Universidad de Navarra

Instrumental Analytical Chemistry (F.Ciencias)

Guía docente 2025-26

INTRODUCTION

BRIEF DESCRIPTION: Diverse most used instrumental techniques -both spectroscopic and electroanalytical- are presented, which allow qualitative and quantitative determinations of minor, trace and ultra-trace components in different matrices.

- **Degree**: Chemistry
- **Module within the Degree**: Module 2, Fundamentals of Chemistry, Analytical Chemistry
- **ECTS**: 6
- **Year, semester**: Third year, first semester
- **Type of course**: Compulsory
- **Professor**: José María Fernández Álvarez
- **Language**: English
- **Classroom, Timetable**: Classroom 34. Mondays, 10 h, Tuesdays, 9 h & Fridays, 12 h. Alternate seminars will take place every second Friday at 11 h in the same Classroom.

LEARNING OUTCOMES (Competencies)

- **Specific skills: CE 1, CE 2, CE 3, CE 4, CE 5, CE 8 & CE 10**
- Have the ability to solve qualitative and quantitative problems and plan strategically for their resolution.
- Be able to relate, foresee and interpret the behavior and macroscopic properties of the more relevant types of materials as a result of a certain chemical composition.
- **General & basic skills: CG 2, CG 6 & CB II & CB V**
- Gain knowledge of the most used spectroscopic and electrochemical techniques in Analytical Chemistry.
- The study of its principles.
- To describe the current instrumentation
- To know the main application fields.
- Be able to choose and suggest the most addequate analytical technique for solving analytical problems as a function of the analyte and matrix natures, and of the sensitivity and selectivity required.

LECTURE SCHEDULE

Lesson 1. - Principles of spectroscopy

Lesson 2. - Design and components of spectroscopic instruments

Lesson 3. - UV and visible spectroscopy

Lesson 4. - Molecular luminiscence spectroscopy

Lessson 5. - Principles of atomic spectroscopy

Lesson 6. - Classification of electroanalytical techniques

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Lesson 7. - Stages of the electrochemical reaction

Lesson 8. - Amperometric and potentiometric titrations

Lesson 9. - Linear, cyclyc and pulse voltammetry

EDUCATIONAL ACTIVITIES

Lectures will be held on **Mondays, 10 h, Wednesdays, 12 h & Fridays, 11 h at Classroom 34.**

Seminars specifically devoted to deal with the topics of the course and discuss the different approaches to solving the practical cases will be held on the following

Wednesdays at 13:00 h in Classroom 34:

September: 17th

October: 8th & 29th

November: 19th & 26th

One-to-one tutorials: Every student may have personal interviews with the professor to help with personal study and learning.

Credits/hours distribution of the activities. 6 ECTS = 150 h (25 h/ECTS)

Activity	ECTS	Alocated time (h)	Percentage (5)
Lectures	1.48	37	24.7
Seminars	0.24	6	4.0
Evaluation	0.32	8	5.3
Total Classroom activities	**2.04**	**51**	**34.0**
One to one tutorials	0.04	1	0.7
Solving of practical cases for Seminars	0.40	10	6.6
Personal study	3.52	88	58.7

TOTAL	6	150	100.0

EVALUATION

ORDINARY CALL

Midterm theory test: 25%

Evaluable Quizzes: 2.5% each

Final exam: 70%

The final exam will consist of a test of theory fundamentals and a practical case. The final exam is the weighted average on both sides (60% theory and 40% of problems).

In order to pass the final exam (in either the ordinary or the extraordinary call) a minimum mark of 4 points should be attained in the theory and a minimum mark of 3 points should be reached in the problems. Should the student fail to reach simultaneously those two mandatory requirements, the global mark of the course would be FAIL, irrespective of the averaged mark calculated using the course activities, and a maximum value of 4 will appear in the official record.

In the extraordinary call, the same criteria will apply, in which the results obtained during the course will only be taken into account if they result in an improvement of the final mark.

OFFICE HOURS

Dr JM Fernández (jmfdez@unav.es)

- Office0-030 research Building. Ground Floor
- Time: Tuesdays through Thursdays 10-11 h

BIBLIOGRAPHY & RESOURCES

- "Principles of Instrumental Analysis" (6th Edition). D.A. Skoog, F.J. Holler, S.R. Crouch. Thomson Brooks/Cole, 2007. ISBN: 0-495-01201-7 Localízalo en la Biblioteca

- "Analytical Electrochemistry", J. Wang, VCH, 1994 Localízalo en la Biblioteca
- "Electrochemical Methods: Fundamentals and Applications", A. J. Bard, L.R. Faulkner, Wiley, 1980. Localízalo en la Biblioteca
- "Problems of instrumental analytical chemistry : a hands-on guide", JM Andrade-Garda et al., World Scientific, New Jersey, 2017. Localízalo en la Biblioteca
- "A collection of Analytical Chemistry solved and explained exercices", JM Fernández, I. Navarro, JI Álvarez. EUNSA, Colección Apuntes. Pamplona, agosto 2020. ISBN: 978-84-313-3483-3 Localízalo en la Biblioteca [recurso electrónico]
- "INSTANCHEM- Instrumental Analytical Chemistry" J.M. Fernández, 2013. Localízalo en la Biblioteca
- "Química Analítica Instrumental". "J.M. Fernández, 2013 Localízalo en la Biblioteca