UNIVERSIDADE DA CORUÑA

Teaching Guide					
Identifying Data					2021/22
Subject (*)	Validation of Analytical Methodology			Code	610509301
Study programme	Mestrado Universitario en Investigación Química e Química Industrial (Plan 2020)				
Descriptors					
Cycle	Period	Year		Type	Credits
Official Master's Degree	1st four-month period	First		Obligatory	3
Language	Spanish				
Teaching method	Face-to-face				
Prerequisites					
Department	Química				
Coordinador	Muniategui Lorenzo, Soledad		E-mail	soledad.muniategui@udc.es	
Lecturers	Carlosena Zubieta, Alatzne Muniategui Lorenzo, Soledad		E-mail	alatzne.carlosena@udc.es soledad.muniategui@udc.es	
Web					
General description	This subject, which is compulsory, belongs to Module M1 (Compulsory Advanced Chemistry Training) and is related to the subjects of the same module and to the optional subjects of the speciality Module M6 (Advanced Analytical Techniques). Its objective is to train the student for the adequate selection of the analytical methodology according to its applicability and to the selection, calculation and evaluation of the adequate criteria for the proposed purpose in control and industry laboratories.				

Contingency plan	(i) ADAPTATION TO BE CARRIED OUT IN THE EVENT OF NON-APPEARANCE due to outbreaks of disease. 1. Modifications to the contents: No changes will be made 2. Methodologies *Teaching methodologies that are maintained: Seminars, supervised projects, objective/subjective test, personalized attention. *Teaching methodologies that are modified: Laboratory practices: as they cannot be carried out in person, their contents will be incorporated into the supervised work methodology. 3. Mechanisms for personalized attention to students: - Email: Daily. Used to make queries, request a virtual meeting to resolve doubts and to follow up on the seminars and tutored works. - Moodle: Daily. According to the needs of the students. It has "thematic forums" to formulate the necessary consultations. - Teams: large group sessions for the advancement of theoretical content and seminars, in the time slot assigned to the subject. Small group sessions for the follow-up and support of the study and programmed activities related to the seminars and tutored works. 4. Modifications in the evaluation. The percentage of the evaluation of the laboratory practices is incorporated into the weighting of the supervised project, which becomes 25% of the qualification of the subject. *Evaluation observations: The other methodologies of the teaching guide are maintained, except that all of them would be carried out virtually or telematically (via Moodle and/or Teams). 5. Modifications to the bibliography or webgraphy: No changes will be made. All working materials are available in Moodle. (ii) ADAPTATION PROVIDED AT THE CENTER FOR CASES WHEN THE CLASSROOM CAPACITY ASSIGNED FOR THE SUBJECT IS EXCEEDEDED: additional spaces will be reserved in which students will be able to follow the activities through the Teams platform. In the case of practical activities, the groups will be divided to adapt them to the capacity of the laboratory.

Study programme competences / results	
Code	Study programme competences / results
A3	Innovate in the methods of synthesis and chemical analysis related to the different areas of chemistry
A5	Properly assess risks and environmental and socioeconomic impacts associated with special chemicals
A6	Design processes involving the treatment or disposal of hazardous chemicals
A7	Operate with advanced instrumentation for chemical analysis and structural determination.
A8	Analyze and use the data obtained independently in complex laboratory experiments and relating them with the chemical, physical or biological appropriate techniques, including the use of primary literature sources
B2	Students should apply their knowledge and ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study.
B3	Students should be able to integrate knowledge and handle complexity, and formulate judgments based on information that was incomplete or limited, include reflecting on social and ethical responsibilities linked to the application of their knowledge and judgments.

