Materials and their environmental impact

Academic Year: (2022 / 2023) **Review date: 24-01-2023**

Department assigned to the subject: Materials Science and Engineering and Chemical Engineering Department

Coordinating teacher: RABANAL JIMENEZ, MARIA EUGENIA

Type: Electives ECTS Credits : 3.0

Year : 4 Semester :

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Chemical Basis of Engineering
Materials Science and Engineering
Industrial Materials

OBJECTIVES

By the end of this content area, students will be able to have:
1. a systematic understanding of the key aspects and concepts of materials science and engineering.
2. coherent knowledge of materials science and engineering including some at the forefront of the branch in mechanical engineering.
3. awareness of the wider multidisciplinary context of engineering.
4. the ability to apply their knowledge and understanding to identify, formulate and solve problems of materials science and engineering using established methods.
5. the ability to design and conduct appropriate experiments of materials science and engineering, interpret the data and draw conclusions.
6. workshop and laboratory skills in materials science and engineering.
7. demonstrate awareness of the health, safety and legal issues and responsibilities of engineering practice, the impact of engineering solutions in a societal and environmental context, and commit to professional ethics, responsibilities and norms of engineering practice.

DESCRIPTION OF CONTENTS: PROGRAMME

Topic 1: Environmental impact of materials. Life cycle of materials. The population and the materials. Reuse and recycling: circular economy. Solid industrial and urban waste. Separation and selection of the RSU. Complex waste: transport vehicles
Topic 2: Recycling of metals and alloys. Integral cycle of metals. Secondary metallurgy Regeneration and welding of railway rail. Pyrometallurgy: Treatment of scrap steel. Recycled aluminum Recycled tin. Hydrometallurgy: Recycling of heavy metals. Recycled lead batteries. Recycling of batteries and batteries. Mercury management
Topic 3. Recycling of ceramic materials. Separation and preparation of construction materials. Difference between glass and glass. Separation by colors. Recycling of glass. Manufacture of containers, fibers, microspheres ... Recycling of photovoltaic cells. Light bulbs, fluorescent tubes, and mercury lamps. Recycled battery: primary, Ni-Cd / Pb / battery Li-ion, ...
Topic 4. Recycling of plastics and composites. Plastic separation treatment. Reuse of hot melts. Recycled thermostable. The "bio" plastics Separation of the elements of the composite materials. Recycled GFRP and CFRP. Reuse or recycling: the cases of tires and tetrabrik.
Topic 5. Obtaining enriched uranium. Low activity wastes High activity wastes: ATC and Deep Burial. Decommissioning of a plant. Recycling of nuclear fuel. Map of the future of nuclear energy.

LEARNING ACTIVITIES AND METHODOLOGY

Master classes, personal and group work, student presentations; oriented to the acquisition of theoretical knowledge.
- The course consists of lectures and practical classes in the classroom that will include the exhibition of work on topics related to Asigntura. (13 sessions
- The student may apply for individual tutoring with his/her teachers prior appointment.
- -All teaching materials (class transparencies, worksheets, practice scripts, and additional material) will be available through the Global Classroom 2 platform in advance.

ASSESSMENT SYSTEM

- The student's final grade will be the weighted average of the continuous assessment of the student's work throughout the course, the final exam grade and the grade of the papers (oral presentation and written work).
- The continuous evaluation throughout the course takes on a particular importance in the subject and represents up to 40% of the final grade. The students will have to prepare written documentation and will make the oral presentation of at least one work on the thematics or the contents of the subject.
- In the regular final exam, the student is evaluated of the remaining 60% of the grade, being necessary to pass this exam with a grade equal to or greater than 4 to be weighted with the rest of the continuous assessment.
- The remaining 40% corresponds to the continuous evaluation. The pass is achieved by reaching a global final grade of 5

Extraordinary exam.
It will be 60% of the mark if the continuous evaluation is taken into account
It will be 100% of the mark if continuous evaluation is not taken into account

% end-of-term-examination:	60
% of continuous assessment (assigments, laboratory, practicals…):	40

BASIC BIBLIOGRAPHY

- AMO KWADE Recycling of Lithium Batteries, Springer, 2018
- ENRIC VAZQUEZ Progress of Recycling in the Built Environment, Springer.
- HUGO MARCELO VEIT Electronic Waste: Recycling techniques, Springer.
- M. Seoánez Tratado de reciclado y recuperación de productos de los residuos, Mundi-Prensa, 2000
- SIMON AICHER, H-W. REINHARDT Materials and joints in timber structures, Springer.
- SUBRAMANIAN SENTHIKANNAN Suatainable Innovation in Recycled Textiles, Springer, 2018
- Varios The McGraw-Hill recycling Handbook, McGraw-Hill , 1996
- Varios Gestion integral de residuos sólidos, McGraw-Hill, 1994