chemical / biological protection gloves

**Directed activities:** Preparation of a bibliographic work:

1. Guidance for carrying out a directed bibliographic work on the characteristics and technology for the process of making canned, juice or frozen vegetables.
2. Selection of a certain fruit or vegetable and establish its general process of canned, juice or frozen.
3. Monitoring of the performance of the work.
4. Public presentation of the work.

## Methodology

Kind of activity	Description	On-site activity		Autonomous activity		Evaluation	Total time	
		Objectives	Hours	Student's work	Hours	Hours	Hours	ECTS
Lecture	Lecture	Explanation of the main concepts	30	Study: Learn, understand and synthesized knowledge.	44	4	78	3,12
Interactive lectura	Interactive lectura	Solving problems and case studies	4	Problems resolution and case discussion	10		14	0.6
Seminar	Participative lectura	Activities for discussion and knowledge application	4	Case discussion	6		10	0.4
Laboratory	Laboratory practice	Practice development	10	Study and prepare the practical report	10		20	0.8
Supervised activities	Monographic exercise (individual or group)	Student orientation	8	Bibliographic search and preparation of a presentation	20		28	1.12
Total			56		90	4	150	6.0

## Evaluation

Type of activity	Assesment type		Weight mark
	Procedure	Number	(%)
Lecture	Written test	2	60 (30 + 30)
Interactive lecture	Written test	2	10
Seminar	Delivering report. Written or oral test	1	5
Laboratory	Delivering report. Written or oral test	2	15
Supervised activities	Delivering report and oral presentation	1	10
Others			
Total			100

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**Note:** If for health reasons, or other unforeseen circumstances, face-to-face tests cannot be taken, they will take place remotely..

## Bibliography

The bibliography of technological subjects requires continuous review. However, some manuals that despite having been written in some cases more than one decade ago, their content is suitable for a first contact with the processes in food industries.

## Basic bibliography

1. Casp, A. (coord.), 2014. Tecnología de alimentos de origen vegetal. Vol 1 y 2. Editorial Síntesis, Madrid.
2. Arthey, D.; Ashurst, P. R. Fruit processing. Ed. Blackie Academic and Professional. London. United Kingdom. (1996)
3. Ashurst, P.R. Producción y envasado de zumos y bebidas de frutas sin gas. Acribia, Zaragoza. (1998)
4. Cox, P.M. Ultracongelación de alimentos. Ed. Acribia, Zaragoza (1987)
5. Southgate, D. Conservación de frutas y hortalizas. Ed. Acribia, Zaragoza (1992)
6. Vamam, A. H. y Sutherland, J. P. Bebidas. Tecnología, química y microbiología. Ed. Acribia. Zaragoza. (1996)

## Complementary bibliography

1. AIJN. Code of practice for evaluation of fruit and vegetables juices. Association of the Industry of Juices and Nectars from Fruits and Vegetables of the European Economic Community (AIJN). Avenue de Cortenbergh 172, 1040 Brussels, Belgium. (1993)
2. Gould, G.W. Food preservation. Ed. Chapman & Hall, New York (1995)
3. Kadoya, T. Food Packaging. Academic Press Inc, New York (1990)
4. Sielaff, H. Tecnología de la fabricación de conservas. Ed. Acribia, Zaragoza (2000)
5. Woodroof, J. G. y Philips. Beverages: Carbonated and non-carbonated. Ed. AVI Publishing, Co, Inc. Westport. Connecticut. USA.: (1974)

## Journals:

Fruit processing (Available in the UdL Library since January 1996)