Teaching Guide				
Identifying Data				2018/19
Subject (*)	Chemistry		Code	730G03005
Study programme	Grao en Enxeñaría Mecánica			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	1st four-month period	First	Basic training	6
Language	SpanishGalician			
Teaching method	Face-to-face			
Prerequisites				
Department	Enxeñaría Naval e IndustrialQuímica			
Coordinador	Fernandez Solis, Jose Maria	E-mail	jose.maria.fsolis@udc.es	
Lecturers	Fernandez Solis, Jose Maria Rodriguez Guerreiro, Maria Jesus	E-mail	jose.maria.fsolis@udc.es maria.guerreiro@udc.es	
Web				
General description	Matter of basic training of first course, in which they give the foundations of general chemistry, inorganic, organic and applied to the engineering			

Study programme competences	
Code	Study programme competences
A4	Capacidade para comprender e aplicar os principios de coñecementos básicos da química xeral, química orgánica e inorgánica e as súas aplicacións na enxeñaría.
B1	Que os estudantes demostren posuír e comprender coñecementos nunha área de estudo que parte da base da educación secundaria xeral e adoita encontrarse a un nivel que, aínda que se apoia en libros de texto avanzados, inclúe tamén algúns aspectos que implican coñecementos procedentes da vangarda do seu campo de estudo
B2	Que os estudantes saiban aplicar os seus coñecementos ao 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
B3	Que os estudantes teñan a capacidade de reunir e interpretar datos relevantes (normalmente dentro da súa área de estudo) para emitiren xuízos que inclúan unha reflexión sobre temas relevantes de índole social, científica ou ética
B4	Que os estudantes poidan transmitir información, ideas, problemas e solucións a un público tanto especializado como leigo
B5	Que os estudantes desenvolvan aquelas habilidades de aprendizaxe necesarias para emprenderen estudos posteriores cun alto grao de autonomía
B6	Ser capaz de concibir, deseñar ou poñer en práctica e adoptar un proceso substancial de investigación con rigor científico para resolver calquera problema formulado, así como de comunicar as súas conclusións ?e os coñecementos e razóns últimas que as sustentan? a un público tanto especializados como leigo dun xeito claro e sen ambigüidades
B7	Ser capaz de realizar unha análise crítica, avaliación e síntese de ideas novas e complexas
C1	Utilizar as ferramentas básicas das tecnoloxías da información e as comunicacións (TIC) necesarias para o exercicio da súa profesión e para a aprendizaxe ao longo da súa vida.
C2	Desenvolverse para o exercicio dunha cidadanía aberta, culta, crítica, comprometida, democrática e solidaria, capaz de analizar a realidade, diagnosticar problemas, formular e implantar solucións baseadas no coñecemento e orientadas ao ben común.
C4	Valorar criticamente o coñecemento, a tecnoloxía e a información dispoñible para resolver os problemas cos que deben enfrontarse.
C5	Asumir como profesional e cidadán a importancia da aprendizaxe ao longo da vida.

Learning outcomes			
Learning outcomes	Study programme competences		
Capacity to comprise and apply the principles of basic knowledges of the general, organic and inorganic chemistry and his applications in the engineering.	A4		
Resolve problems of effective form.		B2	
Learn to learn.		B5	

Apply a critical thought, logical and creative.		B7	
Work of form collaborator.		B4	
Capacity to find and handle the information.		B1	
Capacity of oral communication and written.		B6	
Positive in front of the problems.		B3	
Value critically the knowledge, the technology and the available information to resolve the problems with which have to confront.			C4
Use the basic tools of the technologies of the information and the communications (TIC) necessary for the exercise of his profession and for the learning along his life.			C1
Manage for the exercise of an open citizenship, literate, critical, committed, democratic and solidarity, able to analyse the reality, diagnose problems, formulate and implant solutions based in the knowledge and oriented to the very common.			C2
Assume like professional and citizen the importance of the learning along the life.			C5

