



IDENTIFYING DATA

Basic operations and processes of refining, petrochemicals and carbo-chemicals

Subject	Basic operations and processes of refining, petrochemicals and carbo-chemicals			
Code	V09G291V01302			
Study programme	Grado en Ingeniería de la Energía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	9	Mandatory	3rd	1st
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Domínguez Santiago, María de los Ángeles			
Lecturers	Domínguez Santiago, María de los Ángeles			
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General description	<p>In this subject, the basic concepts of mass and energy balances, chemical reactors and unit operations based in mass transfer more employed in the industry are explained.</p> <p>the fundamentals of the processes to which fossil energy resources are subjected before their use and the synthesis of organic compounds widely used in daily life are also explained</p> <p>English Friendly subject: International students may request from the teachers: a) materials and bibliographic references, b) tutoring sessions in English c) exams and assessments in English</p>			

Training and Learning Results

Code	
A1	That the students demonstrate to possess and understand knowledge in an area of study that is part of the general education (second level), and often found at a level that, although based on advanced textbooks, also includes some aspects that involve knowledge from the avant-garde of the field of study
A2	That the students know how to apply their knowledge to their work or vocation in a professional way and that they possess the competences that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study
A3	That the students have the capability to gather and interpret relevant data (usually within their area of study) to issue judgments that include a reflection on relevant social, scientific or ethical issues
A4	That the students can transmit information, ideas, problems and solutions to a specialized and non-specialized audience
A5	That the students develop those learning capabilities necessary to undertake further studies with a high degree of autonomy.
B1	Ability to draw links between the different elements of all the knowledge acquired, understanding them as components of a body of knowledge with a clear structure and strong internal cohesion.
B3	To suggest and develop practical solutions, using the relevant theoretical knowledge, to phenomena and problems-situations of ordinary reality that are specific to engineering, developing appropriate strategies.
B5	To be familiar with the relevant sources of information, including constant updating, in order to practice one's profession competently, accessing all the present and future tools of information search, constantly adapting to technological and social changes.
C24	Ability to design and manage procedures of applied experimentation, especially for the determination of transmission and thermodynamic properties, and for the modelling of systems and phenomena in the field of chemical engineering, fluid systems, heat transmission, matter transference operations, kinetics of chemical reactions and reactors.
C25	Knowledge about material and energy balance, biotechnology, matter transference, separation operations, engineering of chemical reactions, design of reactors, and assessment and transformation of raw materials and energy resources.
C26	Applied knowledge of the fundamentals of basic process operations.
C27	Applied knowledge of the fundamentals of processes of refining, petrochemicals and carbon chemicals.

- D3 Understanding engineering within a framework of sustainable development with environmental awareness.
- D5 To become aware of the need for continuous training and the constant improvement of quality, developing the values that are characteristic of scientific thinking, showing flexible, open and ethical attitudes in the face of different situations and opinions, particularly as regards non-discrimination on the grounds of gender, race or religion, respect for fundamental rights, accessibility, etc.

Expected results from this subject

Expected results from this subject	Training and Learning Results			
Know and understand the basics of operations of separation and of the chemical reactors	A1 A2 A3 A4 A5	B1 B3 B5	C24 C25 C26	D3
Know the processes used to obtain fuel products and petrochemical raw materials	A2 A3 A4 A5	B1 B5	C27	D3 D5
Know the techniques for measuring the properties of fuels		B1 B3 B5	C24	

Contents

Topic	
Subject 1.- Introduction	Introduction. General concepts.
Subject 2.- Material and energy balances.	Material balances in systems with and without chemical reaction. Energy balances in systems with chemical reaction.
Subject 3.- Operations of separation	Distillation. Rectification. Liquid-liquid extraction. Absorption.
Subject 4.- Introduction to chemical reactors	Design of ideal chemical reactors
Subject 5.- Natural gas and oil refining	Natural gas: constitution and conditioning. Characterisation of the oil. Fractionation, cracking, reformed, alkylation and coquization. Blending of products.
Subject 6.- Petrochemical processes.	Main compound derivatives of the methane, ethene, propene and benzene.
Subject 7.- Coal processes	Technological use of coal: pyrolysis, gasification, etc.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	40.3	80	120.3
Problem solving	20	7.2	27.2
Laboratory practical	8	0	8
Practices through ICT	8	6	14
Problem and/or exercise solving	1.5	30	31.5
Essay questions exam	1	0	1

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Lecturing	Presentation, by the teaching staff, of the main knowledge corresponding to the subject topics.
Problem solving	The teacher proposes a series of problems to the students to work on at home or in the classroom
Laboratory practical	The students will carry out practices related to basic operations
Practices through ICT	A process simulation program is used to simulate the unit operations studied: rectification, liquid-liquid extraction, absorption, etc.

Personalized assistance

Methodologies	Description
Problem solving	Students can consult the teacher, during tutorial hours, with any questions about theoretical or practical aspects of the subject.

Assessment

	Description	Qualification	Training and Learning Results			
Lecturing	Activities will be carried out in Moovi and exercises in class or related to each of the topics. Expected results from this subject: Know the processes used to obtain fuel products and petrochemical raw materials. To know the measurement techniques of the properties of fuels. To know the measurement techniques of the properties of fuels.	15		B1 B3		D5
Laboratory practical	The work and the report made by the students will be assessed. Expected results from this subject: Know and understand the basic aspects of separation operations and chemical reactors.	10	A3 A4	B3 B5	C25 C26	D5
Practices through ICT	The work and the report made by the students will be evaluated. Expected results from this subject: Know and understand the basics of the operations of separation and chemical reactors.	10	A3 A4	B3 B5	C25 C26	D5
Problem and/or exercise solving	An examination of basic operations problems will be carried out, which will take place on the date established in the official calendar of the center. Expected results from this subject: Know and understand the basics of the operations of separation and chemical reactors.	40	A2 A5	B1 B3	C25 C26	
Essay questions exam	An exam will be held in the last week of the semester tackling natural gas and refining, petrochemicals and carbochemicals Expected results from this subject: Know the processes used to obtain fuel products and petrochemical raw materials Know the techniques for measuring the properties of fuels	25		B1	C25 C27	D3 D5

Other comments on the Evaluation

Considerations on continuous assessment

To pass the subject, a minimum of 3.5/10 is required in each of the evaluable sections. In case that after adding all the marks, the value is equal to or greater than 5, but the minimum score is not reached in any of the evaluable sections, the final mark will be 4.

Considerations on global assessment

Students will have a maximum period of two months from the start of the course to refuse to continuous assessment.

This global test can include questions from laboratory practices and practices with the support of ICT, therefore, the student will be allowed to reach 100% of the mark.

Considerations on second opportunity:

In the second opportunity, the marks of the laboratory practices and practices with ICT support will be kept for those students who have passed these methodologies. For those students who have not passed them or have refused to carry out the continuous assessment, the second opportunity exam may include questions from these methodologies.

Sources of information

Basic Bibliography

Himmelblau, D.M., **Basis principles and calculations in chemical engineering**, 6, Prentice-Hall, 1996
McCabe, W.L., Smith, J.C., Harriot, P., **Operaciones unitarias en Ingeniería Química**, 7, McGraw-Hill, 2007
Gary, J.H., Handwerk, G.E., Kaiser, M.J., **Petroleum refining technology and economics**, 5, CRC Press, 2007

Complementary Bibliography

Izquierdo, J.F., Costa, J., Martínez, E., Izquierdo, M., **Introducción a la Ingeniería Química: problemas resueltos de balances de materia y energía**, 1, Reverté, 2011

Recommendations