UNIVERSIDADE DA CORUÑA

Teaching Guide				
Identifying Data				2016/17
Subject (*)	QUÍMICA		Code	730G03005
Study programme	Grao en enxeñaría en Tecnoloxías Industriais			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	1st four-month period	First	FB	6
Language	SpanishGalician			
Teaching method	Face-to-face			
Prerequisites				
Department	Enxeñaría Industrial 2Química Analítica			
Coordinador	Fernandez Solis, Jose Maria	E-mail	jose.maria.fsolis@udc.es	
Lecturers	Fernandez Solis, Jose Maria Gonzalez Soto, Elena Rodriguez Guerreiro, Maria Jesus	E-mail	jose.maria.fsolis@udc.es elena.gsoto@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

Learning outcomes			
Learning outcomes	Study programme competences		
Capacity to comprise and apply the principles of basic knowledges of the general chemistry, 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
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.- Chemical Organic applied to the engineering:	Coal. Oil. Natural gas. Biomass. Natural and synthetic polymers.
Lesson 14.- Chemical Inorganic applied to the engineering:	Metallurgy. Semiconductors. Materials of construction. 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	15	24	39
Supervised projects	A4 B6 B7 C1	5	20	25
Personalized attention		1	0	1
(*)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.
Problem solving	Methodology carried out in average group (20 students) or in small group (10 students): presentation and resolution of bulletins of numerical problems and of bulletins of exercises of theory. 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 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 sessions of solution of problems and of seminar in small group will loan them help to clear concepts and resolve possible doubts. In the preparation of the supervised projects will facilitate them the assistance that require for his preparation and exhibition.

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 an examination of the second part of the subject for the students that have surpassed the partial and a final examination of all the subject for the students that have not approved said partial.	70
Problem solving	A4 B2 B4 B5	Resolution of bulletins of numerical problems, including likewise the resolution of bulletins of exercises of theory 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 transparencies elaborated 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 examination (partial of theory or problems, final of theory or problems) so that they can take into account the punctuations of laboratory practice, problem solving and supervised projects has to be of 3,0 on 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 format Word. For his presentation in the classroom, will elaborate previously of 8 to 10 transparencies in format PowerPoint. The participants in each work have to belong to the same small or 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.

To be able to be described, the student will realise all the practices of laboratory and will participate in the preparation and exhibition of the supervised project. Both methodologies have a compulsory character.

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 have to realise the activities or compulsory methodologies (practices of laboratory and supervised projects), 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 - http://clhorella.cdf.udc.es (2003). . - 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 - VEGA, J. C. (2000). Química Orgánica para estudiantes de Ingeniería. México. Alfaomega. - WILLIS, C. J. (1993). Resolución de Problemas de Química General. Barcelona. Reverté, S. A. - 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
CÁLCULO/730G03001 EXPRESION GRAFICA/730G03002 FÍSICA I/730G03003 INFORMÁTICA/730G03004 ÁLXEBRA/730G03006
Subjects that continue the syllabus
CIENCIA DOS MATERIAIS/730G03007 TERMODINÁMICA/730G03014 ENXEÑARÍA MEDIOAMBIENTAL/730G03017 ENXEÑARÍA DOS MATERIAIS/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, inorganic and organic compounds more common).