Contents	
Topic	**Sub-topic**
The following lessons develop the established contents in the Verification Memory, that are:	-Basic concepts of Chemistry -Thermochemistry; Chemical Kinetics -Chemical Equilibrium; Electrochemistry -Principles of Organic Chemistry -Bases of the Industrial Chemistry: balances of matter -Principles of Instrumental Analysis -Organic and Inorganic Chemistry applied to the engineering
Lesson 1.- Basic concepts of General Chemistry:	Fundamental Principles of Chemistry. The atom: quantum mechanical description. Periodic table and periodic properties. Chemical link: types of link.
Lesson 2.- Thermochemistry:	Introduction: first principle of thermodynamics. Heats of reaction, enthalpy. Thermochemistry: Law of Hess. Calorimetry. Second principle of thermodynamics: entropy. Third principle of thermodynamics: spontaneity of the reaction.
Lesson 3.- Chemical Kinetics:	The rate of reaction. The rate law. Determination of the rate of reaction. Order of reaction. The collisions and of the state of transition theories. Activation energy. Reaction mechanisms. Catalysis: Catalysts.
Lesson 4.- Chemical equilibrium in gaseous phase:	Nature of the chemical equilibrium. The equilibrium constant: applications. Heterogeneous equilibria. Factors that affect chemical equilibrium: Le Châtelier?s principle. Relation between equilibrium constants. Effect of changes in the temperature on the equilibrium constant.
Lesson 5.- Acid-base equilibria:	Acid-base definitions. Autoionization of water. Concept of pH: determination. Dissociation of acids and bases. Acid-base properties of the salts. Acid-base reactions. Buffer solutions. Acid-basic titrations: indicators.
Lesson 6.- Oxidation-reduction (redox) equilibria:	Methods of balancing redox equations. Electrochemical foundations: galvanic cells. Free energy and voltage of the battery. The Nernst equation. Redox titrations.
Lesson 7.- Applications of the electrochemistry:	Primary commercial cells and accumulators. Fuel cells. Electrolytic cells. Industrial applications of the electrolysis: electrodeposition. Metallic corrosion.
Lesson 8.- Principles of Instrumental Analysis:	Analytical Chemistry: concept and division. Classification of quantitative analytical methods. Instrumental analytical methods: classification. Parameters of validation of an analytical method. Evaluation of results.
Lesson 9.- Principles of Organic Chemistry:	Naming organic compounds. Functional groups. Homologous series. Isomery. Determination of molecular structures.

Lesson 10.- Saturated, unsaturated and aromatic hydrocarbons:	Classification. Saturated hydrocarbons: naming, sources, synthesis and properties. Alkenes and alkynes: structure, nomenclature, synthesis and properties. Aromatic compounds: structure, nomenclature, obtaining and properties. Benzene.
Lesson 11.- Other organic compounds:	Compounds of functional groups with simple link: alkyl halides, alcohols, phenols, ethers and amines. Compounds of functional groups with multiple links: carbonyl group compounds, carboxylic acids and his derivatives.
Lesson 12.- Bases of the Industrial Chemistry. Balances of matter:	Prime Matters that uses the chemical industry. The energy in the chemical industry. The chemical processes: examples. Diagrams of flow. The chemical products. Ecological and environmental considerations.
Lesson 13.- Organic Chemistry applied to the engineering:	Coal. Oil. Natural gas. Biomass. Natural and synthetic polymers.
Lesson 14.- Inorganic Chemistry applied to the engineering:	Metallurgy. Semiconductors. Industrial synthesis of an inorganic compound (industry of the chloride of sodium).

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours
Laboratory practice	A4 B3 C5	10	10	20
Objective test	A4 B1 B2 B5	8	12	20
Guest lecture / keynote speech	A4 C1 C2 C4	30	15	45
Problem solving	A4 B2 B4 B5	18	27	45
Supervised projects	A4 B6 B7 C1	2	16	18
Personalized attention		2	0	2
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Laboratory practice	Understanding reading of the practice. Realise the experimental work. Pose and resolve the numerical calculations associated as well as the questions that pose. Examine and value the results. Draft and present the final report of the practices.
Objective test	Tests written divide in two parts (theoretical and of problems) used for the evaluation of the learning of the student.
Guest lecture / keynote speech	Has a expositive function complemented with the use of audiovisual means and the introduction of some questions headed to the students, with the purpose of transmit knowledges and facilitate the learning. The student takes aim, poses doubts and questions. Includes a conference or technical visit to charge specialists in a particular chemical industry.
Problem solving	Methodology carried out in average group (20 students): presentation and resolution of numerical problems bulletins and of theory exercises bulletins. The student, of individual form or in reduced group, poses doubts and /or questions, participating of active form in the classroom.
Supervised projects	Treats of the realization, in reduced groups of students, of studies directed that, each group, has to expose in the classroom and deliver to the professor for his correction.

Personalized attention	
Methodologies	Description

Problem solving Supervised projects Laboratory practice	In the personalized attention will treat to amend possible deficiencies in the previous chemical training of the student and to resolve doubts and punctual questions that, usually, prevent him the general follow-up of the matter. It will realize a follow-up of the work of the student in the laboratory, will take in consideration his suggestions and will loan him help to clear the doubts. In the average group problem solving sessions, they will be helped to clarify concepts and resolve possible doubts. In the supervised projects preparation will facilitate them the assistance that require for his preparation and exhibition. The students that request and was them conceded academic dispense, will be able to remain exempt of the 80 % of the face-to-face classes assistance (Guest lecture and problems solving). They will realise mandatory the laboratory practices and will participate in the training of group of work sessions, preparation and presentation/exhibition of the supervised project, what involves the assistance to the 20 % of the face-to-face classes.

