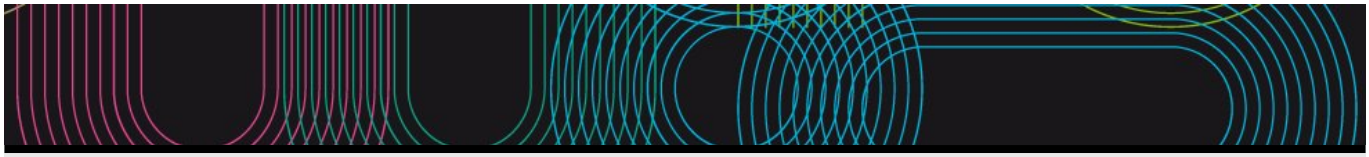

IDENTIFYING DATA				
Instrumental analysis				
Subject	Instrumental analysis			
Code	O01G261V01403			
Study programme	(*)Grao en Ciencias Ambientais			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language	Spanish French Galician English			
Department				
Coordinator	Falqué López, Elena			
Lecturers	Falqué López, Elena			
E-mail	efalque@uvigo.es			
Web				
General description	In this *asignatura, the student will know the foundations of those instrumental technicians of greater use and applicability in the analysis and environmental control.			

Competencies	
Code	
A3	Students will be able to gather and interpret relevant data (normally within their field of study) that will allow them to have a reflection-based considered opinion on important issues of social, scientific and ethical nature.
A4	Students will be able to present information, ideas, problems and solutions both to specialist and non-specialist audiences.
B1	Students will acquire analysis, synthesis and information-management skills to be applied in the food and agriculture and environmental sectors
B2	Students will acquire and apply teamwork abilities and skills.
C1	To know the physical, chemical and biological foundations linked with the environment and its technological processes
C4	Ability to integrate the experimental data found in field and/or lab work with theoretical knowledge.
C5	Ability to interpret data from quantitative and qualitative perspectives.
D1	Capacity of analysis, organization and planning.
D3	COral and written communication in the native language and foreign
D4	Ability of autonomous learning and information management.
D5	Ability of problem solving and decision making
D9	Team of interdisciplinary nature

Learning outcomes				
Expected results from this subject	Training and Learning Results			
Comprise the foundation of the distinct instrumental spectroscopic, electrochemical and chromatographic techniques employees for the analysis and control of quality of the foods, and food and environmental products.	A3 A4	B1 B2	C1 C4 C5	D1 D3 D4 D5 D9
Know and identify the characteristics that owe to gather the analites to select the most adapted techniques for his analysis.	A3 A4	B1 B2	C1 C4 C5	D1 D3 D4 D5 D9

Be able to select and apply the analytical techniques more adapted for the analysis of the foods (raw matters, foods elaborated and environmental products) to determine his characteristics and like this can evaluate and control the food and environmental quality.	A3 A4	B1 B2	C1 C4 C5	D1 D3 D4 D5 D9
Treat, evaluate and interpret the results obtained in the determinations and train to the student so that it take consciousness of the social responsibility of his reports and his repercussion in the taking of decisions.	A3 A4	B1 B2	C1 C4 C5	D1 D3 D4 D5 D9

Contents

Topic	
DIDACTIC UNIT I. Introduction to the Instrumental Analysis and to the Analytical Process.	SUBJECT 1. Introduction to the instrumental methods of analysis.
DIDACTIC UNIT II: Optical Methods.	SUBJECT 2. Optical methods: Generalities. SUBJECT 3. Spectroscopy of molecular absorption UV-vis. SUBJECT 4. Spectroscopy of molecular luminescence. SUBJECT 5. Atomic spectroscopy.
DIDACTIC UNIT III: Electrochemical Methods.	SUBJECT 6. Electrochemical methods: Generalities. SUBJECT 7. Electrodes. SUBJECT 8. Potentiometry.
DIDACTIC UNIT IV: Chromatographic Methods.	SUBJECT 9. Chromatography: Generalities. SUBJECT 10. Paper and thin layer chromatography. SUBJECT 11. High resolution liquid chromatography. SUBJECT 12. Gas chromatography.
DIDACTIC UNIT V: Other instrumental techniques.	SUBJECT 13. Other instrumental technique. Hyphenated techniques.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	28	42	70
Seminars	14	21	35
Laboratory practical	14	0	14
Mentored work	0	14	14
Problem and/or exercise solving	0	2	2
Problem and/or exercise solving	0	1	1
Practices report	0	14	14
Essay questions exam	0	2	2
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies

	Description
Lecturing	Exhibition by part of the professor, or of the student in his case, of the most important appearances of the contents of the subjects of the course, theoretical bases and/or guidelines of a work, exercise or project to develop by the student.
Seminars	Activities focused to the work on a specific subject, to proposal of the professor or of the student, that allow to deepen or complement the contents of the matter.
Laboratory practical	Activities, in groups of 2 or 3 people, in which it will ascertain the direct application of the theoretical knowledges developed in the master sessions and seminars.
Mentored work	The student, of individual way or in group, elaborates a document on an appearance or concrete subject of the course, by what will suppose the research and collected of information, reading and handle of bibliography, editorial, exhibition...

Personalized assistance

Methodologies	Description
Laboratory practical	To the start of each session of laboratory, the professor will do an exhibition of the contents to develop by the students. Likewise, during the development of the practices of laboratory, the student has to elaborate a fascicle of laboratory where collect all the relative observations to the experiment realised, as well as the data and results obtained. The student will have by anticipated, in the platform tem@, of the material employed in classes (so much theoretical, bulletins of problems, like scripts of the practices of laboratory).

