



IDENTIFYING DATA

Instrumental Techniques for Agri-Food and Environmental Analyses

Subject	Instrumental Techniques for Agri-Food and Environmental Analyses			
Code	O01M142V01109			
Study programme	Máster Universitario en Ciencia y Tecnología Agroalimentaria y Ambiental			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Optional	1st	1st
Teaching language	Spanish French Galician English			
Department				
Coordinator	Falqué López, Elena			
Lecturers	Falqué López, Elena			
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Web				
General description	(*)O/a alumno/a coñecerá os fundamentos e perspectivas daquelas técnicas instrumentais de maior uso e aplicabilidade na análise de alimentos, produtos agroalimentarios e medioambientais.			

Training and Learning Results

Code	
A1	
A2	
B2	(*)Que os estudantes sexan capaces de adquirir e aplicar habilidades e destrezas de traballo en equipo, sexan ou non de carácter multidisciplinar, en contextos tanto nacionais como internacionais, recoñecendo a diversidade de puntos de vista, así como o poso das distintas escolas ou formas de facer.
C1	
C2	
C5	
C7	

Expected results from this subject

Expected results from this subject	Training and Learning Results
Be able to select and apply the analytical techniques more adapted for the analysis of the analites (raw materials, foods and environmental products) to determine their characteristics and can evaluate and control the food and environmental quality.	A1 A2 B2 C1 C2 C5 C7
Treat, evaluate and interpret the results obtained in the determinations and train the student to become aware of the social responsibility of their reports and their impact on decision-making.	A2 B2 C1 C2 C5 C7

Contents	
Topic	
DIDACTIC UNIT I. Introduction to the Instrumental Analysis.	SUBJECT 1. Introduction to the instrumental methods of analysis for the investigation in the food and environmental fields.
DIDACTIC UNIT II: Optical Methods applied to the food and environmental investigation.	SUBJECT 2. Optical methods: Generalities. SUBJECT 3. Spectroscopy of molecular absorption UV-vis. SUBJECT 4. Atomic spectroscopy.
DIDACTIC UNIT III: Chromatographic Methods applied to the food and environmental investigation.	SUBJECT 5. Chromatography: Generalities. SUBJECT 6. High performance liquid chromatography. SUBJECT 7. Gas chromatography.
DIDACTIC UNIT IV: Electrochemical Methods in the food and environmental investigation.	SUBJECT 8. Electrodes. SUBJECT 9. Potentiometry.
DIDACTIC UNIT V: Other instrumental techniques.	SUBJECT 10. New instrumental techniques or coupled techniques.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	5	10	15
Problem solving	0	5	5
Laboratory practical	4	8	12
Mentored work	0	40	40
Problem and/or exercise solving	1	0	1
Objective questions exam	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	
	Description
Lecturing	Exhibition by part of the professor, or of the student in his case, of the most important contents of the programme, theoretical bases and/or guidelines of the work, exercise or project to develop by the student. For the modality no-face-to-face will enable some special tutorial hours to suit between the student and the professor.
Problem solving	Activity (of autonomous form) in which they formulate problems and/or exercises related with the main contents of the course. The student has to develop the suitable or correct solutions by means of the exercising of routines, the application of formulas or algorithms, the application of procedures of transformation of the available information and the interpretation of the results.
Laboratory practical	Activities (face-to-face), in groups of 2 or 3 people, in which the direct application of the theoretical knowledge developed in the lectures will be verified. of the theoretical knowledge developed in the lectures.
Mentored work	The student (of autonomous form) elaborates a document on concrete subject of the course, by what will suppose the research and collected of information, reading and handle of bibliography, edition, exhibition...

Personalized assistance	
Methodologies	Description
Problem solving	To the resolution of problems and exercises, the professor will indicate the guidelines or routines for the resolution of them. The student will have by anticipated, in the Moovi platform, of the material employed in classes (so much theoretical, bulletins of problems, like scripts of the practices of laboratory).
Mentored work	In the supervised works, the final document, and in his case also the exhibition of the same, on the thematic, conference, summary of reading, investigation or memory developed will be valued.
Laboratory practical	If all enrolled students can attend in person, this methodology will be developed. At the beginning of each laboratory session, the teacher will make a presentation of the contents to be developed by the students. Likewise, during the development of the laboratory practices, the student must prepare a laboratory notebook where all the observations related to the experiment performed, as well as the data and results obtained will be recorded. The student will have in advance, in the Moovi platform, the material used in classes (both theoretical, problem bulletins, as well as scripts of the laboratory practices).

