Teaching guide

IDENTIFICATION DETAILS

Degree:	Pharmacy
Scope	Pharmacy
Faculty/School:	Experimental Sciences
Course:	CHEMICAL ANALYSIS
Type:	Compulsory
ECTS credits:	6
Year:	2
Code:	2523
Teaching period:	Fourth semester
Subject:	Analytical Techniques
Module:	Chemistry
Teaching type:	Classroom-based
Language:	Spanish
Total number of student study hours:	150

SUBJECT DESCRIPTION

Analytical Chemistry is the part of chemistry that develops and improves methods and instruments for obtaining information about matter. This science includes Chemical Analysis: a practical part that applies analysis methods to solve problems related to the composition and chemical nature of matter. The fields in which Chemical Analysis is applied are very diverse: quality control of raw materials and finished products; certificates of analysis that ensure the specifications of the goods; clinical analyses that facilitate the diagnosis of diseases, etc. This course seeks to enable the student to know the most important analytical methods and to know, depending on the problem posed, to choose the most appropriate one.

GOAL

The purpose of this course is to provide students with the necessary knowledge to develop their profession as pharmacist in any related field: research, development, manufacturing, distribution and dispensing of medicines, as well as health information and promotion. By analyzing and understanding the organization of chemistry, it is intended to promote the student's critical and reflective thinking.

The specific aims of the subject are:

Prepare the student to apply the methodology of Analytical Chemistry in order to acquire a clear knowledge of the analytical process, its foundation and its applications.

Acquire skills in laboratory work and in solving analytical problems, learning to select the most appropriate method to apply in the chosen cases.

Solve analytical problems that help them understand the workings of life

Help the student to understand chemistry as a service for the person.

Understanding that matter and its transformation is fundamental to knowing the person and contributing to the common good.

Encourage the responsibility of being able to manipulate and know matter.

PRIOR KNOWLEDGE

Nomenclature and formulation in inorganic and organic chemistry. Periodic system and oxidation states of the elements. Stoichiometric adjustment of reactions. Expression and calculation of concentrations. Knowledge of the equilibrium in solution contained in the subject of General Chemistry and in the subject of Inorganic Chemistry: acid-base, precipitation, oxidation-reduction reactions, and coordination compounds. Both first-year subjects in the degree in Pharmacy. It is recommended to pass the course of General Chemistry, Organic Chemistry and Inorganic Chemistry. Take, or have passed, the subject of Instrumental Techniques.

COURSE SYLLABUS

The course is structured in four blocks. The first one is dedicated to realizing a vision of Analytical Chemistry. The second block corresponds to the different phases of the experimental design. In the third block, applications of chemical analysis to the analysis of molecules of pharmacological interest will be studied. In the fourth block, laboratory experiences are proposed where the student will put into practice what they have learned in theory.
BLOCK I: Chemistry in chemical analysis. Contents: Introduction to Analytical Chemistry. Purpose and objectives. Role of the pharmacist. Influence of chemical balances on the analysis of molecules.
BLOCK II: Experimental design in chemical analysis. Contents:
Analytical method. Qualitative and quantitative analysis. Compounds in analytical chemistry. Sampling and sampling methodology. Sample treatment. Theory of extraction and separation, including chromatography. Methodology for the determination of molecules of pharmacological interest. Data processing and validation of analytical methods.
BLOCK III: Applications and interpretation of data obtained from the chemical analysis of molecules of pharmacological interest.

BLOCK IV: Laboratory Practices. Teaching a scientific-experimental subject cannot be conceived without including internships in the laboratory in its programming. The internships are divided into four sessions and are directly related to the subject matter taught.

EDUCATION ACTIVITIES

The teaching-learning methodology consists of a series of face-to-face training activities (AFP) and other independent non-face-to-face training activities (AFNP) that the student must carry out autonomously. All of the activities are detailed below, together with a brief description of each one.

FACE-TO-FACE WORK ACTIVITIES (AFP):

AFP1. Expository classes: Classes in which the theoretical concepts of the subject are worked on. Questions and discussion of case studies and problems.

AFP2. Practical classes and AFP3. Exercise classes: Conducting experiments in the teaching laboratory where techniques and knowledge related to the subject are applied. As well as solving case studies and problems.

AFP4. Exhibition of works: Written presentation and/or oral presentation in class of work done individually or in teams.

