

MODULE	SUBJECT MATTER	YEAR	SEMESTER	CREDITS	TYPE
CHEMICALS	Analytic chemistry	1 <sup>o</sup>	1 <sup>o</sup>	6	Obligatory
TEACHING STAFF <sup>(1)</sup>			ADDRESS, TELEPHONE NUMBER, EMAIL, ETC. DIRECCIÓN COMPLETA DE CONTACTO PARA TUTORÍAS (Dirección postal, teléfono, correo electrónico, etc.)		
<ul style="list-style-type: none"> <li>Ana María Gómez Caravaca (Grupo A) <sup>2</sup></li> <li>Francisco Jesús Lara Vargas (Grupo B) <sup>2</sup></li> <li>Jose Luis Vilchez Quero (Grupo C) <sup>1</sup></li> <li>Alejandro Lapresta Fernández (Grupo D) <sup>2</sup></li> <li>David Arráz Román (Grupo E) <sup>1</sup></li> <li>Alejandro Lapresta Fernández (Grupo F) <sup>2</sup></li> </ul>			<sup>1</sup> Dept. of Analytical Chemistry, 3rd floor-Building 3, Faculty of Sciences. Emails: jvilchez@ugr.es; darraez@ugr.es <sup>2</sup> Dept. of Analytical Chemistry, Ground Floor-Building 4, Faculty of Sciences. Emails: anagomez@ugr.es; frjlara@ugr.es and lapresta@ugr.es		
			TIMETABLE FOR TUTORIALS OR LINK TO WEBSITE		
			Group A: Tuesday, Wednesday and Thursday from 11.30-13.30 (Professor Gómez Caravaca). Group B: Tuesday and Wednesday from 16: 00-19: 00 (Professor Lara Vargas). Group C: Monday and Tuesday from 17: 00-21: 00 (Professor Vilchez Quero). Group D: Tuesday from 8:30 a.m. to 11:30 a.m. and Wednesday from 9:30 a.m. to 12:30 p.m. (Professor Lapresta Fernández). Group E: Monday from 8.30-11.30 (Ed. Restoration) and Thursday from 9: 00-12: 00 (Professor Arráz Román). Group F: Tuesday from 8:30 a.m. to 11:30 a.m. and Wednesday from 9:30 a.m. to 12:30 p.m. (Professor Lapresta Fernández).		
BELONGS TO UNDERGRADUATE DEGREE PROGRAMME			AND ALSO TO OTHER UNDERGRADUATE DEGREE PROGRAMMES		

<sup>1</sup> Consult any updates in Acceso Identificado > Aplicaciones > Ordenación Docente

(∞) This course guide should be filled in according to UGR regulations on assessment of student learning: (<http://secretariageneral.ugr.es/pages/normativa/fichasugr/ngc7121/!>)

