



DEGREE CURRICULUM

PLANT FOOD PROCESSING TECHNOLOGY I

Coordination: GARZA GARZA, SALVADOR

Academic year 2023-24

Subject's general information

Subject name	PLANT FOOD PROCESSING TECHNOLOGY I			
Code	102584			
Semester	1st Q(SEMESTER) CONTINUED EVALUATION			
Typology	Degree	Course	Character	Modality
	Bachelor's Degree in Agricultural and Food Engineering	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	1	1	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 this link for more information.			
Language	Spanish 50 % Catalan 50 %			

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
GARZA GARZA, SALVADOR	salvador.garza@udl.cat	1,5	
GRAELL SARLE, JORGE MARIANO	jordi.graell@udl.cat	3	
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Subject's extra information

Attendance to all practical sessions is mandatory.

For the final grade, to pass the course it will be necessary to have obtained at least a 4.0 in each of the modules and an average of more than 5.0 points.

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

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

Learning objectives

BACHELOR IN AGRICULTURAL AND FOOD ENGINEERING

It is intended the student to be capable, at the different food industries studied in this subject, of:

- Describe the fresh conditioning / preservation processes and the transformation processes of plant products (fruits and vegetables).
- Handle and know how to apply the different regulations that affect the fresh packaging and preservation industries and the vegetable products processing industries.
- Outline, in flow diagrams, the fresh conditioning and preservation processes, as well as the processes for preparing and preserving plant products.
- Identify raw materials, ingredients, additives and other materials to be used in the fresh conditioning / preservation industry and in the vegetable products processing industries.
- Assess the influence of the composition and properties of the raw material on the quality of the final product.
- Interpret the physical and chemical changes that occur within the various fresh conditioning / preserving processes and those for transformation processes of plant products.
- Modify fresh conditioning / preservation processes and transformation processes of plant products based on the objectives to be reached.
- Organize the production of fresh conditioning / preservation lines and transformation of plant products.
- Associate composition and defects in the final product with raw materials and applied technologies.
- Select equipment for fresh conditioning / preservation lines and transformation of plant products.
- Sizing production lines and estimating the capacities of fresh conditioning / preservation equipment and transformation of plant products.

Competences

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Basic competences

CB1. Students have been shown to possess and understand knowledge in an area of study that is at the core of general secondary education, and is often found at a level that, while supported by advanced textbooks, also includes some aspects involving knowledge from the cutting edge of their field of study.

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 elaboration 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. Capacity for pre-preparation, design of construction projects which by their nature and characteristics fall within the agri-food industry (extractive, fermentative, dairy, canning, fruit and vegetable, meat, fishing, salting and, in general, any other industries engaged in the processing and/or processing, preservation, handling and distribution of food products)

CG6. Capacity for the management and management of all kinds of agro-food industries, with knowledge of new technologies, quality processes,

CG8. Ability to solve problems with creativity, initiative, methodology and critical reasoning.

CG10. Capacity for the search and use of the regulations and regulations related to its field of action.

CG12. Ability to work in multidisciplinary and multicultural teams.

CG13. Correction in oral and written expression

Specific competences

CEMC8. Management and exploitation of agro-industrial by-products.

CEMC9. Decision making through the use of available resources for working in multidisciplinary groups.

CEIAA1. Food engineering and technology: Food technology. Processes in the agro-food industries.

Subject contents

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CONTENTS

CONDITIONING AND PRESERVATION OF FRESH FRUITS AND VEGETABLES

BLOCK A (30 %): Theory

Topic 1. Introduction

Types and structure of fruits and vegetables.- Chemical composition of fruits and vegetables.- Physiological processes in postharvest of fruits and vegetables.- Postharvest factors that influence the quality and deterioration of fruits and vegetables.- Preharvest factors that influence the quality and deterioration of fruits and vegetables.

Topic 2. Technical Aspects of Fruit and Vegetable Processing Plants.

Typical sections in fruit and vegetable processing plants: constructive aspects - Aspects on plant installations: chambers and cooling installations.

Topic 3. Harvesting and transport of fruit and vegetable products.

Harvesting. Aspects to take into account during harvesting - Optimum harvesting moment - Maturity indexes - Optimum recommended values - Transport of fruit and vegetable products. Optimum recommended values.- Transport and reception of products in the plant.- Preparation operations of cold rooms and other elements.

Topic 4. Pre-cooling of fruits and vegetables.

