VNIVERSITAT DE VALÈNCIA

Course Guide
44437 Management and treatment of industrial emissions and waste

COURSE DATA

Data Subject	
Code	44437
Name	Management and treatment of industrial emissions and waste
Cycle	Master's degree
ECTS Credits	6.0
Academic year	2021 - 2022

Study (s)

Degree	Center	Acad. year	Period
2209 - M.D. in Chemical Engineering	School of Engineering	1	Second term

Subject-matter

Degree	Subject-matter	Character
2209 - M.D. in Chemical Engineering	10 - Management and treatment of industrial emissions and waste	Obligatory

Coordination

Name	Department
BORRAS FALOMIR, LUIS	245 - Chemical Engineering
GABALDON GARCIA, M CARMEN	245 - Chemical Engineering

SUMMARY

Management and Treatment of Industrial Wastes and Emissions is a subject of 6 credits of the MsC on Chemical Engineering. This subject is taught in Spanish.

The student will get the practical knowledge on environmental management for industries and facilities. The subject will provide for an integrated approach to prevention and control of emissions into air, water and soil, to waste management and to accident prevention.

The contents are: Basic principles for environmental management for industries. Pollution prevention of industrial processes. Segregation of waste streams. Minimization and recycling of industrial waste. Treatment and reuse of industrial wastewater. Treatment of industrial waste. Air pollution control.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

OUTCOMES

2209 - M.D. in Chemical Engineering

- Students should be able to integrate knowledge and address the complexity of making informed judgments based on incomplete or limited information, including reflections on the social and ethical responsibilities associated with the application of their knowledge and judgments.
- Students should communicate conclusions and underlying knowledge clearly and unambiguously to both specialized and non-specialized audiences.
- Students should demonstrate self-directed learning skills for continued academic growth.
- Be able to apply the scientific method and the principles of engineering and economics to formulate and solve complex problems in processes, equipment, facilities and services in which matter changes its composition, state or energy content, these changes being characteristic of the chemical industry and of other related sectors such as pharmacology, biotechnology, materials science, energy, food or the environment.
- Conceive, plan, calculate and design processes, equipment, industrial facilities and services in the field of chemical engineering and other related industrial sectors in terms of quality, safety, economics, rational and efficient use of natural resources and environmental conservation.
- Be able to analyse and synthesise for the continued progress of products, processes, systems and services while applying criteria of safety, affordability, quality and environmental management.
- Integrate knowledge and handle the complexity of formulating judgments and decisions, based on incomplete or limited information, which take account of the social and ethical responsibilities of professional practice.
- Adapt to changes and be able to apply new and advanced technologies and other relevant developments with initiative and entrepreneurship.
- Have skills for independent learning in order to maintain and enhance the specific competences of chemical engineering which enable continuous professional development.
- Be able to access information tools in different areas of knowledge and use them properly.
- Be able to assess the need to complete their technical, scientific, language, computer, literary, ethical, social and human education, and to organise their own learning with a high degree of autonomy.

- Be able to defend criteria with rigor and arguments and to present them properly and accurately.
- Be able to take responsibility for their own professional development and specialisation in one or more fields of study.
- Design products, processes, systems and services for the chemical industry and optimise others already developed, on the basis of the technologies of various areas of chemical engineering including transport processes and phenomena, separation operations and engineering of chemical, nuclear, electrochemical and biochemical reactions.
- Apply critical reasoning to their knowledge of mathematics, physics, chemistry, biology and other natural sciences, obtained through study, experience and practice, in order to establish economically viable solutions to technical problems.
- Conceptualize engineering models; apply innovative methods in problema solving and applications suitable for the design, simulation, optimization and control of processes and systems.
- Be able to solve unfamiliar and ill-defined problems that have specifications in competition by considering all possible methods of solution, including the most innovative ones, and selecting the most appropriate, and correct implementation by evaluating the different design solutions.
- Design, build and implement methods, processes and equipment for the comprehensive management of supplies and waste - solids, liquids and gases - in industries and be able to assess their impacts and risks.
- Adapt to structural changes in society caused by economic, energy or natural factors or phenomena in order to solve resulting problems and provide technological solutions with a high commitment to sustainability.

LEARNING OUTCOMES

1. To know the principles on waste minimization and waste recovery. To know how to apply these principles to the design of industrial processes.
2. To know how to design and operate water and waste treatment plants and air pollution control devices. Identification of the best solution accordingly to sustainability criteria.

