

QUALITY IN ANALYTICAL LABORATORIES

26038 - QUALITY IN ANALYTICAL LABORATORIES (2024-25)

General

Code: 26038

Lecturer responsible:

HIDALGO NUÑEZ, MARIA MONTSERRAT

Credits ECTS:

6,00

Theoretical credits:

0,48

Practical credits:

1,92

Distance-base hours:

3,60

Departments involved

- **Dept:** CHEMICAL ANALYSIS, NUTRITION AND FOOD SCIENCE

Area: ANALYTIC CHEMISTRY

Theoretical credits: 0,48

Practical credits: 1,92

This Dept. is responsible for the course.

This Dept. is responsible for the final mark record.

Study programmes where this course is taught

- [DEGREE IN CHEMISTRY](#)

Course type: COMPULSORY (Year: 3)

Competencies and objectives

Course context for academic year 2024-25

With this subject, the student is expected to apply the knowledge acquired in previous subjects, as well as new concepts related to quality in the analytical laboratory, to the resolution of real analytical problems and to the generation of quality analytical results. The theoretical concepts introduced in this subject about quality in the analytical laboratory, use of reference materials and uncertainty budget of experimental results, among others, will be implemented through the participation of students in an interlaboratory comparison exercise for students of analytical chemistry. In this exercise, students will be faced with the resolution of a particular analytical problem, which must be addressed following the steps of a Chemical Measurement Process (CMP). To do this, the student must demonstrate his/her ability to select the most appropriate analytical method for the proposed problem, to develop the selected method (sample preparation, measurement step, treatment and evaluation of obtained data), to interpret the obtained results and to make a detailed report on working activities. In this subject, the student is also intended to be able to study and to plan the activities to be done, both individually and in a group, using the specific bibliography available and theoretical concepts acquired in this subject and others previous.

Generic Degree Course Competences

- **CG1** : Desenvolupar la capacitat d'anàlisi, síntesi i raonament crític.
- **CG2** : Demostrar capacitat de gestió/direcció eficaç i eficient: esperit emprenedor, iniciativa, creativitat, organització, planificació, control, presa de decisions i negociació.
- **CG3** : Resoldre problemes de forma efectiva.
- **CG4** : Demostrar capacitat de treball en equip.
- **CG5** : Comprometre's amb l'ètica, els valors d'igualtat i la responsabilitat social com a ciutadà i com a professional.
- **CG6** : Aprendre de manera autònoma.
- **CG8** : Adquirir una preocupació permanent per la qualitat i el medi ambient i la prevenció de riscos laborals.

Specific Competences:>>Theoretical

- **CE1** : Adquirir els fonaments de la terminologia química, nomenclatura, convenis i unitats.
- **CE16** : Aplicar la metrologia als processos químics, incloent-hi la gestió de qualitat.
- **CE17** : Conèixer i aplicar els mètodes matemàtics i estadístics per a validar models a partir de dades experimentals i optimitzar processos químics.
- **CE5** : Aplicar els principis i procediments utilitzats en l'anàlisi química per a determinar, identificar, i caracteritzar compostos químics

Specific Competences:>>Ability

- **CE24** : Demostrar el coneixement i comprensió dels fets essencials, conceptes, principis i teories relacionades amb les àrees de la química
- **CE25** : Resoldre problemes qualitius i quantitius segons models desenvolupats prèviament.
- **CE26** : Reconèixer i analitzar nous problemes i planejar estratègies per a solucionar-los.
- **CE27** : Interpretar, avaluar i sintetitzar dades i informació química.
- **CE28** : Reconèixer i implementar bones pràctiques científiques de mesurament i experimentació.
- **CE29** : Processar i computar dades en relació amb informació química.
- **CE30** : Utilitzar amb seguretat reactius, instruments i dispositius d'aplicació en química.
- **CE31** : Dur a terme procediments estàndards de laboratoris implicats en treballs analítics i sintètics, en relació amb sistemes orgànics i inorgànics.
- **CE32** : Utilitzar instrumentació química estàndard per a identificació, quantificació, separació i determinació estructural.
- **CE33** : Monitoritzar mitjançant l'observació i mesura de les propietats químiques, successos o canvis, recopilant la informació adequada.
- **CE34** : Planificar, dissenyar i executar investigacions pràctiques, valorant els resultats.
- **CE35** : Interpretar les dades procedents d'observacions i mesures en el laboratori.
- **CE36** : Elaborar, presentar i defensar informes científics tant per escrit com oralment davant d'una audiència.
- **CE37** : Valorar els riscos en l'ús de substàncies químiques i procediments de laboratori, així com gestionar adequadament els residus que es generen.

