Universitat de Lleida

DEGREE CURRICULUM

ANALYSIS AND APPLIED ENVIRONMENTAL CHEMISTRY

Coordination: BACARDIT DALMASES, ANNA

Academic year 2023-24

ANALYSIS AND APPLIED ENVIRONMENTAL CHEMISTRY 2023-24

Subject's general information

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<tr><td>Subject name</td><td>ANALYSIS AND APPLIED ENVIRONMENTAL CHEMISTRY</td></tr>
<tr><td>Code</td><td>102354</td></tr>
<tr><td>Semester</td><td>1st Q(SEMESTER) CONTINUED EVALUATION</td></tr>
<tr><td>Typology</td><td>
<table>
<tr><th>Degree</th><th>Course</th><th>Character</th><th>Modality</th></tr>
<tr><td>Not informed</td><td>4</td><td>OPTIONAL</td><td>Attendance-based</td></tr>
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<tr><td>Course number of credits (ECTS)</td><td>6</td></tr>
<tr><td>Type of activity, credits, and groups</td><td>
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<tr><th>Activity type</th><th>PRALAB</th><th>PRAULA</th><th>TEORIA</th></tr>
<tr><td>Number of credits</td><td>1</td><td>2</td><td>3</td></tr>
<tr><td>Number of groups</td><td>1</td><td>1</td><td>1</td></tr>
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</td></tr>
<tr><td>Coordination</td><td>BACARDIT DALMASES, ANNA</td></tr>
<tr><td>Department</td><td>INDUSTRIAL AND BUILDING ENGINEERING</td></tr>
<tr><td>Teaching load distribution between lectures and independent student work</td><td>Lectures and laboratory activities 60 hours
Independent study work 90 hours</td></tr>
<tr><td>Important information on data processing</td><td>Consult this link for more information.</td></tr>
<tr><td>Language</td><td>Catalan.
Part of the documentation is in Catalan, part in Spanish, and part in English.</td></tr>
<tr><td>Distribution of credits</td><td>Teoria 3C
Praula 2C
Pralab 1C</td></tr>
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ANALYSIS AND APPLIED ENVIRONMENTAL CHEMISTRY 2023-24

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
BACARDIT DALMASES, ANNA	anna.bacardit@udl.cat	4	
CUADROS DOMENECH, SARA	sara.cuadros@udl.cat	2	

Subject's extra information

This subject is centred on the basic concepts of Industrial Chemical Analysis and aims to deepen into the analysis made in engineering to the substances involved in the leather technology, like the collagen and its amino acids, the polyphenols and tannins, the natural and synthetic polymers, pigments, dyes, wax and oils. The difficulty to identify these complete and complex structures, leads to the need of using IR, UV, mass and RMN spectroscopy, as well as thermal analysis and gas and liquid chromatography. It is highly recommended that the student revises all the concepts of Organic Chemistry and Analytical Chemistry, imparted previously to this subject, so as to remember the core information.

The lessons will give a more amplified and applied outlook of the Analytical Chemistry and Organic Chemistry subjects done in this same degree.

The subject is taught during the first semester and has a total of 6 ECTS, which are divided in: 3 ECTS belong to the imparted theory, 2 ECTS to the exercises, and 1 ECTS to the laboratory practices.

There are specific exercises for every unit and more general solvable problems at the end, where the student will have to put in practice the learnt content in all the units.

Besides, part of the subject involves working in group on a project related to a certain topic studied in class, with specific objectives for each team, in order to enhance an active learning progress.

Lessons are taught in Catalan. However, part of the bibliography and exercises are written in English and Spanish.

It is **COMPULSORY** that the students bring the following elements of individual protection (EPI) to the practices at the laboratory.

- Laboratory gown from UdL
- Protection glasses
- Mechanical protection gloves

They can be purchased through the shop Údels of the UdL:

C/ Jaume II, 67 baixos
Centre the Cultures i Cooperació Transfronterera

http://www.publicacions.udl.cat/

There will be a specific service for the *Campus Universitari d'Igualada*.

The use of other elements of protection (for example caps, masks, gloves of chemical or electrical risk, etc.) will depend on the type of practice to be done. In that case, the teacher will inform of the necessity of specific EPI.

Not bringing the EPI's described or not fulfilling the norms of general security that are detailed below imply that the student can not access to the laboratories or have to go out of them. The no realisation of the practices for this reason imply the **consequences in the evaluation** of the subject that are described in this course guide.

GENERAL NORMS OF SECURITY IN LABORATORY PRACTICES

- Keep the place of realisation of the practices clean and tidy. The table of work has to be free from backpacks, folders, coats...
- No short trousers or short skirts are allowed in the laboratory.
- Closed and covered footwear is compulsory in the laboratory.
- Long hair needs to be tied.
- Keep the laboratoy gown laced in order to be protected from spills of chemicals.
- Bangles, pendants or wide sleeves are not allowed as they can be trapped.
- Avoid the use of contact lenses, since the effect of the chemical products is much bigger if they enter between the contact lense and the cornea. Protection over-glasses can be purchased.
- No food or drink is allowed in the laboratory.
- It is forbidden to smoke in the laboratories.
- Wash your hands whenever you have contact with a chemical product and before going out of the laboratory.
- Follow the instructions of the teacher and of the laboratory technicians and ask for any doubt on security.

