

Academic Year/course: 2022/23

## 28956 - Agricultural chemical analysis

### Syllabus Information

**Academic Year:** 2022/23

**Subject:** 28956 - Agricultural chemical analysis

**Faculty / School:** 201 - Escuela Politécnica Superior

**Degree:** 583 - Degree in Rural and Agri-Food Engineering

**ECTS:** 6.0

**Year:** 4

**Semester:** Second semester

**Subject Type:** Optional

**Module:**

### 1. General information

### 2. Learning goals

### 3. Assessment (1st and 2nd call)

### 4. Methodology, learning tasks, syllabus and resources

#### 4.1. Methodological overview

Since the subject is theoretical/practical, the proposed methodology includes classroom lectures complemented by sessions of laboratory practices, where the student will apply the basic knowledge about the main tools of chemical analysis applied to agricultural samples. The lectures are reinforced with solving sessions of various types of numerical problems or exercises. For better monitoring of the learning process, they will be presented to the student a series of questionnaires or exercises throughout the semester and will encourage the student to use the tutorial hours. In support, it is posted on the Web (Moodle platform) Basic reference materials as the course syllabus, class presentations of theoretical issues, scripts complementary practices or different material.

#### 4.2. Learning tasks

The course includes the following learning tasks:

- 1- Lectures (20 hours) that consist of lectures aimed at students to acquire theoretical knowledge and basic principles of Chemical Analysis. Classes will be held interactively with students, discussing with them the aspects that are more difficult or especially interesting for each topic. "Case studies" that allow students to consolidate the theoretical concepts and establish the applicability of chemical analysis in solving problems agrifood be presented.
- 2- Solving-problems sessions (10 hours) for the determination of chemical species in agrifood matrices (soil, water, plants, fertilizers, food) that will be inserted in the calendar as progress is made in the content of the subject to be seeing in classes theoretical.
- 3- Laboratory practice (30 h). According to the academic calendar, 15 sessions of two hours each will be made. various practices on soil nutrient determination, water quality parameters, the composition of fertilizers, etc., that promote the consolidation of theoretical knowledge must be developed. To achieve the goals of the ODS, the following complementary activity is proposed. The practice script will provide an annex with a list of the most important chemical reagents to be used in the laboratory practices together with the link to download the safety data sheets of these reagents for the prevention of risks during their handling. In each of the practices, emphasis will be placed on the importance of handling each reagent correctly, its hazardousness (toxicity) to health and the

environment, and therefore having basic knowledge of how to manage the waste generated in the teaching laboratory (for example: differentiating between reagents that can be poured directly down the drain from those that require collection in carafes, minimising the amount of reagents to be used).

- 4- Tutorials. Attendance at tutorials to clarify any doubts of more individualized students is recommended. In them, the teacher can do a better closer monitoring of student work orientating with the most appropriate methods.

### 4.3. Syllabus

The course will address the following topics:

#### Theory Program

- 1. Introduction to chemical analysis. Classification of analytical methods.
- 2. Stages in chemical analysis.
- 3. Sampling.
- 4. Chemical treatment of the samples
- 5. Calibration methods.
- 6. Volumetric analysis methods.
- 7. Instrumental analysis methods. Introduction. Classification.
- 8. Electro-analytical methods. Conductometric and potentiometric. Applications.
- 9. Spectroscopic methods.
- 10. Chromatographic methods. Applications.
- 11. Soil analysis.
- 12. Water analysis.
- 13. Fertilizer analysis.
- 14. Food analysis.

#### Practical Programme

- 1. Water analysis. Determining different parameters related to water quality: pH, conductivity, alkalinity, chlorides, hardness, sulfates.
- 2. Soil analysis. Nutrient measurements: Organic matter, nitrates, Cu.
- 3. Organic (compost) and inorganic fertilizer analysis. Measuring phosphates, K, Mg.
- 4. Food analysis. Measuring: Protein content in cereals, fat in milk, acidity in wine, caffeine in drinks.
- 5. Analysis of different plant matter.

