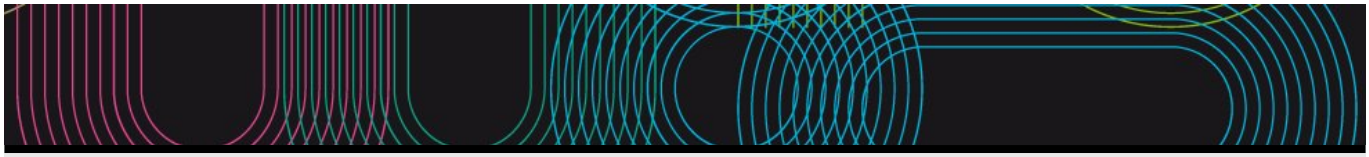

IDENTIFYING DATA				
Chemistry: Chemistry				
Subject	Chemistry: Chemistry			
Code	P52G382V01102			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	Spanish			
Department				
Coordinator	Devesa Rey, Rosa			
Lecturers	Devesa Rey, Rosa Urréjola Madriñán, Santiago Rafael			
E-mail	rosa.devesa.rey@cud.uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	Chemistry is a scientific discipline that studies both the composition, structure and properties of matter, as well as the changes it undergoes during chemical reactions and its relationship with energy. From a degree point of view, engineering applies chemical knowledge to the economical production of specialty chemicals and materials with minimal adverse impact on the environment. This first-year course in mechanical engineering aims to explain to students the basics of chemistry that they can apply throughout their professional life. The overall objective of this subject is to introduce the basic theoretical concepts that allow students to understand the nature of matter, going from atoms to molecules and from these to states of aggregation (solids, gases and liquids), introducing intermolecular forces. The fundamentals of chemical kinetics and thermodynamics necessary to understand chemical reactions and equilibria will be provided. And finally, basic concepts of organic and inorganic chemistry will be introduced, as well as different industrial applications of chemistry.			

Training and Learning Results	
Code	
B3	Knowledge in basic and technological subjects that will enable students to learn new methods and theories, and provide them the versatility to adapt to new situations.
C4	Ability to understand and apply the basic knowledge of general chemistry, organic chemistry and inorganic chemistry, and their applications in engineering.
D2	Problems resolution.
D10	Self learning and work.
D17	Team working.

Expected results from this subject	Training and Learning Results		
The student knows the chemical bases on which support the industrial technologies. Specifically, the student will acquire basic knowledge of general chemistry, as well as organic and inorganic chemistry and their applications in engineering, which will allow them to apply the basic concepts and fundamental laws of chemistry. The student will receive a theoretical-practical training that will allow to take advantage of the laboratory practices and solve basic problems related to this matter.	B3	C4	D2 D10 D17

ENAEE learning outcome:	B3 C4
KNOWLEDGE And UNDERSTANDING: LO1.1- Knowledge and understanding of the mathematics and other inherent basic sciences to his speciality of engineering, in a level that allow to purchase the rest of the competitions of the title. [Level of development: Intermediate (2)]	
ENAEE learning outcome:	D10 D17
COMMUNICATION AND TEAMWORKING: LO7.2- Ability to work effectively in national and international contexts, individually and as a team, and to cooperate with both engineers and people from other disciplines. [Intermediate (2)]	
ENAEE learning outcome:	D10
CONTINUOUS TRAINING: LO8.1- Ability to recognize the need for their own continous training and to undertake this activity throughout their professional life independently. [Intermediate (2)]	
ENAEE learning outcome:	D10
CONTINUOUS TRAINING: LO8.2- Ability to stay up-to-date with news in science and technology. [Intermediate (2)]	

Contents

Topic	
UNIT 1 (U1): ELEMENTAL CHEMISTRY (8 hours)	U1-1. ATOMIC THEORY AND STRUCTURE OF MATTER (3 hours) Introduction to the atomic structure. Structures periodicity. Atom characteristics: Atomic number and atomic mass. Isotopes. Periods and groups. Mendeleev's classification. Periodicity of the properties: atomic volume, ionization energy, electronic affinity and electronegativity. Nuclear chemistry. U1-2. CHEMICAL BONDING (3 hours) Introduction to chemical bonding. Covalent bond: Lewis notation. Valence bond theory. Ionic bond. Metallic bond. U1-3. AGGREGATION STATES (2 hours) Gaseous State: Ideal Gases, Real Gases. Intermolecular forces. Liquid State: Characteristics of liquids. Surface tension and viscosity. State changes: Fusion, evaporation and sublimation. Solutions: Mechanism, classification and colligative properties. Solubility of gases in liquids. Colloidal mixtures. Solid state: Melting points, phase diagrams. Properties of solids.