For further information, you can check the following document of the *Servei de Prevenció de Riscos Laborals de la UdL*: http://www.sprl.udl.cat/alumnes/index.html

Learning objectives

- To learn the fundamentals of the IR, UV, mass and RMN spectroscopy and their integration with the chromatographic techniques, their applications, as well as their limits.
- To establish relationships between molecular structure and its physical, chemical and spectroscopic properties.
- To know how to correctly read the information given by every method.
- To know how to determine the structure of organic molecules and to solve problems of structural characterization of initial level.
- To apply the studied techniques in this course and the chromatographic methods learned in the previous course to determine the substances involved in the leather technology, like the collagen and its amino acids, the polyphenols and tannins, the natural and synthetic polymers, pigments, dyes, wax and oils.
- To know the use of material and devices found in the analytical chemistry laboratory.
- To use diverse applications of the analytical chemistry to the waste water effluents control in the tanneries.
- To acquire the adequate scientific fundamentals to adapt in any emerging technique or method.

Competences

Basic

B03 That students have the ability to gather and interpret relevant data (usually within their area of study) to make judgments that include a reflection on relevant social, scientific or ethical issues.

B04 That students can transmit information, ideas, problems and solutions to a specialized and non-specialized public.

B05 That students have developed those learning skills necessary to undertake further studies with a high degree of autonomy.

Transversal

CT4. To apply basic knowledge of entrepreneurship and professional environments.

CT5. To apply essential notions of scientific thinking.

General

CG4. To solve problems with initiative, make decisions, creativity, critical reasoning and to communicate and transmit knowledge, skills and abilities in the field of Industrial Organization Engineering.

CG6. To implement specifications, regulations and mandatory rules.

CG7. To analyze and assess the social and environmental impact of technical solutions.

CG8. To apply the principles and methods of quality.

CG10. To work in a multilingual and multidisciplinary environment.

Specific

CE15. Apply the basic knowledge of the production and manufacturing systems.

CE20. Analyse, design, simulate, and optimize processes and products.

Subject contents

Unit 1. Introduction. Objectives. Fundamentals of the structural analysis. Bibliography.

Unit 2. Fundamentals of UV spectroscopy and applications.

Unit 3. Fundamentals of IR spectroscopy and applications.

Unit 4. Fundamentals of mass spectroscopy and applications.

Unit 5. Fundamentals of RMN spectroscopy and applications.

Unit 6. Exercises about the structural classification of organic molecules (Including chromatography - spectroscopy integration).

Unit 7. Characterization and analysis of oil, fat and wax.

Unit 8. Characterization of natural polymers (collagen and its amino acids) and synthetic polymers (phenolic, acrylic, polyurethanes, butadiene and nitrocellulose).

Unit 9. Characterization of polyphenols and tannins.

Unit 10. Fundamentals of the wastewater analysis. Main parameters about the tannery effluents.

Methodology

The development of the Subject includes:

1. Theory in large group classes: Lectures where the professor exposes the definitions, materials and the working plan.

2. Exercises: Problem solving of exercises based on real data and of an increasing difficulty.

3. Practical activities: Laboratory practices, with a later written report.

In every unit, various exercises will have to be done individually and autonomously by the students, and delivered to the teacher to be assessed.

In addition, the students have the responsibility to reinforce their knowledge in an autonomous approach, taking as a basis the content given and/or recommended by the professor.

Development plan

Week	Methodology	Units	Attendance hours	Autonomous working hours
1	Lectures and exercise solving lessons.	Unit 1	2	3
2	Lectures and exercise solving lessons. Practical activity.	Units 1 and 2	4	6
3	Lectures and exercise solving lessons.	Units 2 and 3	4	6
4	Lectures and exercise solving lessons. Practical activity.	Unit 3	4	6
5	Lectures and exercise solving lessons.	Unit 3	4	6
6	Lectures and exercise solving lessons. Practical activity.	Units 3 and 4	4	6
7	Lectures and exercise solving lessons. Practical activity.	Units 4 and 5	4	6
8	Lectures and exercise solving lessons.	Unit 5	2	3
9	Mid-course Exam	Units 1 to first part of Unit 5.	2	6
10	Lectures and exercise solving lessons.	Unit 5	4	6
11	Lectures and exercise solving lessons. Practical activity.	Unit 6	4	6
12	Lectures and exercise solving lessons. Practical activity.	Unit 6	4	6
13	Lectures and exercise solving lessons.	Unit 7	2	3
14	Lectures and exercise solving lessons.	Units 8 and 9	4	6
15	Lectures and exercise solving lessons.	Units 9 and 10	4	6
16-17	Final Exam	Units 1 to 10	2	9
18	Tutoring			
19	Second-chance Exam			

Evaluation

Exercises 20%

Laboratory 20%

Written test 1 (Units 1-4) 20%

Written test 2 (Units 1-10) 40%

Students have the right to take the second chance exam of the Written Test 2 in the 19th week.

In order to have the right to obtain the final grade, the laboratory and exercices must be evaluated.

The student body that has the approval to be evaluated by alternative evaluation (see requirements and procedure in the evaluation regulations) must carry out the written test 1 and written test 2.

Bibliography

Main bibliography

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