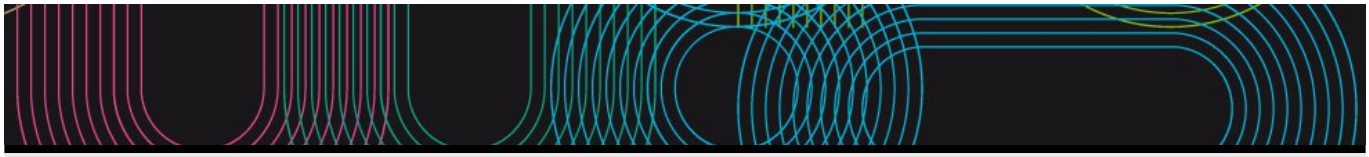

IDENTIFYING DATA				
Introduction to chemical engineering				
Subject	Introduction to chemical engineering			
Code	O01G281V01912			
Study programme	(*)Grao en Enxeñaría Agraria			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	3rd	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Santos Reyes, Valentín			
Lecturers				
E-mail				
Web				
General description	This subject includes the basic principles governing the behavior of aprocess, and that are the basis for further addressing unit operations and transport phenomena involved. More specifically, the issues addressed are: - Material and Energy Balances. - Applied chemical kinetics and ideal reactors. - Introduction to the control of processes.			

Competencies	
Code	
A2	(*)Que os estudantes saiban aplicar os seus coñecementos ó seu traballo ou vocación dunha forma profesional e posúan as competencias que adoitan demostrarse por medio da elaboración e defensa de argumentos e a resolución de problemas dentro da súa área de estudo.
B1	Que los estudiantes sean capaces de desarrollar habilidades de análisis, síntesis y gestión de la información en el sector agroalimentario y del medio ambiente.
B3	Que los estudiantes sean capaces de desarrollar habilidades personales de razonamiento crítico y constructivo.
C31	Capacidad para conocer, comprender y utilizar los principios de la ingeniería y operaciones básicas de alimentos
C39	Capacidad para conocer, comprender y utilizar procedimientos de automatización y control de procesos
D5	Capacidad de resolución de problemas y toma de decisiones

Learning outcomes				
Expected results from this subject	Training and Learning Results			
RA1: Know and apply knowledges of mathematics, physics, chemistry and engineering.	A2	B1	C31	
RA2: Analyse systems using material and energy balances.	A2	B1 B3	C31	D5
RA3: Capacity to know, understand and apply the principles of the engineering, of the basic operations and of the food industry processes	A2		C31 C39	D5
RA4: To know the principles of chemical and biological kinetics, and their application in the design and operation of ideal chemical reactors or basic bioreactors.		B3	C31	D5
RA5: Know the bases for the implantation of a process control system.	A2	B3	C31 C39	D5

Contents	
Topic	
THEME 1) Introduction	1. Definitions concerning Chemical Engineering 2. Chemical Industry and Unit Operations 3. Clasification of Unit Operations

THEME 2) Physical-Mathematical utilities	1. Units and related issues 2. Methods for equation resolution 3. Linear regression 4. Numerical Integration. 5. Graphical diferentiation 6. Triangular diagram
THEME 3) Conservation laws. General Balance Formulation	1. Conservation laws for mass, energy and momentun 2. Macroscopic and y microscopic systems 3. Property streams: Definition and clasification 4. Property transport: General concepts 5. General Balance equation
THEME 4) Material Balances	1. Introduction to the material balances 2. Monophasic Systems 2.1. Study in stationary state 2.2. Study in non stationary state 3. Biphasic systems under thermodynamic equilibrium and stationary state
THEME 5) Energy Balances	1. Therms present in the macroscopic energy balance 2. Macroscopic Systems 2.1. Systems in stationary state 2.2. Systems in non stationary state 3. Enthalpy Balance 3.1. Non-reactant Systems 3.2. Reactant Systems under stationary state 3.2.1. Entalphies of reaction 3.2.2. Thermodynamic Cycles
THEME 6) Chemical kinetics and ideal reactors	1. Chemical kinetics 2. Reaction rate 3. Reversibility of chemical reactions 4. Reaction rate equation 5. Analysis of chemical kinetic equation: application to constant volume systems 5.1. Integral method 5.2. Differential method 5.3. Initial rate method 6. Study of ideal isothermic reactors 6.1. Batch Reactor 6.2. Continuous Stirred Tank Reactor (CSTR) 6.3. Plug Flow Reactor (PFR)
THEME 7) Introduction to process control	1. Definitions and basic concepts 2. Process control strategies: Feedback, feedforward and cascade control 3. Instrumentation 4. Analysis and design of control systems

Planning

	Class hours	Hours outside the classroom	Total hours
Master Session	28	33.6	61.6
Troubleshooting and / or exercises	20	38	58
Classroom work	8	0	8
Laboratory practises	14	8.4	22.4

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

Methodologies

	Description
Master Session	exposition in classroom of the principles of the subject.
Troubleshooting and / or exercises	Proposal and resolution of exercises related to the subject. For every theme, The professor will give the student a list of exercises for their resolution. The professor will resolve some of the exercises and the students, individually or in group, should be able to resolve the others. The professor will propose periodically any problem or exercise that students can resolve and deliver, being evaluated and considered in the final qualification.
Classroom work	Realization in the classroom by the students of proposed exercises and/or questionnaires related to the studied theme. The resolutions will be collected and evaluated.
Laboratory practises	Experiments and laboratory practices related will be carried out in the laboratory. Data analysis and discussion, as explaanation of applied methologies will be considered for evaluation.

