



## IDENTIFYING DATA

### Chemical technology

Subject	Chemical technology			
Code	V12G360V01606			
Study programme	Grado en Ingeniería en Tecnologías Industriales			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3rd	2nd
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Sanroman Braga, María Ángeles			
Lecturers	Fernández Sanromán, Antía Rosales Villanueva, Emilio Sanroman Braga, María Ángeles			
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Web				
General description	In this subject, students learn the basic aspects of Chemical Engineering and the fundamentals of the basic operations most employed in industry.			
	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.			

## Training and Learning Results

Code	
B3	CG3 Knowledge in basic and technological subjects that will enable them to learn new methods and theories, and equip them with versatility to adapt to new situations.
B4	CG4 Ability to solve problems with initiative, decision making, creativity, critical thinking and to communicate and transmit knowledge, skills and abilities in the field of Industrial Engineering.
C4	CE4 Ability to understand and apply the basic knowledge of general chemistry, organic chemistry and inorganic chemistry, and their applications in engineering.
D2	CT2 Problems resolution.
D9	CT9 Apply knowledge.
D10	CT10 Self learning and work.
D17	CT17 Working as a team.

## Expected results from this subject

Expected results from this subject	Training and Learning Results		
To know the bases of chemical technology.	B3	C4	D9
To apply mass and energy balances to real systems.	B4	C4	D2 D9 D10 D17
To know and understand the basic aspects of mass transfer.	B3	C4	D9
To know the fundamentals of separation processes and their application to real cases.	B4	C4	D2 D9 D10 D17

## Contents

Topic	
Introduction	Chemical Engineering. Basic principles. Chemical processes. Unit conversion and calculation tools
Mass and energy balances	Mass balances for systems without chemical reaction. Mass balances for systems with chemical reaction. Energy balances
Implementation of balances into chemical reactor design	Stoichiometry. Reaction rate. Ideal reactors
Mass transfer	Introduction. Mass transfer equations: individual and global coefficients
Distillation and rectification of liquid mixtures	Vapour-liquid equilibrium. Simple distillation. Rectification. Azeotropic and extractive distillation.
Liquid-liquid extraction	Fundamentals. Binary and ternary mixtures. Factors that affect the separation. Operation by simple contact, multiple contact in direct current, multiple contact in multiple countercurrent
Other operations in chemical processes	Gas absorption. Liquid-solid extraction. Adsorption and ion exchange.

### Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	15	40	55
Problem solving	17	31	48
Laboratory practical	8	8	16
Studies excursion	4	1	5
Simulation	4	2	6
Objective questions exam	1.5	4.5	6
Problem and/or exercise solving	3	9	12
Report of practices, practicum and external practices	0	2	2

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

### Methodologies

	Description
Lecturing	Oral and direct exhibition, by part of the professor, of the most important knowledges corresponding to the subjects of the subject in question.
Problem solving	The professor proposes to the students a series of problems so that they work on them home, before that resolve them in class or seminars. Besides along the course made diverse controls in which the students will have to resolve problems of the level of similar difficulty to the made in class
Laboratory practical	The students will make some experiences in the laboratory related with the subjects treated along the course.
Studies excursion	Visits of the students to companies of the surroundings to make an approach to the business reality and visualise the application of the theoretical contents given in the subject
Simulation	Learning and utilisation of programs of simulation applied to the contents of the subject

### Personalized assistance

Methodologies	Description
Lecturing	The students will be able to consult to the professor in any one doubts related with this methodology, as well as in the review of the different proofs of evaluation made, those that doubts have on theoretical and practical appearances linked with the subject.
Problem solving	The students will be able to consult to the professor in any one doubts related with this methodology, as well as in the review of the different proofs of evaluation made, those that doubts have on theoretical and practical appearances linked with the subject.
Laboratory practical	The students will be able to consult to the professor in any one doubts related with this methodology, as well as in the review of the different proofs of evaluation made, those that doubts have on theoretical and practical appearances linked with the subject.
Studies excursion	The students will be able to consult to the professor in any one doubts related with this methodology, as well as in the review of the different proofs of evaluation made, those that doubts have on theoretical and practical appearances linked with the subject.
Simulation	The students will be able to consult to the professor in any one doubts related with this methodology, as well as in the review of the different proofs of evaluation made, those that doubts have on theoretical and practical appearances linked with the subject.