Degree in Pharmacy	
PREREQUISITES OR RECOMMENDATIONS (where applicable)	
Have adequate knowledge about: <ul style="list-style-type: none"> <li>• Formulation</li> <li>• Basic math</li> </ul>	
BRIEF DESCRIPTION OF CONTENT (ACCORDING TO OFFICIAL VALIDATION REPORT)	
Analytical methodology Qualitative and quantitative chemical analysis. Analytical methods of separation. Trace analysis Analytical techniques applied to the analysis of drugs, cosmetics, water, food and the environment.	
GENERAL AND SPECIFIC COMPETENCES	
<p>A. Generic competences</p> <ul style="list-style-type: none"> <li>• CG1. Identify, design, obtain, analyze, control and produce drugs and medicines, as well as other products and raw materials of sanitary interest for human or veterinary use.</li> <li>• CG10. Design, apply and evaluate reagents, methods and clinical analytical techniques, knowing the basic fundamentals of clinical analysis and the characteristics and contents of laboratory diagnosis reports.</li> <li>• CG12. Develop hygienic-sanitary analysis, especially those related to food and the environment.</li> <li>• CG15. Recognize their own limitations and the need to maintain and update professional competence, paying special attention to the self-learning of new knowledge based on the available scientific evidence.</li> </ul> <p>B. Specific competences</p> <ul style="list-style-type: none"> <li>• CE01. Identify, design, obtain, analyze and produce active ingredients, drugs and other products and materials of sanitary interest.</li> <li>• CE02. Select the appropriate techniques and procedures in the design, application and evaluation of reagents, methods and analytical techniques.</li> <li>• CE03. Conduct standard laboratory processes including the use of scientific synthesis and analysis equipment, appropriate instrumentation included.</li> <li>• CE09. Know the origin, nature, design, procurement, analysis and control of medicines and health products.</li> <li>• CE10. Know the principles and procedures for the analytical determination of compounds: analytical techniques applied to the analysis of water, food and environment</li> </ul>	
OBJECTIVES (EXPRESSED AS EXPECTED LEARNING OUTCOMES)	
<ul style="list-style-type: none"> <li>• Introduce the student to the study of the methodology in Analytical Chemistry.</li> <li>• Provide the student with the minimum skills necessary for the numerical resolution of problems related to Analytical Chemistry.</li> <li>• Train the student to correctly manipulate the usual analytical techniques in chemical analysis laboratories.</li> </ul>	



## DETAILED SYLLABUS

### THEORETICAL SUBJECT:

#### Block 1: Analytical methodology.

- Topic 1. Introduction to Analytical Chemistry. Definition of the problem
- Topic 2. Sample taking and preparation
- Topic 3. Introduction to analytical measurement
- Topic 4. Evaluation and expression of analytical results.

#### Block 2: Analytical techniques applied to the analysis of drugs, cosmetics, water, food and the environment.

- Topic 5. Analytical Methods.
- Topic 6. Application to the analysis of drugs, cosmetics, water, food and environmental samples.

### PRACTICAL SUBJECT:

Seminars / Workshops

Resolution of numerical problems / Work exhibitions

Laboratory practices

**Practice 1:** Determination of the conductivity and turbidity of a water sample. Turbidimetric determination of sulphates in a water sample.

**Practice 2:** Determination of acetylsalicylic acid in a pharmaceutical preparation.

**Practice 3:** Determination of potassium by flame photometry.

**Practice 4:** Potentiometric determination of fluorides in a mouthwash.

**Practice 5:** Photometric determination of iron in wines

## BIBLIOGRAPHY

### FUNDAMENTAL BIBLIOGRAPHY:

- *Análisis Químico*, Ramiro Avidad, Ignacio de Orbe. Universidad de Granada 2006
- *Análisis Químico*, F. Rouessac y A. Rouessac. Editorial McGraw Hill, 2003.
- *Fundamentos de Química Analítica. Una aproximación docente-discente*, Miguel Valcárcel Cases, Angela I. López Lorente, M<sup>a</sup>. Ángeles López Jiménez, Ed. Universidad de Cordoba, 2017.
- *Análisis Químico Cuantitativo*, Daniel C. Harris, 3<sup>a</sup> Edición, Ed. Reverté, 2007.
- *Fundamentos de Química Analítica*, D. A. Skoog, D. M. West, F. J. Holler y S. R. Crouch, 9<sup>a</sup> Edición, Ed. Thomson, 2014.
- *Química Analítica Contemporánea*, J.F. Rubinson y K.A. Rubinson, Ed. Pearson Educación, 2000.
- *Química Analítica*, G. Christian, 6<sup>a</sup> Edición, Ed. Mc Graw Hill, 2001.

### FURTHER READING:

- *Introducción al Análisis Instrumental*, L. Hernández Hernández y C. González Pérez. Ariel Ciencia (2002).
- *Principios de Análisis Instrumental*, D.A. Skoog, F.J. Holler, T.A., S. R. Crouch 6<sup>a</sup> Edición, Ed. Mc Graw Hill, 2007
- *Técnicas instrumentales en Farmacia y Ciencias de la Salud*, O. Valls y B. Del Castillo, 4<sup>a</sup> Edición, Ed. Piros, Barcelona, 1998.
- *Problemas de laboratorio químico y farmacéutico*, J. Ruiz Soriano, Ed. Harcourt Brace, Madrid 1997.
- *Estadística y Quimiometría para Química Analítica*, Miller y Miller. Ed. Prentice Hall. 2002.



