



Universitat de Lleida

DEGREE CURRICULUM  
**PLANT FOOD PROCESSING  
TECHNOLOGY II**

Coordination: GRAELL SARLE, JORGE MARIANO

Academic year 2023-24

## Subject's general information

<b>Subject name</b>	PLANT FOOD PROCESSING TECHNOLOGY II			
<b>Code</b>	102238			
<b>Semester</b>	2nd Q(SEMESTER) CONTINUED EVALUATION			
<b>Typology</b>	<b>Degree</b>	<b>Course</b>	<b>Character</b>	<b>Modality</b>
	Bachelor's Degree in Food Science and Technology	3	COMPULSORY	Attendance-based
<b>Course number of credits (ECTS)</b>	6			
<b>Type of activity, credits, and groups</b>	<b>Activity type</b>	PRALAB	PRAULA	TEORIA
	<b>Number of credits</b>	1	0.6	4.4
	<b>Number of groups</b>	3	2	1
<b>Coordination</b>	GRAELL SARLE, JORGE MARIANO			
<b>Department</b>	FOOD TECHNOLOGY, ENGINEERING AND SCIENCE			
<b>Important information on data processing</b>	Consult <a href="#">this link</a> for more information.			
<b>Language</b>	catalan (50%) and spanish (50%)			

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
CASANOVAS CASTRO, MARIA	maria_casanovas@hotmail.com	3	
FRIERO MORENO, IVAN	ivan.friero@udl.cat	2,6	
GRAELL SARLE, JORGE MARIANO	jordi.graell@udl.cat	0	
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SENTÍS MORÉ, PAU	pau.sentis@udl.cat	1	

## Subject's extra information

### DEGREE IN FOOD SCIENCE AND TECHNOLOGY

Having overcome the fundamental subjects of the first and second year, third year in this course is intended to deepen the student's practical study of industrial processes of production of oils and fats in order to acquire the knowledge and skills of a technical expert in the field of oils and fats.

## Learning objectives

The student to pass the course, must be able to:

- Assess the characteristics of different types of oil feedstocks that can be used in the processing industry of oils and fats.
- Specify the requirements to be met by oil raw materials for use in industrial processes of oils and fats.
- Select and plan the necessary steps to carry out a particular process of development of an oil or fat.
- Describe the action of the different technical parameters of an operation or industrial treatment on changes in the characteristics of oils and fats.
- Select the necessary equipment to be applied in each of the stages of a development process oils and fats.

- Solve the sizing of the required equipment capacity processing of oils and fats.
- Compare the different processes which can be applied for obtaining and / or processing of oils and fats, from a technological point of view and engineering.
- Specify the characteristics that, according to the relevant technical regulations submitted by different types and classes of commercial oils and fats.
- Interpret the analytical values of the characteristics of the products and by-products obtained during the development of an oil or fat to proceed with the regulation of the corresponding processes.
- Outline graphically sections that are part of an industry processing of oils and fats, to develop a preliminary design industry.
- Demonstrate knowledge of the nutritional virtues and the different possible uses of oils and fats in the food industry.

## Competences

### Basic skills

CB2: That students know how to apply their knowledge to their work or vocation in a professional way and have the skills that are usually demonstrated through the development and defense of arguments and problem solving within their area of study.

CB3: That students have the ability to gather and interpret relevant data to make judgments that include reflection on relevant issues of a social, scientific, or ethical nature.

CB4: That students can convey 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.

### General skills

CG1: Analyze specific situations, define problems, make decisions and implement action plans in search of solutions.

CG2: Interpret studies, reports, data and analyze them numerically.

CG3: Select and release the available written and computerized sources of information related to the professional activity.

CG4: Work alone and in a multidisciplinary team.

CG5: Understand and express themselves in the appropriate terminology.

CG10: Have a critical and innovative spirit.

CG11: Analyze and evaluate the environmental implications in their professional activity.

### Transversal skills

CT1: Present information correctly orally and in writing (UdL strategic competence).

CT3: Use existing computer and communication tools as support for the development of their professional activity (UdL strategic competence).

CT4. 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

## **Specific skills**

In the field of the manufacturing industries of vegetable oils and cereal derivatives get:

CE1. Select and apply the physical and mathematical foundations necessary for the development of other disciplines and the activities of the profession.

CE2. Identify and apply the chemical foundations necessary for the development of other disciplines and the activities of the profession.

CE5. Apply the basic processes of a laboratory and use equipment, handle reagents, meet safety conditions and prepare reports.

CE6. Pose and solve problems correctly applying the concepts acquired to specific situations.

CE23: Outline, based on flowcharts, the production processes.

CE24: Identify and evaluate raw materials, ingredients, additives and technological aids for use in industry.

CE26: Apply basic knowledge about raw materials, ingredients and additives to food formulation.

CE27: Interpret the physical and chemical changes that occur during the different production processes.

CE28: Modify the production processes based on some objectives.

CE29: Select equipment and organize the lines of elaboration and packaging.

CE30: Develop new processes and products.

