COURSE DATA

Data Subject	
Code	34759
Name	Environment and sustainability
Cycle	Grade
ECTS Credits	6.0
Academic year	2020 - 2021

Study (s)

Degree	Center	Acad. year	Period
1401 - Degree in Chemical Engineering	School of Engineering	2	First term

Subject-matter

Degree	Subject-matter	Character
1401 - Degree in Chemical Engineering	12 - Principles of environmental technologies and sustainability	Obligatory

Coordination

Name	Department
BORRAS FALOMIR, LUIS	245 - Chemical Engineering
RUANO GARCIA, MARIA VICTORIA	245 - Chemical Engineering

SUMMARY

The main objective of the subject Environment and Sustainability is to gain a global view of the environmental pollution on the basis of its origins and problems, attending also to the sustainability principles, the environmental technologies and its application. It is a compulsory subject that is taught quarterly in the first semester of the second year of the Degree in Chemical Engineering. The subject consists of a total of 6 ECTS.

This subject aims for students to become aware of environmental problems, mainly those derived from industrial activities, and that they acquire the strategies and approaches to solve these problems from the perspective of sustainable development principles, prevention of pollution, or, ultimately, from the application of remediation technologies.

The general objectives of the subject are:

- Introduce to students the origins of pollution, its problems and basic principles for its control.
- Ensure that the student understands the concept of sustainability and its integration in the industrial activity.

- To acquaint students with the tools of environmental management, and especially its application in industry.
- Introduce to students the different measures and technologies for the prevention and control of pollution.
- Stimulate and encourage the student those values and attitudes of respect for the environment that should be inherent to an engineer.

The subject contents are: **Sources of environmental pollution. Assessment of water quality. Types of waste and its characterization. Air pollutants. Measurement and control of air quality. Soil contamination. Legislative framework. Waste management strategies, wasted effluents and emissions. Concept of sustainability. Tools for sustainable development in the industry. Wastewater, waste and atmospheric emissions treatment schemes.**

Observations: The theory classes will be taught in Spanish and practical classes as stated in the course sheet available on the website of the degree.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

It is recommended that the student has basic knowledge of physics, chemistry and mass- and energy-balances.

OUTCOMES

1401 - Degree in Chemical Engineering

- G3 - Knowledge of basic and technological subjects that allows students to learn new methods and theories and provides them with versatility to adapt to new situations.
- G4 - Ability to solve problems with initiative, decision-making skills, creativity and critical reasoning and to communicate and transmit knowledge, abilities and skills in the field of industrial engineering.
- G5 - Knowledge to carry out measurements, calculations, assessments, appraisals, surveys, studies, reports, work plans and analogous work.

- G6 - Ability to deal with specifications, regulations and mandatory standards.
- G7 - Ability to analyse and assess the social and environmental impact of technical solutions.
- G8 - Ability to apply the principles and methods of quality control.
- G11 - Knowledge, understanding and ability to apply the necessary legislation for practising professionally as a qualified industrial technical engineer.
- R10 - Basic and applied knowledge of environmental technologies and sustainability.

LEARNING OUTCOMES

Learning outcomes:

- Knowing the sources of pollution (Skills G3, G5 and R10).
- Establish criteria for assessing water quality (Skills G3, G4, G5, G6, G7, G8, G11 and R10).
- Have knowledge of different types of leaks, waste and emissions into the atmosphere, and its problems (Skills G3, G4, G5, G6, G7, G11 and R10).
- Knowing the problems of soil contamination (Skills G3, G6 and G7).
- Establish the framework legislation on environmental (Skills G5, G6 and G11).
- Gain knowledge of the waste and emissions management strategies (Skills G6, G7, G8, G11 and R10).
- Understand the concept of sustainability and its application to industry (Skills G3, G7 and R10).
- Acquire a basic knowledge of wastewater, waste and atmospheric emissions treatment schemes (Skills G3, G8 and R10).