Personalized attention

Methodologies	Description
Troubleshooting and / or exercises	Clarify doubts arising during the resolution of exercises in class. Moreover, guidance and clarification of questions raised in the works proposed for resolution outside the classroom, with feedback once corrected. Communication preferably through the internet learning platform of the University of Vigo and tutorials of teachers.
Laboratory practises	Monitoring the realization of laboratory practices, guiding in the proper handling of equipment, focusing on measurement uncertainties, or solving questions that may arise. Clarify doubts during data processing (classroom) and during preparation of additional material (outside the classroom).
Classroom work	Clarification of doubts that may arise, with the logical limitations in case of evaluation test.

Assessment

	Description	Qualification		Training and Learning Results		
Master Session	An exam considering all matter. The exam will have a section asking for theoretical concepts, and another section proposing the numerical solution of practical cases. RA1, RA2, RA3, RA4 e RA5	50		B1	C31 C39	D5
Troubleshooting and / or exercises	Resolution, outside the classroom, of the proposed exercises. The student wll have support/guidance at professor tutorials or through the e-learning platform of the University of Vigo. RA1, RA2, RA3, RA4 e RA5	20	A2	B1 B3	C31	D5
Classroom work	Considering the resolution made by the student of those exercises or questionnaires suggested by the teacher to be done during the classroom session, which will be collected and evaluated. RA1, RA2, RA3, RA4 e RA5	10		B3	C31 C39	D5
Laboratory practises	Attendance, attitude and aptitude in the laboratory will be considered in evaluation. Additionally, the evaluation includes practice report, spreadsheets with data analysis, and an exam. RA1, RA2, RA3, RA4 e RA5	20	A2	B1 B3	C31	

Other comments on the Evaluation

1. It is necessary to pass the exam of all the subject (obtaining a minimum of 5 points on a 10 base). In other case the global qualification of the subject will be the one corresponding to the exam.
2. It is mandatory the assistance to the laboratory practices and the delivery of complementary material (reports, spreadsheets with data analysis). The evaluation of this issue will include aptitude and laboratory skills, quality of the complementary material, and an exam. It is necesary to obtain a minimum qualification of 4 (Base 10) in each of the three items. In case of documented justified absence at laboratory the student will have the option of an exam including both theoretical and laboratory skills aspects. In any of the cases, it is necessary to obtain a minimum qualification of 5 in "Laboratory Practices" (Base 10) to surpass the subject.
3. In the case of students not assisting to the methodologies of "Troubleshooting and/or exercises" and/or "classroom work", they will have the alternative possibility to realize an additional exam, in the same date that the general exam, that will include questions/problems treated in the deliveries carried out during the academic course.
4. In July the student can opt for examining of the exam parts or of the methodologies not surpassed in June, or of those that wish to improve his previous June qualification. The assigned qualification will be the best of that obtained in June or July for every exam part or methodology.
5. Those students having done less than 30% of the methodologies "Troubleshooting and/or exercises" and/or "classroom work" and not meking the exam, the obtaines qualification will be "not presented". In other case the qualification will be that calculated following the above exposed procedure.
6. The communication with the students will be made through the e-learning platform of the University of Vigo.
7. Students can opt to be examined in the "End of Career" call. In this case the qualification will correspond to that obtained in an exam, that will include questions/problems considered in master sessions, classroom work, problems and/or exercises proposed for realization outside the classroom and further delivery, and laboratory practises.
8. Official dates for the realization of the examinations: 26 of May of 2017 at 10.00 and 3 of July of 2016 at 16.00. The date for the realization of the "End of Career" examination the 4 of October of 2016 at 10.00. Considering possible mistakes and/or modifications, please check it at the Faculty board and/or web.

Sources of information

Levenspiel, O., **Ingeniería de la reacciones químicas**, Reverté,
Calleja Pardo, G. y col., **Introducción a la ingeniería química**, Síntesis,
Himmelblau, D.M., **Principios básicos y cálculos en ingeniería química**, Prentice-Hall Hispanoamericana,
Felder, R.M. e Rousseau, R.W., **Principios elementales de los procesos químicos**, Limusa Wiley,
Toledo, Romeo T., **Fundamentals of food process engineering**, Springer,
Ollero de Castro, P y Fernández Camacho, E., **Control e Instrumentación de Procesos Químicos**, Síntesis,

Recommendations

Subjects that it is recommended to have taken before

Thermal engineering/O01G280V01501