
	PROCESO PARA EL DESARROLLO DE LAS ENSEÑANZAS DE LA ESCUELA DE INGENIERÍAS AGRARIAS		 Escuela de Ingenierías Agrarias
		CÓDIGO: P/CL009_D002	

PROGRAMME IN UNIT OPERATION IN FOOD INDUSTRY

Academic course: 2019-2020

Identification and characteristics of the subject			
Code	501248	Credits ECTS	6
Name (Spanish)	Operaciones Básicas en la Industria Agroalimentaria		
Name (English)	Unit Operations in Food Industry		
Degree	ENGINEERING IN AGRICULTURAL AND FOOD INDUSTRIES		
Center	Agricultural Engineering School		
Semester	(5th)	Type	Compulsory
Module	Food Technology		
Subject	Food Technology		
Language	Spanish		
Professor/s			
Name	Room	e-mail	Web link
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Field of knowledge	Food Technology		
Department	Animal Production and Food Science		
Coordinator (if there is more than one professor)	María Luisa Timón Andrada		
Lessons and contents			
Syllabus			
SECTION 1. INTRODUCTION			
Lesson 1. Basic Principles			
Basic principles of Unit Operations. Fluid flow (momentum transfer), heat transfer and mass transfer. Material and Energy balances: Problems and resolution methods. Process definition. Continuous processes. Flow Chart			
SECTION II. FLUID FLOW (MOMENTUM TRANSFER). UNIT OPERATIONS BASED ON MOMENTUM TRANSFER			
Lesson 2. Fluid: Basic Principles			
Fluid statics and fluid dynamics. Continuous equation and Bernoulli equation.			
Lesson 3. Fluid flow			
Type of flow. Flow measurement and instrumentation			

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Lesson 4. Centrifugation

Centrifugal force. Separation of solid-liquid and immiscible liquids. Types of centrifuge. Applications in food industry

Lesson 5. Filtration

Filtration at constant pressure and constant flow. Filtration equipment. Applications in food industry

Lesson 6. Pressing.

Principles and applications. Equipment and efficiency

Lesson 7. Stirring, mixing and emulsifying.

Introduction. Classification of mixtures. Stirring: definition, power, similarity criteria and stirring mechanisms. Mixing: definition, high viscosity material mixing, solid material mixing and mixers. Emulsifying: definition, interfacial properties, emulsion stability and equipment. Food industry applications.

SECTION 3. HEAT TRANSFER. UNIT OPERATIONS BASED ON HEAT TRANSFER

Lesson 8. Heat transfer

Conduction heat transfer. Convection heat transfer. Radiation heat transfer

Lesson 9. Heat exchanger

Heat transfer mechanism in heat exchanger. Type of equipment

Lesson 10. Evaporation

Heat transfer mechanism in evaporation. Heat transfer coefficients and factors that affect these coefficients. Factors affecting boiling liquid point. Boiling liquid characteristics. Calculations: one effect and multiple effect evaporation. Evaporators. Evaporation applications in Food Industry.

SECTION 4. MASS TRANSFER. UNIT OPERATIONS BASED ON MASS TRANSFER

Lesson 11. Mass transfer

Heat transfer by diffusion: Fick law

Lesson 12. Distillation and rectification

Theory, equipments and applications in food industry

Lesson 13. Solid liquid extraction

Introduction. Mass transfer in the extraction. Extraction efficiency and parameters. Calculations. Equipments. Applications in Food Industry

Lesson 14. Clarification of gases



Principles, equipments and applications

Lesson 15. Membrane separation: Ultrafiltration and reverse osmosis

Theory. Types of membranes. Equipment and applications.

PRACTICAL SYLLABUS

Practical lesson 1: **Solution preparation**

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Practical lesson 2: **Centrifugation**
Practical lesson 3: **Filtration**
Practical lesson 4: **Meat emulsion preparation**
Practical lesson 5: **Heat transfer by conduction and convection**
Practical lesson 6: **Distillation**

Monographic work: **Flow chart preparation and oral presentation**