AFP5. Tutoring: The tutoring schedule will be provided by the teacher at the beginning of the course. Attention to the student to review questions about the contents explained in class, resolve them or discuss specific topics in order for the student to achieve the objectives pursued by the module. The student must prepare for tutoring for greater achievement.

**The publication of material provided to the student for purposes other than those intended is prohibited.

SELF-EMPLOYMENT ACTIVITIES (AFNP):

AFNP1. Study of the subject: Study of the theoretical contents of the programs of the subjects of the module. Use of complementary materials designed in the virtual network spaces of the different subjects and the bibliographic consultation.

AFNP2. Carrying out exercises and case studies: Resolution of practical assumptions. Review and understanding of the experiments carried out in practical laboratory classes. Use of complementary materials designed in virtual networked spaces.

AFNP3. Preparation of individual or group works: Conducting bibliographic searches and selecting appropriate material. Analysis of the selected material and preparation of papers for subsequent presentation and discussion.

AFNP4. Tutoring preparation: The student must prepare the questions they will pose in the tutorials.

DISTRIBUTION OF WORK TIME

TEACHER-LED TRAINING ACTIVITIES	INDIVIDUAL WORK
66,50 Horas	83,50 Horas

Cross Skills

To nurture an attitude of intellectual curiosity and a quest for truth in all areas of life.

To be able to approach a subject by means of rigorous, profound and comprehensive thought.

To be able to assess knowledge acquired.

To be able to apply the theoretical knowledge learnt in the of solving problems and practical cases linked to the various subjects.

LEARNING RESULTS

Estimate the risks associated with the use of chemical substances and laboratory processes.

Know the principles and procedures for the analytical determination of compounds: analytical techniques applied to the analysis of water, food and the environment.

Know the origin, nature, design, procurement, analysis and control of drugs and medical devices.

Select appropriate techniques and procedures in the design, application and evaluation of reagents, methods and analytical techniques.

Carry out standard laboratory processes including the use of scientific synthesis and analysis equipment, including appropriate instrumentation.

SPECIFIC LEARNING RESULTS

Select the most appropriate technique for the analysis and control of drugs, medical devices, analysis of water, food, plants, soil, air, etc., knowing the responsibility it entails for the good of the person.

Describe the general methodology of chemical analysis, ranging from obtaining the sample to the interpretation of results, understanding the limitations from sampling to the statistical study of the result and interpretation.

Acquire skills for the numerical resolution of clinical analysis problems.

Define the sample treatments that allow the application of the analysis methods studied.

Identify the practical application of quantitative methods of analysis.

Use chemicals in laboratory processes safely.

Argue a protocol for action in chemical analysis.

LEARNING APPRAISAL SYSTEM

REGULAR EVALUATION SYSTEM
The evaluation system for the subject Chemical Analysis, based on continuous evaluation, includes the evaluation of all activities carried out in the teaching-learning process of the subject with the following percentages:

