

GRADO EN QUÍMICA

DATOS DE LA ASIGNATURA

ASIGNATURA	INSTRUMENTAL ANALYTICAL CHEMISTRY	SUBJECT	INSTRUMENTAL ANALYTICAL CHEMISTRY
CÓDIGO	757509201		
MÓDULO	FUNDAMENTAL	MATERIA	Q. ANALÍTICA
CURSO	2º	CUATRIMESTRE	1º
DEPARTAMENTO	QUÍMICA PROFESOR JOSÉ CARLOS VÍLCHEZ MARTÍN	ÁREA DE CONOCIMIENTO	QUÍMICA ANALÍTICA
CARÁCTER	OBLIGATORIA	CAMPUS VIRTUAL	MOODLE

DISTRIBUCIÓN DE CRÉDITOS

	TOTAL	TEÓRICOS GRUPO GRANDE	TEÓRICOS GRUPO REDUCIDO	PRÁCTICAS DE INFORMÁTICA	PRÁCTICAS DE LABORATORIO	PRÁCTICAS DE CAMPO
ECTS	9	6	0	0	3	0

DATOS DEL PROFESORADO

COORDINADOR

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DESCRIPCIÓN GENERAL DE LA ASIGNATURA

DESCRIPCIÓN GENERAL

Instrumental Analytical Chemistry provides basic and applied knowledge about analytical features of chemistry, in relation to instrumental methods of analysis. This subject deals mainly with spectroscopic techniques, in which photons are involved, electrochemical techniques and mass spectrometry. These techniques are an important complement for chemists when they have to employ analytical techniques. Practical aspects of these methods will be considered, regarding their use in fields of economic and social interests, such as industrial, environmental, food and health.

ABSTRACT

Instrumental Analytical Chemistry provides basic and applied knowledge about analytical features of chemistry, in relation to instrumental methods of analysis. This subject deals mainly with spectroscopic techniques, in which photons are involved, electrochemical techniques and mass spectrometry. These techniques are an important complement for chemists when they have to employ modern analytical techniques. Practical aspects of these methods will be considered, regarding their use in fields of economic and social interests, such as industrial, environmental, food and health.

OBJETIVOS: RESULTADOS DEL APRENDIZAJE

To provide to the students an overall perspective of instrumental analytical techniques related to molecular and atomic spectroscopy, considering in particular absorption and emission techniques. Electroanalytical techniques will be also described, as well as mass spectrometry and coupled techniques. Applied aspects of the techniques will be considered.

REPERCUSIÓN EN EL PERFIL PROFESIONAL

The students will acquire theoretical and practical knowledge about instrumental techniques that are commonly

employed in current laboratories. As chemists, they will be able to perform the usual analytical tasks that they will face in their professional careers.

RECOMENDACIONES AL ALUMNADO

To have passed the previous courses on Analytical Chemistry.

COMPETENCIAS

COMPETENCIAS BÁSICAS

CB1 - Que los estudiantes hayan demostrado poseer y comprender conocimientos en un área de estudio que parte de la base de la educación secundaria general, y se suele encontrar a un nivel que, si bien se apoya en libros de texto avanzados, incluye también algunos aspectos que implican conocimientos procedentes de la vanguardia de su campo de estudio.

CB2 - Que los estudiantes sepan aplicar sus conocimientos a su trabajo o vocación de una forma profesional y posean las competencias que suelen demostrarse por medio de la elaboración y defensa de argumentos y la resolución de problemas dentro de su área de estudio.

CB3 - Que los estudiantes tengan la capacidad de reunir e interpretar datos relevantes (normalmente dentro de su área de estudio) para emitir juicios que incluyan una reflexión sobre temas relevantes de índole social, científica o ética.

CB4 - Que los estudiantes puedan transmitir información, ideas, problemas y soluciones a un público tanto especializado como no especializado.

CB5 - Que los estudiantes hayan desarrollado aquellas habilidades de aprendizaje necesarias para emprender estudios posteriores con un alto grado de autonomía.

