

**Atmospheric Science**

Code: 106773  
 ECTS Credits: 6

**2025/2026**

| Degree                 | Type | Year |
|------------------------|------|------|
| Environmental Sciences | OB   | 3    |

**Contact**

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**Teaching groups languages**

You can view this information at the [end](#) of this document.

**Prerequisites**

The student must have achieved the objectives of the first-year Physics subject. Throughout the course, the developed topics will be based on physical phenomena explained in the previous subject.

**Objectives and Contextualisation**

In environmental impact studies of projects and activities, meteorological risks and impacts must be studied, and environmental experts must be familiar with their consequences and causes. Likewise, given the growing human concentration in urban areas, topics such as the analysis of air quality in urban environments are of utmost importance and therefore studied in this course.

The course aims to be a simple yet rigorous introduction, both quantitative and qualitative, to atmospheric phenomena. By the end of the course, students should be able to understand different basic meteorological phenomena, the reliability of weather predictions, and their consequences. The objective of this course is to provide basic insights into how the Earth's atmosphere functions and how its functioning affects and is affected by human activities.

**Learning Outcomes**

1. CM37 (Competence) Present proposals for the prevention and mitigation of the impact on the physical environment of natural or anthropogenic action, including that based on green chemistry.
2. KM46 (Knowledge) Identify the most important chemical and geological processes in the different environmental compartments (hydrosphere, soil and atmosphere).
3. KM47 (Knowledge) Recognise the way in which human activity has an impact on the function of physical vectors (water, soil, oceans, atmosphere) in the natural environment.
4. KM48 (Knowledge) Compare the basic principles of science (hydrology, marine sciences, climatology, soil sciences, etc.) that constitute the basis for the study of the Earth system from an environmental perspective.
5. SM45 (Skill) Apply basic mathematical tools and models to describe the dynamics of environmental processes.
6. SM46 (Skill) Characterise the main processes of natural environments (marine, soil, atmosphere), including aspects of physics, chemistry, geology, biology and their interaction.

## Content

1. A brief overview of the atmosphere  
Origin, constituents and characteristics.  
The basics of meteorological analysis.  
Vertical temperature distribution.  
Hydrostatic equilibrium.  
Introduction to the kinetic theory of gases.
2. Atmospheric thermodynamics  
Ideal gas.  
Dry air and humid air.  
Conservation of energy and latent heat.  
Adiabatic rise and fall.  
Condensation and evaporation. Adiabatic charts.  
Vertical stability. Radiosondes. Pollution.
3. Aerosols  
Natural and anthropogenic particles in the atmosphere  
Formation of water droplets.  
Homogeneous condensation and heterogeneous condensation.  
Clouds.
4. Atmospheric dynamics  
Force balances in the dynamic description of the atmosphere.  
Geostrophic wind, gradient wind and friction.  
Thermal wind.  
Fronts, anticyclones and cyclones.  
Weather forecasts and weather maps.

## Activities and Methodology

| Title                      | Hours | ECTS | Learning Outcomes                  |
|----------------------------|-------|------|------------------------------------|
| Type: Directed             |       |      |                                    |
| Practical sessions         | 8     | 0.32 | KM47, SM45, KM47                   |
| Proble-solving classes     | 8     | 0.32 | SM45, SM45                         |
| Theoretical Classes        | 32    | 1.28 | CM37, KM46, KM48, SM45, SM46, CM37 |
| Type: Autonomous           |       |      |                                    |
| Problem solving            | 30    | 1.2  | SM45, SM45                         |
| Reading and study of texts | 63    | 2.52 | CM37, KM46, KM48, SM45, SM46, CM37 |

The course consists of theoretical classes (about 3 hours each week) and practical problem solving (1 hour each week). The materials presented in the theoretical and problem classes will be published on campus. The resolution of the vast majority of the proposed problems will be discussed in class.