- **CE38** : Utilitzar correctament els mètodes inductiu i deductiu en l'àmbit de la química.
- **CE39** : Reconèixer i valorar els processos químics en la vida diària.

Generic UA Competences

- **CGUA1** : Comprensió de la llengua estrangera anglès en l'àmbit científic.
- **CGUA2** : Expressar-se correctament, tant de manera oral com per escrit, en qualsevol de les llengües oficials de la Comunitat Valenciana.
- **CGUA3** : Tenir coneixements d'informàtica relatius a l'àmbit d'estudi.
- **CGUA4** : Adquirir o posseir les habilitats bàsiques en TIC (Tecnologies de la Informació i Comunicació) i gestionar adequadament la informació obtinguda.

Exclusive skill taught in this course

No data

Learning outcomes (Training objectives)

No data

Specific objectives stated by the academic staff for academic year 2024-25

Expand the student's knowledge about important concepts in metrology in chemistry, such as traceability of the analytical results, uncertainty of the experimental results and validation of analytical methods. Sensitize the students about the relevance of quality in the analytical laboratories.

Content and bibliography

Content for academic year 2024-25

ACTIVITY (Type)

T. Lectures hours (In-class)

PL. Laboratory hours (In-class)

SI. Seminar hours in computer classroom (In-class)

TG. Group tutorial hours (In-class)

TI. Individual work: Self-study, preparation of practices and seminars, resolution of questions and exercises, preparation of exams (Distance-based)

TC. Cooperative work: Supervised work, preparation of lab reports (Distance-based)

EVC. Continuous assessment

THEORETICAL CONTENTS: Quality in the analytical laboratory: introduction to quality in the analytical laboratory; Traceability of the results; Uncertainty budget; Validation of analytical methods; Interlaboratory comparison exercises.

Topic 1 (T1): Introduction to quality in the analytical laboratory

- Definition of analytical quality.
- Analytical chemistry and quality.
- Implementation of a quality management system (ISO / IEC 17025): quality assurance plan, quality control, quality assessment, corrective actions.

Topic 2 (T2): Traceability of the results

- Reference standards, calibration and metrological traceability
- Elements of traceability.
- Hierarchy of the calibrations.
- Criteria for establishing the traceability of measurements.
- Examples of traceability.

Topic 3 (T3): Quantifying uncertainty in analytical measurement

- Introduction: Definitions and terminology. Significance of the assessment of uncertainty.
- Standard uncertainty, combined uncertainty and expanded uncertainty
- Uncertainty evaluation: uncertainty type A and type B, contributions to uncertainty, approaches to the assessment of uncertainty.
- Correct presentation of results: rejection of anomalous values, significant digits, rounding of results, presentation of results with expanded uncertainty.
- Examples.

Topic 4 (T4): Validation of analytical methods

- Introduction: Terminology. Goal of validation in quality assurance and good laboratory practices.
- Assessment of a new analytical method: Preliminary stages, validation and verification.
- Parameters for validation / verification.
- Supervision and control of method behaviour.
- Examples.

Topic 5 (T5): Interlaboratory comparison

- Definitions.
- Types of interlaboratory comparisons (ILC).
- Goals of ILC.
- Organization of ILC
- Assignment of actual/true values and assessment.
- Corrective actions after an ILC.

Seminar (SI): Traceability, validation, uncertainty budget: A case to study.

Problems (EVC): Traceability, validation, uncertainty budget: The students will solve a suggested problem and he/she will explain the solution to the professor.

PRACTICAL CONTENTS: The students will work on a real problem and the results will be used for an ILC.

Practice work 1 (PL1): Development of an analytical method for one of the following determinations:

- Determination of ethanol, total acidity and pH of a beer.
- Determination of assimilable/easy sorptive phosphorus, pH and conductivity of a soil sample. Extractable potassium in a solution of ammonium acetate and from a soil sample.
- Determination of protein (Kjeldahl nitrogen) and moisture in a wheat flour.
- Determination of paracetamol and acetylsalicylic acid in a pharmaceutical preparation.
- Determination of ash, calcium and zinc in a sample of milk powder.

Practice work 2 (PL2): The students will participate in an ILC with the results obtained using the analytical method developed on PL1. The analytical method will be applied to a RM supplied by the exercise organizer.