### Assessment

	Description	Qualification	Training and Learning Results		
Studies excursion	Questions and activities related to the visit to be made will be carried out. These may take place before or after the visit.	5	B4	C4	D2 D9 D10 D17
Simulation	Realisation of diverse simulations of chemical processes that will have to deliver after the sessions of simulation that will make along the course	15	B3 B4	C4	D2 D9 D10 D17
Objective questions exam	This evaluation test includes two types of exams with objective questions: + multiple-choice questions in the lecture sessions, which will represent 10% of the total. + Short questions that will be asked in different controls throughout the course, which will represent 20% of the total value of the exam.	30	B3 B4	C4	D2 D9 D10 D17
Problem and/or exercise solving	They will make diverse controls, stating each one of them of problems.	40	B3 B4	C4	D2 D9
Report of practices, practicum and external practices	It will evaluate in this item both the realisation of the practices of laboratory like the reasoning and treatment of the results obtained in the development of the practical classes of laboratory.	10		C4	D9 D10 D17

### Other comments on the Evaluation

#### ASSESSMENT:

The participation of the student in any of the evaluation systems of the subject (laboratory practicals, problem solving and exercises, simulation, field trip, exam of objective questions) will imply the condition of presented and its qualification in the minutes. A minimum attendance of 75% of the practicals, field trips and simulations of the course is required to have the right to the evaluation of the same. Otherwise, the mark for these evaluation systems will be 0.0.

A student who "does not officially waive the continuous assessment" will be failed if he/she does not achieve a MINIMUM mark of 4.0 points (out of 10) in each of the tests described above. The student will pass the subject if the FINAL GRADE is  $\geq 5.0$ , that is, if the sum of the grades obtained in the different evaluation systems of the subject is  $\geq 5.0$ .

#### Second call:

In the second round, students will take a final exam in which they will be assessed on all the teaching methodologies applied throughout the course. This mark will be 100% of the grade.

#### STUDENTS RELEASED FROM CONTINUOUS ASSESSMENT:

When the School releases a student from the continuous assessment process, a "FINAL EXAMINATION" will be held on the dates established in the school calendar. The grade will be the sum of 90% of the mark obtained in the "FINAL EXAMINATION" and 10% of the laboratory practicals mark.

#### ETHICAL COMMITMENT:

The student is expected to show appropriate ethical behaviour. If ethically reprehensible behaviour is detected (for example: copying, plagiarism, use of unauthorised electronic devices, etc.) the student will not be considered to meet the necessary requirements to pass the subject. In this case the overall grade for the current academic year will be a fail (0.0). The use of any electronic device will not be permitted during the assessment tests unless expressly authorised. Bringing an unauthorised electronic device into the examination room will be considered as a reason for failing the subject in the current academic year and the overall grade will be a fail (0.0).

### Sources of information

#### Basic Bibliography

Himmelblau, D.M., **Basic principles and calculations in chemical engineering**, 6th,  
 Felder, R.M. y Rousseau, R.W., **Elementary principles of chemical processes**, 3rd,  
 Ocón, J. y Tojo, G., **Problemas de Ingeniería Química**, 3rd,  
 Coulson, J.M. and others, **Chemical Engineering vol. 1 and vol 2**, 5th,  
 Treybal, R.E., **Mass-transfer operations**, 3rd,  
 Calleja, G., **Introducción a la ingeniería química**, 1ª,  
 Levenspiel, O., **Chemical Reaction Engineering**, 3rd,  
 Wankat, P.C., **Ingeniería de procesos de separación**, 2ª,  
 McCabe, W.L., Smith, J.C. y Harriott, P., **Unit operations of chemical engineering**, 7th,

## Complementary Bibliography

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### Recommendations

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#### Subjects that it is recommended to have taken before

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Physics: Physics 1/V12G360V01102

Physics: Physics 2/V12G360V01202

Mathematics: Calculus 1/V12G360V01104

Mathematics: Calculus 2 and differential equations/V12G360V01204

Chemistry: Chemistry/V12G360V01205

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#### Other comments

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Requirements: To enrol in this subject, it is necessary to have passed or be enrolled in every subject of inferior courses. In case of discrepancies, it will prevail the Spanish version of this document.

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