Mentored work	In the sessions of resolution of problems and exercises, the professor will indicate the guidelines or routines for the resolution of the same. In the tutored works, will value the final document, and in his case also the exhibition of the same, on the thematic, conference, summary of reading, investigation or memory developed. The student will have by anticipated, in the platform tem@, of the material employed in classes (so much theoretical, bulletins of problems, like scripts of the practices of laboratory).

Assessment

	Description	Qualification	Training and Learning Results
Seminars	The assistance and participation in seminars will suppose until 10% of the final note, that will include the assistance, attitude, participation and results obtained in the seminars. With this methodology evaluate all the results of learning.	10	A3 B1 C1 D1 A4 B2 C4 D3 C5 D4 D5 D9
Laboratory practical	The practices of laboratory will value between -1.5 and +1.5 point and will suppose until 15% of the final note, that includes the forcing of attend to all the sessions, the realisation of all the practices and the preparation and delivery of the memory of practices. Also will take into account the attitude and participation of the student in the laboratory. This part will have to be surpassed independently of the other to be able to surpass the course and be in conditions to add the assessment of the other activities. With this methodology evaluate all the results of learning.	15	A3 B1 C1 D1 A4 B2 C4 D3 C5 D4 D5 D9
Mentored work	The participation, attitude, as well as the work in himself (form to tackle the concepts to work, editorial, presentation...Of the document written and exhibition, to be the case) will suppose until 5% of the final note. With this methodology evaluate all the results of learning.	5	A3 B1 C1 D1 A4 B2 C4 D3 C5 D4 D5 D9
Problem and/or exercise solving			
Problem and/or exercise solving	It will realise a Partial (as they suit the professor and the students) and/or a Final Examination, with assessment theory/problems = 50/50. It is necessary to obtain a 5 (on 10) so much in theory, as in problems. With this methodology evaluate all the results of learning.	35	A3 B1 C1 D1 A4 B2 C4 D3 C5 D4 D5 D9
Essay questions exam	It will realise a Partial (as they suit the professor and the students) and/or a Final Examination, with assessment theory/problems = 50/50. It is necessary to obtain a 5 (on 10) so much in theory, as in problems. Likewise it is necessary to reach a minimum punctuation in each one of the Didactic Units. With this methodology evaluate all the results of learning.	35	A3 B1 C1 D1 A4 B2 C4 D3 C5 D4 D5 D9

Other comments on the Evaluation

Will propose to the students the realisation of a Partial Examination optional in which it will examine (with eliminatory character) the half of the course (subjects 1 to 5). So much the partial examination like the officials, with a maximum length in any case of three hours and average by examination, describe of the same way: the part of theory represents 50% of the note and the part of problems represents 50% remaining, having to obtain a minimum of 5 points on 10, so much in theory as in problems; besides, in theory will have to obtain a minimum punctuation in each one of the Didactic Units.

OFFICIAL DATES OF EXAMINATION:End of Career: 1-October-2019 (16 h). 1ª Edition: 24-March-2020 (10 h). 2ª Edition: 23-June-2020 (10 h). In case of error in the transcription of the dates of examinations, the valid are the approved officially and published in the bulletin board and in the web of the Centre.
The practical will be described by the professor in base to the assistance (compulsory), and to the attitude and aptitude of the students during the development of the same. Each group will have to deliver a memory of the practices where state all the calculations realised, as well as the discussion and justification of the final results. In the official examinations, also splits of the questions of theory will be able to treat direct or indirectly on the practices of laboratory.
In the second announcement of the course, the evaluation will carry out of the following way:* Will examine all the theoretical and practical part of the course, having to surpass the minimum punctuation required for each one of the distinct Didactic Units of the course.* Will conserve the qualifications obtained in the practices of laboratory, seminars and tutored works.
The form to evaluate to students in the modality of non-presence (for being working) will be the same: Forcing to realise the practices of laboratory (although it will procure adapt the schedule to the of the student) and the consequent work of

practices, and realisation of the examination-s of the course.
In the "End of Career" announcement: The student who chooses to examine in End of Career will be evaluated only by the examination (that will suposse 100 % of the note). In case of not being present at the above mentioned examination or not to approve it, it will happen to be evaluated in the same way that the rest of students.

Sources of information

Basic Bibliography

Olsen, E.D., **Métodos ópticos de análisis**, Reverté, S.A., 1986

Harris, D.C., **Análisis químico cuantitativo**, 2ª, Reverté, S.A., 2001

Harris, D.C., **Análisis químico cuantitativo**, 3ª, Reverté, S.A., 2007

Harvey, D., **Química Analítica moderna**, McGraw-Hill, Interamericana de España, 2002

Valcárcel, M. y Gómez, A., **Técnicas analíticas de separación**, Reverté, S.A., 1988

Hargis, L.G., **Analytical chemistry: principles and techniques**, Prentice Hall, 1988

Skoog, D.A., West, D.M., Holler, F.J. y Crouch, S.R., **Fundamentos de Química Analítica**, 8ª, Thomson-Paraninfo, 2011

Skoog, D.A, Holler, F.J. y Crouch, S.R., **Principios de Análisis Instrumental**, Cengage Learning, 2008

Complementary Bibliography

Recommendations