



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	102584			
Semester	1st Q(SEMESTER) CONTINUED EVALUATION			
Typology	Degree	Course	Character	Modality
	Bachelor's Degree in Agricultural and Food Engineering	3	COMPULSORY	Attendance-based
	Master's Degree in Management and Innovation in the Food Industry		COMPLEMENTARY TRAINING	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	
MAGRI TERSA, XAVIER	xavier.magri@udl.cat	1,1	
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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

DEGREE IN AGRICULTURAL AND FOOD ENGINEERING

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

BACHELOR IN AGRICULTURAL AND FOOD ENGINEERING

Set of topics

CONDITIONING AND PRESERVATION OF FRESH FRUITS AND VEGETABLES

Unit 1. Fundamentals of the post-harvest of fruits and vegetables

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.- Pre-harvest factors that influence the quality and deterioration of fruits and vegetables.

Unit 2. Aspects of fruit and vegetable storage plants

Purposes of the processing in fruit and vegetable plants.- Types of plants.- Process diagrams.- Typical sections in plants: constructive aspects.- Aspects of facilities in plants: cold rooms and facilities.

Unit 3. Treatments prior to conservation or commercialization

Fruit and vegetable treatments: purpose and methods of application.- Sprout inhibitor treatments.- Curing.- Disinfestation.- Treatments to delay ripening and senescence.- Waxing and other coatings.- Control of microbial disorders.- Control of physiological disorders.- Desastring treatments.

Unit 4. Accelerated maturation and greening

Purpose and benefits.- Physiological basis.- Early ripening in pre-harvest.- Accelerated ripening. Parameters.- Facilities for accelerated maturation.- Greening. Parameters.- Facilities for greening.

Unit 5. Fruit and vegetable cooling

Purpose and benefits of cooling.- Cooling kinetics. Parameters.- Types of cooling methods.- Air cooling: foundation and equipment.- Water cooling: foundation and equipment.- Vacuum cooling: foundation and equipment.- Comparison between cooling methods.

Unit 6. Cold storage

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

Unit 7. Conservation in controlled atmosphere chambers

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

Unit 8. Conditioning and preparation of the product for the market

Purpose of fruit and vegetable conditioning.- Cleaning and washing.- Selection.- Classification.- Packaging.- Labeling.- Conditioning lines. Equipment.- Environmental conditions in the conditioning zone.- Hygiene and occupational safety aspects.- Transport of fruits and vegetables.

Unit 9. Quality of fruits and vegetables.

Definition and meanings of the concept of quality.- Physicochemical quality parameters. Analysis methods.- Sensory attributes. Analysis methods.- Quality standards.- Quality management.

Unit 10. Post-harvest alterations in fruits and vegetables

Types and causes of alterations.- Damage due to wilting.- Mechanical damages.- Microbial alterations. Rot.- Physiological alterations: due to low temperatures, due to mineral deficiencies, due to gaseous composition, due to other causes.- Chemical phytotoxicities.

TRANSFORMATION OF FRUITS AND VEGETABLES

Unit 11. Situation of the vegetable processing sector

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

Unit 12. Legislation

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

Unit 13. Auxiliary materials in the canning industry.

Canned vegetable packaging. Characteristics and handling of metal and glass containers. Frozen vegetable packaging. Additives and technological aids. Function and need for use. Labelling.

Unit 14. Transformation of canned vegetables

Sterilization process parameters. Factors that influence the sterilization of canned vegetables. Quality, alterations and shelf life of canned vegetables. General process of preparing canned vegetables. Application of the HACCP system. Technology for the manufacture of vegetables with low acidity, medium acidity and high acidity.

Unit 15. Frozen vegetables

Quality and shelf life of frozen vegetables. Manufacture of frozen vegetables. General manufacturing process. HACCP system application. Frozen vegetable processing technology. Freezing vegetables. Freezing fruit.

Unit 16.- Composition, properties and nutritional value of juices.

Fruit morphology. Components and technological and nutritional importance. Chemical composition: Sugars. Acids. Suspended solids. Vitamins. Lipids. Minerals. Pigments. Aromas.

Unit 17.- Preliminary and complementary operations.

Influence of raw material. Preliminary operations. Complementary operations: Sieving, Deaeration, Centrifugation, Decantation.

Unit 18- Juice extraction technology.

Extraction of citrus juices. FMC extractor. Sweet fruit extraction systems. Types of press. Hydraulic presses.

Unit 19.- 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 20.- Juice clarification.

Non-enzymatic clarification. Turbidity formation mechanisms. Controls of the clarification process. Clarifying agents. Filtration. Ultrafiltration.

Unit 21.- Juice concentration by evaporation.

Concentration by evaporation. Recovery of aromas. Multiple effect evaporators. Plate evaporators. Design of evaporation plants.

Practical activities

Classroom practices

- Exercise on the dimensioning of cold rooms for fruits storage. Design and selection of equipment in plants.
- Preparation of a study on the post-harvest handling of fresh vegetables.
- Viewing of symptoms of alterations and quality aspects in fruits and vegetables.
- Interpretation of technical information obtained from commercial catalogs
- Interpretation of the information collected in regulations and scientific articles
- Calculation of ingredients and proportions to be used in the manufacture of specific canned vegetables.
- Evaluation of the information offered on the labels of canned, juices and frozen vegetables and their compliance with the legislation.

Laboratory practices

- Analysis of parameters of maturity and quality in fruits and vegetables.
- Preparation of a canned vegetable.
- Control of container closures.
- Quality control of a commercial canned vegetable.

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	40	Estudi: Conèixer, comprendre i sintetitzar coneixements	61	3	104	4.2
Problemes i casos	Classe participativa (Aula. Grup gran)	Aplicació dels conceptes teòrics impartits en classes magistrals	6	Resoldre problemes i casos	10	1	17	0.6
Seminari	Classe participativa (Grup gran)	Realització de activitats de discussió o aplicació	2	Resoldre problemes i casos. Discutir	2		4	0.2
Visita a indústries	Visita a empreses	Conèixer in situ els processos de elaboració	2		2		4	0.2
Laboratori	Pràctiques de Laboratori (Grup gran)		6	Redactar memòria	15		21	0.8
Totals			56		90	4	150	6

Evaluation

BACHELOR IN AGRICULTURAL AND FOOD ENGINEERING

Type of activity	Assesment type		Weight mark
	Procedure	Number	(%)
Lecture	Written test	3	70 (30+15+25)
Interactive lecture	Written test	2	15
Seminar	Delivering report. Written or oral test	1	5
Laboratory	Delivering report. Written or oral test	2	10
Others			
Total			100

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, calculated from the average grade of each module, equal or higher than 5.

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.

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)