Assessment			
Methodologies	Competencies	Description	**Qualification**
Objective test	A4 B1 B2 B5	To half of 1st four-month period will realize an eliminatory partial examination of the matter given until this moment (theory and problems). At the end of the 1st four-month period will realise a final examination of all the subject (the students that have surpassed said partial will not have to repeat in the final examination).	70
Problem solving	A4 B2 B4 B5	Resolution of numerical problems bulletins, including likewise the resolution of theory exercises bulletins in specific sessions. It values the assistance of the student, his active participation in the classroom, his interest and attitude.	10
Supervised projects	A4 B6 B7 C1	Elaboration and presentation in group of a supervised or directed project. It values, in addition to the presentation, the realised work by the students in Word format and the elaborated transparencies for his exhibition in the classroom in PowerPoint format.	10
Laboratory practice	A4 B3 C5	Realization, active participation in each one of the practices and delivery of the corresponding final report. It values the interest and attitude of the student.	10

Assessment comments

This section indicates what marks in each methodology. The objective test describes as it is the examination and the punctuation of each one of the parts of theory and of problems. The minimum note in each part of the exam (theory or problems in the partial or final, or in the second part of the subject) so that you can take into account the scores of laboratory practices, problem solving and supervised work has to be 3.0 over 7.0. To obtain approved in the matter has to fulfil that the sum of the notes of the objective test, laboratory practice, problem solving of and supervised projects was at least 5,0.

Any of the theoretical subjects neither of the problems proposed in the partial examination will be able to leave in white, having to be recovered in the final examination with independence of the note obtained.

The supervised projects, to realize in groups of 5 students, will constitute a summary of the subject proposed by the professor, with an extension in the order of 5-6 pages in Word format. For his presentation in the classroom, previously will elaborate of 8 to 10 transparencies in PowerPoint format. The participants in each work have to belong to the same average group of the class.

All the groups that present a supervised project in a determinate session, will have to be presents in the classroom from the beginning to the end of the same.

In order to be qualified, the student will perform all laboratory practices and participate in the elaboration and exhibition of the supervised work in this subject. These methodologies are mandatory.

To the student that surpass the subject first part (Inorganic and Analytical Chemistry) in the partial examination or in the announcement of january or, well, that surpass the subject second part(Industrial and Organic Chemistry) in the announcement of january, will save him the approved part note during the corresponding academic course. In case to repeat the subject will have to examine of the two parts again.

The student that have been missing to some practice of laboratory or that have not surpassed the examination of recovery of the practice, in case to repeat the matter has to go back to realize all again.

Will take into account, in the measure of the possible, the circumstances of the repeat students.

The students with enrols to partial time will, or with conceded academic dispense, have to realise the activities or compulsory methodologies (laboratory practice and supervised Project), in this case will remain exempt of 80% of the assistance to the face-to-face classes. Nevertheless, it recommends them that they do also the activity problem solving; in this case would remain exempt of 70% of the assistance to the face-to-face classes.

