



Universitat de Lleida

DEGREE CURRICULUM
**BASICS OF FOOD
ENGINEERING**

Coordination: GARZA GARZA, SALVADOR

Academic year 2022-23

Subject's general information

Subject name	BASICS OF FOOD ENGINEERING			
Code	102581			
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	0.4	1.4	4.2
	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 %			
Distribution of credits	Theory: 2 cr Classroom practices: 3 cr. Laboratory practices: 1 cr			

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
GARVIN ARNES, ALFONSO	alfonso.garvin@udl.cat	3	
GARZA GARZA, SALVADOR	salvador.garza@udl.cat	3	

Subject's extra information

Subject/subject in the curriculum as a whole

The subject "Fundamentals of Food Engineering", together with "Food Process Engineering I" and "Food Process Engineering II", provides knowledge about the different balances and basic operations carried out in the elaboration processes of the food industry.

In industrial processes it is essential to know the materials and energies involved in them and above all what are the quantities of these properties that are transferred in each operation of the process, data that are essential for the control and proper design of process equipment.

The study of the operations that form an industrial process is carried out by means of the transport phenomena, recognizing the property or properties that are transferred in each stage: matter, energy and quantity of movement. This study includes the quantity and type of property that is transported through the application of balances, as well as the speed at which the property is transferred, taking into account the mode in which the process is carried out (stationary or non-stationary) and the type of transport (molecular or turbulent).

Recommendations

It is recommended that students taking this course have passed Mathematics and Physics.

Learning objectives

The student who passes the course must know:

- Define basic concepts: process, unit operations, steady state and non-steady state....
- Describe transport phenomena, turbulent and laminar flow regime.
- List, classify and describe the main unit operations.
- To pose and solve problems of macroscopic balances of matter.
- To pose and solve problems of macroscopic energy balances.

Competences

Basic competences

- CB1. Possess and understand knowledge in the area of engineering and basic operations of the food industries.
CB2. Apply the acquired knowledge to your work or vocation in a professional way and possess the skills that are usually demonstrated by problem solving.
CB3. Ability to gather and interpret relevant data to make judgements that include technical reflection.
CB4. Develop those learning skills necessary to undertake further studies with autonomy.

Generic competences

- CG1. Capacity for the preparation and design of projects of the agro-food industry.
CG2. Knowledge in basic and technological subjects that allow continuous learning, as well as an ability to adapt to new situations or changing environments.
CG3. Ability to solve problems with creativity, initiative, methodology and critical reasoning.

Specific competencies

Ability to know, understand and use the principles of:

- SEIAA1. Basic food engineering and operations.
SEIAA2. Engineering of the agro-food industries.

Subject contents

Agenda (50 h)

1.- Introduction to basic operations.

Process or procedure. Engineering of agri-food processes. Flow diagrams. Unit or basic operations. Continuous and discontinuous operations. Stationary and transient regime. Scientific foundations of engineering.

2.- Introduction to transport phenomena.

Historical introduction. Transport phenomena. Definition of transport phenomena. Circulation regimes. Reynolds experiment. Mechanisms of transport phenomena: transport of quantity of motion, energy and matter. Velocity laws. Coupled phenomena.

3.- Classification of basic operations.

Basic physical operations of matter transfer. Basic physical operations of heat transfer. Basic physical operations of simultaneous heat and matter transfer. Basic physical operations of transport of quantity of movement. The basic chemical operation. The chemical reaction. Mathematical model of a basic operation. Model. Level of description.

4.- Macroscopic balances of matter without chemical reaction.

Equation of the balance of matter. Balance of matter applied to a component. Application of the balances of matter.

5.- Macroscopic balances of matter with chemical reaction.

Balances of matter in systems with chemical reaction. Systems with recirculation and purge.

6.- Macroscopic energy balances.

Energy balance equation. Enthalpic balance. Mechanical energy balance.

Practical activities (10 h)

Laboratory practices

- 1.- Macroscopic balance of matter in non-stationary regime without reaction. Dilution of a concentrated solution.
- 2.- Macroscopic energy balance in non-stationary regime. Heating of a stirred tank.

It is **MANDATORY** that students have the following personal protective equipment (PPE) in the course of teaching practices.

- Laboratory coat UdL unisex
- Safety glasses
- Chemical / Biological protection gloves

Methodology

Schedules and programmed activities, as well as the methodology and evaluation procedure, may be modified from time to time for extraordinary reasons.

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	19	Study: Learn, understand and synthesized knowledge.	25	1	45 / 1.80
Interactive lectura	Interactive lectura	Solving problems and case studies	25	Problems resolution and case discussion	50	5	80 / 3.20
Laboratory	Laboratory practice	Practice development	10	Study and prepare the practical report	15		25 / 1
TOTAL			54		90	6	150 / 6

Evaluation

Observations

Attendance to all the practical laboratory sessions is compulsory, as well as the delivery of the reports.

For the purposes of the final grade, in order to pass the course, the final average grade of the course must be equal or higher than 5 points.

To average the student must have obtained a grade equal to or higher than 4 points in each and every one of the different activities evaluated.

If a grade of an evaluable activity is lower than 4 points, the maximum grade of the course will be 4.0.

Type of activity	Evaluation activity		Weight grade
	Procedure	Number	
Written exam	Written tests: Theory and problem solving	2	90 (45+45)
Problems and cases	Hand-in or written tests on problems and cases.		
Laboratory practices	Delivery of reports, written or oral tests.	1	10
TOTAL			100

Bibliography

Basic bibliography

AUCEJO, A.; BENAIGES, M.D.; BERNA, A.; SANCHOTELLO, M. y SOLÀ, C. 1999. Introducció a l'Enginyeria química. Biblioteca Universitaria Pòrtico. Barcelona.

COSTA NOVELLA, E.; SOTELO, J.L.; CALLEJA, G.; OVEJERO, G.; DE LUCAS, A.; AGUADO, J. y UGUINA, M. A. 1983. "Ingeniería Química". Volumen I.- Conceptos generales. Ed. Alhambra, Universidad. Madrid.

COSTA, J.; CERVERA, S.; CUNILL, F.; ESPLUGLAS, S.; MANS, C. y MATA, J. 1993. Curso de química técnica. Introducción a los procesos, las operaciones unitarias y los fenómenos de transporte en la Ingeniería Química. Editorial Reverté. Barcelona.

IBARZ, A.; BARBOSA, G.; GARZA, S. y GIMENO, V. 2000. Métodos experimentales en la ingeniería alimentaria. Ed. Acribia. Zaragoza.

SINGH, R.P. y HELDMAN, D.R. (2014). *Introduction to Food Engineering. Fifth Edition*. Academic Press, San Diego.

Complementary bibliography

COSTA, J.; ESPLUGLAS, S.; GIMÉNEZ, J.; MANS, C. y TEJERO, J. 1994. Problemes d'introducció a l'enginyeria química. Publicacions Universitat de Barcelona. Barcelona.

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PEIRÓ, J.J. 1997. Balances de materia. Problemas resueltos y comentados. Vol. II. Servicio de Publicaciones. Universidad Politécnica de Valencia. Valencia.

TARRAZÓ, J. y BENEDITO, J.J. 1996. Problemas de operaciones básicas en la ingeniería de alimentos. Servicio de Publicaciones. Universidad Politécnica de Valencia. Valencia.