VNIVERSITAT DE VALÈNCIA

# Course Guide
# 43810 Control of air pollution

## COURSE DATA

| Data Subject | |
|---|---|
| **Code** | 43810 |
| **Name** | Control of air pollution |
| **Cycle** | Master's degree |
| **ECTS Credits** | 6.0 |
| **Academic year** | 2020 - 2021 |

**Study (s)**

| Degree | Center | Acad. year | Period |
|---|---|---|---|
| 2227 - M.U. en Ingeniería Ambiental | School of Engineering | 1 | Second term |

**Subject-matter**

| Degree | Subject-matter | Character |
|---|---|---|
| 2227 - M.U. en Ingeniería Ambiental | 3 - Treatment of land, waste and air emissions | Obligatory |

**Coordination**

| Name | Department |
|---|---|
| GABALDON GARCIA, M CARMEN | 245 - Chemical Engineering |

## SUMMARY

Air Pollution Control (6.0 ECTS) is teaching during second term of the Master of Environmental Engineering. The aim of this practical subject is the design and operation of equipment for 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

Previous courses on: Assessment of environmental quality; Transport of pollutants in the environment; Analysis and application of environmental legislation is recommended.

## OUTCOMES

### 2172 - M.U. en Ingeniería Ambiental

- 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.
- Identify and apply technologies, tools and techniques in the field of environmental engineering.
- Assume with responsibility and ethics the Environmental Engineer role in a professional context.
- Promote and apply the principles of sustainability.
- Adapt to changes, being able to apply the principles of Environmental Engineering to unknown cases and use new and advanced technologies and other relevant developments, with initiative and entrepreneurial spirit.
- Identify, declare and entirely analyze environmental problems.
- Assess the application of measures for the pollution prevention and the recovery, protection and improvement of environmental quality.
- Design and calculate engineering solutions to environmental problems, comparing and selecting technical alternatives and identifying emerging technologies.
- Understand and apply environmental national and international legislation, adapting environmental solutions to these regulations.
- Apply standard methodologies for the analysis and evaluation of environmental risks.
- Evaluate the environmental quality of the air from a global point of view, especially when there is a risk to public health.
- Be able to characterize the emissions to air, coming from the anthropogenic activity.
- Evaluate the treatment of emissions to the atmosphere to assess different alternatives and obtain the required information for the design of the selected treatment processes.

- Design and manage wastewater treatment and treatment systems for atmospheric emissions.

## LEARNING OUTCOMES

1. To know the strategies on pollution prevention and control of sources of air emissions.
2. To understand the technological demands in the field of air pollution control.
3. To select the best technological solution among the available options for a specific pollutant and case.
4. To be able of design and operate the established processes for air pollution control.
5. To ideate integrated installations for air pollution control.
6. To identify the novelty technological solutions in the field of air pollution control.

## DESCRIPTION OF CONTENTS

### 1. Pollution prevention and control

Sources. Strategies on air pollution prevention and control. Environmental Regulations. General considerations in process design.

### 2. Particulate control

Sources of particles. Characteristics of particles. Process design and operation: cyclones, fabric filters, electrostatic precipitators and particulate scrubbers.

### 3. Control of gases (I)

Sulfur oxides. Nitrogen oxides. Greenhouse gases.

### 4. Control of gases (II)

Emisión de COVs. Técnicas de prevención: Cambios de producto. Modificación de proceso. Control de fugas. Control de emisiones: incineración, adsorción, condensación y biotratamiento. Fuentes de producción de olores. Eliminación de olores: lavado químico, biofiltración.

### 5. Specific problematics

Mobile sources. Indoor air quality.

## WORKLOAD

| ACTIVITY | Hours | % To be attended |
|---|---|---|
| Classroom practices | 36,00 | 100 |
| Theory classes | 20,00 | 100 |
| Other activities | 4,00 | 100 |
| Development of group work | 10,00 | 0 |
| Study and independent work | 20,00 | 0 |
| Preparation of evaluation activities | 25,00 | 0 |
| Preparing lectures | 10,00 | 0 |
| Preparation of practical classes and problem | 15,00 | 0 |
| Resolution of case studies | 10,00 | 0 |
| **TOTAL** | **150,00** | |

## TEACHING METHODOLOGY

Course lessons will cover theoretical and practical lessons (problems, questionnaires and practical cases).

Practical homework will include problems and practical cases.

Mentoring for specific questions will be also available.

## EVALUATION

The assessment of student learning is performed by:

Continuous assessment: 30% practical deliverables, 20% questionnaires.

Exam covering theoretical and practical issues: 50%

The subject is passed when the total mark of the evaluation is equal to or greater than 5. The marks obtained in the exam must be equal to or greater than 4.5 out of 10. In opposite case, the subject will be rated with the mark obtained in the exam.

In the resitting examination, the final mark will be obtained as the maximum between: 1) the average rating of the continuous assessment and resitting exam and 2) the mark of the resitting exam.

## REFERENCES

### Basic

- de Nevers, N. Ingeniería de Control de la Contaminación del Aire. McGraw-Hill Interamericana (1998). Versión traducida de la 1ª edición de Air Pollution Control Engineering, McGraw-Hill.
- Wark K., Warner, C.F. y Davis, W.T. Air Pollution: its Origin and Control. 3ª ed., Addison-Wesley (1998).
- Cooper, C.D, Alley, F.C. Air Pollution Control: A Design Approach. 4º ed, Waveland Press (2011).
- Theodore, L. Air Pollution Control Equipment Calculations. John Wiley & Sons (2008). Texto completo en línea.

### Additional

- Boubel, R.W., Fox, D.L., Turner, D.B. y Stern, A.C. Fundamentals of Air Pollution. 3ª ed., Academic Press, San Diego (1994).
- Davis, W.T. Air pollution engineering manual. 2º ed., John Wiley & Sons, New York (2000).
- Flagan, R.C. , Seinfled, J.H. Fundamentals of Air Pollution Engineering. 2º ed., Dover Publications (2012). Texto completo en línea.
- Goberna R. Ventilación Industrial: Manual de Recomendaciones Prácticas para la Prevención de Riesgos Profesionales. Generalitat Valenciana (1992).
- McKenna, J.D., Turner, J.H., McKenna Jr, J.P. Fine particle (2.5 microns) emissions: regulations, measurement and control. John Wiley & Sons (2008). Texto completo en línea.
- Niessen, W.R. Combustion and incineration processes. 3ª ed. Marcel Dekker (2002).
- Tata, P., Witherspoon, J, Lue-Hing, C. VOC Emissions from Wastewater Treatment Plants: Characterization, Control and Compliance. CRC Press (2003).
- Vallero, D.A. Fundamentals of Air Pollution. 5ª ed., Elsevier (2014). Texto completo en línea.
- Wang, K.L., Pereira, C., Hung, Y-T Air Pollution Control Engineering. Humana Press (2004).

## 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

1.-The contents initially included in the teaching guide are maintained.

**Volume of work and temporary planning of teaching**

Regarding the workload:

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

Regarding the temporary planning of teaching

1.- 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**

1. 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**

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