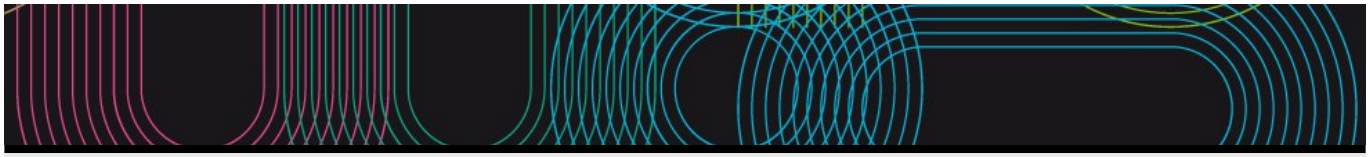

IDENTIFYING DATA				
Basic operations and processes of refining, petrochemicals and carbo-chemicals				
Subject	Basic operations and processes of refining, petrochemicals and carbo-chemicals			
Code	V09G290V01502			
Study programme	Degree in Energy Engineering			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	9	Mandatory	3rd	1st
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Domínguez Santiago, Angeles			
Lecturers	Domínguez Santiago, Angeles			
E-mail	admguez@uvigo.es			
Web	http://faitic.uvigo.es/			
General description	The course starts with mass and energy balances followed by the basis of the unit operations more used in the industry and the fundamentals of chemical reactors. The fundamentals of the petroleum refining and coal processing are introduced and also the obtention of organic derivatives commonly used in every day life. Subject of English Friendly program. International students can ask teachers for:a) teaching materials and bibliographic references in English b) tutoring in English c) tests and exams in English			

Competencies	
Code	
C24	Capacity to design and manage applied experimentation procedures, particularly in order to determine thermodynamics and transport properties, and modelling of phenomena and systems within the scope of chemical engineering, fluid flow systems, heat transmission, material transfer operations, kinetics of chemical reactions and reactors.
C25	Knowledge of material and energy balances, biotechnology, material transfer, separation operations, chemical reaction engineering, reactor design, and assessment and transformation of raw materials and energy resources.
C26	Basic process operations.
C27	Petrochemical and carbon chemical refining processes.
D1	Capacity to interrelate all the acquired knowledge and interpret it as components in a body of knowledge with a clear structure and strong internal coherence
D3	Propose and develop practical solutions, which develop suitable strategies based on theoretical knowledge, for problem phenomena and situations that arise as everyday realities in engineering
D5	Know what sources are available for ongoing and continual updating of all the information required to undertake their work, with access to all the current and future tools for seeking information and adapting it in the light of technological and social changes
D8	Conceive engineering within a framework of sustainable development with an awareness of environmental issues
D10	Become aware of the need for training and continual improvement in quality, developing the values associated with scientific thinking and showing a flexible, open and ethical attitude towards diverse opinions and situations, particularly in matters of non-discrimination on the grounds of gender, race or religion, respect for fundamental rights, accessibility, etc

Learning outcomes	
Expected results from this subject	Training and Learning Results

Know and understand the basic appearances of the operations of separation and of the chemical reactors.	C24 C25 C26	D1 D3 D5 D10
Know the processes used for the obtaining of products fuels and of petrochemical prime matters.	C27	D1 D5 D8 D10
Know the technicians of measure of the properties of the fuels.		D1

Contents	
Topic	
Subject 1.- Introduction	Introduction. General concepts.
Subject 2.- Mass and Energy Balances	Mass balances in steady and non-steady state. Mass balances with and without chemical reaction. Energy balances in systems with chemical reaction.
Subject 3.- Separation units	Unit operations based on mass transfer. Rectification of liquid mixtures. Liquid-liquid extraction: Single and multiple contact. Gas absorption
Subject 4.- Chemical reactors	Ideal isothermal reactors: design equations. Introduction to catalytic reactors.
Subject 5.- Natural gas and petroleum refining	Oil fractional distillation. Reforming, cracking, alkylation and coking. Stream purification. Product blending
Subject 6.- Petrochemical processes	Methane derivatives. Ethylene derivatives. Propylene derivatives. Benzene derivatives
Subject 7.- Coal processing: technological use of coal	Coal pyrolysis. Coal gasification

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	44	76	120
Problem solving	20	40	60
Practices through ICT	6	3	9
Problem and/or exercise solving	4	20	24
Essay questions exam	2	10	12
*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 teacher of the main topics related to the subject
Problem solving	The teacher proposes to the students a series of problems so that they can work on them at home, before they are solved in class
Practices through ICT	Unit operation simulation using software like HYSYS

Personalized assistance	
Methodologies	**Description**
Problem solving	The students can consult the teacher any doubt about the subject area during the tutoring hours.