Skills to be acquired:

The student should be able to:

- Recognize the origins and sources of water, atmosphere and soil pollutants
- Understand the application of the principles of sustainability in production processes
- Describe the objectives and characteristics of the Environmental Management Systems
- Identify engineer's functions in environmental aspects
- Recognize the parameters for the assessment of water, air and soil quality
- Identify the different types of leaks, waste and atmospheric emissions problems
- Gather and understand the environmental regulations
- Define the principles of environment oriented-design and tools for its application
- Consider options for waste and emissions management
- List the principles of integrated pollution prevention
- Gather information on Best Available Techniques
- Recognize the main wastewater, waste and atmospheric emissions treatment schemes

In addition to the specific objectives mentioned above, the subject will encourage the development of several **social and technical abilities**, among which include

- Capacity for critical analysis and synthesis
- Appropriate use of scientific and technical terms
- Ability to communicate orally and in writing
- Skills in interpersonal relationships
- Ability to learn independently
- Creativity. Ability to explore new situations

DESCRIPTION OF CONTENTS

1. ORIGINS AND PROBLEMS OF ENVIRONMENTAL POLLUTION

Economy, Society and Environment. Interaction between industry and environment. Concept of sustainability and its integration into production processes. Tools for sustainable development in the industry. Environmental Management Systems. Functions of the engineer.

2. WASTE AND EMISSIONS MANAGEMENT STRATEGIES

Waste and air emissions. Legal Framework. Prevention/minimization, reuse, recycling, valorization, final treatment.

3. DESIGN FOR ENVIRONMENT

Integrated Product Policy. Life cycle analysis. Ecodesign. Design for X.

4. INTEGRATED POLLUTION PREVENTION IN INDUSTRIAL PROCESSES

Legal Framework. Types of actions. Best available technologies. Lines of action.

5. POLLUTION CHARACTERIZATION

Assessment of water quality. Types of waste and characterization. Air pollutants. Measurement and control of air quality. Soil contamination. Other types of pollution.

6. TECHNOLOGIES FOR THE MANAGEMENT AND TREATMENT OF WASTE AND EMISSIONS

Wastewater, waste and atmospheric emissions treatment schemes.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	45,00	100
Classroom practices	15,00	100
Development of group work	15,00	0
Development of individual work	15,00	0
Preparation of evaluation activities	20,00	0
Preparing lectures	20,00	0
Preparation of practical classes and problem	20,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

The methodology used in the course will consider the following aspects:

Classroom Sessions: a global view of each part will be offered to the students, and they will be focused on those key concepts that will be developed as well as resources to be used for further preparation of the subject in depth. These sessions will present examples and some practical applications, will solve problems and will include presentations and work on groups to enhance the assimilation of the concepts introduced (Skills G3, G5, G6, G7, G8, G11 and R10).

Practical Activities: includes practical classes and seminars that will include, under the supervision of the teacher, practical problems and presentations (Skills G3, G4, G5, G6, G7, G8, G11 and R10).

EVALUATION

The subject will be evaluated, both in the first and second call, by continuous evaluation and by conducting a final objective test on the date of official call.

- Continuous evaluation: It consists of the realization and delivery of activities, not recoverable, in which the theoretical concepts studied in the classroom are worked on. Some of these activities must be carried out in the classroom sessions, while others consist on deliverable homework.
- Objective test: consists of an exam composed of a part of theory and a part of problems. To pass this test the student must obtain, at least 5 points out of 10.

The final grade will be obtained as the maximum grade of:

- Average of the grade of the activities delivered (60%) and the grade of the objective test (40%)
- Grade obtained in the objective test (100%)

The minimum grade to pass the subject is 5 points out of 10. The final grade of students who have not passed the course for having obtained in the objetive test a mark less than 5 points out of 10, will be the grade obteined in the objetive test.

In any case, the evaluation system will be governed by the provisions of the Regulation of Appraisal and Qualification of the University of Valencia per a títols de Grau i Màster (http://links.uv.es/7S40pjF).

