



1. General information

Course: UNIT OPERATIONS II

Type: ELECTIVE

Degree: 411 - UNDERGRADUATE DEGREE PROGRAMME IN AGRICULTURAL AND FOOD ENGINEERING

Center: 107 - E.T.S. OF AGRICULTURAL ENGINEERS OF C. REAL

Year: 3

Main language: Spanish

Use of additional languages:

Web site:

Code: 60419

ECTS credits: 6

Academic year: 2023-24

Group(s): 20

Duration: C2

Second language:

English Friendly: Y

Bilingual: N

Lecturer: LUIS RODRIGUEZ ROMERO - Group(s): 20

Building/Office	Department	Phone number	Email	Office hours
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Lecturer: AMAYA ROMERO IZQUIERDO - Group(s): 20

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2. Pre-Requisites

The Study Program does not establish any prerequisites to take this subject, although it is recommended to have passed the first-year Mathematics, Physics and Chemistry subjects, as well as the second-year Statistics and Computational Methods and Hydraulics subjects.

3. Justification in the curriculum, relation to other subjects and to the profession

This subject, along with the "Basic Operations I" subject, is part of the specific training module "Basic Operations" of the degree. It includes the general and introductory aspects of the Basic Operations module, as well as the unitary operations of engineering and the processes of the agri-food industries. It provides the student's profile with basic information that will allow them to develop their professional skills from the knowledge of the operations that are carried out in an agri-food industry.

The subject Basic Operations II, which is taught in the 3rd year during the 2nd semester, is based on others of a more general nature and basic training, such as Algebra, Calculus, Physics I and II and Chemistry, belonging to the first year. As it was said, it is complementary to Basic Operations I in which heat transfer and momentum transport topics are studied. At a more horizontal level, it is related to the subjects of the Food Technology blocks: Technological Bases of the Agro-food Industries, Quality Control of Agricultural Products. On the other hand, it serves as a basis for the subjects Industries derived from Vegetable Products, Industries derived from Animal Products, Facilities of the Agri-food Industries, Design of Agri-food Industries and Projects. The Basic Operations II subject provides the necessary calculation foundations for the design and dimensioning of many of the processes of the agri-food industries, which is necessary for the professional work of a project engineer or plant engineer in the agro-industrial sector.

4. Degree competences achieved in this course

Course competences

Code	Description
E46	Ability to know, understand and use the principles of engineering and food basic operations
E48	Ability to know, understand and use the principles of the processes in the agri-food industries
G02	Computer knowledge
G03	Speaking and writing skills
G04	Analysis and synthesis capacity
G07	Problem resolution
G08	Decision-making
G10	Teamwork
G13	Teamwork
G14	Autonomous Learning
G20	Environmental sensitivity
G21	Ability to apply practical knowledge
G22	Basic knowledge of the profession
G24	Capacity for the prior preparation, conception, drafting and signing of projects whose purpose is the construction, reform, repair, conservation, demolition, manufacture, installation, assembly or exploitation of movable or immovable property that by its nature and characteristics are included in the technique of agricultural and livestock production (facilities or buildings, farms, infrastructures and rural roads), the agri-food industry (extractive, fermentative, dairy, canning, fruit and vegetable, meat, fishing, salting industries and, in general, any other dedicated to the preparation and/or transformation, conservation, handling and distribution of food products) and gardening and landscaping (urban and/or rural green spaces, parks, gardens, nurseries, urban trees, etc., public or private sports facilities and environments for landscape recovery)
G25	Adequate knowledge of physical problems, technologies, machinery and water and energy supply systems, the limits imposed by budgetary factors and construction regulations, and the relationships between facilities or buildings and farms, agri-food industries and spaces related to the gardening and landscaping with their social and environmental environment, as well as the need to relate them

G30	with human needs and the preservation of the environment. Knowledge in basic, scientific and technological subjects that allow continuous learning, as well as an ability to adapt to new situations or changing environments
G31	Ability to solve problems with creativity, initiative, methodology and critical thinking

5. Objectives or Learning Outcomes

Course learning outcomes

Description

Understand the different processing operations of agricultural and food products (Basic Operations)
 Share your opinion about a specific unit operation and come to an agreement on which equipment is most suitable for a particular product and application
 Recognize the equipment used for the application of the main Basic Operations in the Agri-Food Industry
 Understand the calculation methods and design systems necessary for the application of the main Basic Operations in the Agri-Food Industry
 Acquire knowledge about the fundamentals of Basic Operations on a laboratory scale in order to understand their design on an industrial scale
 Choose those working conditions (equipment, temperature, pressure, etc.) that maximize the final product quality, production, and revenue
 Identify the main strengths and weaknesses of a product and associate them with the processing operations used in its elaboration
 Understand the physical-chemical principles that govern the different Basic Operations
 Develop a critical attitude and aptitude towards the technologies applicable to the processes carried out in the agri-food industry