Related links

No data

Garantía de la calidad en los laboratorios analíticos

Author(s): COMPAÑÓ BELTRÁN, Ramón; RÍOS CASTRO, Ángel

Issue: Madrid : Editorial Síntesis, 2002;

ISBN: 84-9756-024-8 (rúst.)

Category: Complementario

Estadística y quimiometría para química analítica

Author(s): Miller, James M.

Issue: España : Prentice Hall, 2002;

ISBN: 978-84-205-3514-2

Category: Básico

Principios de química analítica

Author(s): Valcárcel Cases, M.

Issue: Barcelona : Springer-Verlag Ibérica, 1999;

ISBN: 84-07-00500-2

Category: Básico

Foundations of Analytical Chemistry : a teaching-learning approach

Author(s): Valcárcel Cases, M.

Issue: Cham : Springer International Publishing, 2018;

ISBN: 978-3-319-62871-4

Category: Básico

Fundamentos de química analítica : una aproximación docente-discente

Author(s): Valcárcel Cases, Miguel ; López Lorente , López Jiménez, Ángela I. ; M^a Ángeles

Issue: Córdoba : Universidad de Córdoba , 2016;

ISBN: 978-84-9927-273-3

Category: Básico

Assessment

Assessment procedures and criteria 2024-25

1. Attendance to the in-class activities is compulsory. A minimum of 80% of lectures and laboratory practice is mandatory to success. Lower percentages of attendance than this will be scored with 4.5. This will be applied only in the first evaluation period. In the second evaluation period only the requirement for laboratory practice assistance will be maintained.
2. A minimum mark of 4.0 points must be obtained in the laboratory practices in order to average with the other evaluation components.
3. A minimum grade of 4.0 points must be obtained in the final test of the subject in order to average with the other evaluation components.
4. Second options: In the second evaluation period only the final test of the subject could be recovered. For this new test a minimum score of 4.0 will also be required in order to average with the other marks. The attendance requirement for the in-class activities described in point 1 will not be applied. Other activities will not be recoverable, therefore in the second evaluation period the marks obtained in the first evaluation period will be maintained.
5. If any of the marks set for laboratory practices or the final test do not match or exceed the minimum fixed (4.0), the final score will be 4.5 (failure).
6. The "No Presentado" (NP) mark will only be assigned to those students who have not participated in any of the planned assessment activities at all.
7. None of the marks obtained in any of the assessment activities will be maintained from one academic year to the next, unless the professor considers it appropriate.
8. Special evaluation for the completion of the (studies of) degree: It will consist of a practical exam, which will take place in the laboratory, and a written exam related to the theoretical and practical contents of the subject. The final score will be given as the weighted average of the grade of the practical (60%) and theoretical exams (40%). A minimum mark of 4.0 in each one of these two tests must be obtained to surpass the special evaluation. Otherwise, the final mark of this special evaluation will be 4.5.

Description	Criteria	Type	Weighting system
Laboratory Practices and Reports	<p>It will be valued:</p> <ul style="list-style-type: none"> - Student's attitude towards laboratory work: acquisition of experimental skills, compliance with safety regulations, individual behavior in the laboratory, response to problems that arise during the development of the experimental work and critical evaluation of the results obtained. - Laboratory reports: Each group of students must submit two laboratory reports throughout the development of the subject. The first report will be devoted to the analysis of a training sample (training test) and the second one to the analysis of a sample provided for the intercomparison exercise organizer (sample problem). The report of training sample should also contain all the information collected through the bibliographic search about possible methods of analysis for the problem suggested, indicating the finally chosen one to carry out the practical work and the reasons for the election. 	ACTIVITIES OF EVALUATION DURING THE SEMESTER	45
Exercises	Assessment of an exercise similar to the one performed during the seminar practice. It will be solved by the student during distance-based hours and defended face-to-face with the professor at the time of delivery.	ACTIVITIES OF EVALUATION DURING THE SEMESTER	5
Final exam	Final written exam: it will consist of some theoretical questions and resolution of exercises related to the theoretical and practical contents of the subject.	FINAL TEST	50

Official exam dates for academic year 2024-25

Exam session	Date	Time	Group - Classroom(s) allocated	Comments
(C3) Periodo ordinario para asignaturas de segundo semestre y anuales	30/05/2025			
(C4) Pruebas extraordinarias para asignaturas de grado y máster	01/07/2025			