B1 - Capacidad de análisis y síntesis.

B2 - Capacidad de organización y planificación.

B5 - Capacidad para la gestión de datos y la generación de información/conocimiento.

B6 - Resolución de problemas.

B8 - Trabajo en equipo.

B9 - Razonamiento crítico.

B10 - Capacidad de aprendizaje autónomo para el desarrollo continuo profesional.

B11 - Sensibilidad hacia temas medioambientales.

COMPETENCIAS GENERALES

CG1 - Que los estudiantes hayan desarrollado y demostrado poseer habilidades de aprendizaje y conocimientos procedentes de su campo de estudio, siendo capaces de aplicarlos en su trabajo, interpretando datos relevantes para emitir juicios de temas de diversa índole pudiendo transmitirlos a un público tanto especializado como no especializado.

COMPETENCIAS TRANSVERSALES

COMPETENCIAS ESPECÍFICAS

C3 - Conocer los principios y procedimientos usados en el análisis químico y en la caracterización de los compuestos químicos.

C16 - Conocer las técnicas instrumentales y sus aplicaciones.

C18 - Conocer la metrología de los procesos químicos incluyendo la gestión de calidad.

C19 - Capacidad para organizar, dirigir y ejecutar tareas del laboratorio químico y de producción en instalaciones industriales complejas donde se desarrollen procesos químicos. Asimismo, para diseñar la metodología de trabajo a utilizar.

Q2 - Capacidad de aplicar dichos conocimientos a la resolución de problemas cualitativos y cuantitativos según modelos previamente desarrollados.

Q3 - Competencia para evaluar, interpretar y sintetizar datos e información química.

Q4 - Capacidad para reconocer y llevar a cabo buenas prácticas en el trabajo científico y profesional.

Q5 - Competencia para presentar, tanto en forma escrita como oral, material y argumentación científica a una audiencia especializada.

Q6 - Destreza en el manejo y procesado informático de datos e información química.

P1 - Habilidad para manipular con seguridad materiales químicos, teniendo en cuenta sus propiedades físicas y químicas, incluyendo cualquier peligro específico asociado con su uso.

P2 - Habilidad para llevar a cabo procedimientos estándares de laboratorio implicados en trabajos analíticos y sintéticos, en relación con sistemas orgánicos e inorgánicos.

P3 - Habilidad para la observación, seguimiento y medida de propiedades, eventos o cambios químicos, y el registro sistemático y fiable de la documentación correspondiente.

P4 - Habilidad para manejar instrumentación química estándar, como la que se utiliza para estudios estructurales y separaciones.

P5 - Interpretación de datos procedentes de observaciones y medidas en el laboratorio en términos de su significación y de las teorías que la sustentan.

P6 - Capacidad para realizar valoraciones de riesgos relativos al uso de sustancias químicas y procedimientos de laboratorio.

TEMARIO Y DESCRIPCIÓN DE LOS CONTENIDOS

TEORÍA

The following sections of topics and the corresponding lessons are:

Topic 1. Introduction to Instrumental Analytical Chemistry

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Lesson 2. Calibration of instrumentation

Topic 2. Molecular Spectroscopy and applications

Lesson 3. Interaction between electromagnetic radiation and matter

Lesson 4. Molecular absorption spectroscopy

Lesson 5. Molecular emission spectroscopy

Topic 3. Atomic Spectroscopy and applications

Lesson 6. Atomic absorption spectroscopy

Lesson 7. Atomic emission spectroscopy

Topic 4. Mass spectrometry and applications

Lesson 8. Mass spectrometry

Topic 5. Electrochemistry and electrochemical techniques

Lesson 9. Electrodes and potentiometry

Lesson 10. Electrogravimetry and coulometry

Lesson 11. Polarography

PRÁCTICAS DE LABORATORIO

1. Spectrophotometric analysis of chromogenic chemical species.

2. Determination of metals by flame atomic absorption spectroscopy.

3. Determination of metals by flame atomic emission spectroscopy.

4. Potentiometric titrations.

5. Potentiometry using ion-selective electrodes: pH, fluoride, ammonium.

METODOLOGÍA DOCENTE

Grupo grande

- Clases presenciales relativas a los contenidos teóricos y prácticas (problemas) de la asignatura, utilizando recursos didácticos tales como transparencias, presentaciones informatizadas y videos.
- Test y resolución de cuestiones teórico-prácticas.

