Universidad Zaragoza

Year : 2019/20

30805 - Key techniques for chemical analysis

Syllabus Information

Academic Year: 2019/20
Subject: 30805 - Key techniques for chemical analysis
Faculty / School: 105 - Facultad de Veterinaria
Degree: 568 - Degree in Food Science and Technology
ECTS: 6.0
Year: 1
Semester: Second semester
Subject Type: Basic Education
Module: ---

1.General information

1.1.Aims of the course

1.2.Context and importance of this course in the degree

1.3.Recommendations to take this course

2.Learning goals

2.1.Competences

2.2.Learning goals

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The learning process that is designed for this subject is based on:

- **40 hours of interactive lecture class:** the contents of each issue are discussed alternating theory with examples, issues and problems.
- **5 hours of seminars:** there are 5 sessions of 1 hour. The group is divided into 2 subgroups. Problems, doubts and applied exercises will be solved.
- **15 hours of laboratory session:** the practice group is divided into 5 teams. There are 5 different practices of 3 hours.
- **8 hours of supervisal practical group.** The students prepare and present a practice to the rest of the group.

4.2.Learning tasks

The course will address the following topics:

- **Section I**
  - **Teaching-learning activities:** (0,8 ECTS)
  - **Lectures: 7 hours**
  - **Seminar: 1 hour**

        - **Student work:** 11 hours of study and 1 hour to solve a self-evaluative test.
- **Section II**
    - **Teaching-learning activities:** (0,5 ECTS)
    - **Lectures: 4 hours**
    - **Seminar: 1 hour**
    - **Student work:** 6,5 hours.
- **Section III**
    - **Teaching-learning activities:** (0,9 ECTS)
    - **Lectures: 8 hours**
    - **Seminar: 1 hour**
    - **Student work:** 12,5 hours of study and 20 minutes to solve a self-evaluative test
- **Section IV**
    - **Teaching-learning activities:** (1,4 ECTS)
    - **Lectures: 13 hours**
    - **Seminar: 1 hour**
    - **Student work:** 20 hours of study and 20 minutes to solve a self-evaluative test,
- **Section IV**
    - **Teaching-learning activities:** (1,5 ECTS)
    - **Practice: 15 hours**
    - **Student work:** 7,5 hours of study and 8 hours of supervised work

4.3.Syllabus

The course will address the following topics:

Section I. Introduction.

- Topic 1. Objectives of the Analytical Chemistry. Analytical process. Analytical signals. Calibration. Calibration line. Sensitivity. Linear response range. Detection limit. Noise

Section II. Electroanalytical techniques.

- Topic 2. Potentiometry. Introduction to electroanalytical techniques. Classification. Potentiometry. Instrumentation. Electrodes. Applications. Potentiometric titrations.

Section III. Chromatographic techniques.

- Topic 3. Introduction to chromatography. Classification. Column chromatography. Analytical signal: the chromatogram. Parameters: a.- dead time (tm) b.- retention time (tr) c.- capacity factor. d.- selectivity factor. e. chromatographic peak width. Efficiency. f. Resolution. Optimization techniques. The general problem of elution. The chromatograph. Qualitative and quantitative information. Calibration: Internal standard.
- Topic 4. Gas chromatography. GC principles. The chromatograph. Columns. Injector. Carrier gas. Injection modes. Detector. Oven. Applications. Methodology
- Topic 5. High performance liquid chromatography. Pumps. Sample injection systems. Chromatographic columns. Detectors. Separation modes. Applications.

Section IV. Molecular spectrometric techniques.

- Topic 6. Introduction to optical analysis techniques. Structure of matter. Energy electromagnetic radiation. Interactions. Classification. Analytical signal. Spectra. Information.
- Topic 7. Molecular absorption spectrometry in the UV-Visible. Parameters and information. Lambert-Beer law. Molecules. Instrumentation. Applications. Quantitative aspects. Deviations from the Beer-Lambert law. Methodology. Other applications: qualitative and photometric ratings.
- Topic 8. Molecular Luminescence. Photoluminescence: fluorescence and phosphorescence. Fluorescent process. Parameters and information. Fluorescent molecules. Instrumentation. Relationship between intensity and concentration. Applications.
- Topic 9. Molecular absorption spectrometry in the infrared. Introduction. Parameters and Information. IR spectrum. Instrumentation. Applications

Section V. Atomic spectrometric techniques.

- Topic 10. Spectrometry flame atomic absorption. Introduction. Parameter measurement. Information. Instrumentation. Radiation sources. Sample compartment: flame. Types of instruments. Applications. Quantitative aspects. Absorbance-concentration relationship. Interferences. Work Methodology Applications

- Topic 11. Atomic emission spectrometry flame. Emission spectra flame photometry. Instrumentation. Quantitative applications. Intensity and concentration ratio. Interferences. Analytical methodology. Applications.

Section VI. Laboratory practices

- Practice 1 Molecular absorption spectrometry UV-Visible. Determination of phosphate in a cola drink. Choosing conditions.
- Practice 2 Atomic Absorption Spectrometry. Determination of copper in wine. Choice of conditions and parameters study. Calibration curve and standard addition.
- Practice 3 High-resolution liquid chromatography. Qualitative determination of additives in a cola drink. Study parameters.
- Practice 4 Gas Chromatography. Determination of alcoholic grade. Study of parameters.
- Practice 5 Potentiometry. Determination of chloride in samples. Study of parameters.

4.4.Course planning and calendar

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the Facultad de Ciencias web https://veterinaria.unizar.es/academico/plan-estudios-grado-cta

4.5.Bibliography and recommended resources

BB Harris, Daniel C. : Análisis químico cuantitativo / Daniel C. Harris . 3ª ed. Barcelona [etc.] : Reverté, cop. 2007

BB Skoog, Douglas A.. Fundamentos de química analítica / Douglas A. Skoog ... [et al.] . 8ª ed. Australia, Madrid [etc.] : Thomson, D.L. 2005

All the material of the course is in http://moodle2.unizar.es.