REFERENCES

Basic

- Aranda, A.; Zabalza, I. (2010) Ecodiseño y análisis de ciclo de vida. Prensas Universitarias de Zaragoza.
- Capuz, S.; Gómez, T. et al. (2002): ECODISEÑO. Ingeniería del ciclo de vida para el desarrollo de productos sostenibles". Editorial Universidad Politécnica de Valencia, Ref.: 2002.675. Valencia.
- Directiva 2010/75/UE del Parlamento Europeo y del Consejo de 24 de noviembre de 2010 sobre las emisiones industriales (prevención y control integrados de la contaminación) (Texto completo en línea)
- Freeman, H.M. (1998): Manual de prevención de la contaminación industrial. Ed. McGraw-Hill.
- Hill, M.K. (2004) Understanding Environmental Pollution. Ed. Cambridge University Press - M.U.A. (Texto completo en línea)
- Kiely (1999) Ingeniería Ambiental.. Ed. McGraw-Hill
- Manual práctico de ecodiseño. Operativa de implantación en 7 pasos (2000). IHOBE. Gobierno Vasco, Departamento de ordenación del territorio, vivienda y medio ambiente
- Rieradevall, J.; Vinyets, J. (1999): Ecodiseño y ecoproductos. Ed. Rubes. Barcelona
- Rigola, M.; (1998). Producció + neta. Barcelona. Ed. Rubes.
- Weiner, R.F., Peirce, J.J., Vesilind, P.A. (1997) Environmental Pollution and Control. Ed. Butterworth-Heinemann. (Texto completo en línea)

Additional

- Clemente, G.; Sanjuan, N. y Vivancos, J.L. (2005) Análisis de ciclo de vida: aspectos metodológicos y casos prácticos. Editorial Universidad Politécnica de Valencia, Ref.: 200.2533. Valencia.
- Elías, X. (2009) Reciclaje de residuos industriales. Residuos sólidos urbanos y fangos de depuradora. Ed. Diaz de Dantos
- J. Ferrer, C. Gabaldón, M. Martín, P. Marzal y A. Seco (1994) Residuos industriales: Minimización y tratamiento. Consejo de Cámaras de Comercio de la Comunidad Valenciana

- Hester, R.E., Harrison, R.M. (1995) Waste Treatment and Disposal. Ed. The Royal Society of Chemistry. (Texto completo en línea)
- Polprasert (2007) Organic Waste Recycling. IWA Pubblishing
- Vesilind, P.A. (2003) Wastewater treatment plant design. Ed. IWA Publishing
- Wark, K.; Warner, C.F.; Davis, W.T. (1998) Air pollution. Its origin and control. Ed. Addison-Wesley
- Woodard & Curran, Inc. (2005) Industrial Waste Treatment Handbook. Ed. Butterworth-Heinemann.(Texto completo en línea)

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

Contents

The contents initially established in the Course Guide are maintained.

Workload and planning of teaching

Workload

The activities described in the Course Guide with their time dedication are maintained.

Planning of teaching

The resources used in the theoretical and practical sessions allow to continue with the planning of teaching both in days and in scheduled, both of if is in-person class or not.

Teaching methodology

In the theoretical and practical classes, there will be the maximum in-person class sessions, always respecting the sanitary restrictions that limit the classroom capacity to 50% of their usual occupation.

Depending on the classroom capacity and the number of students enrolled, it could be necessary to distribute the students into two groups. If this situation occurs, each group will assist to the in-person class sessions by rotating shifts, thus ensuring compliance with the limitation of classroom capacity. The rotation system will be established once the enrollment results is known, guaranteeing, in any case, that the percentage of in-person classes for all the students enrolled in the subject is the same. For non-in-person theoretical and practical classes, preferably, there will be a synchronous online teaching model, as long as compatibility with other scheduled activities allows. Online teaching will be carried out by synchronous videoconference respecting the timetable, or, if not possible, asynchronous.

Once the enrollment results and the availability of spaces are known, the Comisión Académica de la Titulación will approve the Teaching Model of the Degree and its adaptation to each subject, establishing the specific conditions in which the teaching will be developed.

If there is a closure of the facilities for sanitary reasons that totally or partially affects the classes, these will be replaced by non-person sessions following the established timetable.

Evaluación

The evaluation system described in the Course Guide in which the activities have been specified as well as their contribution to the final grade of the subject is maintained.

If there is a closure of the facilities for sanitary reasons that affect the development of any face-to-face evaluable activity, it will be replaced by a test/activity of a similar nature that will be carried out in virtual mode using the computer tools licensed by the University of Valencia. The contribution of each evaluable activity to the final grade of the course will remain unchanged, as established in this guide.

References

The recommended references in the Course Guide is maintained, since they are available. In addition, it will be complemented with notes, slides and problems uploaded to the Virtual Classroom.