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	2020 - 2021

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. Environmental management systems. Environmental impact assessment. Environmental risk analysis. Environmental responsibility.

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 apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.
- 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.
- Students should possess and understand foundational knowledge that enables original thinking and research in the field.
- Lead and define multidisciplinary teams which can make technical changes and address managerial needs in both national and international contexts.
- 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.
- 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.
- Know how to establish and develop mathematical models by using appropriate software in order to provide the scientific and technological basis for the design of new products, processes, systems and services and for the optimisation of others already developed.
- 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.
- Communicate and discuss proposals and conclusions in specialised and non-specialised multilingual forums, in a clear and unambiguous manner.
- 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.
- Direct and supervise all types of facilities, processes, systems and services in different industrial areas related to chemical engineering.

- 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.
- Lead and manage the organisation of work and human resources by applying criteria of industrial safety, quality management, risk prevention, sustainability and environmental management.

LEARNING OUTCOMES

1. Acquire knowledge about environmental management in the industry.
2. Be able to identify and quantify the different industrial wastes
3. To know the bases of minimization of the production of residual currents and of the recovery of resources, and its application to the design of industrial processes.
4. Know how to design all types of water and waste treatment plants and air pollution control devices, and identify the most appropriate solutions from the point of view of environmental sustainability.
5. Know the methodology of evaluation of environmental impacts and analysis of environmental risks.

DESCRIPTION OF CONTENTS

1. Environmental management for industry

Unit 1. Environmental management for industry. Environment-industry interactions. Legal framework. Environmental management system. Environmental aspects: identification and evaluation. Industrial sustainability.

2. Pollution prevention at industry

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.

3. 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.

4. Envionmental impact and risk analysis assesment

Unit 7. Environmental risk assesment. Environmental responsibility. Methodology for Environmental risk assessment. Financial guaranty. Techniques for accident scenario analysis in hazardous systems
Unit 8. Environmental impact assessment. Steps of EIA. Methodologies for identification and evaluation of impacts.

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	10,00	0
Development of individual work	10,00	0
Study and independent work	25,00	0
Readings supplementary material	5,00	0
Preparation of evaluation activities	15,00	0
Preparing lectures	5,00	0
Preparation of practical classes and problem	5,00	0
Resolution of case studies	15,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

The teaching sessions will be comprised of the following:

Theoretical sessions

Practical class sessions

Mentoring sessions

Workshop sessions

EVALUATION

The assessment of student learning is performed by:

- Continuous assessment: 55% in the practical activities deliverables, 5% attendance and class participation

- 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. The marks obtained in the test must be equal to or greater than 5.0 out of 10. In opposite case, the subject will be mark with the mark obtained in the test. Assessment method is independent of the call (1^{st} or 2^{nd}).

REFERENCES

Basic

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- Castells (2005) Tratamiento y valorización energética de residuos. Ed. Díaz de Santos.
  Castells (2009) Reciclaje de residuos industriales. Residuos sólidos urbanos y fangos de depuradora. Ed. Diaz de Santos.
- Domenech(2009) Huella ecológica y desarrollo sostenible. 2º ed, AENOR
- Freeman (1998). Manual de prevención de la contaminación Industrial. McGraw-Hill.
- Gómez Orea(1994). Evaluación de Impacto Ambiental. Ed.Agrícola Española.
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- 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.
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- 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.

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.
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- 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

Contents

The contents initially included in the teaching guide are maintained.

Volume of work and temporary planning of teaching

Regarding the workload:

The different activities described in the Teaching Guide are maintained with the planned dedication.

Regarding the temporary planning of teaching

The material for the follow-up of the theory/practical lessons allows to continue with the teaching schedule both in days and hours (synchronous teaching).

Teaching methodology

Theory and practical lessons will tend to the maximum possible attendance, always respecting the sanitary restrictions. Depending on the capacity of the classroom and the number of students enrolled, it may be necessary to distribute the students into two groups. In this case, the subject will be taught in classrooms with streaming teaching capacity, and there may be students attending online and in class.

Once the enrollment data is available and the availability of spaces is known, the Academic Committee of the Degree will approve the Teaching Model of the Degree and its adaptation to each subject, establishing the specific conditions in which it will be taught.

If there is a closure of the facilities for health reasons that totally or partially affects the classes of the subject, these will be replaced online sessions following the schedules established by synchronous video conferencing, or, if not possible, asynchronous.

Evaluation

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

If there is a closure of the facilities for health reasons that affect the development of any face-to-face evaluable activity of the subject, it will be replaced by a test of a similar nature that will be carried out in virtual mode using the computer tools licensed by the University of Valencia.

Bibliography
The bibliography recommended in the Teaching Guide is kept as it is accessible.