UNIT 2 (U2): REACTIONS AND CHEMICAL PROCESSES (18 hours)	U2-1 CHEMICAL REACTIONS (I) (12 hours) Stoichiometric aspects. Energy aspects: thermochemistry. Kinetic aspects. Introduction to chemical equilibrium. Acid-base reactions and pH Equilibrium of solubility. U2-2 CHEMICAL REACTIONS (II) (6 hours) Redox reactions. Applied electrochemistry: batteries and potential. Corrosion and surface treatment. Electrochemical sensors.
UNIT 3 (U3) INTRODUCTION TO INDUSTRIAL CHEMISTRY (2 hours)	U3-1 INTRODUCTION TO CHEMICAL ENGINEERING (1 hour) Basic concepts of Chemical Engineering. Instrumentation and analysis in Chemical Engineering. U3-2 CHEMICAL INDUSTRY. INORGANIC AND ORGANIC CHEMISTRY (1 hour) Basic Principles of Organic and Inorganic Chemistry. Oil and derivatives: Petrochemistry. Coal: Carbochemistry.
PRACTICES OF LABORATORY (14 hours) includes in this epigraph the realisation of a project.	PL1. CHEMICAL BALANCE: LE CHATELIER´S PRINCIPLE Two reversible reactions will be studied, that have the advantage of the great ease with which the presence of reactants and products are detected, caused by color changes or by the appearance of a precipitate. PL2. ACID-BASE TITRATION: TITRATION CURVE Acid-base titrations are very useful to accurately determine the concentration of an acid/basic solution by adding a base or an acid of known concentration. Specifically, the assessment of a strong base with a strong acid will be carried out, for which different amounts of acid will be added and the pH of the resulting solution will be measured. In this way, the corresponding "titration curve" will be obtained and the pertinent conclusions will be drawn. PL3. REDOX AND ELECTROCHEMICAL PROCESSES: ELECTROLYSIS In order to become familiar with the chemical changes induced by an electric current and with the quantitative relationships involved, students will carry out the following experiences: Electrolysis of aqueous CuSO4(aq) and electrolysis of NaCl(aq). PROJECT Five laboratory sessions will be dedicated to the project, with the following estimated distribution: P1. Presentation of the project: Proposal for treatment systems for ballast water. P2-3 Experimental work in the laboratory. P4 Preparation of the report- P5 Presentation of the results.
SEMINARS (7 hours)	The planning of the seminars will correspond to the development of theory and laboratory classes. S1. Atomic theory and bonding S2. Aggregation states S3. Termochemistry S4. Chemical equilibrium S5. Acid-base S6. Solubility S7. Redox

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	28	44	72
Problem solving	7	7	14
Seminars	15	8	23
Laboratory practical	14	14	28
Objective questions exam	4	0	4
Objective questions exam	9	0	9

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

Methodologies

	Description
Lecturing	The theory classes explain the fundamentals of each topic. Students have in advance a textbook where the subject being studied is developed, in addition to the information available in Moovi, which contains all the files related to the masterclasses, seminars and laboratory practices. The theory classes are recommended to dedicate between half an hour and an hour depending on the content. Lecturers will use computer presentations and the blackboard. Presentations will be provided to the students prior to the classes, so the lecturer and the students will focus onto the exhibition and understanding of the concepts. Anyway, these presentations should not be considered like substitutes of the texts, but like complementary material.
Problem solving	In these classes the students will be given a series of problem bulletins that they have to solve in groups. The teaching material that they have to use is prepared, and the different alternatives will be discussed working in a group and there will be a pooling of the alternatives studied. The student must solve exercises and problems that will be corrected and evaluated by the lecturer.
Seminars	Those students who have not passed the course at the first opportunity will attend an intensive course, of 15 hours, in which reinforcement tasks of the main theoretical and practical contents taught in the course will be carried out. At the end of this course, the extraordinary exam will take place.
Laboratory practical	A series of laboratory practices have been designed in order to fix concepts explained in the classroom and thus students develop their ability to propose technical solutions. The didactic method to be followed in the teaching of the practical classes consists of the teacher supervising the work carried out by the various groups into which the students are divided. Two sessions will be devoted to laboratory work. A methodology of project-based learning will be followed during five laboratory sessions. A project to be carried out in a group (preferably two people) will be proposed. The solution of the project will demand the contribution of the knowledge acquired by each member of the group, thus guaranteeing the positive interdependence that is required for the success of collaborative work. On the other hand, the project will be evaluated in such a way as to guarantee individual enforceability and positive interdependence, that is, all members of the group must have worked and contributed to the final product and must master, at a minimum, all aspects of the project. The project will be carried out in five laboratory sessions. Material and bibliography will always be provided, and a public exhibition of the completed project will be held.

