



Universidad de Jaén

FACULTY OF EXPERIMENTAL SCIENCES

Inorganic Chemistry of Natural Systems

2024-2025
Grado en Química



CREA



Acceso Mayores 40

Guías docentes UJA

Horarios de tutorías

Llamamientos PEvAU

Movilidad (Coordinador)

P.O.D.

Solicitud bilingüismo

Syllabus 2024-25 - 10313006 - Inorganic Chemistry of Natural Systems (Química inorgánica de los sistemas naturales)

Caption

- Level 1: Tutorial support sessions, materials and exams in this language
- Level 2: Tutorial support sessions, materials, exams and seminars in this language
- Level 3: Tutorial support sessions, materials, exams, seminars and regular lectures in this language

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Full version (Spanish)

English

DEGREE:

Grado en Químicas

FACULTY:

FACULTY OF EXPERIMENTAL SCIENCES

ACADEMIC YEAR:

2024-25

COURSE:

Inorganic Chemistry of Natural Systems

SYLLABUS

1. COURSE BASIC INFORMATION

NAME: Inorganic Chemistry of Natural Systems

CODE: 10313006

ACADEMIC YEAR: 2024-25

LANGUAGE: English

LEVEL: 1

ECTS CREDITS: 6.0

YEAR: 4

SEMESTER: SC

2. LECTURER BASIC INFORMATION

NAME: CANO GALEY, MANUELA

DEPARTMENT: U128 - QUÍMICA INORGÁNICA Y ORGÁNICA

FIELD OF STUDY: 760 - QUÍMICA INORGÁNICA

OFFICE NO.: B3 - B3-462

E-MAIL: mcgaley@ujaen.es

P: 953212737

WEBSITE: -

ORCID: -

LANGUAGE: -

LEVEL: 1

3. CONTENT DESCRIPTION

BLOCK I: CHEMICAL ELEMENTS IN THE ENVIRONMENT AND RESOURCES

Chemical justification of the origin and distribution of the chemical elements in the environment. 1.1. Introduction. 1.2. Structure of nuclei. 1.3. Origin of the universe. 1.4. Nuclear synthesis. 1.5. Manufacture of the elements. 1.6. Formation and structure of the earth.

TOPIC 2. Extraction of metals from natural resources. 2.1. Introduction. 2.2. Limitation of resources. 2.3. Some processes of mineral formation. 2.4. Most important metallic resources. 2.5. Extraction of metals. 2.6. Mineral resources in expansion. 2.7. Non-metallic resources.

TOPIC 3. Corrosion of metals. 3.1. Introduction. 3.2 Corrosion chemistry. 3.3. Factors that influence corrosion. 3.4. Classification of the different types of corrosion. 3.4. Protection against corrosion.

TOPIC 4. Chemical energy sources. 4.1. Introduction. 4.2. Energy conversion processes. 4.3. Fossil fuels. 4.3.1. Coal. 4.3.2. Petroleum. 4.3.3. Natural gas. 4.4. Nuclear energy. 4.4.1 Fission. 4.4.2 Fusion. 4.5. Renewable energy. 4.5.1. Solar energy. 4.5.2. Biomass. 4.5.3. Hydropower. 4.5.4. Wind energy. Ocean energy. 4.5.5. Geothermal energy.

BLOCK II: ELEMENTS AND COMPOUNDS OF AGRICULTURAL AND INDUSTRIAL INTEREST.

TOPIC 5. Nitrogen. 5.1. Introduction. 5.2. Biological cycle of nitrogen. 5.3. Nitrogen fixation. 5.4. The nitrogen industry. 5.5. Nitrogen in agriculture. 5.6 Nitrogen and the environment.

TOPIC 6. Phosphorus. 6.1. Introduction. 6.2. Global phosphorus cycle. 6.3. Phosphorus production and allotropic forms. 6.4. Phosphorus in industry. 6.5. Phosphorus in agriculture. 6.6. Phosphorus and the environment.

TOPIC 7. Sulfur. 7.1. Introduction. 7.2. Sulfur chemistry. 7.3 Sulfur cycle. 7.4. Sulfur in industry and agriculture. 7.5. Sulfur and environment.

TOPIC 8. Silicon. 8.1. Introduction. 8.2. Obtaining pure silicon. Properties and applications. 8.3. Silicates. Classification. 8.4. Silicate industry. 8.5. Silicones. 8.6. Silica gel. 8.7. Silica and environment.

TOPIC 9. Chemical aspects of the carbon and oxygen cycles in the environment. Cycle of other elements. 9.1. Introduction. 9.2. Carbon cycle. 9.3. Oxygen cycle. 9.4. Calcium cycle.

BLOCK III: INFLUENCE OF INORGANIC CHEMISTRY ON THE ENVIRONMENT.

TOPIC 10. Air pollution. 10.1 Atmospheric composition. 10.2. Natural pollutants. 10.3. Anthropogenic pollutants.

