COURSE DATA

Data Subject	
Code	44609
Name	Green chemistry
Cycle	Master's degree
ECTS Credits	5.0
Academic year	2017 - 2018

Study (s)

Degree	Center	Acad. year	Period
2218 - Master's Degree in Chemistry	Faculty of Chemistry	1	NULL

Subject-matter

Degree	Subject-matter	Character
2218 - Master's Degree in Chemistry	4 - Green chemistry	Optional

Coordination

Name	Department
GRACIA EDO, LOURDES	315 - Physical Chemistry

SUMMARY

Green Chemistry is the orientation of chemistry, as a set of theoretical and applied knowledge, whose specific aim is the prevention of environmental contamination and the risks associated with chemical products, by introducing or stressing of clean and safe production processes and of less toxic and contaminant chemical products without reducing its contribution to wellness and technological progress.

Sustainable Chemistry must be considered as a part of Environmental Chemistry and endeavours to achieve the current and future prevention of contamination and risk problems originated by chemical substances, by analysing the origin of these problems. With the premises, the objectives of Green Chemistry are the following:

Reducing the generation and use of contaminants in the chemical process

Reducing the risky character of the chemical process

Reducing the noxious effect of the chemicals used by the production sectors or the final consumer.

Reducing the use of extinguishable and scarce raw materials.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

Chemistry knowledge acquired during the Chemistry Degree are required.

COMPETENCES (RD 1393/2007) // LEARNING OUTCOMES (RD 822/2021)

LEARNING OUTCOMES (RD 1393/2007) // NO CONTENT (RD 822/2021)

Be able to valorise the role of Chemistry and its influence on the environment

Be able to valorise the important role of Green Chemistry in the search of more efficient and environmental friendly products and processes.

Identify the residues generated in the different steps of the chemical processes in order to proceed to its possible reuse or selective collection of toxic residues.

Describe the main sources of chemical products and their treatment for the transformation into added value materials.

Know the role of chemistry in the main sources of renewable energy and in the methods for energy storage.

Know the recycling processes of the main materials and metals.

Design, synthesise and perform effective analytical processes for obtaining and valorising products.

Use the different sustainable tools of Chemistry.

DESCRIPTION OF CONTENTS

1. Introduction

Objectives. Use of renewable sources of raw materials. Reduction of polluting substances: chemical substances (Atomic economy, Factor E) and energy. Reduction of the risk associated with substances with toxic, dangerous or aggressive nature: measures of toxicity. Environmental management systems. Legislation.

2. Use of renewable sources of raw materials

Chemical products from glucose. Chemicals from fatty acids. Polymers from renewable sources. Other products from renewable sources.

3. Renewable energy sources

Main renewable energy sources. Solar, eolic, hydroelectric and biomass. Other renewable energy sources. Energy storage systems.

4. Recycling

Waste recycling: paper, plastics, glass, batteries, common metals (Al, Pb,...), scarce metals (Au, Rh, Pd, Ta,...),...

5. Design of sustainable processes. Industrial examples

Factors to consider for the design of a sustainable process. Complete study. Industrial examples.

6. Catalysis: green concepts and applications.

7. Real-time monitoring.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	40,00	100
Tutorials	5,00	100
Seminars	5,00	100
Attendance at events and external activities	5,00	0
Development of group work	20,00	0
Study and independent work	25,00	0
Readings supplementary material	10,00	0
Preparation of practical classes and problem	15,00	0
TOTAL	**125,00**	

TEACHING METHODOLOGY

English version is not available

EVALUATION

The evaluation of the course will be carried out in a continuous manner by the teacher throughout the course and will consist of the following sections.

• Direct evaluation of the teacher. 20% of the note shall direct evaluation of the professor in theoretical classes and problems and in the tutorials. This assessment shall take into account various aspects, which include:

- Attendance and participation reasoned and clear in the discussions raised.

- Progress in the use of the language of the subject.

- Problem solving and approach of doubts.

- Critical thinking.

- Delivery of exercises.

- Use of visits and seminars.

● Evaluation visits and seminars. Be taken into account the responses to the questionnaires raised them on visits and seminars. To this section you will be up 30% of the final note.

● Oral presentation. 50% note is obtained from the presentation that made the students of the assigned work. The skills such as problem solving, of content related to the matter that will be of such a nature that make the student to relate different aspects that appear on different topics of the course and even in different subjects will both be assessed.

REFERENCES

Basic

- M. Lancaster, Green Chemistry, An Introductory Text, Royal Society of Chemistry, Cambridge, 2002
- J. Clark, D. Macquarrie, Handbook of Green Chemistry and Technology, Blackwell, Oxford, 2002
- P. T. Anastas, J. C. Warner, Green Chemistry: Theory and Practice, Oxford University Press, Oxford, 1998
- R. Mestres, Química Sostenible, Ed. Síntesis, 2011
- de la Guardia M. y Armenta S., Green Analytical Chemistry: Theory and Practice, Elsevier, Amsterdam, 2011.
- de la Guardia M. y Garrigues S. (ed), Challenges in Green Analytical Chemistry, RSC Publishing, Cambridge, 2011.
- Rothenberg, G., Catalysis. Concepts and Green Applications. Wiley-VCH, Weinheim, ISBN: 978-3-527-31824-7

Additional

- M. C. Cann, M. E. Connelly, Real-World Cases in Green Chemistry, American Chemical Society, Washington, 2000
- Revista Green Chemistry, 24 números año, Walter Leitner ed., RSC, desde 1999.
- R. L. Garrett, Pollution Prevention, Green Chemistry, and the Design of Safer Chemicals, en, S. C. DeVito y R. L. Garrett Ed., Designing Safer Chemicals, ACS Symposium Series, American Chemical Society, Washington, 1996