6. Units / Contents

Unit 1: Basic principle of mass transfer
Unit 2: Liquid-vapor equilibrium
Unit 3: Distillation and rectification
Unit 4: Solid-liquid extraction
Unit 5: Separation operations using membranes
Unit 6: Air humidification operations
Unit 7: Drying
Unit 8: Freeze drying. Lyophilization.
Unit 9: Complementary operations with solids

ADDITIONAL COMMENTS, REMARKS

PART I: BASIC OPERATIONS CONTROLLED BY THE MASS TRANSFER. Units 1-5.

PART II: UNIT OPERATIONS CONTROLLED BY MASS AND HEAT TRANSFER. Units 6-8.

PART III: COMPLEMENTARY OPERATIONS. Unit 9

PART IV: UNIT OPERATIONS LABORATORY.

7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Class Attendance (theory) [ON-SITE]	Lectures	E46 E48 G04 G20 G22 G24 G25 G30 G31	0.72	18	Y	N	This activity is evaluated taking into account: (1) attendance and participation in class; (2) the mid-term tests or the corresponding exams (ordinary/retake).
Class Attendance (practical) [ON-SITE]	Problem solving and exercises	E46 E48 G02 G07 G08 G10 G14 G20 G21 G24 G25 G30 G31	0.6	15	Y	N	Resolution of problems in the classroom: problem-based learning. This formative activity is evaluated taking into account: (1) attendance and class participation; (2) the mid-term tests or the corresponding exams (ordinary/retake).
Class Attendance (practical) [ON-SITE]	Practical or hands-on activities	E46 E48 G02 G07 G08 G10 G14 G20 G21 G24 G25 G30 G31	0.6	15	Y	Y	The Laboratory Practices are considered as a part of the subject. They include the practical activities of the two subjects: Basic Operations I and Basic Operations II. Practices are mandatory.
Problem solving and/or case studies [ON-SITE]	Workshops and Seminars	E46 E48 G03 G04 G07 G08 G13 G21 G22 G24 G25 G30 G31	0.36	9	Y	N	Classes in which the doubts of the problems/practical cases that the students must solve individually and periodically deliver to the teacher are solved so that they can be evaluated. It can also be passed by taking an exam whose passing certifies that the student has passed the skills to be acquired with this training activity.
Mid-term test [ON-SITE]	Assessment tests	E46	0.12	3	Y	Y	Two mid-term tests will be carried out throughout the course. The minimum mark required to eliminate is 4 points out of 10. The mid-term tests not passed can be recovered in the

							exams corresponding to the ordinary and retake calls.
Writing of reports or projects [OFF-SITE]	Self-study	E46 E48 G03 G07 G08 G10 G13 G14 G20 G21 G22 G24 G25 G30 G31	0.4	10	Y	N	This training activity is evaluated through problems/practical cases that students must solve individually and periodically delivered to the teacher.
Practicum and practical activities report writing or preparation [OFF-SITE]	Self-study	E46 E48 G03 G07 G08 G10 G13 G14 G20 G21 G22 G24 G25 G30 G31	0.4	10	Y	N	This training activity is evaluated by means of the report that the student must deliver, which includes all the calculations, analysis of the results and conclusions related to the practical activities carried out in the laboratory.
Study and Exam Preparation [OFF-SITE]	Self-study	E46 E48 G03 G04 G07 G08 G13 G14 G21 G22	2.8	70	N	-	Autonomous work of the student
Total:			6	150			
Total credits of in-class work: 2.4			Total class time hours: 60				
Total credits of out of class work: 3.6			Total hours of out of class work: 90				

As: Assessable training activity

Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

8. Evaluation criteria and Grading System			
Evaluation System	Continuous assessment	Non-continuous evaluation*	Description
Assessment of problem solving and/or case studies	15.00%	0.00%	Delivery of exercises and problems that will be evaluated by the teacher
Mid-term tests	60.00%	0.00%	Two mid-term tests will be carried out throughout the semester. A minimum grade of 4 points out of 10 will be required to eliminate matter. Students who do not pass these tests will have the option to recover them in the final exams.
Final test	0.00%	85.00%	Final exam of all the content of the subject that ensures that the student reaches the competences assigned to the different training activities.
Laboratory sessions	15.00%	15.00%	Attendance at laboratory practices and delivery of the corresponding report. Attendance at Practices will be mandatory to pass the subject.
Assessment of active participation	10.00%	0.00%	Mere class attendance does not imply getting this % of the grade. Students must participate, answer the questions that are asked and solve the problems proposed in certain classes. Unrecoverable.
Total:	100.00%	100.00%	

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject, an ordinary and an extraordinary one (evaluating 100% of the competences).