TOPIC 11. Inorganic pollutants. 11.1. Carbon oxides. 11.2. Nitrogen oxides. 11.3. Sulfur oxides. 11.4. Other gaseous inorganic pollutants.

CONTROL AND CORRECTION OF INORGANIC AIR POLLUTANTS. 12.1. Introduction. 12.2. Elimination of sulfur oxides. 12.3. 12.3. Removal of hydrogen sulfide. 12.4. Removal of hydrogen fluoride. 12.5. Elimination of nitrogen oxides. 12.6. Removal of solid particulate pollutants.

TOPIC 13. Water contamination by metallic species. 13.1. Causes of metal pollution. 13.2. Fate of metals. 13.3. Factors that condition the accessibility, transport and toxicity of metals in the aquatic environment. 13.4. 13.4. Simplified study of some metals.

TOPIC 14. Contamination of water by anionic species. 14.1. Introduction. 14.2. Simplified study of some anions. 14.2.1. Phosphates. 14.2.2. Nitrates. 14.2.3. Sulfates. 14.2.4. Cyanide.

TOPIC 15. Water treatment. 15.1. Introduction. 15.2. Treatment of water for domestic use. 15.3. 15.3. Water treatment for specific industrial applications. 15.4. 15.4. Wastewater treatment. 15.5. Extraction of organic compounds. 15.6. Extraction of metals. 15.7. Water disinfection.

TOPIC 16.- Chemical contaminants of the lithosphere. 16.1. Introduction. 16.2. Soil salinity. 16.3. Organic contaminants in the soil. 16.4. Inorganic soil contaminants. 16.5. Treatment of contaminated soils.

EXPERIMENTAL PART

Seminars:

- * Resolution of numerical problems and/or questions of practical type.
- * Performance of bibliographical and expository works.

Laboratory experiments:

At least three practices of the following relation will be carried out:

Determination of active chlorine.
 Synthesis of a zeolite. Study of its properties.
 Synthesis of a catalyst. Study of its properties.
 Determination of phosphates in water. Eutrophication.
 Study of the elimination of pollutants in water.

Visit to a Chemical Industry:

An organized visit to a Chemical Industry will be carried out, which will be chosen from the following:

Visit to a solid urban waste treatment plant
 Visit to a Paper Industry
 Visit to a Waste Water Treatment Plant

4. COURSE DESCRIPTION AND TEACHING METHODOLOGY

EXPOSITORY CLASSES IN LARGE GROUPS:

A fundamentally expository method will be used by means of a blackboard and audiovisual resources. At the beginning of each lesson, the content of each subject will be presented, highlighting the main objectives.

Teachers will encourage student participation at all times.

Part of the syllabus will be developed through the use of the PLATEA platform (Topics 1-9).

SEMINARS IN SMALL GROUPS:

The following activities will be carried out in small groups:

a) Seminars in class: in these sessions students will answer questionnaires on previously searched information related to environmental issues and/or make presentations (Topics 10-16). Numerical questions or problems may be posed and solved.

b) Laboratory classes: in these classes students will design and/or perform in pairs new experiments related to topics 10-16.

c) Visit to an industry: An organised visit to an industry will be made, which will be chosen from the following:

i) Visit to an Urban Solid Waste Treatment Plant; ii) Visit to a Water Treatment Plant; iii) Visit to a Paper Industry.

Students with special educational needs should contact the Student Attention Service (Servicio de Atención y Ayudas al Estudiante) in order to receive the appropriate academic support

5. ASSESSMENT METHODOLOGY

The evaluation will be carried out according to the following percentages:

a) S2, 60%: Written exam, competencies B1, Q3, and B11 will be evaluated.

b) S4, 20%: The work done during the development of the classes (10%) and laboratory practices (10%) will be evaluated.

This evaluation will include competences B11 and P3.

c) S3, 20%: Work done by students in directed activities (10%), bibliographic works and class expositions (10%). Competences B1 and Q3 will be evaluated.

Extraordinary exams: For the evaluation of the extraordinary exams of the academic year 2023-2024 will be taken into account, with the same percentages and the same values as in the ordinary call, the grades obtained throughout the course, with the same percentages and the same values as in the ordinary call, will be taken into account.

obtained throughout the course, in the aspects: completion of work, cases or exercises, as well as, laboratory/computer practices.