### 4.4. Course planning and calendar

Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Activity																	
Theoretical classes	2	2	2	1	1	1	2	2	2	2	2	1	1	2	2		
Problems				1	1	1						1	1				
Laboratory classes	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2		
Evaluation																	6
Independent learning																	
Individual work	4	5	4	5	5	5	5	5	3	0	4	5	5	5	5	5	5
TOTAL	8	9	8	9	9	9	9	9	7	4	8	9	9	9	9	11	5

### 4.5. Bibliography and recommended resources

- BB** Faithfull, Nigel T.. Métodos [de] análisis químico agrícola : manual práctico / Nigel T. Faithfull ; traducción de Ana Cristina Ferrando Navarro ; revisión de Miguel Ángel Usón Finkenzeller . Zaragoza : Acribia, 2005
- BB** Harris, Daniel C.. Análisis químico cuantitativo / Daniel C. Harris . 3ª ed. Barcelona [etc.] : Reverté, cop. 2007
- BB** Hernández Hernández, Lucas. Introducción al análisis instrumental / Lucas Hernández Hernández y Claudio González Pérez . Barcelona : Ariel, 2002
- BC** Aceites y grasas / PANREAC . Barcelona [etc.] : Montplet & Esteban, 1983
- BC** Aguas / PANREAC . Barcelona [etc.] : Montplet & Esteban, 1983
- BC** Carne y productos cárnicos / PANREAC . Barcelona [etc.] : Montplet & Esteban, 1983
- BC** Cereales, derivados y cerveza / PANREAC . [s.l.] : Montplet & Esteban, 1983
- BC** Hamilton, Leicester F.. Cálculos de química analítica / Leicester F. Hamilton, Stephen G. Simpson, David W. Ellis ; traducción Luis Rodríguez Terán ; revisión técnica José Luis Morales . 2ª ed. México [etc.] : McGraw-Hill, imp.1990
- BC** Jackson, M.L.. Análisis químico de suelos / M.L. Jackson ; traducido del inglés americano por José Beltrán Martínez . [4a. ed.] Barcelona : Omega, 1982
- BC** Leche y productos lácteos / PANREAC . Barcelona [etc.] : Montplet & Esteban, 1983
- BC** Métodos normalizados : para el análisis de aguas potables y residuales / preparado y publicado conjuntamente por American Public Health Association, American Water Works Association, Water Pollution control Federation ; directora de edición Mary Ann H. Franson . Madrid : Díaz de Santos, D.L. 1992
- BC** Métodos oficiales de análisis / [publicados por el] Ministerio de Agricultura, Pesca y Alimentación, Dirección General de Política Alimentaria . Madrid : Secretaría General Técnica, Ministerio de Agricultura, Pesca y Alimentación, 1993-1994
- BC** Pearson, David. Técnicas de laboratorio para el análisis de alimentos / David Pearson ; traducido del inglés por C. Romero, J. L. Miranda y J. L. Suso . [1a ed.],3a reimpr. Zaragoza : Acribia, D.L. 1997
- BC** Primo Yufera, Eduardo. Química agrícola. I, Suelos y fertilizantes / E. Primo Yúfera, J.M. Carrasco Dorrién . 1a ed., reimpr. Madrid : Alhambra, 1987
- BC** Productos derivados de la uva y similares / PANREAC . [s.l.] : Montplet & Esteban, 1983
- BC** Rubinson, Judith F.. Química analítica contemporánea / Judith F. Rubinson, Kenneth A. Rubinson ; Traducción, Ma Teresa Aguilar Ortega ; Revisión técnica, Josefina de Gyves Marciniack . 1a ed. México [etc.] : Pearson Educación : Prentice Hall Hispanoamericana, 2000
- BC** Rubinson, Kenneth A.. Análisis instrumental / Kenneth A. Rubinson, Judith F. Rubinson . 1a. ed. en español Madrid : Pearson Educación, cop. 2001
- BC** Skoog, Douglas A.. Fundamentos de química analítica / Douglas A. Skoog, Donald M. West, F. James Holler . 4a. ed. Barcelona [etc.] : Reverté, D.L. 1996-1997
- BC** Skoog, Douglas A.. Química analítica / Douglas A. Skoog...[et al.] ; traducción María del Carmen Ramírez Medeles ; revisión técnica Luz Beatriz Santos Aquino . 7a. ed. México [etc.] : McGraw-Hill, cop. 2000

The updated recommended bibliography can be consulted in:

<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=28956>