The course includes some mandatory practicals that students will develop in small groups. The objective of these practical classes is to identify a meteorological phenomenon of interest, describe its origin, causes and consequences with the tools of environmental physics, and analyze its consequences on human activity.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

## Assessment

### Continous Assessment Activities

| Title  | Weighting | Hours | ECTS | Learning Outcomes      |
|--|-----------|-------|------|------------------------|
| First part assessment                          | 40%       | 2     | 0.08 | KM46, KM48, SM45, SM46 |
| Second part assessment                         | 40%       | 2     | 0.08 | KM46, KM48, SM45, SM46 |
| Written practical work and/or Moodle practices | 20%       | 5     | 0.2  | CM37, KM47, SM45       |

### CONTINUOUS EVALUATION

The evaluation of both the first and second parts will consist of a theoretical part and the resolution of practical problems. All students will have the opportunity to take the remedial exam of the first and/or second parts, and the final grade of each part will be the highest grade between the partial exams and the remedial one. To pass the subject, the grade of each evaluation activity must be equal to or greater than 3, and the average grade must be equal to or greater than 5.

Those students who do not attend and participate in the practices will receive a grade of "NO EVALUABLE", regardless of the grade of the partial exams.

### SINGLE EVALUATION

Students who wish to take part in the single evaluation must inform the teacher before the first partial. Otherwise, they will be evaluated continuously. The assessment consists of a final exam on the entire course syllabus with a weight of 80% of the grade that will be given on the same day as the second part. All students will have the opportunity to take the remedial exam, and the final grade will be the highest grade between the final exam and the remedial exam. The practices will account for the remaining 20% of the grade. To pass the subject, the grade of each evaluation activity must be equal to or greater than 3, and the average grade must be equal to or greater than 5.

Those students who do not attend and participate in the practices will receive a grade of "NO EVALUABLE", regardless of the grade of the final exam.

## Bibliography

### Basic References

C.Donald Ahrens Meteorology Today Thomson (Paraninfo), Madrid 2003

Roland Stull Meteorology for Scientists and Engineers Thomson 2002

J.Martín Vide, Mapas del tiempo: Fundamentos, interpretación e imágenes de satélite, Oikos-tau, Vilassar de Mar, 1991

Jordi Mazón, Mariano Barriendos, Marcel Costa, El temps a Catalunya dia a dia, Ara llibres, 2009

J.M.Wallace i P.V. Hobbs, Atmospheric Science, Academic Press, New York, 1977  
Gerard Conesa Prieto, Anàlisi meteorològica a la mar, Edicions UPC, Barcelona 1993

#### Advanced References

W. Cotton, R. A. Pielke, Human Impacts on Weather and Climate, Cambridge, 1995.  
R. G. Fleage, An Introduction to Atmospheric Physics, Academic Press, New York, 1980  
V. Espert, P. Amparo, Dispersión de contaminantes en la atmósfera, Universidad Politécnica de Valencia, Valencia, 2000  
M.R.Estrela i M.M.Millán, Manual práctico de introducción a la meteorología, CEAM, 1994.  
M. Grimalt, J. Martin-Vide i F.Mauri et. al., Els núvols, Edicions El Mèdol, 1995  
J.T.Houghton et al. (ed.), Climate Change, Cambridge University Press, Cambridge, 1996.  
J.E.Llebot, El canvi climàtic, Rubes Editorial, Barcelona, 1998  
J.E.Llebot, Els fluids de la vida, Biblioteca Universitària n. 29, Ed. Proa. 1996  
J.E. Llebot El temps és boig? i 74 preguntes més sobre el canvi climàtic, Rubes editorial, Barcelona 2005

## Software

There is no specific software.

## Groups and Languages

Please note that this information is provisional until 30 November 2025. You can check it through this [link](#). To consult the language you will need to enter the CODE of the subject.

| Name                          | Group | Language | Semester        | Turn          |
|-------------------------------|-------|----------|-----------------|---------------|
| (PAUL) Classroom practices    | 1     | Catalan  | second semester | morning-mixed |
| (PAUL) Classroom practices    | 2     | Catalan  | second semester | morning-mixed |
| (PLAB) Practical laboratories | 1     | Catalan  | second semester | afternoon     |
| (PLAB) Practical laboratories | 2     | Catalan  | second semester | afternoon     |
| (PLAB) Practical laboratories | 3     | Catalan  | second semester | afternoon     |
| (PLAB) Practical laboratories | 4     | Catalan  | second semester | afternoon     |
| (TE) Theory                   | 1     | Catalan  | second semester | morning-mixed |