6. BOOKLIST ([Access the bibliography in the Library catalog](#))

MAIN BOOKLIST:

- Chemistry of the environment. Edition: 3rd ed. Author: Spiro, Thomas G. Publisher: [Mill Valley, Calif.] : University Science Books, 2012 ([Library](#))
- Energy Resources and Systems [Recurso electrónico] : Volume 2: Renewable Resources. Edition: -. Author: Ghosh, Tushar K. Publisher: Dordrecht : Springer Netherlands, 2011 ([Library](#))
- Energy Resources and Systems [Recurso electrónico] : Volume 1: Fundamentals and Non-Renewable Resour. Edition: -. Author: Ghosh, Tushar K.. Publisher: Dordrecht : Springer Netherlands, 2009. ([Library](#))
- Environmental chemistry: a modular approach. Edition: -. Author: Williams, Ian. Publisher: Chichester [etc.]: John Wiley & Sons, cop. 2001 ([Library](#))

7. SUSTAINABLE DEVELOPMENT GOALS

Educación de calidad

Igualdad de género

Agua limpia y saneamiento

Producción y consumo responsables

Acción por el clima

DETAILED INFORMATION

Through the study of this subject, the aim is to make students aware of some of the SDGs through classroom activities:

Ensure that all learners acquire the knowledge and skills needed to promote sustainable development (Target 4.7).

Ensure women's full and effective participation and equal opportunities (Target 5.5)

Improve water quality by reducing pollution, eliminating dumping and minimising the release of chemicals and hazardous materials (Target 6.3)

Efficient use of natural resources (Target 12.2) through waste prevention, reduction, recycling and reuse (Targets 12.4 and 12.5).

Improving environmental education and awareness (Target 13.3).

8. VIRTUAL / CLASSROOM TEACHING SCENARIO

TEACHING METHODOLOGY AND TRAINING ACTIVITIES

A1: Lectures in large groups (32 hours).

A2: Classes in practical groups (10 hours) and seminar classes in small groups (10 hours).

There will be a visit to an industry (6 hours).

A3: Tutorials (2 hours).

EVALUATION SYSTEM

The evaluation system will be face-to-face as far as conditions allow.

RESOURCES

For telematic actions, the technical means provided by the University will be used, including the PLATEA platform, or the set of tools included in Google Suite, as well as other types of resources such as electronic bibliographic resources that do not require physical presence in the library.

Teaching staff involved in teaching reserve the right to withhold consent for the recording, publication, retransmission or reproduction of their speech, image, voice and lecture explanations, in the exercise of their teaching duties, within the University of Jaén.

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Teaching staff involved in teaching reserve the right to withhold consent for the recording, publication, retransmission or reproduction of their speech, image, voice and lecture explanations, in the exercise of their teaching duties, within the University of Jaén.

DATA PROTECTION CLAUSE (on line exams)

Institution in charge of data processing: Universidad de Jaén, Campus Las Lagunillas, s/n, 23071 Jaén

Data Protection Delegate: dpo@ujaen.es

Purpose: In accordance with the Universities Law and other national and regional regulations in force, carrying out exams and assessment tests corresponding to the courses students are registered in. In order to avoid frauds while sitting the exam, the exam will be answered using a videoconference system, being able the academic staff of the University of Jaén to compare and contrast the image of the person who is answering the exam with the student's photographic files. Likewise, in order to provide the exam with evidential content for revisions or claims, in accordance with current regulation frameworks, the exam will be recorded and stored.

Legitimacy: compliance with legal obligations (Universities Law) and other national and regional regulations currently in force.

Addressees: service providers who are the owners of the platforms where the exams are carried out and with whom the University of Jaén has signed the corresponding data access contracts.

Storage periods: those established in current in force regulations. In the specific case of exam videoconference recordings, not before the examination records and transcripts are closed or the exam can still be reviewed or challenged.

Rights: you can exercise your right of access, amendment, cancellation, opposition, suppression, limitation and portability by sending a letter to the postal or electronic address indicated above. In the event that you consider that your rights have been violated, you may submit a complaint to the Andalusian Council for Transparency and Data Protection www.ctpdandalucia.es

CLASS RECORDING CLAUSE PERSONAL DATA PROTECTION

Person in charge: Universidad de Jaén, Paraje Las Lagunillas, s/n; Tel.953 212121; www.ujaen.es

Data protection delegate (DPO): TELEFÓNICA, S.A.U. ; Email: dpo@ujaen.es

Procedure aim: To manage proper recordings of teaching sessions with the aim of facilitating learning process under a multimodal and/or online teaching

Period for record storage: Images will be kept during legal term according to regulations in force

Legitimacy: Data will be managed according to legal regulations (Organic Law 6/2001, December 21, on Universities) and given consent provided by selecting corresponding box in legal admission documents

Data recipients (transfers or assignments): Any person allowed to get access to every teaching modality

Rights: You may exercise your rights of access, rectification, cancellation, portability, limitation of processing, deletion or, where appropriate, opposition. To exercise these rights, you must submit a written request to the Information, Registration and Electronic Administration Service of the University of Jaen at the address above, or by e-mail to the address above. You must specify which of these rights you are requesting to be satisfied and, at the same time, you must attach a photocopy of your ID card or equivalent identification document. In case you act through a representative, legal or voluntary, you must also provide a document that proves this representation and identification. Likewise, if you consider that your right to personal data protection has been violated, you may file a complaint with the Andalusian Data Protection and Transparency Council www.ctpdandalucia.es

Campus Las Lagunillas s/n | 23071 - Jaén

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