CE31: Identify and value the various parts of an industry project.

CE32: Sizing production lines.

CE33: Estimate the capabilities of equipment for production lines and the needs of auxiliary systems.

## **Subject contents**

### **BLOCK A: Theory Vegetable Oils and Cereal Technology**

#### **PART I: TECHNOLOGY OF SEED OILS.**

##### **Item 1.- Introduction.**

Vegetable oils. Sanitary technical regulation. Raw materials. Oil industry.

##### **Item 2 - Preliminary operations.**

Receiving seeds -. Storing seeds. Conditions -. Storage silos. Types -. Drying seeds. Types of dryers -. Cleaning and preparation of seed -. Crushing and laminate seeds -. Conditioning of seed.

##### **Item 3 - Removing oil per pressure.**

Pressure oil extraction. Fundamentals - Continuous presses. - Advantages and disadvantages of the system

pressure - Diagram of pressing system..

## **Item 4-. Extraction by solvent oil.**

Solvent extraction. Basics and benefits - Factors influencing solvent extraction - Extraction systems: percolation, immersion and mixed - Types of percolation extractors - Types of immersion extractors - Types of mixed extractors. - Special processes of solvent extraction.

## **Item 5 -. Final extraction operations.**

Filtration of miscella -. Preconcentration miscella -. Distillation of miscella -. Desolventization of turtos -. Controls.

## **PART II: TREATMENT OF OILS AND FATS**

### **Item 6 -. Refining of oils and fats.**

Objectives of the refining of oils and fats. - Degumming of oil. Equipment for neutralization of oils: chemical system - Bleaching of oils. Equipments -. Deodorization of oils.- Physical refining equipment, oils and fats -. Winterización of oils.

### **Item 7 -. Modification of oils and fats.**

Hydrogenation of oils and fats. Fundamentals -. Applications in the food industry -. Hydrogenation equipment and facilities -. Problems of trans fatty acids -. Fat Interesterification - Margarine and "shortenings" - Other processes:. Obtaining biodiesel.

### **Item 8.- Utilization of refining by-products**

Lecithins.- Valorization of deodorization distillates: recovery of sterols, tocopherol and fatty acids.

## **PART III - CEREAL TECHNOLOGY**

### **Item 9 -. Baking.**

Introduction - Definition and types of bread - Raw materials - Milling of cereals: Manufacture of flour - flour quality parameters - Graph and manufacturing stages. machinery and controls at each stage - aging phenomenon. bread - Application of cold: precooked frozen masses - Application of modified atmosphere packaging.

### **Item 10 -. Made biscuits.**

Introduction - Definition and types of cookies - Raw materials: Features - Diagram and manufacturing stages. Purpose and machines at each stage.

### **Item 11 -. Manufacture of pasta.**

Introduction - Definition and types of food pastes - Features quality pastes - Raw materials: Features - Diagram and manufacturing stages. Purpose machinery and controls at each stage.

### **Item 12.- Other cereals products**

Introduction.- Breakfast cereal.- Starch products.- Other cereal products.

## **BLOCK B: Theory OLIVE OILS**

## **PART IV - OLIVE OIL TECHNOLOGY**

### **Item 13 -. Olive oil. Composition and quality.**

Composition of olive oil -. Classification of olive oils -. Quality of olive oils -. Considerations on the parameters of quality and purity of olive oils -. Diagrams processing of virgin olive oils.

### **Item 14 - The raw material. Olive. Previous operations process.**

The olive. Structure and composition -. Olive ripening -. Variety -. Influence of climatic and agronomic factors -. Collection of olives -. Transportation of olives -. Reception of olives -. Cleaning and washing of olives -. Storage of olives -. Controls in olives.

## **Item 15 -. Operations about olive paste preparation.**

Milling the fruit. Objectives - Types of mills. Comparison - Malaxation of olive paste.- Characteristics of malaxators - Features of olive paste - Difficult olives paste - Adding technological adjuvants.

## **Item 16 -. Operation of oil extraction.Partial extraction and pressing systems**

Fundamentals of partial extraction -. Partial extraction equipment -. Factors influencing extraction -. Coadjuvants technology -. Handling process -. Advantages and disadvantages of partial extraction.- Fundamentals of pressing system -. Description hydraulic press -. Operation pressing -. Factors affecting the operation -. Difficult paste. Technological Coadjuvants -. Advantages and disadvantages of the press system.

## **Item 17 -. Operation of oil extraction. III -. System of centrifugation.**

Extraction of oil by centrifugation. Theoretical foundations - Description of decanter. Operation -. Factors affecting the operation -. Advantages and disadvantages of centrifuge system -. Centrifugation system of 2 phases -. Comparison between 2-phase centrifugation and 3-phase -. Technological coadjuvants.- Separation of liquids by decantation. Factors -. Facilities -. Separation of liquids by centrifugation. - Vertical centrifuges - Mixed system. Decantation and centrifugation.

## **Item 18.- Management and process control.**

Visual and analytical controls in products and byproducts. - Regulation of the press system - Regulation of centrifuge system 3 phase - Regulation of system 2-phase centrifugation - Process automation.

