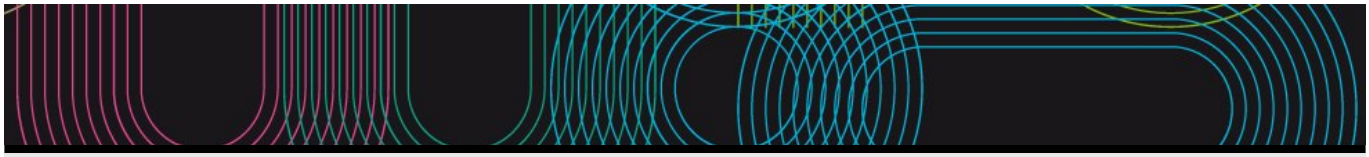

IDENTIFYING DATA				
Chemical engineering				
Subject	Chemical engineering			
Code	V11G201V01301			
Study programme	Grado en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3rd	1st
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	González de Prado, Begoña			
Lecturers	González de Prado, Begoña			
E-mail	bgp@uvigo.es			
Web				
General description	This subject is an introduction to Chemical Engineering, where the knowledge gained in the previous Chemistry degree courses is related to Chemical industry processes. The mail goal is to enable the students to learn the basic knowledge about material and energy balances so that they can applied it to the design of separation processes such as distillation or liquid-liquid extraction. English Friendly subject: International students may request from the teachers: a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English. This subject gives the basis to understand other subjects such as Environmental Quemistry, Food Chemistry and Industrial Chemistry.			

Training and Learning Results	
Code	
A1	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
B4	Ability for analysis and synthesis
C3	Recognize and analyze chemical, qualitative and quantitative problems, proposing strategies to solve them through the evaluation, interpretation and synthesis of data and chemical information
C23	Know the principles and procedures of chemical engineering
D1	Ability to solve problems

Expected results from this subject	Training and Learning Results			
Know and identify the diverse operations of separation and their fields of application.	A1	B4	C3 C23	D1
Draw and interpret liquid vapour equilibria, liquid- liquid equilibria and liquid-gas equilibria diagrams	A1	B4	C3 C23	D1
Design the different operations of separation based in liquid vapour, liquid-liquid and liquid-gas equilibria	A1		C23	D1
Design chemical reactors ideals.	A1		C3 C23	D1

Contents
Topic

Subject 1. Introduction to Chemical Engineering	Origin, concept and evolution of the Chemical Engineering. Discontinuous and continuous operation. Stationary and non stationary state. Cocurrent and countercurrent operations. Classification of the unit operations. Systems of units.
Subject 2. Mass and energy balances	General equation of balance. Mass balances in systems without chemical reaction in steady and non-steady state. Recycle, purge and bypass. Mass balances in systems with chemical reaction in steady and non-steady state. Energy balances. Energy balances in systems with chemical reaction in steady state.
Subject 3. Distillation	Vapour-liquid equilibria. Phase diagrams for binary mixes. Simple and flash distillation. Multistage distillation
Subject 4. Liquid-liquid extraction	Liquid-liquid equilibrium for binary and ternary systems: binodal curve and distribution coefficients. Liquid-liquid extraction in cocurrent and countercurrent contact.
Subject 5. Chemical reactors	Speed of reaction. Ideal reactors: batch stirred tank reactor, continuos stirred tank reactor and plug flow reactor
Subject 6. Heat transfer	Mechanisms of heat transfer. heat transfer through flat walls, cylindrical and spherical. Heat exchangers.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	12	25	37
Problem solving	20	25	45
Collaborative Learning	2	0	2
Autonomous problem solving	0	11	11
Case studies	0	20	20
Objective questions exam	2	19	21
Problem and/or exercise solving	2	12	14

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

Methodologies

	Description
Lecturing	During these classes (one hour per week) the teacher will explain the most relevant aspects of the subject. The students will have the available documentation on Moovi.
Problem solving	There will be a set of exercises of each subject available for the students. Some of these exercises will be solve in class and other ones will be solved by each student and presented to the teacher in order to be corrected.
Collaborative Learning	In some classes of resolution of problems will propose some problem so that they resolve it in groups reduced.
Autonomous problem solving	The students will have to solve some exercises and questions and they will have to present them to through the platform Moovi
Case studies	It will propose a global problem that cover the greater part of the contents of the subject that will have to resolve of individual form and deliver through the platform Moovi for its evaluation

Personalized assistance

Methodologies	Description
Problem solving	In the assigned hours of tutoring the professor will solve any doubts regarding the subject
Collaborative Learning	During the sessions of collaborative learning the professor will resolve the doubts that can arise
Autonomous problem solving	In the assigned hours of tutoring the professor will solve any doubts regarding the subject
Case studies	In the assigned hours of tutoring the professor will solve any doubts regarding the subject

Assessment

	Description	Qualification	Training and Learning Results		
Collaborative Learning	Resolution of exercises in small groups	5	B4	C3 C23	D1
Autonomous problem solving	The students will have to deliver, in the terms indicated, the problems and activities proposed of each subject.	10	B4	C3	D1
Case studies	It will propose a global problem that cover the greater part of the contents of the subject	15	A1	C3 C23	D1

Objective questions exam	It will make a long proof of all the matter of the subject.	40	A1	B4	C3 C23	D1
Problem and/or exercise solving	They will make two short proofs, one of the subjects 1 and 2 and another of the subjects 3 and 4.	30	A1	B4	C3 C23	D1

Other comments on the Evaluation

There will be two short written tests throughout the quarter that do not eliminate matter. At the date set by the centre, the entire subject matter will be evaluated and a minimum of 3 out of 10 points must be reached to take account of the other evaluation elements. If the minimum grade is not reached, the final test note is the grade of the subject.

The different activities carried out in the classroom and autonomously by the students together account for 30% of the final grade. To overcome the subject it is essential to have a minimum score of 3.5 out of 10 points in these sections (collaborative learning, problem solving autonomously, case studies).

The participation of the student in some of the evaluation tests, the delivery of 20% or more of the work ordered by the teacher, implies the condition of "presented" and the assignment of a grade.

Second chance. There will be a long test of all the material that will make up 70% of the grade. The grades corresponding to the activities carried out in the classroom and autonomously obtained, by the students, throughout the course

Sources of information

Basic Bibliography

G. Calleja, F. García, A. de Lucas, D. Prats, J.M. Rodriguez, **Introducción a la Ingeniería Química**, Síntesis, 1999

D.M. Himmelblau,, **Principios Básicos y Cálculos en Ingeniería Química**, Prentice-Hall, 2002

C.J. GEANKOPLIS, **Procesos de transporte y principios de procesos de separación**, CECSA, 2006

W.L. McCabe, J.C. Smith, P. Harriot, **Operaciones Unitarias en Ingeniería Química**, McGraw-Hill, 2002

Complementary Bibliography

C.J. King, **Procesos de Separación**, Reverté, 1986

H.S. Fogler, **Elementos de Ingeniería de la Reacción Química**, Prentice-Hall, 2001

R.M. Felder, R.W. Rousseau, **Principios elementales de los procesos químicos**, Limusa,

Recommendations