Purpose and benefits of cooling - Kinetics of cooling. Types of cooling methods.- Air cooling: rationale and equipment.- Water cooling: rationale and equipment.- Vacuum cooling: rationale and equipment.- Comparison between cooling methods.

Topic 5. Conservation in cold storage chambers

Preparation of chambers - Disinfection of chambers and containers - Product loading in chamber: stowage, loading density and incompatibility between products - Conservation parameters in chamber - Temperature - Relative humidity - Recirculation and air renewal - Monitoring of product conservation - Recommended conservation conditions for fruits and vegetables.

Topic 6. Conservation in controlled atmosphere chambers.

Fundamentals of the controlled atmosphere technique - Benefits of CA preservation - Product maturity at harvest - Preparation of chambers - Tightness - Loading and unloading of the product - Airtightness Loading and sealing of chambers.- Setting up and maintenance of the atmosphere. Equipment and installations.-Chamber conservation parameters. Temperature, relative humidity, air recirculation, O2 and CO2 concentration.- Product handling in chambers.- Special techniques: AC-low ethylene, AC-dynamic.- Recommended conditions for storage of fruits and vegetables in AC.

Topic 7. Treatments prior to preservation or commercialization

Treatments in fruits and vegetables: purpose and application methods.- Sprouting inhibitor treatments.- Curing.- Disinfestation.- Treatments to delay ripening and senescence.- Waxing and other coatings.- Control of microbial alterations.- Control of physiological disorders.- Disastringent treatments.

Topic 8. Accelerated ripening and degreening

Purpose and benefits - Physiological fundamentals - Pre-harvest early ripening - Accelerated ripening - Parameters - Facilities for accelerated ripening - De-greening - De-greening Parameters - Facilities for accelerated ripening - De-greening. Parameters - Facilities for degreening.

Topic 9. Conditioning and preparation of the product for the market.

Purpose of fruit and vegetable conditioning - Cleaning and washing - Sorting - Grading - Packing - Labeling - Conditioning lines - Equipment - Environmental conditions in the packing area - Packaging - Packaging lines - Equipment - Packaging lines - Equipment - Environmental conditions in the packing area Environmental conditions in the conditioning area.- Aspects of hygiene and occupational safety.- Transport of fruits and vegetables.

Topic 10. Quality and postharvest alterations of fruits and vegetables.

Definition and meanings of the concept of quality. Methods of analysis - Sensory attributes. Methods of analysis.- Quality standards.- Quality management.- Postharvest alterations in fruits and vegetables: types and causes of alterations.- Damage due to dehydration.- Mechanical damage.- Microbial alterations.- Rottenness. Physiological alterations: low temperatures, mineral deficiencies, gaseous composition, other causes; - Chemical phytotoxicities.

TRANSFORMATION OF VEGETABLES: CANNED AND FROZEN PRODUCTS.

BLOCK B (23 %): Theory

Topic 1. Situation of the vegetable processing sector.

Current situation and perspectives of the fruit and vegetable processing sector. Installation and organization of vegetable processing industries.

Topic 2. Legislation

European and Spanish legislation affecting the installation and operation of vegetable canning and freezing industries, as well as the products obtained.

Topic 3. Auxiliary materials in the canning industry.

Canning of canned vegetables. Characteristics and handling of metallic and glass containers. Packaging of frozen vegetables. Additives and technological coadjuvants. Function and necessity of use. Labeling.

Topic 4. Processing of canned vegetables.

Sterilization scales. Factors that influence the sterilization of canned vegetables. Quality, alterations and shelf life of canned vegetables. General process of elaboration of canned vegetables. Application of the HACCP system. Manufacturing technology for low acid, medium acid and high acid vegetables.

Topic 5. Frozen vegetables

Quality and shelf life of frozen vegetables. Elaboration of frozen vegetables. General manufacturing process. Application of HACCP system. Frozen vegetables processing technology. Freezing of vegetables. Fruit freezing.

VEGETABLE PROCESSING: PREPARATION OF JUICES AND DERIVATIVES.

BLOCK C (25 %): Theory

Topic 1. Juice processing technology. Introduction

Definitions and basic concepts. Basic legislation of the sector. Raw materials. Process diagrams of the main products.

Topic 2. Puree elaboration technology.

Preliminary operations. Boning. Sieving. Deaeration. Pasteurization. Storage. Aseptic packaging.

Topic 3. Technology for the elaboration of concentrated clarified juices.

Preliminary operations. Crushing. Enzymatic maceration. Extraction. Clarification. Concentration.

