25219 - Atmospheric pollution

Información del Plan Docente

Academic Year	2018/19
Subject	25219 - Atmospheric pollution
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.Aims of the course

1.2.Context and importance of this course in the degree

1.3.Recommendations to take this course

This subject is offered in the English Friendly form

2.Learning goals

2.1.Competences

2.2.Learning goals

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

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

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as lectures, problem-solving, laboratory and computer sessions, autonomous work and study and assessment tasks.

4.2.Learning tasks

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This course is organized as follows:

- **Lectures** (30 hours). 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.
- **Problem-solving sessions** (12 hours). This activity complements the contents presented in lectures by problem-solving sessions. A very active participation of the students in the sessions will be promoted. Working in groups.
- **Academic project**: This activity requires the student to work in groups 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.
- **Lab and computer sessions** (10 hours). This activity requires autonomous study of the protocols and instructions for planned activities before going to the lab or the computer classroom. 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. 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.
- **Complementary activities** (when possible): visits to places of interest for the course, 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 course (up to 0.5 points/10). Thus, GLOBAL MARK (GM) = FINAL MARK (FM) + EXTRA POINTS (up to 0.5 maximum, if FM > or = 5).
- **Autonomous work and study** (75 hours)
- **Assessment tasks**

4.3.Syllabus

This course will address the following topics:

Lectures

- **Topic 0**. General issues about the course
- **Topic 1**. Atmospheric pollution. Natural and anthropogenic pollution. Concepts of emission and immission. Primary and secondary pollutants. Sources and sinks of pollutants.
- **Topic 2**. Pollution phenomena on a global scale. Destruction of the ozone layer. Anthropogenic greenhouse effect.
- **Topic 3**. Pollution phenomena on local and regional scales. Tropospheric ozone. Photochemical smog. Acid rain. Light and noise pollution.
- **Topic 4**. Analytic methods of atmospheric pollution. Air quality.
- **Topic 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).
- **Topic 6**. Britter McQuaid dispersion models for heavier than air gases. Dispersion models for dust.
- **Topic 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, NOx, SO2. Dust and gases control examples in incineration plants and power plants. CO2 capture techniques in industrial processes.

Note: The Topic order displayed above might vary according to educational or organizational needs.

Lab and computer sessions

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

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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.

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

4.4.Course planning and calendar

The student must dedicate 150 hours (6 ECTS) including 60 hours of face-to-face activities, and 75 hours of autonomous work and study. Those are scheduled as follows:

Activity / Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Face-to-face																	
Introduction	1																
Lectures	1	2	2	2	2	2		4	2			2	2	2	2	2	
Problem seminars	1	2	2			2					2			2		1	
Lab sessions				2	2												
Computer sessions												2	2		2		
Academic project	1	0.5		0.5		0.5		0.5	2					0.5	1	3	
Visits							4										
Autonomous work																	
Individual work	4	3	4	3	4	3	4	3	4	8	6	5	5	5	5	5	8
Group		1	1	1	1	1	1	1	1								

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work																	
TOTAL	8	8.5	9	8.5	9	8.5	9	8.5	9	8	8	9	9	9	9	8	8

For students enrolled in the course, 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.

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course will be provided on the first day of class or please refer to the Faculty of Sciences website and Moodle.

4.5.Bibliography and recommended resources

BB	Contaminación ambiental : una visión desde la química / C Orozco Barrenetxea ... [et al.] . Madrid [etc.] : Thomson, D. 2002
BB	Contaminación atmosférica / Alejandrina Gallego Picó ... [e Madrid : UNED, 2012
BB	Espert Alemany, Vicent. Dispersión de contaminantes en la atmósfera / Vicent Espert Alemany, P. Amparo López Jimé Valencia : Universidad Politécnica de Valencia, D.L. 2000
BB	Espert, V., López, P. (1998): Complementos de tecnología medio ambiente. Módulo: Emisión y dispersión de contami Universidad Politécnica de Valencia
BB	Turner, D. Bruce. Workbook of atmospheric dispersion esti an introduction to dispersion modelling / D. Bruce Turner . Boca Raton : Lewis, cop. 1994
BC	Aragón, P., Catalá, M. (2013): Problemas de contaminació atmosférica. Valencia: Universidad Politécnica
BC	Baird, Colin. Química ambiental / Colin Baird ; versión espa por Xavier Domènech Antúnez . Ed. en español, reimpr. (2 Barcelona [etc.] : Reverté, D.L. 2004
BC	Casal, J. (2007): Evaluation of the effects and consequenc mayor accidents in industrial plants. Elsevier
BC	Figueruelo, Juan E.. Química física del ambiente y de los procesos medioambientales / Juan E. Figueruelo, Martín M Dávila . Barcelona [etc.] : Reverté, cop. 2004
BC	Finlayson-Pitts, Barbara J.. Chemistry of the upper and low atmosphere : theory, experiments and applications / Barba Finlayson-Pitts, James N. Pitts, Jr. . San Diego [etc.] : Aca Press, cop. 2000
BC	Gutiérrez López, Enrique. Contaminación atmosférica, ruid radiaciones / Enrique Gutiérrez López, coordinador ; Franc Javier Albert Payá . Madrid : Editex, D.L. 2001

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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 / Alb 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 medioambienta Miguel Á. Sierra, Mar Gómez Gallego . [reimp. de la ed. de Madrid: Síntesis, 2008
BC	Spiro, Thomas G.. Química medioambiental / Thomas G. S William M. Stigliani ; traducción, Yolanda Madrid Albarrán . reimp. Madrid [etc.] : Pearson Prentice-Hall, cop. 2004 (rei 2009)

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