Universidad Zaragoza

**Academic Year/course: 2024/25**

# 25219 - Atmospheric pollution

## Syllabus Information

**Academic year:** 2024/25
**Subject:** 25219 - Atmospheric pollution
**Faculty / School:** 201 - Escuela Politécnica Superior
**Degree:** 571 - Degree in Environmental Sciences
**ECTS:** 6.0
**Year:** 2
**Semester:** Second Four-month period
**Subject type:** Compulsory
**Module:**

## 1. General information

The subject and its expected results respond to the following approaches and objectives:

- To know the main atmospheric pollutants (their sources and evolution) and the phenomena of atmospheric pollution (AC)
- Training in different areas related to AC: air quality assessment and management, pollutant analysis, calculation and prediction of the impact of some sources, best available techniques for reducing emissions, regulations, etc
- Raise awareness of the negative impact of AC, the need to protect air quality and good environmental practices.

These approaches and objectives are aligned with the following Sustainable Development Goals (SDGs) of the United Nations Agenda 2030 (https://www.un.org/sustainabledevelopment/es/), so that the acquisition of the learning results of the subject provides training and competence to contribute to some extent to their achievement: 3, 4, 9, 11 and 13.

## 2. Learning results

Upon completion of the subject, the student will be able to:

1. Recognize the main atmospheric polluting activities. (SDGs 3, 4, 9, 11 and 13)

2. Identify the main atmospheric pollutants (natural and anthropogenic). (SDGs 3, 4, 9, 11 and 13)

3. Describe the behaviour and evolution of the main atmospheric pollutants in the environment. (SDGs 3, 4, 9, 11 and 13)

4. Explain the environmental effects derived from the presence of certain atmospheric pollutants. (SDGs 3, 4, 9, 11 and 13)

5. Explain the role of stratospheric ozone: (SDGs 3 and 4)

- photochemical cycles involved in their formation and destruction
- pollution involved, evolution and consequences of the ozone layer hole

6. Explain the phenomenon of global warming: greenhouse gases, radiative forcing, etc. (SDGs 4, 9 and 13) 7. Explain the role of pollutants causing acid rain: their chemical generation and consequences. (SDGs 3, 4, 9 and 11)

8. Explain the problems derived from human activity in densely populated areas and indicate good environmental practices leading to a reduction of this type of more local pollution (photochemical smog, surface or tropospheric ozone , substances harmful to health, light and noise pollution). (SDGs 3, 4, 9, 9, 11 and 13) 9. Training in the field of air quality assessment and management. (SDGs 3, 4 and 11)

10. Identify and describe different methods of air pollution analysis: measurements in emission (confined and open spaces ) and in emission. (SDGs 4 and 11)

11. Evaluate health risk conditions according to recommendations, guidelines and specific legislation, established by competent official bodies (national or international). (SDGs 3, 4, 9 and 11)

12. Identify means for the control of atmospheric pollution. (SDGs 4, 9, 11 and 13)

13. Manage by means of practical laboratory work current techniques and equipment used for the evaluation of the quality of a specific atmosphere. (SDGs 3, 4 and 11)

14. Evaluate and predict the dispersion of pollutants in the atmosphere in different locations of the emitting focus and taking into account the local meteorology. (SDGs 4, 9 and 11)

15. Handle specialized software for dispersion and diffusion models of pollutants in the atmosphere. (SDGs 4 and 11)

16. Solve problems and cases both qualitatively and quantitatively related to air pollution . (SDGs 4, 9 and 11)

17- Search and manage bibliographic sources, evaluating their quality and scientific-technical rigor. (SDG 4)

18. Work in groups in a coordinated and autonomous manner on a topic related to a specific aspect of the air pollution. (SDG 4)

19- Clearly and rigorously explain the fundamental aspects of the work. (SDG 4)

20. To become familiar with the Sustainable Development Goals proposed by the United Nations in the 2030 Agenda, while identifying existing relationships with the aspects covered in the subject. (SDGs 3, 4, 9, 11 and 13)

## 3. Syllabus

THEORY:

**Item 0.** Presentation of the subject

**Topic 1.** Atmospheric pollutants

**Topic 2.** Pollution phenomena on a global scale

**Topic 3.** Pollution phenomena on a regional and local scale

**Topic 4.** Methods of AC analysis. Air quality

**Topic 5.** Dispersion of pollutants in the atmosphere

**Topic 6.** Britter McQuaid dispersion models for gases denser than air. Dispersion models for sedimentable particles

**Topic 7.** AC control methods

PRACTICES:

LABORATORY. Evaluation of illuminance level and air acceptability in working environments.