Prácticas de laboratorio

- Prácticas de laboratorio con grupos reducidos manejo de técnicas experimentales, discusión de resultados, obtención de conclusiones, presentación de una memoria final.

CRONOGRAMA ORIENTATIVO I

SEMANAS (S):	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15
GRUPO GRANDE	1	2	3	4	4	5	5	6	6	7	8	8	9	10	11
GRUPO REDUCIDO															
PRÁCTICAS DE LABORATORIO															
PRÁCTICAS DE INFORMÁTICA															
PRÁCTICAS DE CAMPO															

EVALUACIÓN DE LA ASIGNATURA

PRIMERA EVALUACIÓN ORDINARIA (FEBRERO/JUNIO)

EVALUACIÓN CONTINUA

The Continuous Evaluation of the First Ordinary Proposal will consist of 4 trials:

- Exam of theoretical and practical questions. A minimum grade of 4.5 over 10 in this exam is necessary to obtain the final grade.
- Complementary activities (tests, exercises) to be solved in the classroom.
- Report of laboratory practices. The results obtained and reported by the students in the laboratory will be graded.
- Test exam of the laboratory practices.

Requirements: Is mandatory to perform the laboratory practices and to hand the reports to the teacher.

The final grade of the subject will be calculated as:

- 70% of the grade of the Exam of theoretical and practical questions,
- 10% of grade of the complementary activities,
- 10% of the grade of the Report of laboratory practices,
- 10% of the Test exam of the laboratory practices.

To pass the subject, the final grade has to be 5 or higher, on a scale of 10.

The final grade will consider the student's non-compliance of the basic rules of behaviour and operation, approved by the Centre Board, that the university community must follow at the Experimental Science Faculty.

EVALUACIÓN FINAL



Universidad
de Huelva

GUÍA DOCENTE

Curso 2021/2022



To have the right for the Final Evaluation of the First Ordinary proposal, the student must indicate it to the teacher responsible of the subject. The student has to do it within the first two weeks of the teaching period or within the first two weeks after enrollment in the subject, using the corresponding application form of the Faculty. Choosing the Final Evaluation will imply explicitly to lose the chance of taking the Continuous Evaluation, without possibility of changing the procedure of examination. As in the Continuous Evaluation, the final grade will consider the student's non-compliance of the basic rules of behaviour and operation approved by the Centre Board that the university community must follow at the Experimental Science Faculty.

The single Final Evaluation of the Ordinary Proposal will consist of 3 trials:

- Final Exam of theoretical and practical questions. A minimum grade of 4.5 over 10 in this exam is necessary to obtain the final grade.
- Report of one laboratory practice. The results obtained and reported by the students in the laboratory will be graded. Note: If the student has previously done the lab practices within the established period and has delivered the Reports, graded equal or higher than 5 on scale of 10, this grade will be considered
- Test Exam of the laboratory practices. Note: If the student has previously done the test of lab practices within the established period with a grade equal or higher than 5 on scale of 10, this grade will be considered.

Requirements: It is mandatory to perform the laboratory practice and to hand the report to the teacher.

The final grade of the subject will be calculated as:

80% of the grade of the Final Exam of theoretical and practical questions,

10% of the grade of the Report of laboratory practices,

10% of the Test Exam of the laboratory practices.

To pass the subject, the final grade has to be 5 or higher, on a scale of 10.

The final grade will consider the student's non-compliance of the basic rules of behaviour and operation, approved by the Centre Board, that the university community must follow at the Experimental Science Faculty.