Personalized assistance

Methodologies	Description
Seminars	Attention to the student will be carried out in a personalized way either in tutorships or through email. In the field of tutorships, academic tutoring actions are distinguished as well as personalized tutoring. In the first case, the students will have at their disposal hours of tutorships in which they can consult any questions related to the contents, organization and planning of the course, as well as contents and exercises, etc. The tutorships can be individualized, but groups will be encouraged to solve problems related to the activities carried out. In the personalized tutorships, each student, individually, will be able to discuss with the lecturer any problem that is preventing her/him from carrying out an adequate follow-up of the course, in order to find some kind of solution between them. By combining both types of tutorships, it is intended to compensate for the different learning rhythms through attention to diversity. The lecturers of the course will answer the doubts and queries of the students in person or by telematic means (email, videoconference, Moovi forums, etc.) at the time that will be published on the CUD-ENM website or by appointment.

Assessment

	Description	Qualification	Training and Learning Results
Problem solving	AUTONOMOUS PROBLEM SOLVING AND SYSTEMATIC OBSERVATION The autonomous resolution of exercises or questions proposed by the lecturers of the course will be evaluated, assessing, among other concepts: the adequate resolution of exercises, the approach, order and delivery on time.	10	B3 C4 D2 D10 D17
Laboratory practical	REPORT OF LABORATORY PRACTICES (10 % of the final note) The activities carried out in the laboratory will be evaluated, the resolution of questions from the practice script, the attitude and order in the laboratory and the resolution of questionnaires about the practices carried out, which can be done in person or through the virtual platform of the subject. EVALUATION OF THE LEARNING BASED IN PROJECTS (10 % of the final note) The final project delivered will be evaluated, taking into account criteria related to the content and format of the final report delivered, as well as the use of language, the quality of the presentation and the answers to questions from the teachers, in the case of the presentation. oral. In this presentation, any member of the group must answer questions about the project. Everyone must therefore demonstrate in-depth knowledge of the delivered product, regardless of the part on which they have focused their efforts.	20	B3 C4 D2 D10 D17
Objective questions exam	INTERMEDIATE EXAMS All the knowledge acquired so far will be evaluated by taking two intermediate exams: o Test 1: 10% of the final grade o Test 2: 20% of the final grade	30	B3 C4 D2 D10
Objective questions exam	GLOBAL EXAM It will consist of a part of theoretical concepts and a part of problems. It is a necessary condition to pass the course by continuous evaluation to obtain a minimum of 4 points. The qualification of the student who does not exceed this minimum will be the weighted sum of the grades obtained up to that moment, as long as it does not exceed 5, in which case, the qualification will be a 4.	40	B3 C4 D2 D10

Other comments on the Evaluation

Ordinary and Extraordinary Exams

In order to evaluate all the skills in the ordinary and extraordinary exams, these will include, in addition to theory questions and part of problems, questions from the laboratory part. The evaluation will be considered positive when a score of 5 points out of 10 is reached.

ACADEMIC INTEGRITY: Students are expected to show adequate ethical behaviour, committing to act honestly. Based on article 42.1 of the Regulation on the evaluation, qualification and quality of teaching and the student learning process of the University of Vigo , as well as point 6 of the fifth rule of Order DEF/711/2022, of July 18th, which establishes the requirements for evaluation, progress, and ongoing enrolment in military educational training centres for incorporation into the ranks of the Armed Forces, any violation of academic integrity in the assessment process, as well as the cooperation in it will result in the assignment of a failing grade to the student (zero) for the entire course in the corresponding assessment opportunity, regardless of the percentage of importance that the test in question had in the overall continuous assessment and independently of other disciplinary actions that may be applied.

Sources of information

Basic Bibliography

Petrucci, R. H., Herring, F.G., Madura, J.D., Bissonnette, C., **Química General**, 8, Ed. Prentice-Hall, 2009

Willis, C.J., **Resolución de problemas de Química General.**, 1, Ed. Reverté., 1995

Complementary Bibliography

Chang, R., **Química**, 4, Ed. McGraw Hill, 2006
Atkins, P.W., **Química General**, 1, Ed. Omega, 1992
Reboiras, M.D, **Cuestiones de opción múltiple de química general**, 1, Ed. Abecedario, 2010
Quiñoá, E., Riguera, R. y Vila, J.M:, **Nomenclatura y formulación de los compuestos inorgánicos**, 1, Ed. McGraw Hill, 2006
Fernández, M. R. y col., **1000 Problemas de Química General**, 1, Ed. Everest, 2007
Masterton, W.L. y Hurley C.N., **Química, Principios y Reacciones**, 4, Ed. Thomson, 2003
López Cancio, J.A., **Problemas de Química**, 1, Ed. Prentice Hall, 2001

Recommendations

Other comments

It is recommended that students of the subject "Chemistry" have taken and passed the subject of chemistry in the last year of high school or have passed the specific test for access to the degree. Knowledge of formulation is recommended.