- Toma y tratamiento de muestra, C. Cámara, P. Fernández, A. Martín-Esteban, C. Pérez-Conde y M. Vidal, Ed. Síntesis, Madrid 2004.
- Garantía de calidad en los laboratorios analíticos, R. Compañó y A. Ríos. Editorial Síntesis, 2002.

## RECOMMENDED LINKS

General bibliography: <http://www.ugr.es/~biblio/>

Glossary of Analytical Terms: [http://seqa.es/SEQA2013/Glosario\\_archivo\\_final.pdf](http://seqa.es/SEQA2013/Glosario_archivo_final.pdf)

Software, animations, etc.:

[http://www.shsu.edu/~chm\\_tgc/sounds/sound.html](http://www.shsu.edu/~chm_tgc/sounds/sound.html)

<http://www.educaplus.org/luz/index.html>

<http://micro.magnet.fsu.edu/primer/lightandcolor/>

[http://www.mnccn.csic.es/docs/repositorio/es\\_ES/investigacion/cromatografia/principios\\_de\\_cromatografia.pdf](http://www.mnccn.csic.es/docs/repositorio/es_ES/investigacion/cromatografia/principios_de_cromatografia.pdf)

<http://www.espectrometria.com>

## TEACHING METHODOLOGY

- General approach to the objectives of the subject.
- Presentation of the contents of the syllabus throughout a series of theoretical classes and seminars.
- Assignment to the students of works about the exposed contents for their presentation and / or exhibition in seminar sessions.
- Conducting experimental sessions for the assimilation and understanding of the contents of the subject.

## ASSESSMENT (ASSESSMENT INSTRUMENTS, CRITERIA AND PERCENTAGE VALUE OF FINAL OVERALL MARK, ETC.)

It is possible to choose between two types of evaluation:

### Continuous assessment

The evaluation will be carried out from the presentations and / or exposition of the theory and problem papers and the exams in which the students will have to demonstrate the acquired competences.

Passing any of the tests will not be achieved without a uniform and balanced knowledge of all the subject.

COMPETENCES	EVALUATION SYSTEM	% FINAL SCORE
CG10, CG12, CE02, CE09, CE10	Written development exams (SE.1), short answer written exams (SE.2), written test exams (SE.3) <sup>1</sup>	70
CG12, CG15	Work exhibitions (SE.5), Preparation of group work (SE.11)	10



CG1, CE01, CE03	Practice exams by practical test (SE.7), Practice exams by written test (SE.8), Attendance and active participation (SE.15) <sup>1,2</sup>	20
-----------------	--	----

<sup>1</sup> **It is necessary to obtain a minimum grade of 5 out of 10** to pass this part and, therefore, take into account the rest of the marks.

<sup>2</sup> **Attendance at all practices is compulsory.** Pass the practices with a minimum grade of 5, is an essential requirement to pass the course.

**The extraordinary evaluation will consist of:**

- Written exam of the contents taught in the master classes that will account for 70% of the final grade for the course. It is necessary to obtain a minimum grade of 5 out of 10 to pass this part.
- Written exam type test on the practical sessions with a value of 20% of the final mark of the subject as long as the practices have been carried out. It is necessary to obtain a minimum grade of 5 out of 10 to pass this part.
- Activity on subject content with a value of 10% of the final grade for the course.

**Final exam dates**

The exam dates will be published on the Degree website:

<http://grados.ugr.es/farmacia/pages/infoacademica/convocatoria>

There will also be a partial exam set with a date:

<http://grados.ugr.es/farmacia/pages/infoacademica/convocatoria>

• **Note of interest:** As established in article 22 of the Regulations for the Evaluation and Qualification of Students of the University of Granada, in the case of subjects whose Teaching Guides contemplate a final exam that represent 50% or more of the total of the weighting of the final grade of the subject and the student decides not to do it, will appear in the minutes with the annotation of "Not presented".