Academic staff



HIDALGO NUÑEZ, MARIA MONTSERRAT

Lecturer responsible

THEORY CLASS: Groups: 1

LAB PRACTICALS: Groups: L1

GROUP TUTORIALS: Groups: T1

THEORETICAL/PRACTICAL SEMINAR / WORKSHOP: Groups: S1



AGUIRRE PASTOR, MIGUEL ANGEL

LAB PRACTICALS: Groups: L2



CANALS HERNANDEZ, ANTONIO

THEORY CLASS: Groups: 8

GROUP TUTORIALS: Groups: T8

THEORETICAL/PRACTICAL SEMINAR / WORKSHOP: Groups: S8

Groups

THEORY CLASS

Group	Semester	Morning or afternoon session	Language	No. of enrolled students
Gr. 1 (THEORY CLASS) : 1	2S	Morning	Spanish	48
Gr. 8 (THEORY CLASS) : 8	2S	Morning	English	5

LAB PRACTICALS

Group	Semester	Morning or afternoon session	Language	No. of enrolled students
Gr. L1 (LAB PRACTICALS) : L1	2S	Morning	Spanish	22
Gr. L2 (LAB PRACTICALS) : L2	2S	Morning	Spanish	19
Gr. L3 (LAB PRACTICALS) : L3	2S	Morning	Spanish	12

























GROUP TUTORIALS

Group	Semester	Morning or afternoon session	Language	No. of enrolled students
Gr. T1 (GROUP TUTORIALS) : T1	2S	Morning	Spanish	48
Gr. T8 (GROUP TUTORIALS) : T8	2S	Morning	English	5

THEORETICAL/PRACTICAL SEMINAR / WORKSHOP



















Group	Semester	Morning or afternoon session	Language	No. of enrolled students
Gr. S1 (THEORETICAL/PRACTICAL SEMINAR / WORKSHOP) : S1	2S	Morning	Spanish	48
Gr. S8 (THEORETICAL/PRACTICAL SEMINAR / WORKSHOP) : S8	2S	Morning	English	5

THEORY CLASS


Group	Start date	End date	Day	Start time	End time	Lecture room
1	30/01/2025	30/01/2025	JUE	09:00	10:00	A2/A01 
1	06/02/2025	06/02/2025	JUE	09:00	10:00	A2/A01 
1	07/02/2025	07/02/2025	VIE	10:00	11:00	A2/A01 
1	13/02/2025	13/02/2025	JUE	09:00	10:00	A2/A01 
1	14/02/2025	14/02/2025	VIE	10:00	11:00	A2/A01 
1	20/02/2025	20/02/2025	JUE	09:00	10:00	A2/A01 
1	21/02/2025	21/02/2025	VIE	09:00	10:00	A2/A01 
1	21/02/2025	21/02/2025	VIE	10:00	11:00	A2/A01 
1	25/02/2025	25/02/2025	MAR	10:00	11:00	A2/A01 
1	27/02/2025	27/02/2025	JUE	09:00	10:00	A2/A01 
1	05/03/2025	05/03/2025	MIE	10:00	11:00	A2/A01 
1	07/03/2025	07/03/2025	VIE	09:00	10:00	A2/A01 
8	30/01/2025	30/01/2025	JUE	09:00	10:00	A2/C04 
8	06/02/2025	06/02/2025	JUE	09:00	10:00	A2/C04 
8	07/02/2025	07/02/2025	VIE	10:00	11:00	A2/C04 
8	13/02/2025	13/02/2025	JUE	09:00	10:00	A2/C04 
8	14/02/2025	14/02/2025	VIE	10:00	11:00	A2/C04 
8	20/02/2025	20/02/2025	JUE	09:00	10:00	A2/C04 
8	21/02/2025	21/02/2025	VIE	09:00	10:00	A2/C04 
8	21/02/2025	21/02/2025	VIE	10:00	11:00	A2/C04 
8	25/02/2025	25/02/2025	MAR	10:00	11:00	A2/C04 
8	27/02/2025	27/02/2025	JUE	09:00	10:00	A2/C04 
8	05/03/2025	05/03/2025	MIE	10:00	11:00	A2/C04 
8	07/03/2025	07/03/2025	VIE	09:00	10:00	A2/C04 