Assessment			
	Description	Qualification	Training and Learning Results

Problem solving	Knowledge and skills of students to solve the problems proposed along the course will be evaluated. Learning outcomes Know and comprise the basic principles of the operations of separation and of the chemical reactors Know the processes used for the obtaining of products fuels and of petrochemical prime matters. Know the technicians of measure of the properties of the fuels.	10	C24 C25 C26	D3
Practices through ICT	Work and report performed by the students related to unit operation simulation will be evaluated Learning outcomes Know and comprise the basic principles of the operations of separation and of the chemical reactors	10	C25 C26	D1 D3 D5
Problem and/or exercise solving	Problem exam. This exam will allow to evaluate the student skills in the resolution of practical examples Learning outcomes Know and comprise the basic principles of the operations of separation and of the chemical reactors	50	C25 C26	D1 D3 D5 D10
Essay questions exam	Short question exam related to petroleum refining, petrochemical processes and coal processing. Learning outcomes Know the processes used for the obtaining of products fuels and of petrochemical prime matters. Know the technicians of measure of the properties of the fuels.	30	C27	D1 D8 D10

Other comments on the Evaluation

Regarding to second call exam, problem solving and practices through ICT grades will be retained.

Test schedule. Consult the web http://minasenerxia.uvigo.es/es/docencia/examenes

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

Ramos Carpio, M.A., **Refino del petróleo, gas natural y petroquímica**, 1, Fundación Fomento Innovación Industrial, 1997

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

Contingency plan

Description

Considering the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University establishes an extraordinary planning that will be activated when the administrations and the institution determine it. It is based on safety, health and responsibility, and it guarantees teaching in an online or semi-presential modalities. These already planned measures will guarantee, at the required time, the development of teaching in a more agile and effective way, because they will be known in advance by students and teachers through the standardized tool for teaching guides DOCNET.

1. Semi-presential modality
Once the semi-presential teaching is required, it would mean a reduction of the capacity of the teaching spaces used in the face-to-face modality. Therefore, as the first measure of the centre, the capacity of the teaching spaces would be reformulated and informed to the teachers, in order to proceed to reorganize the formative activities for the rest of the semester. It should be noted that the reorganization will depend on the moment throughout the semester in which this semi-presential modality is activated. For the reorganization of the teaching activities, the following guidelines would be followed:

Through the FaiTIC platform, all the students will be informed about the new conditions under which the formative activities and assessment tests will be carried out at the end of the semester.

The tutorial sessions will be carried out by telematic means (email, videoconference, FAITIC forums, ...) with prior agreement.

Once some of the students have carried out experimental or computer laboratory practices in the face-to-face modality, if it is possible, the rest of the students will have the possibility to perform the same or equivalent activities in the same modality.

For the rest of the activities until the end of the semester, it should be done a proper identification of those formative activities which can be done under face-to-face modality and those which will be carried out remotely.

Regarding the potential tools to be applied for the formative activities during the online mode, CampusRemoto and the FaiTIC platform will be used.

2. Online modality
In the event that the non-face-to-face teaching modality is required (suspension of all face-to-face formative and assessment activities), the tools currently available at the University of Vigo, CampusRemoto and the FaiTIC platform will be used. The reorganization will depend on the moment throughout the semester in which this online modality is activated. In the reorganization of the teaching activities, the following guidelines would be followed:

2.1. Communication
Through the FaiTIC platform, all the students will be informed about the new conditions under which the formative activities and assessment tests will be carried out at the end of the semester.

2.2. Adaptation and / or modification of teaching methodologies
As the teaching methodologies have been conceived for the face-to-face teaching modality, the teaching methodologies that would be kept and those which would be modified or replaced in the online modality are indicated below.

The teaching methodologies that would be kept, since they can be used in face-to-face and online teaching mode are lecturing and problem solving

The teaching methodologies that would be modified are the following: Practices through ICT would be carried out using free software.

2.3. Adaptation of tutorial sessions and personalized attention
The tutorial sessions may be carried out by telematic means (email, videoconference, FAITIC forums, ...) with prior agreement.

2.4. Evaluation
Essay questions exam would be replaced by a quiz question exam. The other assessment tests and the weight in the final grade of all tests will be kept.

2.5. Bibliography or additional material to facilitate self-learning