

69751 - Material cycles

Syllabus Information

Academic year: 2024/25

Subject: 69751 - Material cycles

Faculty / School: 100 - Facultad de Ciencias

Degree: 627 - Master's Degree in Circular Economy
655 -

ECTS: 6.0

Year: 01

Semester: First semester

Subject type: Compulsory

Module:

1. General information

The subject of *Material Cycles* is designed to learn about the main features of natural and technical cycles of elements and water. The subject is taught from the University of Zaragoza. Regular use of the teaching platform and daily study of the concepts presented is recommended, with special emphasis on the solving of practical activities. It is also quite important to make use of personalised tutoring.

2. Learning results

- To describe the interaction of chemicals with the environment, including greenhouse gases and pollutants in air, water and soil.
- To evaluate the scientific and technical limits of economic development due to the use of critical raw materials.
- Critical thinking. To reason reflectively on a topic, being able to deliberate on its validity by subjecting one's own and external convictions to debate.
- To indicate the fundamentals of the natural and technical cycles of chemical elements and water.
- Democratic values and sustainability. To develop a commitment to the society in which we live so that it prospers through the dimensions of democratic values and sustainability, materialised in the global framework that defines it at all times.

3. Syllabus

Topic 1. Biogeochemical (natural) and anthropogenic (technical) cycles.

Topic 2. Atmosphere.

Topic 3. Water cycle.

Topic 4. Element cycles.

Topic 5. Persistent Organic Pollutants (POPs): depletion, remediation.

Topic 6. Biophysical limits of the planet: geographical distribution, resource availability and evolution.

Topic 7. Analysis of stocks and flows of raw materials in the technosphere.

Topic 8. Hubbert's Peak.

Topic 9. Criticality of raw materials.

Topic 10. Metal recycling: secondary raw materials, quality standards, downcycling, upcycling.

4. Academic activities

Master classes: 24 hours

Sessions of 50 minutes each for the entire group. Teachers explain the theoretical contents and solve representative applied problems. The teaching materials are available on the Moodle teaching platform. Regular attendance is recommended.

Problem solving and case studies: 36 hours of student work, including 12 face-to-face hours.

Students must prepare two reports.

Study: 83 hours

Students must study theory, read supplementary readings and prepare for the final test.

Assessment tests: 7 hours

Students take a final short answer, long answer and/or open-ended questions test.

5. Assessment system

The subject is assessed using two evaluation methods: continuous and global. For this, the grades obtained in the following tests will be used:

- A report (rated I). The report consists of a report on a topic related to the subject or the critical analysis of a research or popularisation article. The reports are sent to the lecturer electronically.
- Final short answer, long answer and/or open-ended question test (graded F). The test is held simultaneously in each university under conditions that guarantee the proper identification of students and the impossibility of fraud

The grades obtained by each student in the above assessment activities are weighted according to the following formulas:

Fórmula 1:

Final grade of the subject: $0.3 \times I + 0.7 \times F$

Fórmula 2:

Final grade for the subject: F

For the application of formula 1, it is necessary to obtain at least a 4 in the assessment test. The final mark for the subject is calculated as the best grade obtained between those obtained with formulas 1 and 2.

6. Sustainable Development Goals

9 - Industry, Innovation and Infrastructure
12 - Responsible Production and Consumption
13 - Climate Action