25219 - Atmospheric pollution

Información del Plan Docente

Academic Year	2017/18
Faculty / School	201 - Escuela Politécnica Superior
Degree	277 - Degree in Environmental Sciences 571 - Degree in Environmental Sciences
ECTS	6.0
Year	2
Semester	Second Four-month period
Subject Type	Compulsory
Module	---

1.General information

1.1.Introduction

1.2.Recommendations to take this course

This subject is offered in the English Friendly form

1.3.Context and importance of this course in the degree

1.4.Activities and key dates

2.Learning goals

2.1.Learning goals

2.2.Importance of learning goals

3.Aims of the course and competences

3.1.Aims of the course

3.2.Competences

4.Assessment (1st and 2nd call)

4.1.Assessment tasks (description of tasks, marking system and assessment criteria)

5.Methodology, learning tasks, syllabus and resources

5.1.Methodological overview

The course involves the use the following teaching/learning methods and activities:

1. **Lectures** : The theoretical sessions consisting mainly in participatory lectures.

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2. **Problem seminars** : The proposed problems may be discussed in group. The participation of students will be promoted intensively.
3. **Academic project** : Students will work in group in a topic of interest for the subject under the supervision of the professor. This serves as a starting point for the acquisition of new knowledge, thus promoting self-learning students. Several class sessions in which teachers give some basic notions about teamwork, structure of the report, oral presentation, etc. will be held. In addition, each group will have tutoring sessions in which they will present their progress and emerging difficulties to the professor. Finally, all groups will orally present the most important aspects of the work, opening a short discussion on the topic afterwards.
4. **Lab and computer sessions** : the detection of atmospheric pollutants with different techniques and the use of software to predict the dispersion of pollutants, will respectively, carried out in the lab and in the computer classroom.
5. **Complementary activities** (when possible): visits to places of interest for the subject, videos viewing, debates, comment on articles and news, conduct seminars-conferences on specific issues of particular relevance, etc.
6. **Self-study and work**
7. **Evaluation**

5.2.Learning tasks

Learning methods and strategies designed for the subject include the following activities...

1. **Lectures:** The lectures (30 h) are designed to provide the students with knowledge about the different pollutants of the atmosphere, their chemistry and evolution, as well as techniques of measurement and pollution control. It will be encouraged an interactive environment that will be used to discuss and reinforce the lecture contents.
2. **Problem seminars** : This activity (12 h) complements the contents presented in lectures by problem-solving sessions. A very active participation of the students in the sessions will be promoted.
3. **Academic project** : This activity requires the student to work in a group of students on a topic related to atmospheric pollution that extends the contents of lecture, and finally they will elaborate a written report and present orally the most relevant of it. The tutor will give the student regular feedback on progress. In addition, the project requires the student to construct logical arguments to communicate effectively.
4. **Lab and computer sessions** :
5. This activity (10 h) requires self-study of the protocols and instructions for planned activities before going to the lab or the computer classroom. In addition, students have to elaborate final reports for each session that should include the answer to different questions about the worked theoretical-practical issues.
6. **Complementary activities** (when possible): visits to places of interest for the subject, videos viewing, debates, comment on articles and news, conduct seminars-conferences on specific issues of particular relevance, etc. In addition to the mandatory activities of this course, other voluntary activities (some of the complementary activities) may be offered. Tasks resulting from these activities will be evaluated and may add extra points to the final mark of the subject (up to 0.5 points/10). Thus, GLOBAL MARK (GM) = FINAL MARK (FM) + EXTRA POINTS (up to 0.5 maximum, if FM > or = 5).

5.3.Syllabus

THEORY

Lesson 0 . General issues about the course

Lesson 1 . Atmospheric pollution. Natural and anthropogenic pollution. Concepts of emission and immission. Primary and secondary pollutants. Sources and sinks of pollutants.

Lesson 2 . Pollution phenomena on a global scale. Destruction of the ozone layer. Anthropogenic greenhouse effect.

Lesson 3 . Pollution phenomena on local and regional scales. Tropospheric ozone. Photochemical smog. Acid rain. Light

and noise pollution.

Lesson 4 . Analytic methods of atmospheric pollution. Air quality.

Lesson 5 . Pollutants dispersion in the atmosphere. Factors affecting dispersion. Dispersion models. Gaussian dispersion models for gases in the case of instantaneous emissions (puffs). Gaussian dispersion models for gases in the case of continuous sources (plumes).

Lesson 6 . Britter McQuaid dispersion models for heavier than air gases. Dispersion models for dust.

Lesson 7 . Controlling atmospheric pollution methods . Particulate material control: Mechanical methods. Filters. Gas scrubbing. Electrofilters. Applications. Gases and vapors control: Direct burning, absorption y adsorption. COVs, NO x , SO 2 . Dust and gases control examples in incineration plants and power plants. CO 2 capture techniques in industrial processes.