**DESCRIPTION OF THE EXERCISES WHICH WILL CONSTITUTE SINGLE FINAL ASSESSMENT AS ESTABLISHED IN UGR REGULATIONS**

In accordance with the Regulations for the Evaluation and Qualification of Students of the UGR, the completion of a single final evaluation is contemplated, which may be accepted by those students who cannot comply with the continuous evaluation method for work reasons, health status, disability or any other duly justified reason that prevents them from following the continuous assessment regime.

**To benefit from the final single evaluation, the student must request it in accordance with the procedure set forth in Article 8 of the Regulations for the Evaluation and Qualification of Students of the University of Granada.**

This final single evaluation will consist of:

- A written theory examination of the subject's syllabus. This part will represent 80% of the final grade.
- A theoretical exam if practicals has been developed during the course, or a theoretical-practical exam if practicals has not been developed. This part will represent 20% of the final grade.



## SCENARIO A (ON-CAMPUS AND REMOTE TEACHING AND LEARNING COMBINED)

### TUTORIALS

#### TIMETABLE

(According to Official Academic Organization Plan)

Group A: Tuesday, Wednesday and Thursday from 11.30-13.30 (Professor Gómez Caravaca).  
 Group B: Tuesday and Wednesday from 16: 00-19: 00 (Professor Lara Vargas).  
 Group C: Monday and Tuesday from 17: 00-21: 00 (Professor Vilchez Quero).  
 Group D: Tuesday from 8:30 a.m. to 11:30 a.m. and Wednesday from 9:30 a.m. to 12:30 p.m. (Professor Lapresta Fernández).  
 Group E: Monday from 8.30-11.30 (Ed. Restoration) and Thursday from 9: 00-12: 00 (Professor Arráez Román).  
 Group F: Tuesday from 8:30 a.m. to 11:30 a.m. and Wednesday from 9:30 a.m. to 12:30 p.m. (Professor Lapresta Fernández).

#### TOOLS FOR TUTORIALS

(Indicate which digital tools will be used for tutorials)

In accordance with the Regulations for the Evaluation and Qualification of Students of the UGR, the completion of a single final evaluation is contemplated, which may be accepted by those students who cannot comply with the continuous evaluation method for work reasons, health status, disability or any other duly justified reason that prevents them from following the continuous assessment regime.

In the blended scenario, with some exceptions, the tutorials will be attended by videoconference (Google Meet) or official email. Individual tutorials will take place upon request of the student. The teacher may propose group tutorials, compulsory or optional, if he deems it appropriate as a training return tool in the event that virtual classes have to be taught asynchronously

### MEASURES TAKEN TO ADAPT TEACHING METHODOLOGY

In accordance with the Regulations for the Evaluation and Qualification of Students of the UGR, the completion of a single final evaluation is contemplated, which may be accepted by those students who cannot comply with the continuous evaluation method for work reasons, health status, disability or any other duly justified reason that prevents them from following the continuous assessment regime.

- Theoretical classes and face-to-face seminars, until full capacity is allowed in the classroom according to health regulations, and synchronous through videoconference using platforms such as Google Meet if necessary.
- Teaching material in PRADO
- Exhibition of work in the classroom, up to completing the capacity allowed in the classroom according to health regulations, or through videoconferences. This measure could be adapted to send the corresponding activities to the teacher for evaluation.
- Practical classes: due to the reduction of the capacity of the laboratories to comply with health regulations, the preparation of the practice, if necessary, will be carried out prior to the laboratory work (using material provided by the teacher through PRADO and / or asynchronous tools). In this way, in case of reducing the time of stay of the students in the laboratory (in order to be able to connect all the small groups), they will come with the previous knowledge necessary to carry out the practical session.

