



Teaching Guide				
Identifying Data			2023/24	
Subject (*)	Environment and Quality	Code	610G01037	
Study programme	Grao en Química			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	2nd four-month period	Fourth	Optional	4.5
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Química			
Coordinador	Andrade Garda, Jose Manuel	E-mail	jose.manuel.andrade@udc.es	
Lecturers	Andrade Garda, Jose Manuel Del Castillo Busto, Estela Fernández Amado, María Lopez Mahia, Purificacion	E-mail	jose.manuel.andrade@udc.es estela.delcastillo@udc.es maria.fernandez.amado@udc.es purificacion.lopez.mahia@udc.es	
Web	http://campusvirtual.udc.es			
General description	The subject is about studying the major environmental pollutants, their most frequent sources and the effects they may cause into the environment. The most relevant national and international legislation will be reviewed. Major emphasis will be placed on developing procedures to identify environmental problems and how to set an analytical strategy to study them. Following, how to report the information and how to evaluate it according to legal settings will be discussed. The subject deals also with the basics of formal, internationally-driven, Environmental Management Systems and Quality Management in laboratories.			

Study programme competences / results	
Code	Study programme competences / results
A14	Ability to demonstrate knowledge and understanding of concepts, principles and theories in chemistry
A15	Ability to recognise and analyse new problems and develop solution strategies
A16	Ability to source, assess and apply technical bibliographical information and data relating to chemistry
A17	Ability to work safely in a chemistry laboratory (handling of materials, disposal of waste)
A19	Ability to follow standard procedures and handle scientific equipment
A23	Critical standards of excellence in experimental technique and analysis
A26	Ability to follow standard laboratory procedures in relation to analysis and synthesis of organic and inorganic systems
A28	Acquisition, assessment and application of basic principles of industrial activity, organisation and task management
B2	Effective problem solving
B3	Application of logical, critical, creative thinking
B4	Working independently on own initiative
B5	Teamwork and collaboration
B6	Ethical, responsible, civic-minded professionalism
B7	Effective workplace communication
C1	Ability to express oneself accurately in the official languages of Galicia (oral and in written)
C3	Ability to use basic information and communications technology (ICT) tools for professional purposes and learning throughout life
C4	Self-development as an open, educated, critical, engaged, democratic, socially responsible citizen, equipped to analyse reality, diagnose problems, and formulate and implement informed solutions for the common good
C7	Acceptance as a professional and as a citizen of importance of lifelong learning

Learning outcomes	
Learning outcomes	Study programme competences / results



To know how to identify the main pollutants and their sources. To know how to identify and predict the effects they may cause into the environment. To know how to identify and apply current legislation. To know how to perform sampling and how to apply the analytical methodologies to evaluate the environmental quality of a natural system.	A15	B2	C3
	A16	B3	C4
	A17	B4	
	A19 A23		
To know the basic criteria of the Quality management and Environmental management systems, according to international guidelines (ISO9001, EFQM, ISO14001 y EMAS). To know how to interpret the information derived from such tools. To give the most importance to the Human resources.	A14	B3	C1
	A16	B4	C3
	A26	B5	C7
	A28	B6 B7	

Contents	
Topic	Sub-topic
Chapter 1. Environmental Analytical Chemistry.	Scope. Definitions and types of pollution. The need for Analytical Chemistry to study the environmental problems. Types of analyses. Basic knowledge on environmental legislation.
Chapter 2. Main atmospheric pollutants. Analytical control.	Atmospheric pollution: emission and inmision. Major pollutants and their sources. Their effects on health and the environment. Parameters to state the quality of the air. Surveillance and control nets. Legislation. Sampling and Analytical research of the main atmospheric pollutants.
Chapter 3. Analytical control of aquatic pollution.	Physico-Chemical characterization of natural water. Main parameters to define the water quality. Major pollutants and their sources. Legislation. Sampling: water, sediments and living organisms. Analytical research of the main pollutants in aquatic environments.
Chapter 4. Main pollutants in soils and vegetables: their sources and the effects they produce. Analytical control.	Soils as a receptor of residues and spillages. Origin, transport and fate of main pollutants. Legislation. Sampling: soils and vegetation. Analytical research of the main pollutants.
Chapter 5. Quality in Analytical Laboratories.	Definition of Quality and Quality in an analytical laboratory. The customer's perspective. The within-laboratory perspective. Quality as a process.
Chapter 6. International models to Quality Management.	Formal definition of Quality. ISO 9000, ISO 17025. Main aspects. Some usual difficulties in their applications. Some critical aspects that determine quality in a laboratory. Basic management tools: Pareto's diagram, Ishikawa's plots, affinity charts. Control charts. other tools.
Chapter 7. A brief introduction to the Environmental Management systems.	Taguchi's idea. Role of the companies in environmental protection. Brief introduction to ISO 14000 and the EU EMAS system.
Laboratory classes	They try to mimic the overall process from sampling to reporting results. The measurements of some common environmental quality parameters will be carried out.