Remark: The lesson order displayed above might vary according to educational or organizational needs

LAB AND COMPUTER SESSIONS

1. Measure of polluting gases: short range colorimetric tubes.

2. Handling of luxometers for the evaluation of illumination levels and handling of gases and particles sensors.

3. Gaussian dispersion models for contaminant gaseous atmospheric. Application to instantaneous transmission sources (PUFF)

4. Gaussian dispersion models for contaminant gaseous atmospheric. Application to continued future emissions (PLUME)

5. Gaussian dispersion models for contaminant gaseous atmospheric. Application to pollutants denser than air.

Remark: The practical activities order might vary according to educational or organizational needs

5.4.Course planning and calendar

The student must dedicate 150 hours (6 ECTS) including 60 hours (aprox.) of classroom teaching activities, and 75 hours of self-work. Those are schedule as follows:

Activity / Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	Total

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Classroom hours																					**64**
Introduction	1																				**1**
Lectures	2	2	2	2	2	2	1		2	3	1	1	2	2	2	1					**27**
Problem seminars	1	2	2							2	1	2			2						**12**
Lab sessions													2	2							**4**
Computer sessions				2	2	2															**6**
Academic project	1									0.5			0.5	1	3						**6**
Visits							4														**4**
Evaluation																		4			**4**
Self-work																					**86**
Individual work	4	4	4	4	4	4	4	5	4	4	4	4	6	4	6	6	5				**79**
Group work					1	1		1		1	1	1	1								**7**
TOTAL	7	8	8	8	9	6	5	11	9,5	7	8	11.5	10	13	7	5	4				**150**

For students enrolled in the subject, place and schedule of lectures and examinations will be available on the EPS website , and the course on Moodle at the University of Zaragoza. Submission of academic projects will be held according to the schedule that will be announced in advance on Moodle . In addition, course materials and readings will be also available on the website for the course.

5.5.Bibliography and recommended resources

BB	Contaminación ambiental : una visión desde la química / Carmen Orozco Barrenetxea ... [et al.] . Madrid [etc.] : Thomson, D. L. 2002
BB	Contaminación atmosférica / Alejandrina

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	Gallego Picó ... [et al.] . Madrid : UNED, 2012
BB	Espert Alemany, Vicent. Dispersión de contaminantes en la atmósfera / Vicent Espert Alemany, P. Amparo López Jiménez . Valencia : Universidad Politécnica de Valencia, D.L. 2000
BB	Espert, V., López, P. (1998): Complementos de tecnología del medio ambiente. Módulo: Emisión y dispersión de contaminantes. Universidad Politécnica de Valencia
BB	Turner, D. Bruce. Workbook of atmospheric dispersion estimates : an introduction to dispersion modelling / D. Bruce Turner . 2nd ed. Boca Raton : Lewis, cop. 1994
BC	Aragón, P., Catalá, M. (2013): Problemas de contaminación atmosférica. Valencia: Universidad Politécnica
BC	Baird, Colin. Química ambiental / Colin Baird ; versión española por Xavier Domènech Antúnez . Ed. en español, reimpr. (2004) Barcelona [etc.] : Reverté, D.L. 2004
BC	Casal, J. (2007): Evaluation of the effects and consequences of mayor accidents in industrial plants. Elsevier
BC	Figueruelo, Juan E.. Química física del ambiente y de los procesos medioambientales / Juan E. Figueruelo, Martín Marino Dávila . Barcelona [etc.] : Reverté, cop. 2004
BC	Finlayson-Pitts, Barbara J.. Chemistry of the upper and lower atmosphere : theory, experiments and applications / Barbara J. Finlayson-Pitts, James N. Pitts, Jr. . San Diego [etc.] : Academic Press, cop. 2000
BC	Gutiérrez López, Enrique. Contaminación atmosférica, ruidos y radiaciones / Enrique Gutiérrez López, coordinador ; Francisco Javier Albert Payá . Madrid : Editex, D.L. 2001
BC	Manahan, Stanley E.. Environmental chemistry / Stanley E. Manahan . 8th ed. Boca Raton [etc] : CRC, cop. 2005
BC	Parker, Albert. Contaminación del aire por la industria / Albert Parker ; [versión española por José Costa López y Rubén Simarro Dorado] . 1ª reimp. Barcelona : Reverté, D.L. 1983, (reimp. 2001)
BC	Sierra, Miguel Ángel. Principios de química medioambiental / Miguel Á. Sierra, Mar Gómez Gallego . [reimp. de la ed. de 2007] Madrid: Síntesis, 2008
BC	Spiro, Thomas G.. Química medioambiental / Thomas G. Spiro,

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William M. Stigliani ; traducción, Yolanda Madrid Albarrán . 2ª ed. reimp. Madrid [etc.] : Pearson Prentice-Hall, cop. 2004 (reimp. 2009)

The updated recommended bibliography can be consulted in:
http://psfunizar7.unizar.es/br13/egAsignaturas.php?id=10977