Evaluation criteria for the final exam:

Continuous assessment:

Continuous evaluation of all the training processes that will be weighted to obtain a final grade between 0 and 10 points. 60% partial tests, 40% complementary activities carried out during the course (assistance with class participation, problem solving, seminars and laboratory practices). It is necessary to obtain a minimum grade of 4 out of 10 in each of the mid-term tests to eliminate matter.

Non-continuous evaluation:

Students who do not wish to undergo continuous assessment must notify the teacher by email a few days before the ordinary/retake exam (otherwise it will be considered continuous assessment). These students should NOT carry out the complementary activities, except the laboratory practices, or take the mid-term tests. They will carry out ONE SINGLE final exam of all the subject that allows them to acquire the competences assigned to each of the training activities (with the exception of laboratory practices).

Specifications for the resit/retake exam:

Continuous assessment of all the training processes that will be weighted to obtain a final grade between 0 and 10 points. 60% partial tests, 40% complementary activities carried out during the course (assistance with class participation, problem solving, seminars and laboratory practices). In case of not passing the "Complementary Activities" during the course, they can be recovered by taking an exam (or as indicated by the teacher), so that it is reflected that the student acquires the skills assigned to said Complementary Activities. The exception to the above is constituted by laboratory practices, the performance of which is mandatory. The student must notify the teacher in advance of his intention to take the recovery tests for the complementary activities. The NON-continuous evaluation is similar to that of the Ordinary Call.

Specifications for the second resit / retake exam:

The student will be able to pass the subject in the second retake call if a grade equal to or greater than 5.0 out of 10 is obtained in the corresponding exam.

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
Class Attendance (theory) [PRESENCIAL][Lectures]	18
Class Attendance (practical) [PRESENCIAL][Problem solving and exercises]	15
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	15
Problem solving and/or case studies [PRESENCIAL][Workshops and Seminars]	9

Mid-term test [PRESENCIAL][Assessment tests]	3
Writing of reports or projects [AUTÓNOMA][Self-study]	10
Practicum and practical activities report writing or preparation [AUTÓNOMA][Self-study]	10
Study and Exam Preparation [AUTÓNOMA][Self-study]	70
Global activity	
Activities	hours
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	15
Problem solving and/or case studies [PRESENCIAL][Workshops and Seminars]	9
Mid-term test [PRESENCIAL][Assessment tests]	3
Class Attendance (theory) [PRESENCIAL][Lectures]	18
Class Attendance (practical) [PRESENCIAL][Problem solving and exercises]	15
Writing of reports or projects [AUTÓNOMA][Self-study]	10
Practicum and practical activities report writing or preparation [AUTÓNOMA][Self-study]	10
Study and Exam Preparation [AUTÓNOMA][Self-study]	70
Total horas: 150	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Valiente Bardenas, M.C.	Manual Del Ingeniero Quimico			9789681844875	2009	
Welty, J.R	Fundamentos de transferencia de momento, calor y masa	Limusa Wiley			2000	
Aguado, J.	Ingeniera de la industria alimentaria /	Sntesis,		84-7738-667-6 (Obra	2009	
Brennan, J.G.	Manual del procesamiento de los alimentos	Acribia		978-84-200-1099-1	2008	
Robert H. Perry, Don W. Green, James O. Maloney	Manual del ingeniero químico	McGraw-Hill, D. L.		84-481-3008-1 (o. c.	2001	
Calleja Pardo, G	Introducción a la ingeniería Química	Síntesis			1999	
Coulson, J. M.	Ingeniería químicaTomo 2: Unidades SI, operaciones básicas	Reverté		978-84-291-7136-5 (t	2003	
Coulson, J. M.	Ingeniería químicaTomo I: Unidades SI, flujo de fluidos, tra	Reverté		978-84-291-7135-8	2008	
Earle, R.L.	Ingeniería de los alimentos	Acribia			1988	
Fellows, P.Peter1953-	Food Processing Technology: Principles and Practice	Boca Raton ; Cambridge : CRC Press : Woodhead		978-1-4398-0821-4	2009	
Geankoplis, C.J.	Procesos de transporte y Operaciones Unitarias	Continental			1982	
Hermida Bun, J.R	Fundamentos de ingeniería de procesos agroalimentarios	Mundi-Prensa			2000	
McCabe, Warren L.	Operaciones unitarias en ingeniería química	McGraw-Hill		978-970-10-6174-9	2007	