Assessment

Description		Qualification	Training and Learning Results		
Lecturing	There will be a Partial Exam (theory related to Didactic Units I and II) and a 2nd Partial Exam (Didactic Units III and IV). Those who do not pass any of the parts will be examined again in a Final Exam. It is necessary to obtain, at least, a 5 (out of 10) in each Partial Exam. It is also necessary to achieve a minimum score in each of the Didactic Units. In the case that laboratory practices cannot be carried out, the grade of the theory exams will represent 30% of the final grade.	20	A1 A2	B2	C1 C2 C5 C7
Problem solving	There will be a Partial Exam (problems related to Didactic Units I and II) and a 2nd Partial Exam (Didactic Units III and IV). Those who do not pass any of the parts will be examined again in a Final Exam. It is necessary to obtain, at least, a 5 (out of 10) in each Partial Exam. In the case that laboratory practices cannot be carried out, the grade of the exams of problems will suppose a 30% of the final grade.	10	A2	B2	C1 C5
Laboratory practical	The laboratory practices will account for up to 30% of the final grade, which includes the obligation to attend all sessions (in case it is unanimously decided to do them), the completion of all practices includes the obligation to attend all the sessions (in case it is unanimously decided to do them), the completion of all the practices and the elaboration and delivery of the practice report. The student's attitude and participation in class will also be taken into account.	30	A1 A2	B2	C1 C2 C5 C7
Mentored work	Participation, attitude, as well as the work itself (how to approach the concepts to be worked on, writing, presentation... of the written document and exposition, if applicable) will account for up to 40% of the final grade.	40	A1 A2		C1 C2 C5 C7

Other comments on the Evaluation

There will be two different groups of students: those who have never taken a similar subject (group A) and those who already have knowledge (demonstrated) of the instrumental techniques explained in the subject (group B).

GROUP A STUDENTS:

• 1ST ANNOUNCEMENT:

There will be two partial exams, in which the theoretical knowledge acquired in the subject will be evaluated, having to obtain a minimum of 5 points out of 10 in each exam; in addition, a minimum score must be obtained in each of the Didactic Units. Each partial theory exam will represent 20% of the final grade.

There will be two partial exams, in which the numerical resolution of problems will be evaluated, having to obtain a minimum of 5 points out of 10 in each exam. Each partial exam of problems will represent 10% of the final grade. At the teacher's discretion, these exams could be substituted by the handing in of different tasks.

For the final evaluation, the attendance to the classes of theoretical explanation of the subject will be taken into account (5%), as well as the participation in them (5%).

If all the students can and agree, laboratory practices will be carried out, which will be graded by the teacher on the basis of the attendance (compulsory), and the attitude and aptitude of the students during the development of the same. Each group will have to deliver a report of the practices where all the calculations carried out, as well as the discussion and justification of the final results are included. The qualification represents 30%. In the case of not being able to carry out this activity, this score will be distributed between the theory exams (each exam will pass from 20 to 25%) and the problem solving exams (each exam will pass from 10 to 20%).

• 2ND ANNOUNCEMENT:

In the second call of the course (July) all the practical (problem solving and laboratory practices, if applicable) and theoretical part of the course will be examined, having to pass the minimum score required for each of the different Didactic Units of the course.

OPTIONAL EVALUATION for STUDENTS OF GROUP B:

Performance of a work on a technique (or group of techniques) of analysis that has not been included in the syllabus (neither of the subject of the Master, nor of the subject that the student has taken previously). It will be graded according to the attitude and the work itself (the way of approaching the concepts to be developed, writing, presentation... of the written document and exposition, if applicable) and will account for up to 100% of the final grade.

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., Crouch S.R., **Principios de Análisis Instrumental**, Cengage Learning, 2008

Complementary Bibliography

Recommendations