### MEASURES TAKEN TO ADAPT ASSESSMENT (Instruments, criteria and percentage of final overall mark)

#### Ordinary assessment session

- Same as for the scenario of complete normality (previous)

#### Extraordinary assessment session



**UNIVERSIDAD  
DE GRANADA**

Page 6

**INFORMACIÓN SOBRE TITULACIONES DE LA UGR**  
[grados.ugr.es](http://grados.ugr.es)

• Same as for the scenario of complete normality (previous)	
Single final assessment	
• Same as for the scenario of complete normality (previous)	
SCENARIO B (ONCAMPUS ACTIVITY SUSPENDED)	
TUTORIALS	
TIMETABLE (According to Official Academic Organization Plan)	TOOLS FOR TUTORIALS (Indicate which digital tools will be used for tutorials)
As indicated in PRADO	<p>Synchronous tools: Tutorials will be attended by videoconferences and / or by asynchronous tools: PRADO and email</p> <p>Individual tutorials will take place upon request of the student. The teacher may propose group tutorials, compulsory or optional, if he deems it appropriate as a training return tool in the event that virtual classes have to be taught asynchronously</p>
MEASURES TAKEN TO ADAPT TEACHING METHODOLOGY	
<ul style="list-style-type: none"> <li>• The theoretical agenda will not be modified with respect to the initial planning of the subject.</li> <li>• The adapted material will be located in PRADO.</li> <li>• Theoretical classes will be held by videoconference at the usual time of the subject.</li> <li>• Practical classes by videoconference or alternative activities by other audiovisual or electronic means.</li> <li>• Seminars will be held through videoconference. As was done in the course, through Prado, students will have problem relationships where the student will try to solve it before the teacher resolves it so that the student can check the level of knowledge acquired continuously.</li> <li>• Presentation of work by videoconferences. This measure could be adapted to send the corresponding activities to the teacher for evaluation.</li> <li>• Students can contact the teacher at any time through email or the Prado platform for the resolution of doubts. If necessary, synchronous individual or group tutoring will be carried out by videoconference, by appointment and confirmed by email to the teacher in charge of the group.</li> </ul>	
MEASURES TAKEN TO ADAPT ASSESSMENT (Instruments, criteria and percentage of final overall mark)	
Ordinary assessment session	
<p><b>Theoretical test on the date set:</b></p> <ul style="list-style-type: none"> <li>• PRADO questionnaires with controlled execution time.</li> <li>• Obtain a minimum score of 5 out of 10.</li> <li>• 70% on final grade.</li> </ul> <p><b>Practice test on the date set:</b></p> <ul style="list-style-type: none"> <li>• PRADO questionnaires with controlled execution time.</li> <li>• Obtain a minimum score of 5 out of 10.</li> <li>• 20% on the final grade.</li> </ul>	



**Activity on the contents of the subject:**

- Presentation and delivery of work in PRADO with deadline.
- 10% on the final grade.

**Extraordinary assessment session****Theoretical test on the date set:**

- PRADO questionnaires with controlled execution time.
- Obtain a minimum score of 5 out of 10.
- 70% on final grade.

**Practice test on the date set:**

- PRADO questionnaires with controlled execution time.
- Obtain a minimum score of 5 out of 10.
- 20% on the final grade.

**Activity on the contents of the subject:**

- Presentation and delivery of work in PRADO with deadline.
- 10% on the final grade.

**Single final assessment****Theoretical-practical test on the date set:**

- PRADO questionnaires with controlled execution time.
- Questions about theory (80%) and practices (20%).

**ADDITIONAL INFORMATION (if necessary)**

The adaptations expressed in this guide to the two possible scenarios in relation to content, teaching methodologies and assessment are strictly exceptional, and do not imply, in any way, their continuity in successive courses once the crisis scenario that justifies them. The detailed casuistry of the national and international mobility students enrolled in the subject will be taken into account to search for extraordinary mechanisms that allow their evaluation in ordinary, extraordinary or single call.