B5	Students must possess learning skills to allow them to continue studying in a way that will have to be largely self-directed or autonomous.
B10	Use of scientific terminology in English to explain the experimental results in the context of the chemical profession
B11	Apply correctly the new technologies to gather and organize the information to solve problems in the professional activity.
B12	Being able to work in a team and adapt to multidisciplinary teams.
C1	CT1 - Elaborar, escribir e defender publicamente informes de carácter científico e técnico
C2	CT2 - Traballar en equipo e adaptarse a equipos multidisciplinares.
C3	CT3 - Traballar con autonomía e eficiencia na práctica diaria da investigación ou da actividade profesional.
C4	CT4 - Apreciar o valor da calidade e mellora continua, actuando con rigor, responsabilidade e ética profesional.

Learning outcomes			
Learning outcomes	Study programme competences / results		
The student must acquire knowledge about the selection of the best analysis procedure to solve problems of interest, as well as how to implement and validate this procedure.	AC8	BC2 BC5 BC11	CC1 CC2 CC3
The student must know how to select for each particular situation innovative techniques both in the treatment of the analytical sample and in the determination techniques and data processing procedures.	AC3	BC10 BC11 BC12	CC1 CC3 CC4
The student must be able to apply the knowledge acquired to the resolution of practical cases of clinical, industrial and environmental interest, among others	AC3 AC5 AC6 AC7 AC8	BC2 BC3 BC5 BC11	CC1 CC2 CC3

Contents	
Topic	Sub-topic
1. Introduction: Selection of the analytical methodology	Criteria for selecting a method of analysis. Classification of methods of analysis. Characteristics of qualitative and quantitative analysis
2. Validation of analytical methodology	Selection of performance criteria for a method. Development, evaluation and use of an analytical methodology. Official guidelines for the validation of an analytical method. Validation tools. Types of intra-laboratory or inter-laboratory validation. Evaluation of validation studies
3. Innovative technologies in Analytical Chemistry	Innovative Technologies in Analytical Chemistry. Automation and miniaturization in Analytical Chemistry
Practice cases study	Practical examples will be addressed, learning how to determine the optimum operational conditions of a process, that a method is fit for purpose, ensuring that the results obtained through a methodology are reliable and of good quality, etc.

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A3 A5 B2 B3 B5 B11 C3 C4	10	10	20
Seminar	A8 B2 B3 B5 B10 C1 C2 C4	7	21	28
Laboratory practice	A6 A7 A8 B2 B3 B12 C2	5	5	10
Supervised projects	A5 A8 B2 B3 B5 B10 B11 B12 C1 C2 C4	3	12	15

Mixed objective/subjective test	A5 B2 B3 B10 C1 C4	2	0	2
Personalized attention		0		0
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	**Description**
Guest lecture / keynote speech	The teacher teaches the fundamental concepts and the most important contents of each programme topic. In addition, he/she proposes different questions to be discussed and resolved by the students, encouraging participation.
Seminar	The professor, in the seminars, clarifies and expands on some aspects dealt with in the guest lectures and laboratory practices, especially related to the practical application of the methodologies studied. Students participate and discuss possible strategies to solve environmental and/or industrial problems that arise under the guidance of the professor.
Laboratory practice	In the laboratory sessions the student will have the opportunity to make contact with advanced scientific techniques and instrumentation. Whenever possible, laboratories of research centres or companies will be visited.
Supervised projects	It will include the search for information in different sources, the elaboration, exposition and defense of a subject proposed by the teacher related to some environmental, industrial, clinical problem, etc. The hours will be dedicated to the orientation for the elaboration and exposition/defense of the same.
Mixed objective/subjective test	Final exam to evaluate the degree of learning of both theoretical and practical contents of the whole subject.

Personalized attention	
Methodologies	**Description**
Supervised projects Guest lecture / keynote speech Seminar Laboratory practice	Throughout the course, at the time specified by the teacher, all the aspects related to the teaching that the student considers necessary at each moment will be oriented and/or discussed. In the seminars the teacher supervises for each student the methodology applied and the process of solving the problems proposed, solving individually the doubts formulated by the student and guiding the learning process. In the supervised work it is important to carry out a personalised follow-up to comment on the progress made and to provide the student with the necessary guidance to develop the work. The student with recognition of part-time dedication and academic exemption from attendance will be attended to in the form of tutorial hours (by appointment).