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Seminar	A15 A16 B2 B3 B4 B5 B7 C3	7	17.5	24.5
Laboratory practice	A17 A19 A23 A26 B7	9	25	34
Mixed objective/subjective test	A14 A15 A28 B2 C1	3	0	3
Supervised projects	A15 A16 B5 B7 C1 C3	1	16	17
Guest lecture / keynote speech	A15 A16 A28 B6 C4 C7	16	16	32



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
Seminar	Seminars will complement the theoretical lessons. They will be focused on the solution of numerical problems and other queries that are to be delivered to the students. Main focus will be on addressing real issues that are required to state the quality of air, soils or water. Some discussions will be held on the critical issues that determine the quality of a laboratory.
Laboratory practice	The theoretical concepts are to be applied to a true problem. Experimental results will be confronted to legislation and a discussion will be required. Students will be required to deliver a report on the experimental studies carried out. This will include a report and a critical discussion of the experimental results.
Mixed objective/subjective test	It will be constituted by short questions. Some of them should be scored whereas others must be selected amongst several options (type test). Other questions must be answered shortly. Numerical exercises will be included.
Supervised projects	O ealumnado deberá facer un traballo escrito onde se comparen os aspectos principais dos dous sistemas de xestión da calidade nos laboratorios. Para iso deberá estudar previamente a normativa da Unión Europea e as guías de ISO. Segundo o número de estudantes podería ser individual ou en grupo e, inclusive, facer un pequeno debate entre grupos para discutir ideas e aproximacións a un problema.
Guest lecture / keynote speech	It is highly advised that students read the suggested literature, preferably before a given chapter is discussed. The classes will be delivered using different media. Discussions will be empowered and a deep understanding of the main concepts will be required. Doubts will be addressed and participation and critical ideas will be requested from the students.

Personalized attention	
Methodologies	Description
Laboratory practice Seminar Supervised projects	<p>The practical laboratory classes are designed as small group activities in which the student participates directly. In this way, students receive personalised attention, allowing for better monitoring and guidance.</p> <p>Regarding the supervised projects, for each group of students a tutelage session will be programmed for discussion of the activities and resolution of doubts. Therefore, the teacher will be able to analyse if the process of learning of the student is suitable.</p> <p>Students being recognized officially as partial-time and entitled not to attend the lectures will be attended in a tutorship regime (set hour with teacher in advance).</p>

Assessment			
Methodologies	Competencies / Results	Description	Qualification
Mixed objective/subjective test	A14 A15 A28 B2 C1	The exam will consist of short questions, multiple test-type questions, numerical exercises and/or discussion of case-studies.	35
Laboratory practice	A17 A19 A23 A26 B7	The experimental work in the laboratory (ability, attitude, order, attention, etc.), along with the final report, will be scored.	15
Seminar	A15 A16 B2 B3 B4 B5 B7 C3	The level of participation of the student in the classes, along with its ability to solve numerical exercises and answer particular questions will be scored.	15



Supervised projects	A15 A16 B5 B7 C1 C3	O traballo será avaliado pola ligazón que se plasme entre os conceptos tratados, a extensión da comparación das normas internacionais baixo análise e pola calidade da redacción	35
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Assessment comments

The fraudulent performance, including plagiarism in any activity, during the assessment tests or activities, once confirmed, will directly imply the qualification of failing (numerical score "0") in the subject in the corresponding academic course, regardless of whether the fault was done in the first or the second call. For this, the score of the first call will be modified, if necessary.

The student's work will be assessed continuously and periodically through regular attendance at the assessable activities, participation in the seminar work, the resolution of questions and exercises posed by the lecturer (which must be handed in by the deadline indicated), the laboratory practicals and the mixed test.

