UniversidadeVigo

Subject Guide 2023 / 2024

*		Subje			5/2024
IDENTIFYIN	IG DATA				
Enhanceme	ent of Analytical Chemistry				
Subject	Enhancement of				
	Analytical				
	Chemistry				
Code	V11G201V01406				
Study programme	Grado en Química				
Descriptors	ECTS Credits Choose Ye	ar	Qı	uadmest	er
	6 Optional 4t	h	2r	d	
Teaching	Spanish				
language					
Department					
Coordinator	Lavilla Beltrán, María Isela				
Lecturers	Lavilla Beltrán, María Isela				
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Web	http://quimica.uvigo.es/gl/	-			
General	This subject provides students with knowledge about important and current a	spects of an	alytic	al chemi	istry
description	(e.g., bioanalytical techniques, automation and miniaturisation, sensors and interview to a sensitive data as a sensitive data	chemometric	s). Sti	Jdents v	vill be
	able to complete their training and integrate the knowledge acquired in analy	tical chemis	cry, w	nicn will Naustrial	allow fielde)
	them to address problem-solving in areas of special interest (e.g., clinical, en	vironnentai		luustiiai	neius).
Training an	d Loorning Doculto				
Code					
A1 Student	ts can apply their knowledge and understanding in a mapper that indicates a r	rofessional a	nnroa	ch to th	oir work
or voca	tion and have competences typically demonstrated through devising and sust	aining argun	ients	and solv	/ina
problen	ns within their field of study	annig argan	Terres		, ing
A3 Studen	ts have the ability to gather and interpret relevant data (usually within their fie	eld of study) t	o info	rm iuda	ments
that inc	lude reflection on relevant social, scientific or ethical issues	· · · · , ,		J C	
B4 Ability 1	for analysis and synthesis				
C30 Ability	to understand, interpret and adapt the advances in the field of Analytical Chen	nistry			
D1 Ability	to solve problems	-			
Expected r	esults from this subject				
Expected res	sults from this subject	Tr	aining	and Le	arning
Recognize th	ne main current trends in analytical chemistry		R4	C30	
Use and reco	agnize different bioanalytical methodologies	Δ1		<u> </u>	
Describe and	distinguish the different types of automatic analysis systems		R4	<u> </u>	
Understand	the advantages and limitations of automation	Δ٦	 B4	<u> </u>	
To train stud	lents in the development of miniaturized analytical tools and their application	<u></u>		C30	
Value the im	portance of the use of sensors to obtain fast and reliable analytical information	<u>, Α</u>		C30	
Correctly an	nly different chemometric techniques to solve analytical problems	Δ1		<u>C30</u>	 D1
concerty up		A3		000	
Acquire skills	s to approach an analytical problem in all its stages (from the selection of an	A1	B4	C30	D1
appropriate	analytical methodology, through the practical laboratory work, to the interpret	ation of A3			

appropri results).

Contents	
Торіс	
Topic 1. Immunoassay	Introduction. In vitro antigen-antibody reaction. Immunoassay techniques without marker. Immunoassay techniques with marker: generalities. Radioimmunoassay. Enzyme immunoassay. Fluoroimmunoassay. Luminoimmunoassay.

Topic 2. Enzymatic methods of analysis	Introduction. Enzymatic end-point methods: single-step methods and methods with coupled reactions. Enzyme kinetic methods: methods based on zero-order kinetics and methods based on one-order kinetics.
Topic 3. Determination of nucleic acids: Hybridization and PCR techniques	Introduction. Nucleic acid extraction and purification techniques. Hybridization assays: liquid phase, solid phase and in situ. Polymerase chain reaction: basics. Variants of classical PCR.
Topic 4. Automation and miniaturization	Introduction. Automation: generalities. Analyzers. Flow Injection Analysis (FIA). Sequential injection analysis (SIA). Miniaturization: fundamentals and approaches.
Topic 5. Chemical sensors and biosensors	Introduction. Recognition systems. Classification of chemical sensors and biosensors. Analytical characteristics of the sensors. Applications of interest.
Topic 6. Chemometrics	Introduction to chemometrics. Structure of hypothesis testing. Rejection of anomalous results. Comparison of analytical results: parametric and non-parametric tests. Control charts. Introduction to experimental design.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	24	36	60
Seminars	12	24	36
Laboratory practical	14	10	24
Objective questions exam	2	10	12
Objective questions exam	0	18	18
*The information in the planning table is	for guidance only and does no	t take into account the het	erogeneity of the students.

