VNIVERSITAT DE VALÈNCIA

Course Guide
33981 Chemical Analysis

COURSE DATA

Data Subject	
Code	33981
Name	Chemical Analysis
Cycle	Grade
ECTS Credits	6.0
Academic year	2021 - 2022

Study (s)

Degree	Center	Acad. year	Period
1103 - Degree in Food Science and Technology	Faculty of Pharmacy and Food Sciences	2	First term

Subject-matter

Degree	Subject-matter	Character
1103 - Degree in Food Science and Technology	9 - Analytical chemistry	Obligatory

Coordination

Name	Department
BENEITO CAMBRA, MIRIAM	310 - Analytical Chemistry

SUMMARY

Chemical Analysis is a core course taught in the second year of Food Science and Technology Grade along the first four-month period. In the curriculum, it involves 6 ECTS credits.

The aim of the course is, essentially, student training to perform instrumental and chemical analysis, and the establishment of the necessary basis to understand the fundamentals of each step of the analytical procedure, in order to be able to apply it correctly.

The study of this subject is justified due to the necessary acquirement of theoretical and practical knowledge, relative to sampling, sample preparation, and the analytical possibilities of the classical and instrumental analytical techniques. Some concepts previously acquired on Mathematics, Physics and Chemistry, are used, since they constitute a base key to the normal development of the subject.

This subject will provide to the future Graduate in Food Science and Technology the necessary skills to achieve a complete education in order to face with success any analytical problem in his/her future job.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

Students enrolling in this course are expected to know and use basic chemical concepts learnt before university access. Students should have had previous coursework in undergraduate Physics and Mathematics

OUTCOMES

1103 - Degree in Food Science and Technology

- Be able to interpret, evaluate and communicate relevant data in the different branches of the profession by making use of information and communication technologies.
- Capacidad para transmitir ideas, analizar problemas y resolverlos con espíritu crítico, adquiriendo habilidades de trabajo en equipo y asumiendo el liderazgo cuando sea apropiado.
- Design, apply and evaluate reagents, methods and analytical techniques.
- Carry out health and hygiene analyses related to food.

LEARNING OUTCOMES

At the end of the course, he / student should be able to:
1. Collect and interpret information within the area of science and technology of food from various sources and analyze and synthesize the information.
2. Communicate information, ideas, problems and solutions to both specialist and non-specialist.
3. Ability for teamwork
4. Selecting and applying appropriate sampling techniques.
5. To assess the possible errors in quantitative analysis and correctly.
6. Prepare the samples correctly according to the type of analysis provided.
7. Describe and know how to properly apply classical techniques to determine the major components of a sample.
8. Describe and know how to apply suitable separation techniques in chemical analysis.
9. Describe and know how to apply appropriate electroanalytical chemical analysis.
10. Describe and know how to apply appropriate optical techniques in chemical analysis.

DESCRIPTION OF CONTENTS

1. Introduction and Terminology

Concept. Types and levels of information. Steps of the analytical process. Classification of analytical techniques

2. Evaluation of analytical data

Types of errors in Chemical Analysis. Evaluation of analytical data. Presentation of results. Quality criteria for analytical methods.

3. CALIBRATION AND ANALYTICAL FIGURES OF MERIT

Linear calibration. Analytical figures of merit: sensitivity, detection and quantification limits, dynamic range. Standard addition method. Internal standard method.

4. SAMPLING, STORAGE AND PREPARATION OF MATERIALS

Importance of the processes of sampling and treatment of materials. Sampling. Previous treatments of the sample. Dissolution of solid samples. Extraction techniques.

5. VOLUMETRIC ANALYSIS

Introduction to volumetric methods. Acid-base titrations. Complexometric titrations. Precipitation titrations. Redox titration. Applications in food analysis.

6. GRAVIMETRIC ANALYSIS

Fundamentals of gravimetric methods. Precipitation mechanisms. Basic operations of gravimetric analysis. Calculations. Applications in food analysis.

7. ELECTROCHEMICAL ANALYSIS

Electrochemical cells. Electrode potentials. Potentiometry. Instrumentation. Analytical methodology. Analytical features and performance. Applications in food analysis

8. SPECTROSCOPIC METHODS OF ANALYSIS

Molecular spectroscopic techniques. Atomic spectroscopic techniques. Fundamentals. Instrumentation. Analytical methodology. Analytical features and performance. Applications in food analysis.

9. CHROMATOGRAPHIC METHODS OF ANALYSIS

Concept and classification of chromatographic techniques. Main parameters in chromatography. Gas chromatography. Liquid chromatoghraphy. Instrumentation. Analytical methodology. Applications in food analysis.

10. Laboratory

1.Determination of the total acidity of a commercial vinegar
2.Determination of the total hardness of a water sample
3.Spectrophotometric determination of nitrite in water
4. Determination of additives in foods by liquid chromatography

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	38,00	100
Laboratory practices	15,00	100
Seminars	2,00	100
Tutorials	2,00	100
Development of group work	8,00	0
Development of individual work	6,00	0
Study and independent work	48,00	0
Readings supplementary material	5,00	0
Preparation of evaluation activities	10,00	0
Preparing lectures	3,00	0
Preparation of practical classes and problem	10,00	0
TOTAL	**147,00**	

TEACHING METHODOLOGY

The subject is structured considering the following activities for its development: lectures, workshops, coordinated seminars, laboratory sessions and tutorials.

Lectures. Participatory lecture is used as didactic strategy. In the lectures, the instructor offers an overview of the topic, and proposes questions and small activities to be resolved in the classroom by the students.