COMPUTER. Gaussian dispersion models (gases). Application to instantaneous (puff) and continuous (pen) sources.

Britter McQuaid models (gases denser than air).

Note: The order of these topics may change, depending on teaching and organizational needs.

## 4. Academic activities

**Explanatory and participative lessons** (all students). Presentation of contents by the teaching staff, by external experts or by the students themselves, viewing of videos/discussions, etc..: 30 hours

**Problem solving and case studies** (preferably in small groups). Practical exercises, analysis and comments on news and articles of interest, etc.: 12 hours

**Laboratory practices** (small groups): 4 hours

**Computer practices** (small groups): 6 hours

**Completion of tutored work** (preferably in groups) and oral presentation: 11 hours

**Academic visits to places of interest** (subject to available budget): 4 hours **Autonomous work** (student): 79 hours

Assessment tests. 4 hours

## 5. Assessment system

GLOBAL EVALUATION is carried out according to the Polytechnical School calendar for the two official calls. However, prior deliveries (practical work and reports) may be made.

| **TEST[1]** | **% Final grade (CF)** | **Remarks** |
|---|---|---|
| **1. Theory examinations (ET)[2]** | 35 | (Topics 1-4) 50% (Topics 5-7) 50% (Topics 1-4) 50% (Topics 5-7) 50% (Topics 5-7) 50% (Topics 6-7) |

| | | | | |
|---|---|---|---|---|
| **2. Examination problems (EP)** | 35 | (Topics 1-4) 50% (Topics 5-7) 50% (Topics 1-4) 50% (Topics 5-7) 50% (Topics 5-7) 50% (Topics 6-7) | | |
| | | | Anticipate | Global |
| | | | | test |
| | | | **[4]** | **[5]** |
| **3. Work (TT)[3]** | 10 | Work: | 40% | 40% |
| | | Presentation: | 60% | 60% |
| **4. Practical laboratory exam (PL)[2]** | 8 | | | |
| **5. Computer practices (PO)** | 12 | Anticipate:**[4]** Reports | | |

| | | | |
|---|---|---|---|
| | | Global test: Examination **[5]** | |
| **GC[6] = CF[7] (0.35 NET + 0.35 NEP + 0.1 NTT + 0.2 NP)** | | | |
| **[1]** Both calls. | | | |
| **[2]** Multiple choice questions, true or false, brief development, etc. | | | |
| **[3]** They evaluate SDG, being able to account for up to 1% of CF. | | | |
| **[4]** Recommended. | | | |
| **[5]** Faculty should be contacted in advance (1 week). | | | |
| **[6]** Global rating (GC): sum of CF. Only if CF is equal to or greater than 4.5 | | | |
| (both calls). The subject is only considered passed if the GC is equal to or higher than 5. | | | |
| **[7]** To average with the rest of the activities in the calculation of CF, it will be necessary to obtain at least 4 points out of 10, in each test of mandatory evaluation: ET, EP, TT and P (mean between PL and PO). If this is not met, even if the CF is equal to or higher than 5, the subject is not passed and the grade of 4.0 (fail) will be reflected in the transcript. Moreover, a minimun of 15% is required in all exams both theoretical and numerical exercices, in order to promediate between scores of the different tests. | | | |

**The detailed definition of the evaluation system will be explained in the presentation of the subject.**

Success rates in the academic years 2019/20 (89%), 2020/21 (58%), 2021/22 (90%), 2022/23 (93.75%)

## 6. Sustainable Development Goals

4 - Quality Education
11 - Sustainable Cities and Communities
12 - Responsible Production and Consumption