Assessment			
Methodologies	**Competencies / Results**	**Description**	**Qualification**
Supervised projects	A5 A8 B2 B3 B5 B10 B11 B12 C1 C2 C4	Supervised projects will be evaluated by the performance and/or presentation of the project by the students.	20
Guest lecture / keynote speech	A3 A5 B2 B3 B5 B11 C3 C4	Attendance at the teaching sessions and active participation of the student will be evaluated	5
Seminar	A8 B2 B3 B5 B10 C1 C2 C4	The seminars will evaluate the students' acquisition of knowledge and skills through problem solving, case studies, etc.	10
Mixed objective/subjective test	A5 B2 B3 B10 C1 C4	The final exam will cover all the contents of the subject. It will consist of theoretical questions, applied issues and problem solving.	60
Laboratory practice	A6 A7 A8 B2 B3 B12 C2	The work and participation of students in the practical sessions will be continuously evaluated by means of questions and oral questions, tests, etc.	5

Assessment comments

The evaluation of this subject will be done through continuous assessment and a final exam, which can only be taken by the student who participates in a minimum of 80% of the mandatory classroom teaching activities (lectures, seminars, practices). The student will have the qualification of Not Presented when he/she does not carry out the supervised work and does not take the final exam. The qualification of the assessable activities can be kept in the July call, except for the mixed test in case of being suspended. In the following academic years, the teaching-learning process, including all assessable activities, will begin again with a new course. For part-time students with academic exemption from attendance, if they are unable to take all the continuous assessment tests, the teacher will take the appropriate measures so as not to affect their grade. In the evaluation of the subject, all that is established in article 14, regarding the Fraud Commission and disciplinary responsibilities, of the UDC's Rules for the Evaluation of Degrees and Master's Degrees will be applied.

Sources of information	
Basic	- R. Kellner, J. M. Mermet, M. Otto, M. Valcarcel y H. M. Widmer, Eds (2004). ?Analytical Chemistry: A Modern Approach to Analytical Science. Ed. Wiley-VCH. - Eurolab España. P.P. Morillas y colaboradores. (2016). Guía Eurachem: La adecuación al uso de los métodos analíticos ? Una Guía de laboratorio para la validación de métodos y temas relacionados . Disponible en www.eurachem.org - M. VALCARCEL (1999). Principios de Química Analítica. Springer, Barcelona - AOAC, IUPAC (2016). AOAC and IUPAC Official Guidelines for Validation of Analytical methods .
Complementary	- Ramis Ramos G., García Álvarez-Coque M.C (2001). Quimiometría . Síntesis. Madrid. - Compañó Beltrán R., Rios Castro A (2002). Garantía de calidad en los laboratorios analíticos. Ed. Springer. - I. Rodríguez, E. Trullos, X. Rius (2003). Validación de Métodos Analíticos Cualitativos.. Técnicas de Laboratorio, 281 (2003) 328-335. http:/www.quimica.urv.es/quimio - Kruve A. et al. (2015). Tutorial review on validation of liquid chromatography?mass spectrometry methods: Part I. Analytica Chimica Acta 870 (2015) 29?44

Recommendations
Subjects that it is recommended to have taken before
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Chromatography and Analytical Separation Techniques /610509125 Advanced Atomic Techniques and Sensors/610509127 Advanced Sample Preparation Techniques/610509324
Other comments
GREEN CAMPUS PROGRAM RECOMMENDATION: in order to help achieve an immediate sustainable environment and comply with point 6 of the "Environmental Declaration of the Faculty of Science (2020)", the documentary works requested in this subject:(a) Will be requested mostly in virtual format and computer support.(b) If paper is used: -No plastics will be used -Double-sided printing will be used -Recycled paper will be used -The use of drafts will be avoided.