Topic 4. Technology for the elaboration of citrus juices.

Preliminary operations. Process operations: extraction, pulping... Valorization of by-products.

Topic 5.- Situation of the sector

Facts and figures of the sector: production, imports and exports. Business data. Sector associations.

PRACTICAL ACTIVITIES

BLOCK D (22 %)

Laboratory practicals: Fresh fruits and vegetables (10 %)

1. Analysis of maturity and quality parameters in fruits and vegetables.
2. Evaluation of postharvest disorders in horticultural products.

Classroom practicals: Problems and cases - Fresh fruits and vegetables (10 %)

1. Elaboration of a study on postharvest handling of horticultural product.

Classroom practicals: Seminars - Canned and frozen foods (2 %)

1. Evaluation of the information provided on the labels of canned, juices and frozen vegetables and their compliance with legislation.

Methodology

GRAU EN ENGINYERIA AGRARIA I ALIMENTARIA

Tipus d'activitat	Descripció	Activitat presencial Alumne		Activitat no presencial Alumne		Avaluació	Temps total	
		Objectius	Hores	Treball alumne	Hores	Hores	Hores	ECTS
Llísó magistral	Classe magistral (Aula. Grup gran)	Explicació dels principals conceptes	42	Estudi: Conèixer, comprendre i sintetitzar coneixements	62	4	108	4.32
Problemes i casos	Classe participativa (Aula. Grup gran)	Aplicació dels conceptes teòrics impartits en classes magistrals	6	Resoldre problemes i casos	10		16	0.64
Seminari	Classe participativa (Grup gran)	Realització de activitats de discussió o aplicació	4	Resoldre problemes i casos. Discutir	2		6	0.24
Laboratori	Pràctiques de Laboratori (Grup gran)		4	Redactar memòria	16		20	0.8
Totals			56		90	4	150	6

Evaluation

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EVALUATION

Evaluation blocks:

- Block A: 30 % - Written test
 Block B: 23 % - Written test
 Block C: 25 % - Written test
 Block D: 22 % (Laboratory practicals: 10 %; Problems and cases: 10 %; Seminars: 2 %)

Type of activity	Assesment type		Weight mark
	Procedure	Number	(%)
Lecture	Written test Minimum grade of 4 out of 10 in blocks A, B and C	3	Block A: 30 % Block B: 23 % Block C: 25 %

Practical activities: (Not recoverable)			Block D: 22 %
Practical Laboratory	Assessment of attendance, attitude and interest.	2	10 %
Problems and cases	Delivery of practical report.	1	10%
Seminars	Delivery problems and cases. Delivery of reports. Written or oral tests.	1	2 %
Total			100

Observations:

The completion of the laboratory practices is mandatory, as well as the delivery of the corresponding practice reports and other evaluable activities. Block D is not recoverable.

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

- 1.- To obtain a minimum grade of 4 out of 10 in blocks A, B and C.
- 2.- To obtain an overall average grade of 5 out of 10 or higher.

The overall average grade of the subject will be calculated from the weighted average grade of each of the blocks.

ALTERNATIVE EVALUATION:

It will consist of a global written test (exam) of the entire content of the subject, on the date established by the center, which will account for 100% of the final grade of the subject.

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

Bibliography

BACHELOR IN AGRICULTURAL AND FOOD ENGINEERING

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. Namesny, A., 1993. Postrecolección de hortalizas. Vol. 1,2,3. Ediciones de Horticultura, Reus.
6. Southgate, D. Conservación de frutas y hortalizas. Ed. Acribia, Zaragoza (1992)
7. Varnam, A. H. y Sutherland, J. P. Bebidas. Tecnología, química y microbiología. Ed. Acribia. Zaragoza. (1996)
8. Wills, R.H.H., McGlasson, B., Graham, D., Joyce, D., 1998. Introducción a la fisiología y manipulación poscosecha de frutas, hortalizas, plantas ornamentales. 2 ed, Acribia, Zaragoza, 240 pp.
9. Viñas, I., Usall, J., Echeverría, J., Graell, J., Lara, I., Recasens, I. 2013. Poscosecha de pera, manzana y melocotón. Mundiprensa, Madrid, 358 pp

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. Kader, A., 2002. Postharvest Technology of Horticultural Crops. University of California.
5. Sielaff, H. Tecnología de la fabricación de conservas. Ed. Acribia, Zaragoza (2000)
6. 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)

Postharvest Biology and Technology (Available in the UdL Library)