Universitat Autònoma de Barcelona

2020/2021

Meteorology and Climatology

Code: 102849
ECTS Credits: 6

Degree	Type	Year	Semester
2501915 Environmental Sciences	OB	3	2

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

Contact

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Use of Languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

Prerequisites

Students will need to have achieved the objectives of 1st year Physics. During the course meteorological and climatic issues will be developed using physical phenomena explained in this course assets.

Objectives and Contextualisation

The course pretends to be a quantitative and qualitative introduction to weather and climatology, in a simple way but, at the same time, rigorous. At the end of the course students should be able to understand different meteorological and climatic phenomena and scenarios, the feasibility of the weather and climatic forecasts and their consequences.

The goal of this course is to give to environmental professionals basic ideas of how the atmosphere works and how affects human activities. Meteorological risks and impacts should be considered in environmental impact studies of projects, programs and activities, and the environmental experts should be aware of its causes and consequences. Also due to the fact each time the urban population is growing up and up issues related with air quality analysis and assessment in urban environments are of capital relevance for environmental studies and in consequence, are studied in the course.

In another context it is needed that the experts in environmental issues get ready to understand and manage actions to deal with extreme meteorological and climatic events, to develop and adopt measures of prevention and / or adaptation.

Competences

- Adequately convey information verbally, written and graphic, including the use of new communication and information technologies.
- Analyze and use information critically.
- Collect, analyze and represent data and observations, both qualitative and quantitative, using secure adequate classroom, field and laboratory techniques
- Demonstrate adequate knowledge and use the most relevant environmental tools and concepts of biology, geology, chemistry, physics and chemical engineering.
- Demonstrate concern for quality and praxis.
- Demonstrate initiative and adapt to new situations and problems.
- Learn and apply in practice the knowledge acquired and to solve problems.
- Quickly apply the knowledge and skills in the various fields involved in environmental issues, providing innovative proposals.
- Teaming developing personal values regarding social skills and teamwork.
- Work autonomously

Learning Outcomes

1. Adequately convey information verbally, written and graphic, including the use of new communication and information technologies.
2. Analyze and use information critically.
3. Define the fundamentals of synoptic climatology.
4. Demonstrate concern for quality and praxis.
5. Demonstrate initiative and adapt to new situations and problems.
6. Describe the main features of atmospheric thermodynamics.
7. Explain the internal and external causes of climate change.
8. Identify the physical processes in the surrounding environment and evaluate them properly and originally.
9. Learn and apply in practice the knowledge acquired and to solve problems.
10. Observe, recognize, analyze, measure, and so properly and safely represent physical processes applied to environmental sciences.
11. Teaming developing personal values regarding social skills and teamwork.
12. Work autonomously

Content

1. A brief vision of the atmosphere

    1. Composition and origin
    2. Temperature distribution
    3. The climate system:observational network. Energy balances
    4. Changes of climate: Milankovitch variation. Solar activity.
    5. Greenhouse warming. Thermohaline circulation

2. Atmospheric thermodynamics

    1. Dry and moist air
    2. Hydrostatic equilibrium. Vertical profiles
    3. Adiabatic and pseudoadiabatic processes
    4. Vertical stability. Atmospheric soundings

3. Radiation

    1. Planck, Stefan Boltzmann and Wien laws
    2. Absorption, emission and diffusion of radiation
    3. General radiative balances. Radiative models

4. Atmpspheric dynamics

1. Forces in the dynamic description of the atmosphere
2. Geostrophic model. Gradient and thermal winds
3. Baroclinic waves. Vorticity
4. Air masses and fronts
5. Thunderstoms and weather forecasting

5. Aerosols

1. Natural and non natural particles in the atmosphere
2. Nucleation, condensation, coagulation, diffusion and sedimentation of atmospheric particles
3. Homogeneous and heterogeneous condensation
4. Clouds and precipitation.
5. Air quality

6. Pollution dispersion in the atmosphere

1. Fick's law
2. Diffusion versus advection
3. Gaussian model
4. Pollution disperssion versus atspheric profiles.

Methodology

The course will be given entirely in Catalan. All the course material (slide presentations, problems, homework and exams) will be distributed in Catalan. Therefore, exams and problems in Spanish and English will be accepted.

This course will consist of theory lectures (3 hours per week) and solving practical problems (1 hour per week). Problem lists will be given to be solved. The solutions of the problems will be discussed in the problem classes.

The course also includes a practical work that students could do in small groups. The objective of the practice is to train student scientific communication skills.

The students will have to prepare, at least, two written exams: a mid term exam, a second exam at the end of the course. Both exams, if it is needed could be re-taken once.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Practical lectures	10	0.4	2, 3, 5, 4, 6, 7, 8, 10
Practices	8	0.32	9, 3, 6, 7, 8, 10, 11
Theoretical lectures	34	1.36	3, 6, 7, 8, 10
Type: Autonomous			
Practical work	16	0.64	3, 6, 7, 8, 10, 12
Study and reading texts	53	2.12	
Written work	15	0.6	3, 5, 6, 7, 8, 10, 12, 11

Assessment

Ther will be two compulsory exams. Students should get in each one, at least, a mark of 3,5 (over 10). If they fail, there is a resit exam at the end of the regular course.

In each exam students shouls respond some test questions and solve two practical problems. Those student that do not get the minimum mark will have the opportunity for a resit exam only if they have atended at least to 2/3 of the evaluation tests of the course.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Exam: first part	40	2	0.08	2, 9, 3, 6, 7, 8, 10, 1, 12
Exam: second part	40	2	0.08	2, 9, 3, 4, 6, 7, 8, 10, 1, 12
Written work and/or practical molde	20	10	0.4	5, 11

Bibliography

Reference books

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