 Methodologies

 Lecturing
 The lecturer will develop the contents of the programme based on the material provided to the student through Moovi. In the lecture sessions, the lecturer will present the fundamental aspects of the subject, which should be complemented by the recommended bibliography.

 Seminars
 The seminar classes will help to reinforce the learning of the subject matter explained during the lectures by solving numerical problems and/or theoretical-practical exercises. The lecturer will regularly propose different problems, exercises or questionnaires that will be solved individually by the student and delivered for evaluation.

 Laboratory practical
 Laboratory experiments will be carried out in 4 sessions of 3.5 hours each. Prior to each practical session, the student will be provided with supporting material in Moovi for the preparation of the experiments to be carried out.

Personalized assistance			
Methodologies	Description		
Lecturing	The lecturer will resolve doubts in a personalised manner on any of the proposed activities (lectures, seminars, laboratory practicals and exams). For this purpose, the tutoring hours of the teaching staff will be used.		
Seminars	The lecturer will resolve doubts in a personalised manner on any of the proposed activities (lectures, seminars, laboratory practicals and exams). For this purpose, the tutoring hours of the teaching staff will be used.		
Laboratory practical	The lecturer will resolve doubts in a personalised manner on any of the proposed activities (lectures, seminars, laboratory practicals and exams). For this purpose, the tutoring hours of the teaching staff will be used.		
Tests	Description		
Objective questions exam	The lecturer will resolve doubts in a personalised manner on any of the proposed activities (lectures, seminars, laboratory practicals and exams). For this purpose, the tutoring hours of the teaching staff will be used.		
Objective questions exam	The lecturer will resolve doubts in a personalised manner on any of the proposed activities (lectures, seminars, laboratory practicals and exams). For this purpose, the tutoring hours of the teaching staff will be used.		

Assessment				
Description	Qualification	Training and		
		Learning Results		

Seminars	For the evaluation of this activity, the teacher will propose the resolution and delivery by the student of some problems, exercises and/or questionnaires in seminar classes.	5	A1 A3	B4	C30	D1
Laboratory practical	The teacher will assess the experimental work carried out by the student in the laboratory sessions through observation and the delivery of the obtained results (laboratory report).	15	A1 A3	B4	C30	D1
	Attendance at laboratory sessions is compulsory. Absence from any laboratory session must be duly justified.					
Objective questions exam	There will be a first examination limited to approximately half of the subject.	40	A1 A3	B4	C30	D1
	This exam may consist of short answer questions, problems and multiple choice questions.					
	The fact of sitting the exam precludes the student from the grade "Not presented".					
	Students who obtain a minimum score of 5 out of 10 will not be examined again in the contents considered in the first examination.					
Objective questions exam	This final exam is compulsory.	40	A1	Β4	C30	D1
	Students who have passed the first part will take the second part of the syllabus.		AJ			
	This examination may consist of short answer questions, problems and/or multiple-choice questions.					
	The fact of sitting the exam precludes the student from the grade "Not presented".					
	Students who have not passed the first part will have to take the first part of the sylabus (40% final mark).					

Other comments on the Evaluation

Second opportunity (July):

The marks obtained by the student during the course in the laboratory practicals and seminars will be retained (20 % of the grade).

Students will be able may do both exams.

The student who wishes may opt for the overall assessment.

Sources of information

Basic Bibliography

Paolo Ugo, Pietro Marafini, Marta Meneghello, **Bioanalytival chemistry. From biomolecular recognition to** nanobiosensing, Primera, De Gruyter, 2021

Miguel Valcárcel, Soledad Cárdenas, **Automatización y miniaturización en Química Analítica**, Primera, Springer, 2000 Florinel-Gabriel Bănică, **Chemical sensors and biosensors: Fundamentals and applications**, Primera, Wiley, 2012

Guillermo Ramis Ramos, María Celia García Álvarez-Coque, **Quimiometría**, Prmera, Síntesis, 2001 Complementary Bibliography

Recommendations

Subjects that are recommended to be taken simultaneously

Quality in Analytical Labs/V11G201V01407 Food, Agricultural and Environmental Analytical Chemistry/V11G201V01410

Subjects that it is recommended to have taken before

Biochemistry/V11G201V01201 Analytical Chemistry I: Principles of Analytical Chemistry/V11G201V01202 Analytical Chemistry II: Optical Methods of Analysis/V11G201V01207 Analytical Chemistry III: Electroanalytical Methods and Separations/V11G201V01302 Analytical Chemistry IV: Chromatographic and Affine Methods/V11G201V01306