¿Contempla una evaluación parcial?

SÍ

It will be possible to perform one partial exam, corresponding to lessons 1 to 7, both included. If the students get a 5, he/she will not have to perform that part in the final exam. If the student gets 4.5 or higher, he/she can compensate it with the corresponding part of lessons 8 to 11.

The students have the possibility to renounce to the grade obtained in the partial exam, and to take an exam again of lesson 1 to 7 within the final exam. The students will be evaluated with the new grade obtained in the final exam. The students who are willing to do so have to contact the teacher before the final exam.

SEGUNDA EVALUACIÓN ORDINARIA

The II Ordinary Proposal will consist of 3 trials, following the considerations of Final Exam evaluation:

- Final Exam of theoretical and practical questions. A minimum grade of 4.5 over 10 in this exam is necessary to obtain the final grade.
- Report of one laboratory practice. The results obtained and reported by the students in the laboratory will be graded. Note: If the student has previously done the lab practices within the established period and has delivered the Reports, graded equal or higher than 5 on scale of 10, this grade will be considered
- Test Exam of the laboratory practices. Note: If the student has previously done the test of lab practices within the established period with a grade equal or higher than 5 on scale of 10, this grade will be considered.

Requirements: It is mandatory to perform the laboratory practices and to hand the reports to the teacher.

The final grade of the subject will be calculated as:

- 80% of the grade of the Final Exam of theoretical and practical questions,
- 10% of the grade of the Report of laboratory practices,
- 10% of the Test Exam of the laboratory practices.

To pass the subject, the final grade has to be 5 or higher, on a scale of 10.

The final grade will consider the student's non-compliance of the basic rules of behaviour and operation, approved by the Centre Board, that the university community must follow at the Experimental Science Faculty.

The III Ordinary Proposal will consist of 3 trials, following the Final Exam evaluation:

- Final Exam of theoretical and practical questions. A minimum grade of 4.5 over 10 in this exam is necessary to obtain the final grade.
- Report of one laboratory practice. The results obtained and reported by the students in the laboratory will be graded. Note: If the student has previously done the lab practices within the established period and has delivered the Reports, graded equal or higher than 5 on scale of 10, this grade will be considered.
- Test Exam of the laboratory practices. Note: If the student has previously done the test of lab practices within the established period with a grade equal or higher than 5 on scale of 10, this grade will be considered.

Requirements: It is mandatory to perform the laboratory practices and to hand the reports to the teacher.

The final grade of the subject will be calculated as:

- 80% of the grade of the Final Exam of theoretical and practical questions,
- 10% of the grade of the Report of laboratory practices,
- 10% of the Test Exam of the laboratory practices.

To pass the subject, the final grade has to be 5 or higher, on a scale of 10.

The final grade will consider the student's non-compliance of the basic rules of behaviour and operation, approved by the Centre Board, that the university community must follow at the Experimental Science Faculty.

OTROS CRITERIOS DE EVALUACIÓN

¿Contempla la posibilidad de subir nota una vez realizadas las pruebas?

SÍ

If the students want to obtain a higher grade than 5, they should write contact the teacher by email or presenting a document, indicating that they renounce to their present grade and that they are willing to take that part of the subject again. or o entregando un documento por escrito. In this case, they will be considered "no presentado" in that proposal, and will be able to take the examination of the next proposal, following the previously described criteria of evaluation.

Requisitos para la concesión de matrícula de honor

The number of "matrículas de honor" (honors) will be estimated following the proceedings of the University of Huelva, and will be given to students with a final grade in the subject of 9.5 or higher.

REFERENCIAS

BÁSICAS

- D.A. SKOOG, J.F. Holler, S.R. Crouch, Principles of Instrumental Analysis, 5th ed., Cengage Learning (2014)
- D.C. HARRIS, Quantitative Chemical Analysis, 8th ed., Freeman (2010)
- J.T. Watson, Introduction to Mass Spectrometry, 3rd edition, Lippincott-Raven (1997)