Teaching Guide				
Identifying Data				2018/19
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 Lopez Mahia, Purificacion	E-mail	jose.manuel.andrade@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	
Code	Study programme competences
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

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 A16 A17 A19 A23	B2 B3 B4	C3 C4
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 A16 A26 A28	B3 B4 B5 B6 B7	C1 C3 C7

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: emision 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, afinity 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**	**Ordinary class hours**	**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
Guest lecture / keynote speech	A15 A16 A28 B6 C4 C7	16	28.8	44.8
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 quereis 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 hold 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.
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	The teachers will devote some seminars to work closely with the students. Therefore, participation on those classes is a must. They are expected to discuss ideas and solve numerical exercises (if necessary, with the teacher's aid). The teachers will also address pupils' doubts in their offices. 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).

Assessment			
Methodologies	**Competencies**	**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.	70
Laboratory practice	A17 A19 A23 A26 B7	The experimental work in the laboratory (ability, actitude, order, atention, 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

Assessment comments

Students will be evaluated in a continuous way according to their attendance to the scheduled activities, their engagement in the seminars, their discussions on the questions and exercises posed by the teacher (some of which should be delivered in advance), the laboratory practices and the mixed test. Laboratory practices are mandatory, otherwise the subject will not be aproved. At the end of the laboratory practices a report should be delivered. It should contain the analytical procedures, the experimental results and a discussion on them.

The "Not presented" score will be obtained in case the student makes less than 25% of the academic activities.

FIRST OPPORTUNITY

To pass the subject it is required to get, at least, 5 points (out of 10) in the mixed test (exam) and, for each and every other activity, at least, 4 points (out of 10), so that the weighted sum reaches -at least- 5 points (out of 10). The subject will not be passed in case the weighted sum reaches 5 points but the score of an activity does not reach 4 points. In this case, the final score of the subject will be fail (4.5 points).

SECOND OPPORTUNITY

The "second opportunity" should be understood as a second opportunity for the mixed test (exam). All the original scores associated to practices y seminars will be maintained, only the score of the exam made now will substitute that of the first opportunity. To pass the subject in the second opportunity a minimum score of 5 points (out of 10) in the exam must be obtained, so that the weighted sum of all scores reaches (at least) 5 points (out of 10).

The maxixum score (10, Matricula de Honor) will be obtained by pupils doing the second exam (July) only if that score was not given in the first exam (May-June), according to the Administrative requirements.

PARTIAL-TIME AND/OR EXEMPTED FROM REGULAR ATTENDANCE TO THE LESSONS

Students being recognized officially as partial-time and/or exempted from regular attendance to the lessons, will be evaluated only according to their scores on the objective tests (85%) and the laboratory practices (15%). For them, the laboratory practices will be scheduled as flexible as possible, although taking into account the regular timetables, as well as the instrumental and human resources available. This holds for both evaluation opportunities.

NEXT COURSES

For next courses no score will be maintained and all activities will have to be repeated.

Sources of information

Basic	- 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	- BAIRD, C (2014). Química ambiental. Barcelona, Reverté - F.W. Fifield and P.J. Haines. (2000). Environmental analytical chemistry. Oxford, Backwell Science - JURAN, J.M.; GRYNA, F.M. (1993). Manuel 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, searchs on the web, etc.).Basic knowledge of English will be needed.