ISE1. Written or oral, developmental, short answer or test-type tests: 55% The degree of comprehension and assimilation of the contents of theoretical classes and exercises will be evaluated. A written exam will be taken to evaluate the learning of the contents presented in theoretical and practical classes and in those for solving exercises and practical cases. In the exam, the student will demonstrate knowledge and understanding of the subject, as well as their ability to apply what they have learned in the analysis of various chemical quantities. The minimum grade to pass this part is 5 out of 10 points.
IF 2. Daily activities and exercises + SE4. Attendance and participation in face-to-face classroom activities: 10%
The completion of practical exercises and activities proposed within a deadline set by the teacher will be evaluated, as well as attendance and participation in face-to-face activities in the classroom.
IF 3. Individual and group work: 15%
Completion and preparation in class or in tutoring will be evaluated, as well as the quality of the work delivered in writing and/or its oral defense.
SE8. Attendance and participation in face-to-face activities in the laboratory: 20%
The way in which the student performs in the laboratory, the ability to solve experimental problems, the interpretation of research results and behavior during the development of the practices will be evaluated. The maximum grade in this section is 20% of the final grade of the course. The minimum grade to pass this part is 5 out of 10 points.
Attendance at all practical sessions (regardless of where they take place: laboratory, computer rooms, simulation tunnel, etc.) is mandatory. The unjustified absence of any of these sessions leads to the loss of the right to an internship evaluation in the ordinary call and a suspension of the course. Students in this situation should immediately contact the teacher. In the same way, arriving late or leaving the internship session early leads to the loss of the right to continuous evaluation.
Absences of assistance due to illness must be justified by a medical certificate. Any other lack of assistance must be duly justified. Absences of attendance due to the preparation or study of exams in other subjects are not justified and therefore such classes will not be recovered.
In order to pass the course, and to compensate for the different sections, it is necessary to obtain a minimum of 5 points in both SE1 and SE8. The course is approved with a grade equal to or greater than 5 points, averaging with all the sections. If either of these two sections are suspended, the note for the rest of the sections, including section SE2 and SE3, will be kept until the extraordinary call.
ALTERNATIVE EVALUATION SYSTEM
Intended for students who enroll for the second or more times in the subject and who cannot take advantage of the ordinary system because they cannot attend classes regularly. Students in second or subsequent enrollment must contact the teacher to request to take advantage of this system.
ISE1. Written or oral, developmental, short answer or test-type tests: 55%.
IF 2. Daily activities and exercises: 10%. In this case, exercises or activities will be taken into account and must be delivered within a deadline set by the teacher.
IF 3. Individual and group work: :15%
SE8. Attendance and participation in face-to-face activities in the laboratory: 20%. The teacher will indicate the specific evaluation criteria for each case, taking into account whether he has done the internship before and the result of this process.
Plagiarism, the use of illegitimate means in evaluation tests, and inappropriate behavior within the laboratory will be sanctioned in accordance with those established in the Evaluation Regulations and the University's Coexistence Regulations.

ETHICAL AND RESPONSIBLE USE OF ARTIFICIAL INTELLIGENCE

1.- The use of any Artificial Intelligence (AI) system or service shall be determined by the lecturer, and may only be used in the manner and under the conditions indicated by them. In all cases, its use must comply with the following principles:

a) The use of AI systems or services must be accompanied by critical reflection on the part of the student regarding their impact and/or limitations in the development of the assigned task or project.
b) The selection of AI systems or services must be justified, explaining their advantages over other tools or methods of obtaining information. The chosen model and the version of AI used must be described in as much detail as possible.
c) The student must appropriately cite the use of AI systems or services, specifying the parts of the work where they were used and describing the creative process followed. The use of citation formats and usage examples may be consulted on the Library website(https://www.ufv.es/gestion-de-la-informacion_biblioteca/).
d) The results obtained through AI systems or services must always be verified. As the author, the student is responsible for their work and for the legitimacy of the sources used.
2.- In all cases, the use of AI systems or services must always respect the principles of responsible and ethical use upheld by the university, as outlined in the Guide for the Responsible Use of Artificial Intelligence in Studies at UFV. Additionally, the lecturer may request other types of individual commitments from the student when deemed necessary.
3.- Without prejudice to the above, in cases of doubt regarding the ethical and responsible use of any AI system or service, the lecturer may require an oral presentation of any assignment or partial submission. This oral evaluation shall take precedence over any other form of assessment outlined in the Teaching Guide. In this oral defense, the student must demonstrate knowledge of the subject, justify their decisions, and explain the development of their work.

BIBLIOGRAPHY AND OTHER RESOURCES

Basic

Skoog, Douglas A. Principles of Instrumental Analysis/7th ed. Mexico:Cengage Learning, 2018.

Skoog, Douglas A., author. Foundations of Analytical Chemistry/4th edition.

Christian, Gary D. Analytical Chemistry/6th ed. Mexico:McGraw-Hill, 2009.

Additional

Ralph H. Petrucci... [et al.]. General Chemistry [Electronic Resource]/11th ed. [S. l.] :Pearson, 2017.
(Ralph H. Petrucci... [et al.]. General Chemistry [Electronic Resource]/11th ed. [S. l.] :Pearson, 2017. , ||Daniel C. Harris. Quantitative chemical analysis/Third edition. Barcelona: Editorial Reverté, 2016.)

Luis María Polo Díez. Fundamentals of Chromatography/Madrid:Dextra Editorial, 2015.
(Luis María Polo Díez. Fundamentals of Chromatography/Madrid:Dextra Editorial, 2015. , ||Pilar Marchante Castellanos [and 4 others]; Hector Zumbado Fernández edition; production by Raul G. Torricella Morales. Pharmaceutical chemical analysis: classical quantitative methods/Havana: Editorial Universitaria, 2007.)