## **Item 19 -. Final operations. Storage and packaging of oils**

Conservation of virgin olive oil: alterations - Properties of store deposits - Filtration of oils - Types of filters and application - Packaging oils - Terms and packaging types.- By-products: quantities and characteristics - Olive pomace. - Waste water. Environmental problems -. Disposal and utilization of waste water.

## **Item 20.- Treatment of olive oil by-products**

Introduction.- Types and characteristics of olive oil by-products.- Use and treatment of olive pomace.- Use and treatment of "alpechin".- Other by-products.

## **BLOC C: Practical activities:**

Classroom Practices: will consist of some of the following activities:

- Interpretation of technical information from industrial equipment catalogs.
- Interpretation of information in scientific and technical articles.
- Analysis of technical regulations.
- Analysis of the contents of a draft of an industry.
- Exercises dimensioning calculations on an industrial process equipment.

Laboratory Practice: will consist of some of the following activities

- Extraction of olive oil for a centrifuge system (Abencor equipment).
- Extraction of seed oils.
- Analysis of parameters of quality and purity in oils.

- Sensory oil tasting.

## Methodology

Some face-to-face activities may happen to be carried out on-line due to the Covid pandemic.

Activity	Description	Face-to face Activity	Hours	Not face-to-face Activity	Hours	Evaluation	Total time /ECTS
		Objectives		Student work		Hours	
<b>Master class in theory</b>	Master class	Explanation of the main concepts	<b>44</b>	Study: Know, understand and synthesize knowledge	<b>60</b>	4	<b>108/4.32</b>
<b>Problems i cases</b>	Participatory class in the classroom	Problem solving and cases	<b>6</b>	Learn to solve problems and cases	<b>12</b>		<b>18/0.72</b>
<b>Laboratory</b>	Laboratory Practices	Execution of the practice in Laboratory	<b>10</b>	Make reports	<b>14</b>		<b>24/0.96</b>
<b>Totals</b>			<b>60</b>		<b>86</b>	4	<b>150/6</b>

Observations: 25 hours of total activity per ECTS credit.

## Evaluation

Activity	Evaluation	Quantity	Weight rating
	Procedure		
<b>Master class</b>	Written tests on the theory of the subject program	2	<b>70% (35+35)</b>
<b>Laboratory</b>	Assistance and test on the practices carried out.		<b>15%</b>
<b>Problem and cases (in classroom)</b>	Solve exercises and test.		<b>15%</b>
<b>Total</b>			<b>100</b>

Observations:

- Attendance at all internship sessions is obligatory.



- For the purposes of the final grade, to pass the subject it will be necessary to have obtained at least a score **greater than or equal to 4** in each of the written tests.
- To pass the course it is necessary to obtain an overall score equal to or higher than 5 considering all the activities evaluable with his weight.

In the event that a student takes advantage of an **alternative evaluation**, this will consist of a single written test that weights 100% of the grade

- Note: If for health reasons, or other unforeseen circumstances, it is not possible to carry out face-to-face tests, these will take place remotely.

## Bibliography

The bibliography of technological subjects requires continuous review. However, some manuals are cited that despite having been written in some cases more than a decade ago, their content is suitable for a first contact with the study of processes in the food industries. At the beginning of the course, teachers provided a more complete list of bibliographic sources, including portals and Internet addresses with industry information.

### Basic Bibliography:

- Casp, A. (coord.), 2014. Tecnología de los alimentos de origen vegetal. Vol 1 y 2. Editorial Síntesis, Madrid.
- Bernardini, E., 1981. Tecnología de aceites y grasas. Ed. Alhambra. Madrid, 493 pp.
- Civantos, L., 2008. Obtención del aceite de oliva virgen (3ª ed.), Ed. Agrícola Española, S.A. Madrid.

### Complementary Bibliography:

- Bockisch, M., 1998. Fats and Oils Handbook. AOCS Press, Champaign, USA.
- Kiritsakis, A.K., 1993. El aceite de oliva. Ed. AMV ediciones. Madrid.
- Carpio, A., Jiménez, B., 1993. Características organolépticas y análisis sensorial en el aceite de oliva. Colección: Apuntes 10/93. Ed. Servicio de Publicaciones, Consejería de Agricultura de la Junta de Andalucía. Sevilla, 74 pp.
- Frías, L., García-Ortiz, A., Hermoso, M., Jiménez, A., Llaveró, M<sup>a</sup>Paz, Morales, J., Ruano, M<sup>a</sup>.Teresa, Uceda, M., 1991. Analistas de laboratorio de almazara. Colección: Apuntes, nº6/1991. Servicio de Publicaciones, Consejería de Agricultura de la Junta de Andalucía. Sevilla, 107 pp.
- Hamm, W., Hamilton, R.J., 2000. Edible Oil Processing. CRC Press, Boca Raton, USA.
- Gunstone, F.D., 2002. Vegetable oils in food technology. CRC Press, Boca Raton, USA.