The completion of the practical exercises is compulsory and failure to complete them will prevent the student from passing the subject; at the end of the practical exercises, a report on the procedure, the results obtained and their interpretation must be handed in.

The student will obtain a grade of Not Presented when he/she has completed less than 25% of the evaluable activities.

FIRST OPPORTUNITY

In order to pass the subject, a minimum mark of 5 (out of 10) must be obtained in the mixed test and in the practical exercises. The final grade of the subject will not be lower than the grade of the mixed test or the grade resulting from weighting the rest of the evaluable activities.

SECOND OPPORTUNITY

At the second opportunity, the mixed test will be taken and the marks obtained in the problem solving, case studies and field trips will be maintained, while the mark obtained in the mixed test at this opportunity will replace the mark obtained at the first opportunity.

Students assessed at the second opportunity will only be eligible for honours registration if the maximum number of honours for the corresponding course was not fully covered at the first opportunity.

ADVANCED OPPORTUNITY

The qualifications of the previous year will be maintained but the percentages will be those of the current year.

STUDENTS WITH PARTIAL-TIME DEDICATION

The evaluation criteria applied is the same indicated previously.

STUDENTS EXEMPTED FROM REGULAR ATTENDANCE TO THE LESSONS

The same evaluation criteria as above apply (except in the Seminar part where only the resolution of the questions/problems posed by the teacher will be taken into account). The practical sessions will be facilitated within the flexibility allowed by the coordination timetables and the material and human resources. This applies to both opportunities. Students being recognized officially as partial-time and entitled not to attend the lectures will be attended in a tutorship regime (set hour with teacher in advance).

In the evaluation of the subject, all the provisions of Article 14, regarding the Fraud Commission and disciplinary responsibilities, of the UDC's Rules for the Evaluation of Bachelor's Degrees and Master's Degrees, shall be applied.

Sources of information

Basic	<ul style="list-style-type: none">- MANAHAN, S.E. (2000). Environmental chemistry. Boca Raton, Lewis- OROZCO, C.; PEREZ, A.; GONZALEZ, n.; RODRIGUEZ, F.J.; ALFAYATE, J.M. (2003). Contaminación ambiental: una visión desde la Química. Madrid : International Thomson Editores- BADIA, A. (2002). Calidad, Modelo ISO9001. Deusto- SAGRADO, S.; BONET, E.; MEDINA, M.J.; MARTIN-BIOSCA, Y (2005). Manual práctico de calidad en los laboratorios. Madrid, AENOR- OROZCO, C.; PEREZ, A.; GONZALEZ, n.; RODRIGUEZ, F.J.; ALFAYATE, J.M. (2003). Problemas resueltos de contaminación ambiental : cuestiones y problemas resueltos . Madrid : International Thomson Editores
Complementary	<ul style="list-style-type: none">- BAIRD, C (2014). Química ambiental. Barcelona, Reverté- F.W. Fifield and P.J. Haines. (2000). Environmental analytical chemistry. Oxford, Backwell Science- JURAN, J.M.; GRZYNA, F.M. (1993). Manual de control de calidad. Madrid, Díaz de Santos, McGraw Hill- PATNAIK, P (2000). Handbook of environmental analysis chemical pollutants in air, water, soil, and solid wastes. Boca Raton, CRC Press



Recommendations

Subjects that it is recommended to have taken before

Analytical Chemistry 1/610G01011

Analytical Chemistry 2/610G01012

Instrumental Analytical Chemistry 1/610G01013

Instrumental Analytical Chemistry 2/610G01014

Subjects that are recommended to be taken simultaneously

Advanced Analytical Chemistry and Chemometrics/610G01015

Subjects that continue the syllabus

Final Dissertation/610G01043

Other comments

Basic knowledge of classical and (common) instrumental methods of analysis will be required. They correspond to the major techniques studied in previous semesters (spectrometry, chromatography, electrochemistry, etc.). The student should be able to use common informatic tools (spreadsheets, text processors, searches on the web, etc.). Basic knowledge of English will be needed. Green Campus Program Facultade de Ciencias To preserve the environment and to fulfill the objective set at point 6 of the "Declaración Ambiental da Facultade de Ciencias (2020)", the written reports for this subject should: a. be presented, preferently, in a virtual-electronic format. b. If they are delivered in print: - Do not use plastics. - Print double side. - If possible, use recycled paper. - Avoid printing drafts.

(*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.