Workshops. Throughout the course there are workshop sessions focused on various aspects of the subject. The teacher provides the necessary materials and proposes a series of activities.

Coordinated seminars. They will be conducted on topics provided by the teacher and must follow the guidelines on seminars available at the web page of the Faculty. The development of the seminar will be monitored through tutorials, to be agreed between the teacher and students. The seminars will be presented in writing and submitted by students. After the oral presentations other students will have a speaking time moderated by the teacher.

Tutorial sessions. In them, the teacher will give to the student advices on all the elements of the learning process, in terms of global strategies and specific issues. Also, students will present the results they have obtained on the additional problems and the questions set by the teacher, and will discuss them on the blackboard.

Laboratory sessions. The course is enhanced with practical lessons that develop in the laboratory where the student acquires the skills necessary to implement the knowledge developed. To support the teaching practice the student is supplied with a booklet with practical protocols to perform. The protocol includes the theoretical, reagents, procedures and calculations involved.

During the classes, application examples of the subject contents in relation to the Sustainable Development Goals (SDG) will be indicated, as well as, in the topic proposals for coordinated seminars. Thereby, it is intended to provide students with knowledge, skills, and motivation to understand and address these SDGs.

EVALUATION

The evaluation of students learning will take into account the different aspects outlined in the methodology section of this guide and will be performed by the teacher in a continuous way. For this purpose, the subject is structured in three parts: theoretical sessions, laboratory sessions and coordinated seminars.

The score or the **theoretical part**, which weighs 75% in the final mark, include the qualification of a written exam at the end of the first semester (weighs 75% in the theoretical part), and the note of the activities carried out in workshops and tutorials on compulsory attendance (25% of the theoretical part). The written exam will consist of conceptual questions and problems that allow the student to demonstrate his/her degree of assimilation of fundamental concepts. They may also include more general topics where the student will have to show his/her ability to synthesize and expose.The qualification obtained in the activities carried out in workshops and tutorials will not be preserved for following academic year.

To evaluate **laboratory sessions**, where attendance is compulsory, the student will have to present a report gathering the analytical results of all practices. In addition, during the last laboratory session, there will be an written exam on issues discussed during their development. The overall qualification will rate 15% of the final score of the subject. In case of not passing the subject, the mark obtained in the laboratory part will be preserved for following academic years.

The qualification obtained in the **coordinated seminar** will rate 10 % of the global qualification of the subject, according with the regulations of coordinated seminars on the degree program. In case of not passing the subject, the mark obtained in the laboratory part will be preserved for following academic years.

FIRST GENERAL EXAM OPPORTUNITY

The final course score is calculated averaging the specific scores in theory, laboratory sessions and coordinated seminar by the following expression:

Final Rating = THEORY x 0.75 + PRACTICAL x 0.15 + SEMINAR x 0.10

This expression only applies in case of obtaining a minimum score of 4.5 out of 10 in each of the parts. likewise, inside the theory block it is also necessary to obtain a minimal note of 4 in the written exam to average with the note of the activities of workshops and tutorials. To pass the subject, the student must obtain a qualification of 5 out of 10. In the case of the final rating being smaller than 5.0 points, or not having obtained a minimum score of 4.5 to balance underscored parts (or 4 in the written theory exam), the subject will be considered failed.

SECOND GENERAL EXAM OPPORTUNITY

In the second round of qualification, the same criteria used in the first round are applied. Students who did not pass in the first opportunity one or more of the three parts, should have to be examined of the all of pendant parts.

REFERENCES

Basic

- QUÍMICA ANALÍTICA. D.A. Skoog, D.M. West , F.J. Holler y S.R. Crouch, 8ª edición, Thomson, 2005.
  ANÁLISIS QUÍMICO CUANTITATIVO. D.C. Harris, 3ª edición, Reverté, 2007.
  QUÍMICA ANALÍTICA MODERNA. D. Harvey, McGraw-Hill Interamericana, 2002.
  PRINCIPIOS DE QUÍMICA ANALÍTICA. M. Valcárcel, Springer, 1999.
  Analytical Chemistry 2.0:
  http://acad.depauw.edu/harvey_web/eText%20Project/AnalyticalChemistry2.0.html

Additional

- QUÍMICA ANALÍTICA. G. D. Christian, McGraw-Hill Interamericana, 2009.
  APROXIMACIÓ A LANÀLISIS QUANTITATIVA MITJANÇANT LA RESOLUCIÓ DE PROBLEMES. C. Gómez Benito, S. Torres Cartas, S. Meseguer Lloret, C. Cháfer Pericás, Y. Martín Biosca, editorial UPV, 2009.
  QUÍMICA ANALÍTICA CONTEMPORÁNEA. J.F. Rubinson y K.A. Rubinson, Prentice Hall, 1999.
  TOMA Y TRATAMIENTO DE MUESTRAS. C. Cámara (ed.), P. Fernández, A. Martín Esteban, C.

Pérez Conde y M. Vidal., Síntesis, 2002.

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

3. Teaching Methodology

Theory classes will be carried out by synchronous videoconference (Blackboard Collaborate, MS TEAMs) and following the timetable established by the centre.

The laboratory sessions will consist in a combination of laboratory work and other activities such as video viewing, calculations, etc. Additionally, students will take a final evaluation questionnaire using Aula Virtual.

The coordinated seminars will be virtual. They will be held on-line by videoconference as established by the centre.

4. Evaluation

There are no modifications with regard to the evaluation established in the teaching guide