LAB PRACTICALS

Group	Start date	End date	Day	Start time	End time	Lecture room
L1	24/03/2025	24/03/2025	LUN	16:00	19:00	0007P3027 
L1	25/03/2025	25/03/2025	MAR	16:00	19:00	0007P3027 
L1	26/03/2025	26/03/2025	MIE	16:00	19:00	0007P3027 
L1	27/03/2025	27/03/2025	JUE	16:00	19:00	0007P3027 
L1	31/03/2025	31/03/2025	LUN	11:30	14:30	0007P3027 
L1	01/04/2025	01/04/2025	MAR	11:30	14:30	0007P3027 
L1	02/04/2025	02/04/2025	MIE	11:30	14:30	0007P3027 
L1	03/04/2025	03/04/2025	JUE	11:30	14:30	0007P3027 
L1	07/04/2025	07/04/2025	LUN	11:30	14:30	0007P3027 
L1	08/04/2025	08/04/2025	MAR	11:30	14:30	0007P3027 
L1	09/04/2025	09/04/2025	MIE	11:30	14:30	0007P3027 
L1	10/04/2025	10/04/2025	JUE	11:30	14:30	0007P3027 
L1	11/04/2025	11/04/2025	VIE	11:30	14:30	0007P3027 
L2	24/03/2025	24/03/2025	LUN	16:00	19:00	0007P3023 
L2	25/03/2025	25/03/2025	MAR	16:00	19:00	0007P3023 
L2	26/03/2025	26/03/2025	MIE	16:00	19:00	0007P3023 
L2	27/03/2025	27/03/2025	JUE	16:00	19:00	0007P3023 
L2	31/03/2025	31/03/2025	LUN	11:30	14:30	0007P3023 
L2	01/04/2025	01/04/2025	MAR	11:30	14:30	0007P3023 
L2	02/04/2025	02/04/2025	MIE	11:30	14:30	0007P3023 
L2	03/04/2025	03/04/2025	JUE	11:30	14:30	0007P3023 


Group	Start date	End date	Day	Start time	End time	Lecture room
L2	07/04/2025	07/04/2025	LUN	11:30	14:30	0007P3023 
L2	08/04/2025	08/04/2025	MAR	11:30	14:30	0007P3023 
L2	09/04/2025	09/04/2025	MIE	11:30	14:30	0007P3023 
L2	10/04/2025	10/04/2025	JUE	11:30	14:30	0007P3023 
L2	11/04/2025	11/04/2025	VIE	11:30	14:30	0007P3023 
L3	24/03/2025	24/03/2025	LUN	16:00	19:00	0007P3027 
L3	25/03/2025	25/03/2025	MAR	16:00	19:00	0007P3027 
L3	26/03/2025	26/03/2025	MIE	16:00	19:00	0007P3027 
L3	27/03/2025	27/03/2025	JUE	16:00	19:00	0007P3027 
L3	31/03/2025	31/03/2025	LUN	11:30	14:30	0007P3027 
L3	01/04/2025	01/04/2025	MAR	11:30	14:30	0007P3027 
L3	02/04/2025	02/04/2025	MIE	11:30	14:30	0007P3027 
L3	03/04/2025	03/04/2025	JUE	11:30	14:30	0007P3027 
L3	07/04/2025	07/04/2025	LUN	11:30	14:30	0007P3027 
L3	08/04/2025	08/04/2025	MAR	11:30	14:30	0007P3027 
L3	09/04/2025	09/04/2025	MIE	11:30	14:30	0007P3027 
L3	10/04/2025	10/04/2025	JUE	11:30	14:30	0007P3027 
L3	11/04/2025	11/04/2025	VIE	11:30	14:30	0007P3027 

GROUP TUTORIALS

Group	Start date	End date	Day	Start time	End time	Lecture room
T1	06/03/2025	06/03/2025	JUE	09:00	11:00	A2/A01 

Group	Start date	End date	Day	Start time	End time	Lecture room
T1	04/04/2025	04/04/2025	VIE	11:30	13:30	A1/1-29M 
T1	05/05/2025	05/05/2025	LUN	11:30	13:30	A1/1-29M 
T8	06/03/2025	06/03/2025	JUE	09:00	11:00	A2/C04 
T8	04/04/2025	04/04/2025	VIE	11:30	13:30	A2/D12 
T8	05/05/2025	05/05/2025	LUN	11:30	13:30	A1/1-28M 

THEORETICAL/PRACTICAL SEMINAR / WORKSHOP

Group	Start date	End date	Day	Start time	End time	Lecture room
S1	18/03/2025	18/03/2025	MAR	11:30	14:30	A2/E23 
S8	18/03/2025	18/03/2025	MAR	11:30	14:30	GB/INF1 