DESCRIPTION OF CONTENTS

1. Pollution prevention at industry

Unit 1. Environmental management for industry. Environment-industry interactions. Legal framework. Environmental management system. Environmental aspects: identification and evaluation. Industrial sustainability.
Unit 2. Environmental Analysis Process. Environmental analysis for minimization. Life-cycle assessment. Tools for identification, characterization and quantification of wastes and emissions. Industrial pollution: sources and properties of industrial wastewater, industrial waste, air emissions and other sources.
Unit 3. Minimization strategies and cleaner production. Cleaner production: incentives and barriers. Cleaner production techniques. Cleaner production integration in facilities. Case studies.

2. Industrial pollution management and treatment

Unit 4. Industrial wastewater treatment. Challenges on industrial wastewater treatment. Unit operations. Chemical processes. Biological treatment. Water reuse. Case studies.
Unit 5. Treatment and management of industrial wastes. Industrial waste identification. Waste treatment for recycling. Waste treatment without recycling. Case studies.
Unit 6. Air Pollution control. Dust removal. Removal of inorganic gaseous pollutants. Volatile organic compound removal. Case studies.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	27,00	100
Classroom practices	15,00	100
Seminars	10,00	100
Tutorials	8,00	100
Development of group work	15,00	0
Study and independent work	40,00	0
Preparation of evaluation activities	15,00	0
Preparing lectures	5,00	0
Preparation of practical classes and problem	10,00	0
Resolution of case studies	5,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

The teaching sessions will be comprised of the following:

Theoretical sessions

Practical class sessions

Laboratory sessions (flipped classroom)

Mentoring sessions

Workshop sessions

EVALUATION

The assessment of student learning is performed by:

- Continuous assessment: 30% in the practical cases deliverables, 25% laboratory report and 5% participation in laboratory sessions and their preparation.
- Test covering theoretical and practical issues: 40%

The subject is considered adopted when the average rating of the evaluation is equal to or greater than 5.0. The marks obtained in the test must be equal to or greater than 4.7 out of 10. In opposite case, the subject will be mark with the mark obtained in the test

REFERENCES

Basic

- Carretero (2007). Aspectos ambientales. Identificación y evaluación 2ª ed AENOR
- Castells (2005) Tratamiento y valorización energética de residuos. Ed. Díaz de Santos.
- Freeman (1998). Manual de prevención de la contaminación Industrial. McGraw-Hill.
- Gómez Orea(1994). Evaluación de Impacto Ambiental. Ed.Agrícola Española.
- Lagrega y col. (2001) Hazardous Waste Managenment. Ed. Waveland Pr
- Mackenzie (2010) Water and Wastewater Engineering. Ed. McGraw-Hill.
- El-Halwagi (1997). Pollution Prevention through Process Integration. Ed. Academic Press.
- Nemerow (1998). Tratamiento de vertidos industriales y peligrosos. Ed. Diaz de Santos.

- de Nevers (1998). Ingeniería de Control de la Contaminación del Aire. Ed. McGraw-Hill Interamericana.
- Rigola (1989). Tratamiento de aguas industriales: Aguas de proceso y residuales. Marcombo.
- Riogola (1998). Producció més neta. Generalitat Catalunya.
- Rossiter (1995). Waste minimization through process design. Ed. McGraw-Hill.
- Simon y col. (2011) Gestion del riesgo: responsabilidad ambiental y estrategia empresarial. Wolters Kluwer
- Theodore (2008). Air pollution control equipment calculations John Wiley & Sons
- Mann (1999). Industrial water reuse and wastewater minimization. Ed. McGraw-Hill.
- Castells (2009) Reciclaje de residuos industriales. Residuos sólidos urbanos y fangos de depuradora. Ed. Diaz de Santos.

Additional

- Bolea (1986) Evaluación de Impacto Ambiental. Mapfre.
- Fiksel,(1997). Ingeniería de Diseño Medioambiental. DFE. Desarrollo Integral de Productos y Procesos Ecoeficientes. Ed. McGraw-Hill.
- Fullana y Puig (1997). Análisis de ciclo de vida. Ed. Rubes.
- Gabriela y col. (2005). Análisis de Ciclo de Vida. Aspectos metodológicos y casos prácticos. Universidad Politécnica de Valencia
- Levin y col. (1997). Biotratamiento de Residuos Tóxicos y Peligrosos. Ed. McGraw-Hill.
- Metcalf & Eddy (2003) Wastewater Engineering. Treatment and Reuse, 4ª Ed., McGraw-Hill.
- Rieradevall y Vinyets (1999). Ecodiseño y Ecoproductos. Ed. Rubes.
- Wang y col. (2004) Air Pollution Control Engineering. Humana Press.
- Wark y col. (1997) Air Pollution: its Origin and Control". 3ª ed., Prentice Hall.

ADDENDUM COVID-19

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

If it is required by the sanitary situation, the Academic Committee of the Degree will approve the Teaching Model of the Degree and its adaption to each subject, establishing the specific conditions in which it will be developed, taking into account the actual enrolment data and the space availability.