



IDENTIFYING DATA

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

Subject	Basic operations and processes of refining, petrochemicals and carbo-chemicals			
Code	V09G311V01402			
Study programme	Grado en Ingeniería de los Recursos Mineros y Energéticos			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	9	Optional	4th	1st
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Domínguez Santiago, María de los Ángeles			
Lecturers	Domínguez Santiago, María de los Ángeles			
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Web	http://moovi.uvigo.gal			
General description	<p>In this subject, the basic concepts of mass and energy balances, chemical reactors and separation operations based on the mass transfer most used in the industry are introduced.</p> <p>The fundamentals of the processes to which fossil energy resources are subjected before their use are also exposed, as well as the obtaining of organic derivatives widely used in daily life.</p> <p>English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.</p>			

Training and Learning Results

Code	
B1	Scientific and technical training and qualification as a Mining Engineer and knowledge of the functions of consultancy, analysis, design, calculus, project, construction, maintenance, preservation and exploitation.
B2	To be familiar with the multiple technical and legal factors involved in the process of development, within the field of mining engineering, with the knowledge acquired in accordance with section 5 of order CIN/306/2009, pertaining to geological and mining prospecting and investigation, the explorations of all sorts of geological resources, including groundwater, underground construction, underground storage, treatment and benefit plants, energy plants, mineral processing and steel and iron plants, building materials plants, carbon chemistry, petrochemistry and gas plants, waste treatment and tributary plants, explosives factories, and ability to use well-tested methods and accredited technologies, with the aim of achieving the highest efficiency and ensuring the protection of the Environment and the safety and health of workers and users.
B3	Ability to design, write and plan partial or specific projects within the units specified in the previous section, such as mechanical and electric plants and their maintenance, networks of energy transportation, facilities for transportation and storage of solid, liquid and gaseous materials, waste sites, tailing dams, foundation and support, demolition, restoration, controlled explosions and explosives logistics.
B4	Ability to design, plan, run, inspect, sign and manage projects, plants or facilities, within their field.
C47	To know, understand and use the principles of basic process operations.
C48	To know, understand and use the principles of processes of refining, petrochemicals and carbon chemicals.
D1	Ability to draw links between the different elements of all the knowledge they acquired, understanding them as components of a body of knowledge with a clear structure and strong internal cohesion.
D3	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.
D5	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.
D8	Understanding engineering within a framework of sustainable development with environmental awareness.

D10 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 basic aspects of separation operations and chemical reactors.	B1 B2 B3	C47	D3 D5 D10
Know the processes used to obtain fuels and petrochemical raw materials	B1 B2 B3 B4	C48	D1 D5 D8 D10
Know the techniques for measuring the properties of fuels	B3	C48	D1 D8 D10

Contents

Topic	
1. Introduction	Introduction. General concepts
2. Material and energy balances	Material balances in systems with and without chemical reaction. Energy balances in systems with and without chemical reaction.
3. Separation operations	Distillation. Rectification Liquid-liquid extraction Absorption
4. Introduction to chemical reactors	Design of ideal chemical reactors
5. Natural gas and petroleum refining.	Natural gas: constitution and conditioning. Petroleum characterization. Fractionation, cracking, reforming, alkylation and coking. Products mixture.
Petrochemical processes	Main compounds derived from methane, ethene, propene and benzene.
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
Essay questions exam	1	23	24
Problem and/or exercise solving	1.5	30	31.5

*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 subjects of the subject.
Problem solving	The teacher will propose to the students a series of problems so that they can solve them in the classroom or outside the classroom.
Laboratory practical	The students will carry out practices related to separation operations.
Practices through ICT	A process simulator will be used to simulate the basic operations studied: rectification, liquid-liquid extraction, absorption, etc.

Personalized assistance

Methodologies	Description
Problem solving	The students can consult, during tutorial hours, any doubt about theoretical or practical aspects of the subject.

Assessment

	Description	Qualification	Training and Learning Results
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Lecturing	They will make activities in Moovi and exercises in class or of autonomous form related with each one of the subjects.	15	B1 B3	D5
	Expected results: Know and understand the basic aspects of separation operations and chemical reactors. Know the processes used to obtain fuels and petrochemical raw materials. Know the techniques for measuring the properties of fuels.			
Laboratory practical	The work and the report made by the students will be valued.	10	B2 B4	C47 D1
	Expected results: Know and understand the basic aspects of separation operations and chemical reactors			
Practices through ICT	The work and the report made by the students will be valued.	10	B2 B3	C47 D1 D3 D8
	Expected results: Know and understand the basic aspects of separation operations and chemical reactors			
Essay questions exam	An examination will be carried out, in the last week of the term, on the topics of natural and refined gas, petrochemical and coal processes.	25	B1 B2	C48 D1 D5 D8 D10
	Expected results: Know the processes used to obtain fuels and petrochemical raw materials. Know the techniques for measuring the properties of fuels.			
Problem and/or exercise solving	An examination of basic operations problems will be carried out on the date established in the official calendar of the center.	40	B1 B2 B4	C47 D3 D8 D10
	Expected results: Know and understand the basic aspects of separation operations and chemical reactors.			

Other comments on the Evaluation

Continuous evaluation - First assessment :

To pass the subject, a minimum of 3.5/10 is required in each of the evaluable sections. In the event that the result of the addition of all the grades is equal to or greater than 5, but the minimum score is not reached in any of the evaluable sections, the final grade will be 4.

Global evaluation considerations:

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

This global test can include questions from laboratory practices and ITC supported practices, therefore, the student will be able to achieve 100% of the qualification.

Continuous evaluation - Second assessment:

In the second opportunity, the grades for the laboratory practices and ITC supported practices will be kept for those students who have passed these methodologies. For those students who have not passed them or have renounced the continuous assessment option, the second assessment exam may include questions from these methodologies.

Exam Timetable: Exam dates and rooms must be verified in the official webpage of the school:
<http://minaseenerxia.uvigo.es/es/docencia/examen>

Sources of information

Basic Bibliography

Himmelblau, D.M., **Basic 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., Martinez, E., Izquierdo, M., **Introducción a la Ingeniería Química**, 1, Reverté, 2011

Recommendations