Sources of information

Basic	- BERMEJO, F.; PAZ, M.; BERMEJO, A.; PAZ, A. (1996). 1000 Problemas Resueltos de Química General y sus Fundamentos Teóricos. Madrid Paraninfo, S. A. - RECLAITIS, G. V. (1991). Balances de materia y energía. México. McGraw-Hill/Interamericana - QUIÑOÁ, E.; RIGUERA, R. (2004). Cuestiones y Ejercicios de Química Orgánica. Madrid. McGraw-Hill/Interamericana de España, S. A. U. - PÉREZ, J.; SECO, H. M. (2006). Experimentos de Química. Aplicaciones a la vida cotidiana. Badajoz. Filarias - VIAN, A. (1999). Introducción a la Química Industrial. Barcelona. Reverté, S. A. - SKOOG, D. A.; HOLLER, F. J.; NIEMAN, T. A. (2000). Principios de Análisis Instrumental. Madrid. McGraw-Hill/Interamericana de España, S. A. U. - CHANG, R. (2010). Química. México McGraw-Hill- Interamericana - SKOOG, D. A.; WEST, D. M.; HOLLER, F. J., CROUCH, S. R. (2001). Química Analítica. México. McGraw-Hill/Interamericana - PAZ, M.; CASTRO, F.; MIRÓ, J. (1995). Química I. Madrid. E. T. S. I. I.; U. N. E. D. - CABILDO, M. P. (1999). Química Orgánica. Madrid. U. N. E. D. - LINSTROMBERG, W. W. (1979). Química Orgánica. Barcelona. Reverté, S.A. - MORRISON, R. T.; BOYD, R. N. (1990). Química Orgánica. Addi-Wesley Iberoamericana E. U. A. - PRIMO, E. (1994). Química Orgánica Básica y Aplicada. Barcelona. Reverté, S.A - PETER, K.; VOLLHARDT, C.; SCHORE, N. E. (2000). Química Orgánica. Estructura y función. Barcelona. Omega. - PETRUCCI, R. H.; HERRING, F. G.; MADURA, J. D.; BISSONNETTE, C. (2011). Química General. Principios y Aplicaciones Modernas . Madrid. Pearson Educación, S. A.
Complementary	- SOLOMON, T. W. G. (1999). Fundamentos de Química Orgánica. México. Limusa Noriega - LÓPEZ, J. A. (2000). Problemas de Química General. Cuestiones y Ejercicios. Madrid. Pearson Educación-Prentice Hall - WITTCOFF, H. A.;REUBEN, B. G. (1997). Productos Químicos orgánicos industriales. México. Limusa - RUSSELL, J. B.; LARENA, A. (1994). Química. Madrid. McGraw-Hill - BERMEJO, F.; BERMEJO, P.; BERMEJO, A. (1991). Química Analítica General, Cuantitativa e Instrumental. Madrid. Paraninfo, S. A. - SECO, H. M.; PÉREZ, J.; FERNÁNDEZ, J. M. (2010). Química de la Vida en Ejercicios Resueltos. Badajoz. Filarias - COTTON, F. A.; WILKINSON, G. (1991). Química Inorgánica Básica. México. Limusa - BONNER, W. A.; CASTRO, A. J. (1981). Química Orgánica Básica. Alhambra Universidad - WILLIS, C. J. (1993). Resolución de Problemas de Química General. Barcelona. Reverté, S. A. - VEGA, J. C. (2000). Química Orgánica para estudiantes de Ingeniería. México. Alfaomega. - GONZALEZ, J. A. (1984). Teoría y Práctica de la Lucha contra la Corrosión. Madrid. C. S. I. C. (C. E. N. I. M.) - OROZCO, C.; GONZÁLEZ, M. N.; PÉREZ, A. (2011). Problemas Resueltos de Química Aplicada. Madrid. Paraninfo, S. A. - FERNÁNDEZ, J. M.; PÉREZ, J.; SECO, H. M. (2012). Estadística Sencilla para Estudiantes de Ciencias. Madrid. Síntesis, S. A. - ROSENBERG, J.; EPSTEIN, L.; KRIEGER, P. (2014). Química. México. McGraw-Hill Education - SKOOG, D. A.; WEST, D. M.; HOLLER, F. J., CROUCH, S. R. (2005). Fundamentos de Química Analítica. Madrid. Thomson - VALE, J.; FERNÁNDEZ, C.; PIÑERO, M.; ALCALDE, M.; VILLEGAS, R.; VÍLCHES, L.; NAVARRETE, B.; GARCÍA, (2004). Problemas Resueltos de Química para Ingeniería. Madrid. Thomson

Recommendations
Subjects that it is recommended to have taken before
Subjects that are recommended to be taken simultaneously

Calculus /730G03001
Engineering Drawing/730G03002
Physics I /730G03003
Computting/730G03004
Linear Algebra/730G03006

Subjects that continue the syllabus

Materials Science/730G03007
Thermodynamics /730G03014
Environmental Engineering/730G03017
Materials Engineering/730G03030

Other comments

Since it treats of a matter that gives in the 1st four-month period of first course of the career, is indispensable that the student handle with fluency concepts and basic knowledges of Mathematics, Physical and Chemistry of the high school diploma. Previously to study this matter considers of big importance to know the chemical nomenclature (that is to say, appoint and formulate the chemical elements and more common inorganic and organic compounds).

To help to achieve some immediate surroundings sustained and fulfil with the aim of the number 5 action: "Teaching and healthy and sustainable investigation environmental and social" of the "Plan of Action Green Campus Ferrol":
The delivery of the documentary works that realise in this matter:
* They will request in virtual format and/or computer support
* Will realise through Moodle, in digital format without need to print them
* In case to be necessary to realise them in paper:
- They will not employ plastic
- Will realise impressions to double expensive
- Will employ paper recycled
- Will avoid the impression of drafts.

* It has to do a sustainable use of the resources and the prevention of negative impacts on the half natural.